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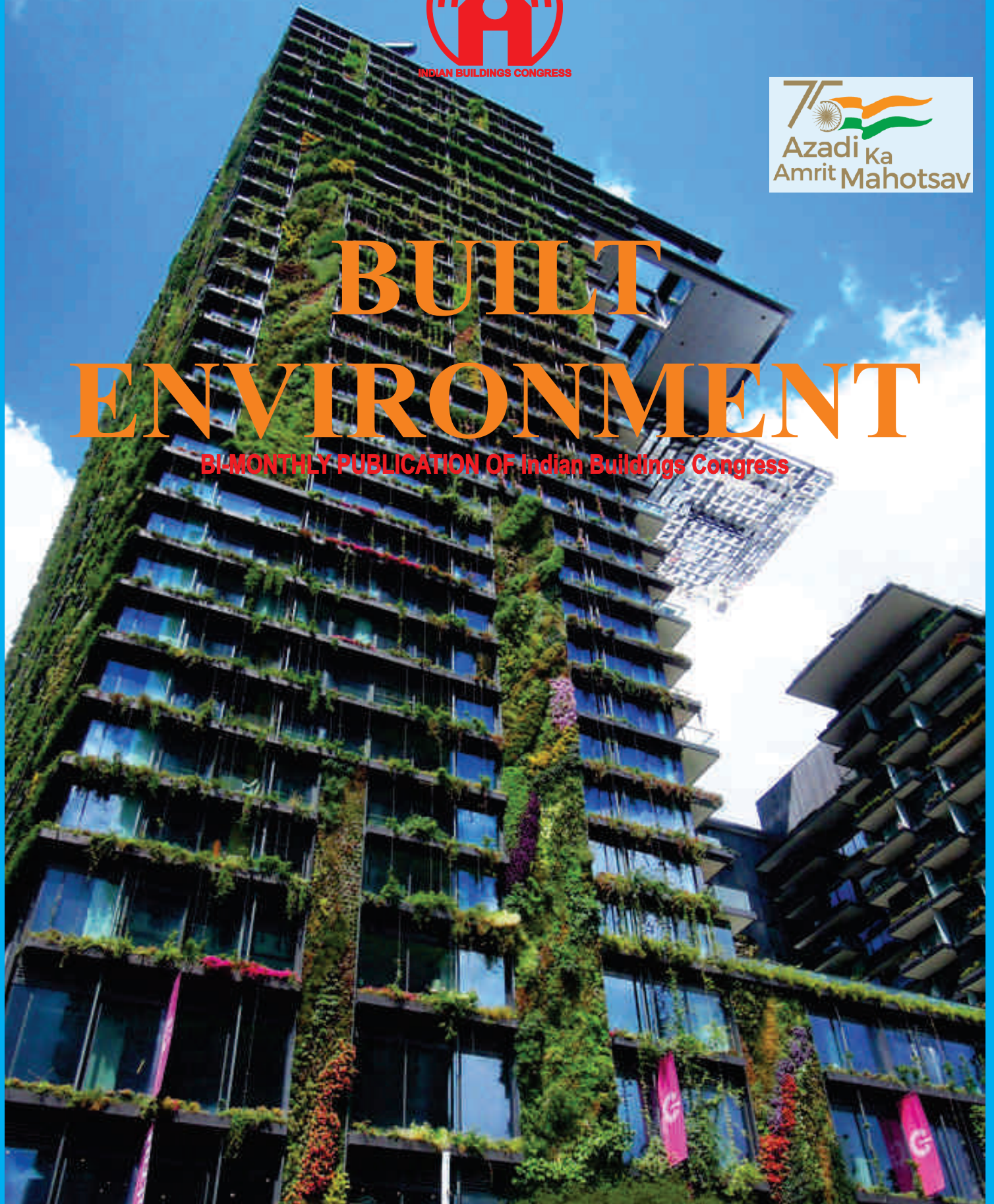


September-October, 2021



# BUILT ENVIRONMENT

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## From President's Desk



The climatic change has become a global concern over the last few decades. Besides, these climatic changes affect life on the earth in various ways. Human beings due to their need and greed are involved in many activities that not only harm the environment but themselves too. Research on climate change has revealed that the earth's temperature is rising due to a phenomenon called the greenhouse effect. These climatic changes cause various adverse impact on the ecosystem and ecology. Due to these adverse changes, water level of ocean is rising, glaciers are melting fast, CO<sub>2</sub> in the air is increasing and a number of species of plants and animals have become extinct.

Human activities that harm the climate the most include deforestation, mining, extraction, processing, transportation using fossil fuel, industrial waste, construction and demolition waste, different type of pollution and many more as all these activities release greenhouse gases into the atmosphere.

In the process of development which has led to rapid increase in construction activities, we are exploiting the nature unabatedly without realising its consequences. All the development activities are damaging the environment and eco-system. We're slowly killing an entire planet. If we don't fix what we're losing, we won't have a home to live in. Our successors for whom we try our best to make a good future for, won't have a future in the first place.

We're experiencing extreme weather conditions and climate change that has caused frequent heat waves storms, hurricanes etc. Environmental pollution has caused multiple health ailments. All of these used to be rare issues, or at the very least they used to be less of a common issue. Science has given proven solution to all these problems. The only thing we need to do now is to raise awareness of these problems, and enforce the solutions by replacing all our problematic technologies with less problematic and more efficient ones. Sustainable development keeping use of non-renewable resources and related activities within the limits of carrying capacity of the eco-systems, promotes the well being of both people and eco-system.

The duty is therefore cast upon the construction industry to encourage use of construction materials with least embedded energy, use of prefabricated/ pre-engineered construction technologies, onsite generation of energy from renewable resources like sun, wind, waves etc, and to adopt the principle of 3Rs i.e Reduce, Reuse and Recycle. In totality our aim is to ensure that the infrastructure construction industry is armed with new age capabilities, innovative technologies in construction of buildings and infrastructure for contributing in containment of climate change and greenhouse gases effect. In line with its vision of built environment, IBC is working in this direction to spread the awareness among all stake holders.

(Pradeep Mittal)

### 98<sup>th</sup> Governing Council Meeting of IBC held at Indore on 4<sup>th</sup> September, 2021

98<sup>th</sup> Governing Council meeting of IBC was held at Indore on 4<sup>th</sup> September, 2021.

To mark the occasion, a technical seminar on "Making clean Indore and making Statue of Unity" was also organised by the Indian Buildings Congress before holding GC meeting in Hotel Pride at Indore on 4<sup>th</sup> September, 2021.

Besides the Chief Guest Shri Shankar Lalwani, Hon'ble Member of Parliament, the Seminar was attended by Shri O.P.Goel Founder President, IBC; Shri Manish Singh, IAS, District Collector, Indore; Smt. Pratibha Pal, IAS, Commissioner, Indore Municipal Corporation; Major Edmund Keen, Project Manager, Turner International; Shri Anant Kumar, Vice President, IBC; Shri Vijay Singh Verma, Vice President, IBC; Shri Chinmoy Debnath, Vice President, IBC; Shri Hitendra Mehta, Chairman IBC Indore Chapter; Shri H.P.Gupta, Honorary Secretary, IBC and many EC & G.C.Members; besides other guests.

The Seminar was inaugurated by Shri Shankar Lalwani, Hon'ble Member of Parliament. The Hon'ble MP, informed about the journey of transformation of the Indore city from the dirty city to the cleanest city of the country and among first three cleanest cities of the world.

Shri Manish Singh the DM and Collector, Indore who earlier happened to be Municipal Commissioner also of Indore Municipal Corporation during 2015 -16 said that Indore could achieve the tag of cleanest city of the country because of support from all classes of the society including peoples representative, media and judiciary.

Smt. Pratibha Pal, Commissioner, informed that all the guidelines of Swatch Bharat Mission were followed. They took new task every year. Public movement for solid waste, three R's principle, digitalisation, river cleaning and sustainable sanitation were the main points which led them to success on every front.

Shri Pradeep Mittal, President, IBC expressed the necessity for changing the general public attitude of 'Sab Chalta Hai'. Shri O.P.Goel, founder President, IBC and former, DG(W), CPWD while narrating the journey of IBC informed how the IBC spread awareness among all stake holders. Shri Anant Kumar, Vice President, IBC informed

that IBC has been getting inspiration from Indore and other such cleaner cities in its drive towards creating built environment. Shri Hitendra Mehta, Chairman, Indore Chapter of IBC informed that the Indore chapter will help the country in this direction for making cities cleaner.

In the Seminar on making Statue of Unity, Major Edmund Keen, Project Manager, Turner International informed the detailed planning starting from creation of four separate and independent zones for various activities of casting, foundation, manufacturing and assembling of individual panels. The casting of bronze panel of statue was done in China and assembling the same and working on 600 feet height was a big challenge in making the statue. Working with 4500 workers and 450 supervisors to achieve the target was a great experience in itself.

After the conclusion of technical Seminar, 98<sup>th</sup> Governing Council meeting of IBC was held at Indore on 4<sup>th</sup> September, 2021. In the meeting, GC discussed the agenda items and took decision on various points.

#### Activities of State/Local Centres

##### Kota Local IBC Centre

आई.बी.सी. के राष्ट्रीय अध्यक्ष का कोटा प्रवास एवं लोकल सेन्टर की एग्जीक्यूटिव कमेटी की मीटिंग

श्री प्रदीप मित्तल, राष्ट्रीय अध्यक्ष, इंडियन बिल्डिंग कांग्रेस के 2 अक्टूबर, 2021 को कोटा आगमन पर, इंडियन बिल्डिंग्स कांग्रेस कोटा लोकल सेन्टर की एग्जीक्यूटिव कमेटी के सदस्यों द्वारा हार्दिक स्वागत किया गया। इस अवसर पर श्री प्रदीप मित्तल जी की अध्यक्षता में इंडियन बिल्डिंग्स कांग्रेस कोटा लोकल सेन्टर की एग्जीक्यूटिव कमेटी की मीटिंग का आयोजन दिनांक 02 अक्टूबर, 2021 को किया गया जिस में कोटा लोकल सेन्टर की गतिविधियों एवं शक्ति को बढ़ाने के लिए विचार एवं सुझावों पर मंथन किया। मीटिंग में श्री प्रदीप मित्तल जी द्वारा बहुत महत्वपूर्ण सुझाव दिए गए।

जिसमें मुख्य सुझाव निम्न है: -

“देशव्यापी स्वच्छता अभियान को गति प्रदान करने के लिए इंडियन बिल्डिंग्स कांग्रेस द्वारा संगोष्ठी का आयोजन”



“निर्माण के विभिन्न क्षेत्रों में योगदान देने वाले व्यक्तियों, संस्थाओं के साथ इंडियन बिल्डिंग्स कांग्रेस द्वारा विशेष सहयोग प्रदान कर सदस्यों के रूप में जोड़ना”

“स्थानीय स्वायत्त संस्थाओं के साथ मिलकर विकास व निर्माण कार्यों के लिए इंडियन बिल्डिंग्स कांग्रेस कोटा लोकल सेन्टर किस तरह उनकी आवश्यकताओं के अनुसार योगदान दे सकता है पर चर्चा करना”



स्वागत भाषण कोटा लोकल सेन्टर के चेयरमैन श्री पी.के. जैन द्वारा व अन्त में कोटा लोकल सेन्टर के सचिव श्री आर.पी. शर्मा द्वारा सभी को धन्यवाद दिया। इस मिटींग में कोटा चेप्टर के विशिष्ट सदस्य श्री धीरेन्द्र माथुर, श्री बी.पी.सुनेजा, श्री एम.एल.कलवार, श्री बी.एल. मालव, श्री सुनिल गर्ग, श्री आर.सी.गौड़, श्री एन.एस.

पुरावत, श्री विजय कुमार जैन, आदि उपस्थित रहे।

## इंडियन बिल्डिंग्स कांग्रेस कोटा लोकल सेन्टर द्वारा निःशुल्क योग शिविर का आयोजन

दिनांक 4 जून से 21 जून, 2021 तक कोटा लोकल सेन्टर द्वारा जूम ऐप के माध्यम से योग शिविर लगाया गया।

इसमें योगा फ्रॉम हार्ट में इंजी. मनीश जैन (Yoga Teacher & Evaluator, Yoga Protocol Instructor, Verified by YCB, Under Ministry of Ayush) द्वारा अलग अलग तरह से 18 दिनों तक योगाभ्यास करवाया गया। योगाभ्यास बहुत ही अच्छे, सरल व व्यवस्थित ढंग से करवाया गया। इंजी. मनीश जैन कोटा लोकल चेप्टर के कार्यकारिणी सदस्य भी हैं।

शिविर में अध्यक्ष श्री पदम जैन, सेक्रेटरी श्री आर. पी. शर्मा एवं अन्य सदस्यों के अलावा 100 से ज्यादा सदस्यों द्वारा रजिस्ट्रेशन करवाया गया। शिविर का उद्देश्य अपने शरीर को स्वस्थ बनाए रखना, इम्युनिटी सिस्टम



को बढ़ाना, मानसिक तनाव को कम कर अवसाद से बाहर निकलना था।

योगाभ्यास की शुरुआत प्रार्थना से कर, शरीर और मन में सामंजस्य, विभिन्न तरह के आसन, कपालभारति, नाडी-शोधन, ओम् मैडिटेशन कराया गया। योगाभ्यास का समापन संकल्प एवं प्रार्थना द्वारा किया गया। इंजी. मनीश जैन ने बताया कि हम लोग किस तरह से अपने शरीर के Respiratory System, Circular System, Digestive System को Improve कर सकते हैं।

## Chhattisgarh State Centre-Raipur Inauguration of office of IBC, Chhattisgarh State Centre Raipur



The office of Indian Buildings Congress, Chhattisgarh State Center Raipur at National Institute of Technology Campus, Golden Tower Raipur was inaugurated on 19<sup>th</sup> October 2021 by Shri Pradeep Mittal, President Indian Buildings Congress and Sh. O.P. Goel, Founder President Indian Buildings Congress in the presence of National

Executive Committee Members of Indian Buildings Congress, Shri Shailendra Sharma, Chairman Indian Buildings Congress, Chhattisgarh State Center and other office bearers of Chhattisgarh State Centre and members of IBC. The office premises consist of chairman cabin, a conference hall of 50 + participants, space for library and reception area.

### Seminar on Sustainable Development Goals, through shared vision for a better world

Indian Buildings Congress Chhattisgarh State Center (IBC-CSC), Raipur Organised a seminar on "Sustainable Development Goals, through shared Vision for better World" in association with Bureau of Indian Standards (BIS), Chhattisgarh Renewable Energy Development Agency (CREDA), Development of front and climate, ASSOCHAM-GEM (CG Chapter) on 20<sup>th</sup> October 21 at 10:30 am at Hotel Grand Imperia, Raipur. The panelist Shri Rakesh Chaturvedi, IFS, PCCF, Government of Chhattisgarh; Shri V. Gopinath, Head, BIS, Raipur; Shri Pamlay R. Dhankar, National Chairman, ASSOCHAM-GEM; Shri Sanjeev Jain, Chief Engineer, CREDA and Dr. S.K. Ambart, Joint Director, NIBSM, Raipur delivered their talk in the Seminar.





Sh. Pradeep Mittal, President IBC in his Opening Address while welcoming all present in the seminar emphasized the importance of Sustainable Development Goals (SDGs), briefed about 17 SDGs adopted by UN and informed that 10 out of 17 SDGs contribute towards built environment.

Shri V. Gopinath, Head, BIS, Raipur in his talk informed about world standard day importance and also about ISO, IEC & ITU compliances. Shri Rakesh Chaturvedi in his presentation elaborated the initiatives taken by Government of Chhattisgarh at very basic level of sustainable development by promoting & announcing the scheme of Narwa, Ghurwa, Badi which promotes the well being of the people and the climate.

Shri Rakesh Chaturvedi said "it is the most appropriate time to take care of our environment & forest for overall sustainable development". Shri Pankaj R. Dhankar, National Chairman, ASSOCHAM-GEM, in his presentation appreciated the efforts of IBC and CSC, for organizing the seminar on most relevant topics of SDGs.

Shri Sanjeev Jain, Chief Engineer, CREDA informed the initiatives taken by CREDA for the growth of energy in the State of Chhattisgarh. He further said "the sustainable growth is best achieved by switching to Solar, Hydro and Wind Energy rather than by attempting to produce the energy by conventional thermal energy."

Dr. S.K. Ambart, Joint Director, NIBSM, Raipur in the talk mentioned the importance of standards on sustainable agriculture and emphasized the importance of horticulture, and cash crops for achieving sustainability in the rural areas.

Shri O.P. Goel, Founder president Indian Buildings Congress blessed as a guest of honors while thanking the organizers for conducting seminar on such a relevant topic of the need to conserve the climate for achieving the sustainable development goals.

Shri Salil Rai Shrivastawa, OSD, Department of Housing of environment in his concluding remarks, summed up the issues brought out by various speakers. The seminar was well attended by over 200 participants.

At the end of seminar, Sh. Shailendra Sharma, Chairman, IBC-CSC presented the vote of thanks.

## Activity of IBC Chhattisgarh State Centre Raipur

IBC Foundation Day was celebrated on 01/09/2021 by organizing Webinar on "Introduction of Self Compacting Concrete". Dr. Shirish V. Deo, Associates Professor, NIT, Raipur was the main speaker in the Webinar. The webinar was attended by over 100 participants.

## Jharkhand State IBC Centre – Ranchi

### Annual General Meeting of IBC Jharkhand State Centre, Ranchi

In a meeting held on 8th Nov., 2021 at IEI Hall Ranchi, AGM of IBC Jharkhand State Centre was held. The meeting has been considered as AGM since notice was circulated to all and a committee consisting of following office bearers has been formed and the next committee will be formed in the next AGM to be held in April 2022.

S.No.	Name	Portfolio
1.	Sh. L.K. Tibrewal	Chairman
2.	Shri Sanjoy Singh CE, Bldg., Sh.C.K. Raipat	Vice Chairman
3.	Sh. B.P. Agarwal	Secretary
4.	Sh. Ajay Bahadur, Sh. Pramode Kr. Nirala	Asstt. Secretary
5.	Sh.S.K.Sultania	Treasurer
6.	Sh. Vinod Kumar	Asstt. Treasurer
7.	Sh. Naseem Ali, Sh. Kanhai Prasad, Sh. Rohit Agarwal,	Executive Member

Sh. C. Debnath, Vice President, IBC briefed about IBC & its activities. In the meeting it was decided to approach the Secretary PWD Jharkhand for providing two rooms in the office complex of CE, PWD (Bldg.) Ranchi as office of IBC Jharkhand Centre. Till getting the regular accommodation, the office of the Chief Engineer PWD (Bldg.) Ranchi will be considered for correspondence address of IBC Jharkhand Centre.

Special drive will be given for membership of IBC. Technical programme will be organized on various subject in which HQ will be requested to send experts. Initially programme will be organized on construction materials & specification.

Joint venture programme between IBC, Tripura Centre & Jharkhand Centre will be organized in Jan. & Feb. 2022 on Specification etc & recommendation will be framed after both programme at Ranchi in Jan 2022 and at Agartala in Feb. 2022. Shri C. Debnath, Vice President spoke to Shri Sanjay Pant, Head, Civil Engg. Dept., BIS, New Delhi who agreed to be associated with this programme as Co-organisers.

It was assured by the new committee that now onwards the centre will work properly maintaining all system schedule, CE PWD (Bldg.) also assured to extend all possible support in this regard.

## Assam State IBC Centre - Guwahati

### Special General Meeting of IBC, Assam Centre held on 9th Nov., 2021

A special General Meeting of Indian Buildings Congress, Assam Centre was held on 9th November, 2021 at 06.00 PM at the Hall of the Institution of Engineers (India), Assam State Centre at Guwahati at the initiation of Sh. C. Debnath, Vice President, IBC. At the outset, Sh Pulak Sarmah, Secretary, IBC, Assam Centre welcomed all and detailed about the present position of IBC, Assam Centre. Thereafter that, Sh.. C. Debnath, Vice President, IBC briefed about the IBC and its activities and he requested for activating the IBC Assam State Centre which was set up long back. Accordingly, communication was made to the Chief Engineer, PWD (Building), Chief Engineer, CPWD, Chief Engineer, MES for better involvement of their Department in the activity of Assam State Centre alongwith Builders / Contractors. He also requested members to hold regular meetings and also to organize some technical activities alongwith initiating special

membership drive. The Secretary, IBC, Assam State Centre will take up with Chief Engineer, PWD (Building) and Addl. Chief Engineer, PWD (Building), for allotment of 2 (two) rooms in the name of IBC, Assam State Centre as Office of IBC. Till regular accommodation is organized, the address of Office of the Chief Engineer, PWD (Building), Govt. of Assam at Guwahati may be used for correspondence of IBC, Assam State Centre.

The committee has been reconstituted with Sh. Jyotish Kumar Sharmah, ML/ 5616 and Sh. Pulak Sarmah, ML/8571 as Chairman and Secretary respectively. The 11 (eleven) members Executive Committee is detailed below.

S.No.	Name	Portfolio
1	Sh. Jyotish Kr. Sarmah	Chairman
2	Sh. Dilip Deka, Sh C.R.Baid	Vice Chairman
4	Sh. Pulak Sarmah	Secretary
5	Sh. Sailadip Das, Sh Bimal Sen Deka	Asstt. Secretary
7	Sh. Kumud Goswami	Treasurer
8	Sh. Mridul Bharali	Asstt. Treasurer
9	Sh.Konjengbam Darunkumar Singh, Sh. Kailash Das, Sh. Afzal Karim	Exec.Members

## Meghalaya State IBC Centre- Shillong

### Formation of IBC Meghalaya State Centre, Shillong

On 10<sup>th</sup> Nov., 2021 with the efforts of Shri C. Debnath, Vice President, IBC, Meghalaya State Centre was established which has started functioning from





the office of Chief Engineer, PWD (Building), Govt. of Meghalaya, Lower Lachumiere, Shillong. Regular office accommodation for the centre will be arranged in due course.

An adhoc committee of the following has been formed which will continue till recognition received from IBC HQ after achieving the target no. of membership.

S.No.	Name	Portfolio
1.	Sh. T.G.Nengnong, Secretary PWD	Chairman
2.	Sh. J.V.L. Lyngdoh, CE, PWD (Bldg.), Sh. L.D.Suchiang, CE, PWD (Road)	Vice Chairman
3.	Sh. D.Mawroh, Dy.CE, PWD (Road)	Secretary
4.	Sh. A.K. Singh, EE, CPWD, Sh. M. Kalita, EE, NEC	Asstt. Secretary
5.	Sh. M. Nongpluh, Under Secy., (W) PWD	Treasurer

6.Sh. K.Khonglah, EE, PHE

Asstt. Treasurer

7.Sh. R. Sutnga, EE, PWD (Bldg.),  
Sh. Chonseng Sangma,  
SE, PWD (Road), Sh Paia Lhuid, EE, PWD(Bldg.)

Exec. Members

The Committee meeting will be held once in a month. Secretary PWD, CE PWD (Bldg.), CE PWD (Road), CE PW(S&D). Other Engineers of Bldg. & Roads of Meghalaya, Engineers from CPWD MES, NEC were Present in the meeting. Shri C. Debnath Vice President, IBC briefed about IBC and its activities.

Secretary PWD also assured that before next AGM scheduled in April 2022 and the membership number will cross 100. Accordingly, wing wise target will be fixed. Effort will be made to involve Builders /Contractors, MES, CPWD, NIT.

## Gujarat State IBC Centre-Gandhinagar

### Formation of IBC Gujarat State Centre, Gandhinagar



With the efforts of Shri C. Debnath, Vice President, Gujarat State Centre of IBC was established on 13<sup>th</sup> Nov., 2021.

An adhoc committee consisting of following has been formed which will continue till next AGM in April, 2022.

S.No.	Name	Portfolio
1.	Sh. S.B. Vasava, Secretary, R&B	Chairman
2.	Brig. G. Muthukumar, CE, (Air force) MES, Sh.P.R.Patel C.E. & Addl.Secy., R&B	Vice Chairman
3.	Sh. Girishkumar H. Shah Prop. Singhai Techno Arch Consultancy	Secretary
4.	Sh. P.J. Mishra, SE, R&B, Prof.(Dr.)G.P.Vadodaria, Dean,(Engg.) Gujarat Technological University	Asstt. Secretary
5.	Sh.Purushottam P. Doijode, Jt. Dir. O/o the EE (Air force) MES	Treasurer
6.	Sh. K.M. Rana, Jt. Dir.(Plg.) O/o the CE (Air force) MES	Asstt. Treasurer
7.	Ms. Prabha Jain, Dir. (Arch.) O/o the CE (Air force) MES, Dr. Vikram Patel, Prof. Civil & Infrastructure, Adani Institute of Infrastructure Engg., Dr. Samir Patel, HoD, Civil Engg. Dept. Indus University.	Executive Members

Secretary R&B; CE, R&B; CE, MES; Professor; Consultant and Engineers were present in the meeting. Shri C. Debnath, Vice President, IBC briefed about IBC and its activities.

In the meeting, it was decided to write to Secretary, R &B, Govt. of Gujarat for providing two rooms in the office complex of CE, R&B Gandhinagar as office of IBC Gujarat Centre. Till getting the regular accommodation for IBC office, the office of the Chief Engineer & Addl. Secretary R &B dept. of Govt. of Gujarat, 14/2 Sardar Bhavan, New Sachivalaya, Gandhinagar-382010 will be the correspondence address of IBC Gujarat, Centre. The committee meeting will be held once in a month. It was also discussed to hold the committee meeting by rotation at office of PWD, MES and Technical Institutes. The quarterly report will be sent to HQ by the Committee. Technical programme will be organized on various subject.

## National News-

### Madhya Pradesh gets Asia's longest high-speed track for automotive testing

Asia's longest high-speed track for automotive testing near Indore in Madhya Pradesh was virtually inaugurated by heavy industries & public enterprises minister Prakash Javadekar on 29<sup>th</sup> June, 2021.

The four-lane track measures 11.3 kilometres, making it the fifth-largest in the world as well. The oval-shaped National Automotive Test Tracks (NATRAX) facility is 16 metres wide and spread on 2,960 acres of land in Pithampur, located 50 km from Indore.

After the inauguration, Javadekar said it was a proud moment for India and a key initiative in realising Prime Minister Narendra Modi's vision of Aatmanirbhar Bharat. "High-Speed Track is the heart of any proving ground for the auto sector", he later tweeted.

It will be used for automotive and component testing of the maximum speed capabilities of automobiles, including high-end cars. It can test up to 250 kmph of neutral speed and up to 375 kmph of maximum speed on curbs with no limit on the straight patch. Moreover, the track has no longitudinal slope, which helps in improving the accuracy of the performance measurement.

NATRAX offers 14 different types of testing tracks, including braking, handling, fatigue, comfort, gradient, and sustainability track, with state-of-the-art test equipment. The new facility can also be used for commercial events like product launches and racing.

The high-speed track would carry out development and homologation tests for all kinds of vehicles. Now the original equipment manufacturers (OEMs) will be able to perform a wide variety of automotive tests — like coast down, brake, speedometer calibration, constant speed fuel consumption, noise, vibration measurement, and mileage accumulation among others — on one track.

According to Financial Express, the new track is also open to having vehicles from other countries for getting evaluated.

## Watermelon Seeds an eco-friendly and cost-effective way of strengthening and crack healing of concrete

Due to tremendous increase in demand of durable building materials, there is requirement of environmental friendly, economical and efficient techniques to augment the physico-mechanical properties of cementitious materials.

Researchers at Visvesvaraya National Institute of Technology (VNIT), in their innovative research work, have proved that bio cementation using watermelon seeds can strengthen and heal cementitious materials.

The researchers claim that bio cementation using watermelon seeds is the best environment-friendly and economically feasible approach to ameliorate strength of structures, and also a best solution for crack healing of structures. A patent has been granted by Indian patent Office to Dr. Latkar and team on this work. The principal investigator, Dr. Madhuwanti Latkar, Associate Professor, Department of Civil Engineering, VNIT is one of the leading researchers in India in the area of bio cementation.

She has published several research articles in many esteemed international journals and has also presented her work in various International and National Conferences. She also has four patents to her credit in this research area, granted by Indian Patent Office.

As per Dr. Latkar, "Watermelon seeds are magic beans when it comes to imparting strength to cementitious materials." The watermelon seeds are innately very rich in an enzyme called urease. This enzyme is the key player in the bio cementation process, causing strength enhancement of cementitious materials. Snigdha Bhutange, a research scholar working under Dr. Latkar's guidance has performed multiple experiments to establish statistical reliability of the work. The research is mentored by Dr. Tapan Chakrabarti, former Director, NEERI, Nagpur and former Chair Professor (MPCB), VNIT. Dr. Latkar reported around 22% increment in compressive strength and 19% reduction in water absorption, in seeds blended concrete specimens as compared to conventional concrete. The bio cemented concrete also qualified various durability tests, and in fact proved to be significantly more durable than conventional concrete.

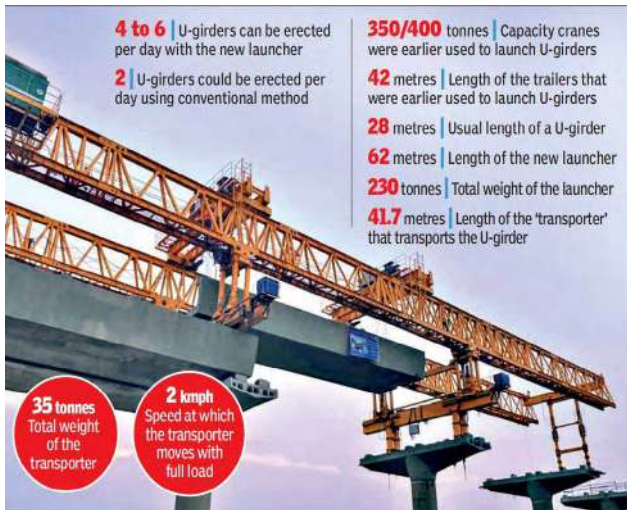
This technology has also been proved to be excellent in crack healing of concrete.

According to her, this is one of the best technologies to heal and strengthen concrete so far. Most of the bio cementation techniques involve use of ureolytic bacteria. However, factors such as involvement of bacteria, nutritional requirements to grow the bacteria and experts' supervision to successfully achieve the purpose may limit the on-site application of bio cementation using bacteria. This also may impart additional cost. Use of powdered seeds instead of bacteria as a source of urease, eliminates all these disadvantages. It reduces overall cost of the process, as it does not require special supervision or maintenance like that required for ureolytic bacteria. Storage and maintenance of seeds is much easier than that of bacteria, thus making the process practicable. Watermelon seeds which are of inferior quality, and regarded as waste material can be effectively used for bio cementation purpose to make the process practicable and economical. Thus, use of watermelon seeds for bio cementation overcomes all the drawbacks of other bio cementation processes which use bacteria. Dr Latkar explained, laboratory scale studies have shown excellent results for both strength enhancement as well as crack healing of concrete using this technology. On-field validation of this technology is initiated. Once the field applicability of this technology is established, this environment friendly technique would certainly prove to be a major tool in achieving sustainable development, added Dr Latkar.

## New Technology to save time and cost to put Phase-IV corridors of Delhi Metro on the Fast Track

Delhi Metro Rail Corporation (DMRC) has introduced the latest technology for construction of Phase-IV corridor, which will result in faster construction of elevated sections with a minimum blockage of road space or traffic movement.

DMRC introduced a specially designed "62 meters long launcher attached with a 41.7 meters long transporter" on 5th July, 2021 for the launch of U-girders on its elevated section of the Phase-IV Janakpuri West - RK Ashram Marg corridor. Total weight of the launcher is 230 tonnes.



**Fig. 62 Metres Long Launcher**

Longer than the conventional box girders, U-girders are “pre-tensioned” and tracks can be laid on these immediately. The length of U-girders is usually 28 metres which is difficult to transport from the casting yards through the city traffic to construction sites, apart from requiring precision in “launching” them.

In a congested urban city like Delhi, it is challenging to find adequate space for positioning heavy capacity cranes, which occupy a lot of space. In addition, transporting U-girders of 28 meter length with such long trailers is also a herculean task as roads in NCR are either too congested or has massive traffic volumes even during the night. These limitations often discouraged the use of ‘U’ girders in construction inspite of the fact they are the most suitable structures for viaducts in terms of cost and time.

In earlier phases only 2 U-girders could be launched in a day using conventional method with the help of 350-400 tonnes capacity cranes placed at each pillar location, where these were transported with the help of 42 meter-long trailers.

This new fully electric launcher with transporter however has higher output compared with conventional launchers or cranes. The transporter carries the U-girders from one designated point and moves forward on rails laid on already erected U-girders from the feeding point to the launcher. As a result, the U-girders are transported on trailers only up to the feeding point identified at a suitable location and not for the entire stretch of the section. With the help of new launcher, now 4 to 6 U-girders can be erected per day thereby speeding up the progress of work.

This is the first time such a technology is being used in India, with ‘launcher’ being made operational for construction of a 9.5km viaduct from Mukarba Chowk to Ashok Vihar.

## NTPC set to construct India’s largest Solar Power Park in Kutch

Kutch region in Gujarat, the largest salt desert in the country and host to two of India’s largest coal-fired power plants, will now add another feather to its cap.

State-run generation utility NTPC’s renewable energy arm will set up India’s single-largest solar photovoltaic project at Rann of Kutch at Khavada in Gujarat, the company said on 13<sup>th</sup> July, 2021.

A company statement said NTPC Renewable Energy Ltd (NTPC REL) has received the renewable energy ministry’s nod to build the project with a capacity of 4750 MW. NTPC REL will produce green hydrogen on a commercial scale from the park.

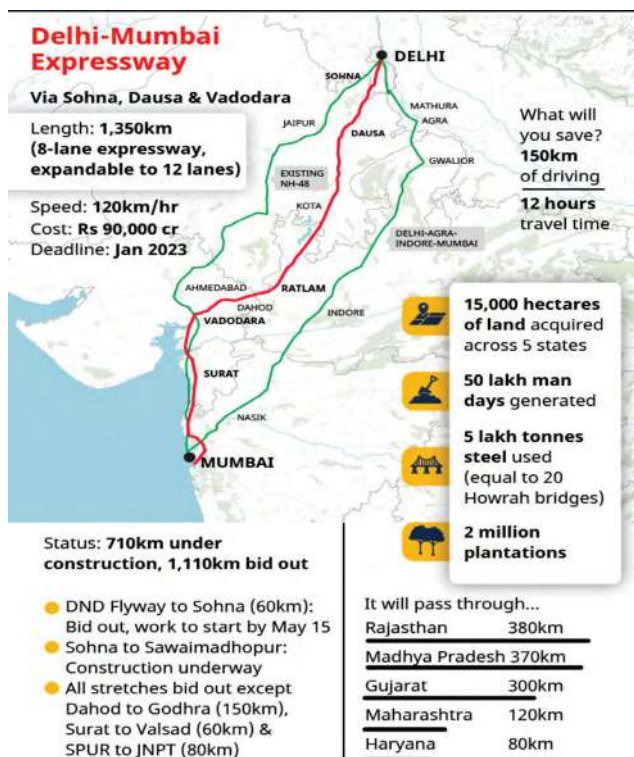


The solar project is part of the parent’s plan to transform itself from the country’s biggest coal burner into a green energy major. NTPC REL has plans to generate green hydrogen on a commercial scale from this park.

The NTPC project will be almost twice the capacity of the Bhadla solar park in Rajasthan, currently the largest single-location solar power project in the country. NTPC has a target of building 60 GW (gigawatts) renewable energy capacity by 2032.

## Drive from Delhi to Mumbai in Just 12 hours

Nation's longest 1,350-km Delhi-Mumbai 8-lane Expressway, the life line of country connecting the national capital with financial capital Mumbai which is under construction now will bring the 2 metros nearer by 12 hours, when it opens two years from now. It will also reduce the journey between two metros by 150Kms. The Rs. 90,000 Crores expressway will cut across five states- Haryana, Rajasthan, Madhya Pradesh, Gujrat and Maharashtra.



The eight-lane expressway has many firsts to its credit score. The total stretch can have six-foot partitions on each side to stop animals and pedestrians from getting into. Enough area has been left on both facet to allow enlargement to 12 lanes.

This would be the first expressway in Asia to have animal overpasses where it runs through wildlife sanctuaries. There will also be the nation's first eight-lane tunnel in Mukundra sanctuary to minimise the effect of traffic zipping fast at speed upto 120kmph.

Two million bushes and shrubs, watered with drip irrigation, will be planted alongside the entire stretch whereas some elements of the expressway will be lit

utilizing a mixture of energy provided from state grids and photo voltaic power.

NHAI is advertising it as a "green highway", and it'll rope in school children for a plantation drive alongside the route. A proposal to prioritise green fuel stations, including hydrogen fuel pumps, is beneath dialogue. The expressway will have wayside facilities like resorts, eating places, meals courts, ATMs, Vehicle charging facilities, gas stations, handicraft markets, shower rooms and dormitories at 93 locations. It will be the first expressway in the nation to have helipads for emergency and fully equipped trauma centres for accident victims. The expressway will have healthcare / small trauma care facility at every 100km, water harvesting at 2000 water recharge points one at every 500 meters, intelligent automated traffic management system, 5 animal overpasses and sound barriers. Single four lane concrete road paver will be used in the construction of expressway. There is a plan for one dedicated lane of electric highway.

The scale of the venture might be gauged from the truth that it is going to consume 5 lakh tonnes of steel and 35 lakh tonnes of cement besides 50 crore cubic metres of earth used to lay its foundation. It will also create 19,000 man-years of employment. The expressway is predicted to save greater than 320 million litres of gas yearly.

"All aspects of the project from alignment selection and pavement technology to the mode of contracts have been carefully thought through. The foremost challenge was acquisition of 15,000 hectares of land, which is 90% done," mentioned Manoj Kumar, NHAI member and in-charge of expressways.

Sh. Suresh Kumar, Venture Director of NHAI mentioned that they minimised the time for shifting high tension energy strains, environmental clearances, underground surveys, buying land, compensating farmers and finalising contracts for mining soil from adjoining fields to use in the expressway. The land acquisition was done in a record time. The compensation amount to farmers was transferred digitally and not a single cheque was issued to any individual. Officials are mapping monthly progress of expressway work with drones.

## Telangana's Ramappa temple gets UN Heritage Tag

The UNESCO on 25<sup>th</sup> July, 2021 has conferred the World Heritage inscription to the Telangana's 13th century historic Rudreswara Temple also known as Ramappa temple at Palampet in Mulugu district. Ramappa temple has become the first Unesco's world heritage site in Telangana.

The temple complexes of Kakatiyas have a distinct style, technology and decoration exhibiting the influence of the Kakatiyan sculptor. The Ramappa Temple is a manifestation of this and often stands as a testimonial to the Kakatiya creative genius.

The Rudreswara temple was constructed in 1213 AD during the reign of the Kakatiya empire by Recherla Rudra, a general of Kakatiya king Ganapati Deva. The temple is dedicated to Lord Shiva and worshiped by devotees. The presiding deity is Ramalingeswara Swamy. It is also known as the Ramappa temple, after the sculptor who executed the work in the temple for 40 years, an official release said.

The temple stands on a six feet high star-shaped platform with walls, pillars and ceilings adorned with intricate carvings that attest to the unique skill of the Kakatiyan sculptors.

Rudreswara (Ramappa) temple is a masterpiece of technology with the use of engineering innovation by creating floating bricks, sand-box foundations, material selection knowledge and ingenuity in stone sculpting as



Fig. : Rudreswara (Ramappa) Temple

a technological ensemble. The temple remained intact even after repeated wars, plunder and destruction during wars and natural disasters. There was a major earthquake during the 17th century which caused some damage. It survived the earthquake due to its 'sandbox technique' of laying foundation.

The roof (garbhalayam) of the temple is built with bricks, which are so light that they are able to float on water. Some bricks of the Ramappa temple were sent for examination to Dr. Habib Haman, Chief Chemist of Government Industrial Laboratory, Hyderabad, Division. In his report he mentioned: 'the material used to make the brick spongy was apparently saw-dust; and the weight of the specimens is 1/3 to 1/4 of the ordinary bricks of the same size.'

The main structure is in reddish sandstone, but the columns round the outside have large brackets of black basalt which is rich in iron, magnesium and silica. These are carved as mythical animals or female dancers or musicians, and are "the masterpieces of Kakatiya art, notable for their delicate carving, sensuous postures and elongated bodies and heads."

European merchants and travelers were mesmerised by the beauty of the temple and one such traveler Marco Polo, during his visit to the Kakatiya empire, had remarked that the temple was the "brightest star in the galaxy of medieval temples of the Deccan," the release added.

## NTPC starts India's largest floating Solar Plant in Andhra Pradesh

NTPC commissioned India's largest floating solar power plant of 25MW capacity on the reservoir at its Simhadri coal-fired power station in Vishakhapatnam (Andhra Pradesh) on 21<sup>st</sup> August 2021.

Floating solar power projects are seen as a game-changer in India's quest for building 450 GW (gigawatts) renewable energy capacity because of their inherent advantages over onland projects, which require large contiguous tracts of non-farming, non-forest land. Floating solar reduces temperature-related losses due to the cooling effect of water they float on, reduce evaporation rate of water bodies and have lower maintenance costs.

NTPC's floating solar installation covers 75 acres of the Simhadri reservoir's surface. It will produce power



**Fig.: India's Largest Floating Solar Power Plant of 25MW capacity**

from more than a lakh of solar PV modules for lighting 7,000 households. The project will annually save 46,000 tonnes of CO<sub>2</sub> emission and 1,364 million litres of water, which is adequate to meet the requirement of 6,700 households in a year. The floating solar plant is part of the coal-burning behemoth's plan to turn green by adding a 60 gigawatts renewable energy capacity by 2032.

NTPC is also building a 100 MW floating solar power plant on the reservoir of its Ramagundam thermal power station in Tamil Nadu. Green Energy Development Corporation of Odisha Ltd has tied up with NHPC to explore, plan and develop commercially feasible floating solar power projects with a total capacity of 500 MW in a phased manner on the state's reservoirs.

## Delhi gets first Smog Tower

A 20 meter tall structure, the first smog tower, of the country has been commissioned at Baba Kharak Singh Marg in the Connaught Place area of Delhi to improve the air quality. The tower will purify 1,000 cubic metres of air per second within a radius of around 1 km.

If the pilot project is successful, more smog towers will be installed. A study will be undertaken by experts to ascertain the effectiveness of the smog tower. A control room has been set up at the site to monitor the operations of the smog tower. Tata Projects Limited (TPL) built the smog tower with technical support from IIT-Bombay and IIT-Delhi, which will analyse its data. Based on the results,

the government will take a decision on installing more towers.

Spread in a area of 742 sqm, the tower is built at a cost of Rs 20 crore by the Delhi Government.

Concentrations of tiny deadly particles in New Delhi's air regularly exceed safe limits by up to 20 times, particularly in the winter when its 20 million people are enveloped in a noxious grey blanket of smog. Notably, Delhi is one of the most polluted cities across the country. The city witnesses a major fall in its air quality during winter.

A smog tower is basically a structure designed to work as a large-scale air purifier to curb air pollution particles. Forty giant fans on the 25-metre (82-foot) tower will pump 1,000 cubic metres of air per second through filters that halve the number of harmful particulates in a radius of one square kilometre (0.4 square miles), according to the engineers. The structure will suck polluted air from above and release clean air from below.

## Special features of Nagpur Metro

The Nagpur Metro's unique section -- with a metro train zipping through the fourth floor of a 20-storeyed commercial building, a first in India -- became operational on 10<sup>th</sup> Sept. 2021, running 1.6 kms between Sitabuldi-Zero Mile-Kasturchand Park.

The iconic corridor, incorporating unique architecture and design, has been constructed by the Maharashtra Metro Rail Corporation Ltd. (MahaMetro) and was



**The 1.6 km corridor in the Zero Mile Freedom Park station and 20-floor tall commercial tower is part of the upcoming 19 km long north-south metro rail**

inaugurated by Chief Minister Shri Uddhav Thackeray along with Union Ministers Shri Nitin Gadkari and Shri Hardeep Singh Puri in the presence of top officials.

The 1.6 km corridor in the Zero Mile Freedom Park station and 20-floor tall commercial tower is part of the upcoming 19 km long north-south metro rail that will be ready by the year-end.

It is part of the total 38-km long Nagpur Metro with another 19 kms coming up in the east-west directions, with barely a handful of such metro train passing through commercial or residential structures in the world, said a MahaMetro official.

Simultaneously, the 40,000-square feet 'Freedom Park' flanking the Zero Mile Freedom Park station was also inaugurated to mark the 75<sup>th</sup> anniversary of Independence.

Nagpur Metro is a green metro with two-thirds of its energy needs met from solar power, it will recycle 100 percent water used by it, plus harvest rainwater, bio-digesters are provided at all stations, making it a clean and sustainable project.

A traditional Rajput-style architecture has been used in designing the Kasturchand Park station including its facade, umbrellas, arcs, nets etc, making it a unique structure in the city.

The new corridor links the Vidhan Bhavan, Reserve Bank of India, Central Museum, Samvidhan Chowk and Morris College in Nagpur.

The Freedom Park has unique concepts like a Public Plaza and a long History Wall depicting major moments of the Indian Freedom Movement. An Indian Army's battle-wary T-55 tank which saw action in war is displayed on a pedestal, plus an amphitheatre, adequate seating and moving spaces for the people of the city and tourists.

## Solar Ironing Cart

14 year old Ms. Vinisha has designed a mobile ironing cart, with the solar panels on top and batteries to power an electric iron which uses solar panels to power a steam iron box. This can be powered by pre-charged batteries, electricity or diesel-powered generator in the absence of sunlight. The most important benefit of solar ironing cart is that it eliminates the need of coal for ironing. The vendors can move around and offer services at



doorstep for increasing their daily earning. For earning extra income, the ironing cart can be fitted with a coin-operated GSM PCO, USB charging points and mobile recharging.

It was nice to see the pollution levels drop during the COVID-19 lockdown, however as people started stepping out, cities started to get polluted again. Because of this, people continue to innovate in ways the impact of pollution could be reduced on our planet. And now, a 14-year-old girl has tried to reduce the impact of pollution that arises due to ironing.

We often use electric iron at our homes but people who do ironing for a living tend to stick to conventional ironing methods with the use of charcoal, and according to India's Department of Science and Technology, roughly 5 kilograms of charcoal gets consumed by each vendor on a daily basis. This equals a ton of pollution while causing a severe risk of lung issues for the one operating the iron.

The device needs five hours of bright sunlight to fully charge and each battery is capable of providing power for nearly six hours.

She added, "Today, solar energy is inevitable, particularly in sunny nations such as India, where some parts of the country get 300 days of sun a year. In the long run, my innovation will not only work out cheaper for vendors but help the environment too."

### शुद्धिपत्र

पत्रिका के अंक जुलाई-अगस्त 2021 में प्रकाशित "इंडियन बिल्डिंग्स काँग्रेस छत्तीसगढ़ राज्य केन्द्र रायपुर के कार्यालय भवन का स्वामित्वग्रहण" (पृष्ठ 16) के अंतर्गत परिच्छेद के अंतिम पंक्ति में दिनांक 01/02/2021 के स्थान पर 01/08/2021 पढ़ा जाए।



## आयुर्वेदिक पौधे हमदम बनकर घोटेंगे विलायती कीकर का दम

दिल्ली के सेंट्रल रिज पर स्थानीय प्रजातियों के लिए दुश्मन साबित हो रहे विलायती कीकर के जहर का उपचार अब आयुर्वेदिक पौधों की 'दवा' से किया जाएगा। ये पौधे कीकर को चारों तरफ से घेरकर कुछ इस तरह अपनी गिरफ्त में लेंगे कि उसे भोजन-पानी मिलना बंद हो जाएगा। ऐसे में धीरे-धीरे यह विलायती कीकर खुद ही दम तोड़ना शुरु कर देगा।

गौरतलब है कि सेंट्रल रिज पर 423 हेक्टेयर क्षेत्र में फैला विलायती कीकर स्थानीय प्रजाति के पेड़-पौधों के लिए जानलेवा साबित हो रहा है। इसके दुष्प्रभाव से स्थानीय प्रजातियों के पौधे पनप ही नहीं पाते। विलायती कीकर पानी का भी दुश्मन है। इसके असर से भूजल का स्तर भी गिरने लगता है। इसके फूल श्वास रोग पैदा करने वाला भी माना जाता है। इन्ही कारणों से विलायती कीकर की दिल्ली से समाप्त करने की रणनीति बनाई गई है। इस दिशा में पायलट प्रोजेक्ट के तौर पर पहला अभियान सेंट्रल रिज के वन क्षेत्र में शुरु किया जाना है। दिल्ली सरकार की ओर से इसके लिए एक छह सदस्यीय समिति का गठन भी कर दिया गया है, जो इस अभियान की पूरी निगरानी करेगी।

युं तो दिल्ली में विलायती कीकर 7,777 हेक्टेयर क्षेत्र में फैला हुआ है, लेकिन इसको समाप्त करने के लिए सबसे पहले सेंट्रल रिज का 423 हेक्टेयर क्षेत्र चुना गया है। दिल्ली सरकार ने पांच सालों में चरणबद्ध तरीके से यहां विलायती कीकर हटाकर स्थानीय प्रजाति के पौधे लगाने का लक्ष्य निर्धारित किया है। विलायती कीकर की तरह ही लैंडाना को भी समाप्त करने की योजना तैयार कर ली गई है।

कीकर के पौधे ऊपर से फैलकर धूप को नीचे आने से रोकते हैं। इससे स्थानीय प्रजाति के छोटे पौधों को धूप नहीं मिल पाती और वे विकसित भी नहीं हो पाते। इसीलिए कीकर को समाप्त करने के लिए उनके छतनार को खास तरह से काटा जाएगा, जिससे धूप नीचे तक आ सके और स्थानीय प्रजाति के पौधे पनप सकें। इसे कैनोपी ओपनिंग तकनीक कहते हैं। यमुना बायोडायवर्सिटी पार्क के प्रभारी डा. फैयाज ए खुदसर बताते हैं कि विलायती कीकर की रोकथाम में इन प्रजातियों की भूमिका बेहद कारगर साबित हुई है।

विलायती कीकर की रोकथाम के लिए चार लता नुमा आयुर्वेदिक पौधे खासतौर पर मददगार साबित

होंगे। इसमें गिलोय, खबर बेल, जल जमनी और हेम जीवन्ती शामिल है। ये लतरनुमा पौधे तेजी से बढ़ते हैं और पेड़ पर छ जाते हैं। इससे उसे पूरी धूप और हवा नहीं मिलती। नतीजा, वह पेड़ धीरे-धीरे खत्म होने लगते हैं। इसी तरह लैंडाना को समाप्त करने के लिए कट रुट स्टॉक प्रणाली का इस्तेमाल किया जाएगा।

## गंदे पानी को साफ करते समय बिजली भी बनाएगा यह इलेक्ट्रोड

रसायन युक्त और गंदगी वाला जल आज के समय में हमारे वातावरण की बड़ी समस्या है। यह जलजीवों और इंसान सभी के लिए बड़ा खतरा है। दो वैज्ञानिकों ने दो वर्ष के शोध के बाद ऐसा उपकरण तैयार किया है, जिससे पर्यावरण को दोहरा लाभ पहुंचेगा। उन्होंने ऐसा स्पेशल इलेक्ट्रोड तैयार किया है, जिसे गंदे पानी में डालने पर पानी साफ होगा और बिजली भी बनेगी। यह इलेक्ट्रोड गंदे पानी से तब तक बिजली बनाएगा, जब तक पानी साफ नहीं हो जाएगा।

इस विशेष तकनीक को विकसित करने के लिए भारत सरकार के विज्ञान और तकनीकी विभाग द्वारा वित्तीय सहायता दी गई है। एमिटी इंस्टीट्यूट आफ रिन्यूबल एंड आल्टरनेटिव एनर्जी के प्रोफेसर व विज्ञानी डा. वी.के. जैन और डा. सुमन ने मिलकर यह विशेष इलेक्ट्रोड तैयार करने का सफल प्रयोग किया है।

इस तकनीक को हाल ही में पुणे की डेक्कन वाटर ट्रीटमेंट प्राइवेट लिमिटेड कंपनी को दिया गया है। कंपनी इस प्रोजेक्ट को अपनाकर गंदे पानी से बिजली तैयार करेगी।

नालों के जरिये औद्योगिक क्षेत्रों का रसायन नदियों में गिरता है। रसायन के कारण कई नदियों के अस्तित्व तक पर संकट आ गया है। ऐसे रसायनयुक्त पानी को भी इलेक्ट्रोड पूरी तरह साफ कर देगा। डा. वी.के. जैन के मुताबिक दिल्ली में कालिंदी कुंज के पास यमुना के गंदे पानी में भी इस इलेक्ट्रोड का प्रयोग किया गया था। प्रयोग के तौर पर चार बीकर में चार इलेक्ट्रोड डालकर उन्हें आपस में तार के जरिये जोड़कर बिजली उत्पादन का सफल प्रयोग किया गया। साफ हुए पानी की गुणवत्ता पीने लायक तो नहीं है, लेकिन इसे सिंचाई व निर्माण कार्य में आसानी से प्रयोग किया जा सकता है। नदी व नाले में इलेक्ट्रोड का प्रयोग करने के लिए बीच-बीच में दीवार बनानी होगी, जिससे इलेक्ट्रोड पानी के बहाव

के साथ बहें नहीं और बहाव अधिक होने पर उसमें लगा तार टूट न जाए।

इस विशेष इलेक्ट्रोड की विशेषता है कि इसका प्रयोग घर, शौचालय, फैक्ट्री से निकलने वाले रसायनयुक्त और गंदे पानी को साफ करने के साथ बिजली उत्पादन में किया जा सकता है। इसका प्रयोग ट्रेन में भी किया जा सकता है। चार से आठ इलेक्ट्रोड का प्रयोग करके घर में एलइडी बल्ब को जलाया जा सकता है। इलेक्ट्रोड से बनने वाली बिजली से बैटरी को भी चार्ज किया जा सकता है।

एक इलेक्ट्रोड की लागत करीब 200 रुपये है। इलेक्ट्रोड को सीधे वायर से जोड़कर एलइडी लाइट जलाई जा सकती है। एक इलेक्ट्रोड से एक वोल्ट बिजली तैयार होगी। इलेक्ट्रोड की चेन बनाकर बड़े पैमाने पर बिजली बनाई जा सकती है। चार इलेक्ट्रोड के जरिये नौ वोल्ट की बैटरी चार्ज करने में सिर्फ बीस मिनट का समय लगता है।

### पर्यावरण के अनुकूल गोबर की ईंट से बनाएं घर, न जलेगा न गलेगा

सहज भरोसा नहीं होता कि सुखे गोबर में आग नहीं लगेगी। भविष्य में घर गोबर की ईंटों (गोक्रीट) से तैयार होंगे। लैब जांच में साबित हो गया है कि 350 डिग्री सेंटीग्रेड तापमान पर भी इन ईंटों का कुछ नहीं बिगड़ेगा। इन ईंटों में 80 फीसद गोबर है। बाकी 20 फीसद में चूना, मिट्टी, ग्वार, नींबू का रस और अन्य पदार्थ हैं।

बिना भट्टी और पानी के यह ईंटें दस से बारह दिनों में तैयार हो जा रही हैं। हरियाणा के सोनीपत स्थित माइक्रो इंजीनियरिंग एंड टेस्टिंग लैबोरेट्री से फरवरी महीने में कराई गई जांच काफी उत्साहवर्धक रही। एक मार्च 2021 को प्राप्त रिपोर्ट में पता चला कि 350 डिग्री सेंटीग्रेड पर भी गोबर की ईंट सुरक्षित है और उसमें आग नहीं लगेगी। गोधन के गोबर से तैयार ईंट की ताकत 11 एमपीए (मेगा पास्कल) तक है जो 70 से 80 साल तक खराब नहीं होती। कच्ची मिट्टी के घरों की ताकत औसतन 0.5 एमपीए होती है तो लाल ईंट की ताकत औसतन 14 एमपीए होती है। इसके साथ ही लाल ईंट की तरह यह तेजी से गर्म और ठंडी भी नहीं होती। ऐसे में गोबर की ईंट से घर में बिजली की खपत भी कम होगी। कीमत भी लाल ईंट से कम है।

हरियाणा के रोहतक निवासी रसायनशास्त्री डा. शिव दर्शन मलिक की खोज को रायपुर नगर निगम से जुड़ी संस्था 'पहल सेवा समिति' ने प्रयोग में लाना

शुरू कर दिया है। संतोषी नगर स्थित नगर निगम के गोठान में गोबर से ईंटों का उत्पादन शुरू हो गया है। वैज्ञानिक प्रविधि से तैयार ईंटों के लिए आधा दर्जन से अधिक ग्राहकों की मांग भी पहुंच चुकी है। डा. शिव दर्शन मलिक इन दिनों बीकानेर स्थित वैदिक प्लास्टर एवं गोक्रीट अनुसंधान केंद्र स्थित अपनी प्रयोगशाला में व्यस्त हैं। वहां गोबर की ईंट से मकान तैयार हो चुका है। डा. मलिक के मुताबिक गोवंश के गोबर में प्रोटीन और फाइबर होता है। प्रोटीन मजबूती प्रदान करता है तो फाइबर किसी भी वस्तु को जोड़ने के लिए जरूरी है। सीधे तौर पर कहे तो यह ईंट पूरी तरह ईको फ्रेंडली है। वहीं, लाल ईंट में मिट्टी के खनन से खेती प्रभावित होती है। ईंट पाथने में पानी का और पकाने में कोयले का उपयोग होता है। इससे मिट्टी पानी का दोहन और वायु प्रदूषण होता है।

डा. मलिक कहते हैं, भारतीय संस्कृति में गोबर के महत्व को पीढ़ी दर पीढ़ी मान्यता मिलती रही



प्रो. अश्विनी अग्रवाल

है। इस ईंट के निर्माण में केवल और केवल देसी गाय और बैल का ही गोबर उपयुक्त है। देसी गोवंश बचाने के लिए इस शोध का अधिकाधिक प्रचार जरूरी है। उन्होंने बताया कि रोहतक में अभी तक सात प्रशिक्षण शिवाविर आयोजित किए जा चुके हैं, जिनमें देश भर से 70 से अधिक लोग प्रशिक्षण प्राप्त कर गोक्रीट से ईंट व मकान बनाना आरंभ कर चुके हैं। कई राज्यों में ईंटों का उत्पादन शुरू हो गया है। रोहतक, बीकानेर और झारखंड में इन ईंटों से मकान भी बन चुके हैं।

### आई.आई.टी. दिल्ली ने बनाया हवा से प्रदूषण सोखने वाला कपड़ा

घर के भीतर हों या बाहर, हर जगह वायु प्रदूषण का दुःप्रभाव दिख रहा है। बड़ी तादाद में लोग इसकी वजह से अस्थमा, सांस समेत गंभीर बीमारियों का

दंश झेलने को मजबूर हैं। इस समस्या को ध्यान में रखते हुए भारतीय प्रौद्योगिकी संस्थान (आई.आई.टी.), दिल्ली ने एक खास किस्म का प्रदूषण रोधी कपड़ा तैयार किया है, जो हवा में मौजूद प्रदूषित तत्वों को अवशोषित कर लेता है। यदि इस कपड़े का खिड़कियों, दरवाजे पर पर्दे के रूप में इस्तेमाल किया जाए तो बाहर का प्रदूषण कमरे में प्रवेश नहीं कर पाएगा। आई.आई.टी. ने इस कपड़े के पेटेंट के लिए आवेदन कर दिया है।

सूती कपड़े को उन्नत करके यह कपड़ा बनाया गया है। रसायनों की मदद से सामान्य सूती कपड़े के मुकाबले विकसित कपड़ा 600 गुना से भी अधिक टाक्सिक अवशोषित करेगा। कपड़ा तैयार करने में जिंक नाइट्रेट हेक्साहाइड्रेट, मिथाइलिमिडाजोल, कोबाल्ट नाइट्रेट हेक्साहाइड्रेट, सोडियम हाइड्रॉक्साइड, मेंथाल समेत कई अन्य रसायनों का प्रयोग किया गया है। प्रत्येक रसायन के उपयोग के बाद इसके परीक्षण का दौर चला। आई.आई.टी. ने फिलहाल दो प्रकार का कपड़ा तैयार किया है जिसे रसायनों के आधार पर जेडआइएफ-67 एवं जेडआइएफ - 8 नाम दिया गया है। एक कपड़े का रंग सफेद, जबकि दूसरे का बैंगनी है।

टेक्सटाइल और फाइबर इंजीनियरिंग विभाग के प्रो. अश्विनी अग्रवाल ने बताया कि पार्टिकुलेट मैटर, नाइट्रस आक्साइड, सल्फर आक्साइड, कार्बन आक्साइड और अन्य जहरीले वाष्पशील कार्बनिक कंपाउंड (वीओसी) के बढ़ते स्तर के परिणामस्वरूप वायु प्रदूषण खतरनाक बन जाता है। इन रसायनों के प्रति मिलियन के कुछ हिस्सों के लंबे समय तक संपर्क में रहने से भी स्वास्थ्य पर बेहद प्रतिकूल असर पड़ता है और इससे अस्थमा आंख और गले में जलन आदि हो सकती है। व्यक्ति सबसे अधिक समय इमारत के भीतर समय गुजारता है, इसी को ध्यान में रखकर यह कपड़ा तैयार किया गया है।

शोधार्थी श्री हरदीप सिंह ने बताया कि यह कपड़ा 120 डिग्री सेंटीग्रेड तापमान पर धोकर दोबारा प्रयोग किया जा सकेगा। कपड़े को तीन बार धोकर परीक्षण किया गया था, जिसके परिणाम सकारात्मक रहे। उन्होंने बताया कि स्कूल, घर, आफिस ही नहीं थियेटर, कार, हवाई जहाज समेत अन्य परिवहन के साधनों में भी इसका प्रयोग किया जा सकता है। यह सोफा कवर, कारपेट, पर्दा समेत कई अन्य तरीके से उपयोग में लाया जा सकेगा। बताया कि पेटेंट मिलने के बाद इस उत्पाद को बाजार में लाने की योजना पर काम किया जाएगा।

## उमस खत्म कर भरपूर आक्सीजन दे सकेंगी घर की दीवारें

काशी हिंदू विश्वविद्यालय - (बीएचयू) के विज्ञानियों को एक ऐसी जेली (इलेक्ट्रोलाइट) बनाने में सफलता मिली है जो बिजली की बेहद कम खपत में न सिर्फ भीषण गर्मी और उमस से निजात दिलाएगी बल्कि कमरों में आक्सीजन की आपूर्ति भी बढ़ा देगी।

भारत सरकार के विज्ञान और प्रौद्योगिकी मंत्रालय के अधीन कार्यरत टेक्नोलाजी इंफारमेशन फारकारिस्टिंग एंड एसेसमेंट कौंसिल ने गत 22 जुलाई को इसके पेटेंट को मंजूरी दी है। इस टेक्नोलाजी के जमीन पर उतरने में अभी थोड़ा समय है, लेकिन बी.एच.यू. ने पर्यावरण के लिए नुकसानदेह और अत्याधिक बिजली खर्च करने वाले ए.सी. पर निर्भरता कम करने के साथ अधिक आक्सीजन सुनिश्चित कराने का राह दिखाई है।

गर्मी के दिनों में हवा जितनी अधिक नम होती है, उमस उतनी ही अधिक बैचन करने वाली होती है। बी.एच.यू. के महिला महाविद्यालय की भौतिक विज्ञानी प्रो. नीलम श्रीवास्तव की अगुआई में शोध टीम ने स्टार्च (स्वाद व गंध रहित पाली सैकेराइड कार्बोहाइड्रेट) और नमक (सोडियम आयोडाइड पर क्लोरेट, सोडियम क्लोराइड और मैग्नीशियम क्लोराइड में कोई एक) को घोलकर जेली तैयार की जो हवा में मौजूद नमी को सोख लेती है। स्टार्च के प्रमुख स्रोत आलू, गेहूं, मक्का, अरारोट, ब्राउन राइस आदि होते हैं।

प्रो. नीलम ने पाया कि इलेक्ट्रोड (धातु प्लेट या छड़) और विद्युत प्रवाह के लिए 0.2 वोल्ट का उपकरण लगाने पर जेली में अवशोषित पानी हाइड्रोजन और आक्सीजन में टूट जाता है। इससे कमरे में आक्सीजन की मात्रा बढ़ जाती है और वातावरण में नमी खत्म हो जाती है। इलेक्ट्रोड लगाकर जेली को दीवार पर लगाने से आक्सीजन बढ़ने के साथ उमस से भी राहत मिलेगी। दीवारों पर लगने वाली सीलन से भी मुक्ति मिलेगी। इससे दीवार के पेंट को कोई नुकसान नहीं पहुंचेगा, लंबे समय तक टिकाऊ होगी और ए.सी. की तुलना में बेहद सस्ती होगी।

## चावल के स्टार्च से बनाई जाएगी बायोडिग्रेडेबल प्लास्टिक

इंदिरा गांधी कृषि विश्वविद्यालय, रायपुर में चावल के स्टार्च से बायोडिग्रेडेबल (प्राकृतिक रूप से नष्ट हो जाने वाली) प्लास्टिक बनाई जाएगी। विश्वविद्यालय के बायोटेक्नोलाजी विभाग में इसका प्रारंभिक प्रयोग

सफल हुआ है। प्रयोग में बने उत्पाद को उन्नत करने और बाजार में भेजने लायक बनाने के लिए कृषि विश्वविद्यालय और भाभा परमाणु अनुसंधान केंद्र (बार्क), मुंबई के मध्य संयुक्त अनुसंधान को लेकर तीन वर्षीय अनुबंध भी किया गया है।

इस बायोडिग्रेडेबल प्लास्टिक को मिट्टी में दबा देने पर खुद-ब-खुद नष्ट होकर खाद बन जाएगी, जिसका इस्तेमाल बगीचों या फसलों में किया जा सकेगा। इससे पर्यावरण का संरक्षण होगा। इससे बने कैरीबैग में फल-सब्जी, अन्य सामान लाने के साथ ही गरम खाना भी पैक किया जा सकेगा।

अनुसंधान से जुड़े विज्ञानियों के अनुसार कृषि विश्वविद्यालय में प्रयोग के बाद बनाई गई पालीमर की फिल्म से कंपोस्टेबल बायोडिग्रेडेबल पालीबैग बनाने के लिए बार्क में अनुसंधान होगा। विश्वविद्यालय के पास फिलहाल कंपोस्टेबल बायोडिग्रेडेबल कैरीबैग बनाने की मशीन नहीं है, इसलिए बार्क की मदद ली जाएगी। बार्क के पास अत्याधुनिक मशीनें हैं जो कृषि विश्वविद्यालय में प्रारंभिक प्रयोग के बाद तैयार पालीमर फिल्म की मोटाई को कम करके इसे आमजन के प्रयोग लायक कैरीबैग बनाने में मदद करेंगी। उम्मीद है कि छह माह से एक साल के भीतर बाजार में उतारने लायक बैग का मैटीरियल तैयार हो जाएगा। इसके बाद कंपनियों से बात करके इसके कामर्शियल उत्पादन की तैयारी है।

## चेन्नई देश का पहला ऐसा शहर - भूमिगत जल पूरी तरह समाप्त

पूरे देश में भूमिगत जल समाप्त होने के मामले में चेन्नई पहला शहर बन गया है। यहां पर अब भूमिगत जल के लिए 2000 फीट तक पानी नहीं होने के बाद शासन ने सूचना जारी की है। भूमिगत जल समाप्त होने के कारण बोरिंग अब पूरी तरह प्रतिबंधित कर दिए गए हैं। 200 फीट तक भरपूर पानी देने वाले चेन्नई की इस दुर्दशा के पीछे पूरे शहर को सीमेंट की सड़कों और निर्माणों से पाट देना प्रमुख है। शहर के प्राकृतिक तालाबों को भी पाट दिया गया है। शहर के किसी भी भाग में पानी जमीन में जाने का कोई साधन नहीं बचा है। अब चेन्नई गर्मी के दिनों में भीषण जल संकट का सामना कर रहा है।

शहरों के विकास और सड़कों के अलावा फूटपाथ और खुले मैदान सीमेंट से बनाए जाने के कारण चेन्नई की यह दुर्दशा हो गई है। इस मामले में स्थानीय नागरिकों का कहना है कि शहर में जल

संरक्षण को लेकर कोई अभियान नहीं चलाए गए तो वहीं बेतरतीब निर्माणों के चलते चुनिंदा तालाब भी पानी के लिए तरस गए। साथ ही भूमिगत जल को लेकर कहीं पर कोई विशेष कार्य नहीं किए गए। इसी का परिणाम है कि अब चेन्नई में भूमिगत जल समाप्त हो चुका है।

## अब रिजेक्ट कोल से बनेगी बिजली

कोयले के कण-कण के सदुपयोग करने के लिए कोल इंडिया वाशरी के रिजेक्ट कोल से व्यावसायिक रूप से कोयला उत्पादन करने की दिशा में पहली बार आगे बढ़ रही है। इसकी इकाई भारत कोकिंग कोल लिमिटेड (बी.सी.सी.एल.) कोयला उत्पादन के बाद अब कामर्शियल बिजली उत्पादन में उतरने जा रही है। नैवेली लिग्नाइट कारपोरेशन लि. के साथ पहले चरण में बी.सी.सी.एल. 250 मेगावाट बिजली उत्पादन करेगी। इस पहल से दो फायदे होंगे। एक तो मुसीबत बने रिजेक्ट कोल से मुक्ति मिलेगी, दूसरा बिजली मद का पैसा बचेगा। साथ ही, उसे बेचने से आमदनी भी होगी। इससे पर्यावरण को भी फायदा होगा। वर्तमान में करीब 24 लाख टन रिजेक्ट कोल बीसीसीएल के पास पड़ा है। खुले में पड़े रहने से हवा में कोयला कण उड़ने से प्रदूषण होता है।

दरअसल, बी.सी.सी.एल. में नौ नयी कोल वाशरी बननी हैं। जब ये सभी वाशरी तैयार हो जाएंगी, तो करीब 18 मिलियन (1.8 करोड़) टन प्रतिवर्ष वाश कोल उत्पादन होने लगेगा। एक अनुमान के मुताबिक, हर दिन इन वाशरी से करीब 10 हजार टन से अधिक रिजेक्ट कोल निकलेगा। ऐसे में इसके समुचित इस्तेमाल के लिए बिजली का प्लांट लगाने की योजना है। हालांकि देश में कुछ कंपनियां रिजेक्ट कोल से बिजली उत्पादन कर रही हैं, मगर उनकी मांग उतनी नहीं है। वजह है इसमें ऊष्मीय कैलोरी का कम होना, जो इसकी दुलाई पर लगने वाली लागत के मुकाबले घाटे का सौदा है। बी.सी.सी.एल. की सुदामडीह वाशरी बंद है। यहीं पर पावर प्लांट निर्माण करने की योजना बन रही है। बी.सी.सी.एल. वाशरी डिवीजन के जी.एम. पी.के. महतो के अनुसार रिजेक्ट कोल करीब 400 से 700 रुपये प्रति टन मिल जाता है, जबकि सामान्य कोयले के लिए इससे छह गुना अधिक कीमत चुकानी पड़ती है। बावजूद रिजेक्ट कोल की मांग उतनी नहीं है।

कोयला में राख प्रतिशत कम करने के लिए उसे धोया जाता है। इस दौरान जो कोयला व पत्थर का चूर्ण निकलता है, वह रिजेक्ट कोल है। इसमें कार्बन कणों के अलावा, वाष्पशील पदार्थ होते हैं। इस

कोयले की ऊष्मीय क्षमता 17 सौ कैलोरी से अधिक होती है। मगर यह ऊष्मीय क्षमता सामान्य कोयले से कम होती है। इसे तकनीक का प्रयोग कर जलाया जाए, तो ब्वायलर में वाष्प बना सकती है, क्योंकि कार्बन कणों के साथ वाष्पित होने वाले पदार्थ गैस बनकर जलते हैं। वाष्प से मोटर चलती है और इससे बिजली बनती है।

### 183 वर्ष पुराना रंग जी मंदिर बारिश की बूंदों का संचयन करने का अद्वितीय उदाहरण

भूजल के बेहिसाब दोहन से हालात बिगड़े हैं। भविष्य की चिंता में वर्तमान समय में बारिश की बूंदों का संचयन करने पर जोर दिया जा रहा है, लेकिन वृंदावन का रंग जी मंदिर प्रबंधन काफी पहले ही जल संकट को लेकर सचेत हो गया था। यहां 183 साल पहले ही बारिश के पानी को सहेजने का काम शुरू हो गया था। मंदिर के विशाल पुष्करणी सरोवर (तालाब) में बारिश का पानी एकत्र किया जाता है।

दक्षिण भारतीय संस्कृति के रंग जी मंदिर का यहां 1833 में निर्माण शुरू हुआ था। मंदिर निर्माण के साथ यहां बारिश के पानी को सहेजने के लिए ही 100 मीटर लंबे और इतने ही चौड़े पुष्करणी सरोवर का निर्माण भी हुआ था। बारिश के दिनों में पूरे मंदिर परिसर का पानी पुष्करणी में ही जमा हो जाता है।



वृंदावन में रामानुज संप्रदाय के प्रसिद्ध रंग जी मंदिर परिसर में स्थित पुष्करणी

पूजन के दौरान मंदिर में इस्तेमाल होने वाला पानी भी पुष्करणी में ही जाता है। पुष्करणी में तीन कुएं हैं, प्रत्येक की गहराई सौ मीटर बताई जाती है। बारिश का पानी पुष्करणी से इन कुंओं के जरिये भूगर्भ में जाता है। समय-समय पर पुष्करणी की सफाई भी कराई जाती है, ताकि गंदा पानी भूगर्भ में न जाए।

नियमित देखरेख के चलते पुष्करणी का जल इतना साफ है कि उसे दैनिक उपयोग में भी ला सकते हैं। बारिश का पानी पुष्करणी के जरिये कुंओं में जाता है।

### International News- Paper Made Stone

As the name suggests, this paper is made of stone. It is 100% recyclable waterproof and almost carbon neutral.

Stone Paper products generically referred to as bio-plastic paper, mineral paper or rich mineral paper, are strong and durable paper-like material manufactured from calcium carbonate bonded with small amount of high-density polyethylene (HDPE) resin. They are used in many of the same applications as cellulose-based paper.

Stone Paper materials consist of three components: Calcium Carbonate, High-Density Polyethylene (HDPE), and usually a proprietary coating, which serves to enhance printing quality and performance.

Stone paper materials have a density range of 1.0-1.6g/cm<sup>3</sup>, which is equal to or slightly higher than that of ordinary paper, and a texture somewhat like that of the outer membrane of a boiled egg. It may be recycled with Number 2 plastics or remade into stone paper again.

Because it is not made from cellulose fibers, stone paper can have a smoother surface than most traditional products, eliminating the need for additional coating or lamination. The calcium carbonate is sourced from mines, and reduced to fine white calcium carbonate powder. The production of stone paper uses no water, acid, bleach or optical brighteners. It can be recycled endlessly into itself, but only if recycled separately at dedicated civic amenity sites.

### साइंस इनोवेशन - फर्श पर चलने से जलेगी घर की लाइट

लकड़ी बिजली की कुचालक है, लेकिन स्विट्जरलैंड में विज्ञानियों ने लकड़ी का उपयोग करके बिजली पैदा करने का नया तरीका खोज लिया है। विज्ञानियों ने एक नये तरह की लकड़ी की फर्श विकसित की है। इस पर चलने से बिजली उत्पन्न होती है। यह नई तकनीक बिजली के मामले में भवनों को भविष्य में आत्मनिर्भर बनने का विकल्प दे सकती है।

स्विस शोधकर्ताओं ने फर्शबोर्ड के नीचे लकड़ी और इलेक्ट्रोड के टुकड़े बिछाकर उसे नैनोजेनरेटर में बदलने में सफलता हासिल की है। जब कोई व्यक्ति उस फर्श पर चलता है, तो परतें विद्युत आवेशित हो जाती हैं। शोधकर्ताओं के मुताबिक, फर्श पर चलने से इलेक्ट्रिकल कनेक्शन का एक पैटर्न जनरेट होता है और लोअर लेवल से वह डिस्कनेक्ट हो जाता है। यह पैटर्न ट्राइबोइलेक्ट्रिक प्रभाव उत्पन्न करता है, जो इलेक्ट्रानों के प्रवाह को सक्षम बनाता है। इस तरह इससे बिजली उत्पन्न होती है। प्रमुख शोध लेखक गुइडो पंजारासा ने कहा कि लकड़ी ट्राइबोन्यूट्रल है, जिसका अर्थ है कि इसमें इलेक्ट्रान को प्राप्त करने या खोने का कोई वास्तविक गुण नहीं होता है। घर में फर्श का उपयोग रोशनी और छोटे इलेक्ट्रानिक्स को बिजली देने के लिए किया जा सकता है। यदि यह प्रयोग और अधिक क्षमता दिखाता है, तो जल्द ही बिजली उत्पादन के बाहरी स्रोतों पर निर्भरता कम हो सकेगी।

## Obituary



**Shri R.K. Bhandari Former Engineer Member, DDA and Past President, IBC expired on October 09, 2021. Shri Bhandari was Life Member of Indian Buildings Congress for last many years. President, Indian Buildings Congress; members of EC and GC deeply mourns the sad demise of Shri Bhandari and prays that the departed soul may rest in peace.**



”

*Dream is not that which you see while sleeping. It's something that does not let you sleep.*

# BRIDGING THE GAP IN CONSTRUCTION-PRE-ENGINEERED & PPVC

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## Abstract

At the time of India's independence on 15<sup>th</sup> August 1947, there was some development which had taken place, but India was lagging far behind to a very great extent in almost all areas. These included communications, highways, railways, electrification, sanitation & water supply, education, irrigation facilities, ports, airports etc. There was a huge shortage of housing. The housing shortage got aggravated because of the influx of refugees from East & West Pakistan because of the partition. India embarked upon rapid development through the various Five-Year Plans. Even though India could reduce the gap but still there remained a very big gap. This is in all areas, be it infrastructure development, or housing for millions. The need of the hour is to think of some alternative methods of construction in addition to the traditional methods. This paper suggests some alternative methods of construction.

Keywords – Cast-in-situ, Pre-cast, Pre-Engineered, Pre-fabricated, PPVC.

Abbreviations - Building Construction Authority of Singapore (BCA), Building Information Modelling [BIM], Construction industry development council [CIDC] Pre- engineered buildings (PEB), Metal Building Associations (MBMA), Pre-engineered, Pre-finished Volumetric Construction (PPVC)

## INTRODUCTION

There is a great deal of demand for construction in the country. India is one of the very few countries whose economy has been growing at a rapid pace. It had surpassed the growth of the economy of China also. Today, because of various factors, including outbreak of Corona Virus, the global economy has slowed down. This may be a temporary phase. The global economy as well as the Indian economy is expected to be back on rails in not too distant future. With the growth in the economy, the population demands better housing, sanitation, potable water, communications-be it better road connectivity, telephones, railways, flyovers, metro rail corridors, ports, bridges, airports, water and un-interrupted power supply, etc.

There is a big gap between the demand & supply. It's a herculean task to bridge this gap in the shortest possible time. India has been generally using age-old methods of construction, depending largely on traditional construction, employing a large work force. Some mechanization has stepped in during the last 2-3 decades after liberalization. But it is still a long way to go before we achieve our targets. There is a shortage of manpower in the construction sector, particularly of the skilled manpower. The degree of skill availability is also not commensurate with the requirements.

As far as the housing sector is concerned, there is a shortage of housing units in both the urban & the rural areas. Various studies have been conducted both in the government (in the Ministry of Housing & Urban Affairs-earlier the Ministries of Urban Development & Housing and Urban Poverty Alleviation) & the private sector. The shortage is likely to increase in the years to come. As per Sept. 2018 report of KPMG- NAREDCO [1], the following table emerges:

**Table 1: Housing for All**

	Urban(crore units)	Rural(crores units)	Total(crore units)
Current housing shortage	1.9	4.0	5.9
Required housing units by 2022	2.6-2.9	2.3-2.5	4.9-5.4
Total needed	4.4-4.8	6.3-6.5	10.7-11.3

**Source:** Funding the vision — Housing for all by 2022, KPMG in India, 2014

Therefore, to provide housing to all by 2022, India needs to build about 11 crore units, as one of the recommendations is “Promote mass housing technologies”.

The focus should be on affordable urban houses, which are 70% of total urban housing requirements. In addition, as has been recently witnessed, there should be a speedy construction of shelters for migrant labour in the cities across the country to mitigate the problems faced by millions of workers, who were forced to rush back to their villages in the hinterland in view of the lock down because of the Coronavirus. The financial requirement for the construction of affordable houses and shelters for the migrants is a huge one.

Apart from the infrastructure growth, there is going to be a huge growth in the real estate sector as well. This sector is expected to grow to US\$ 650 billion in 2025, over US\$ 850 billion by 2028 & exceed US\$ 1 trillion in 2030 [2].

## PRESENT SCENARIO

We, in India, are still, generally, going on with the traditional type of construction. There have been some efforts made by certain entrepreneurs to bring in mechanized type of construction. These are however, at present, generally, limited to construction of ware houses, factories etc. A few entrepreneurs have also started construction of houses planned by some development authorities across various regions of the country.

It is heartening to note that some of the recently constructed airports, like IGI airport New Delhi, Bengaluru airport, Chennai airport, Hyderabad airport, Chhatrapati Shivaji airport Mumbai, Netaji Subhash Chandra airport Kolkata, the new Goa airport and the airports at Ahmedabad, Amritsar, Raipur, Ranchi, Vishakhapatnam, Vijayawada, Chandigarh, etc., a fair amount of pre-engineered, pre-fabricated elements have been used.

There are a large number of Metro rail projects being constructed all over the country. For these also, a fairly large chunk of the work is being done on the pre-engineered, pre-fabricated construction. These are both by using steel construction & concrete construction. Elevated sections of the metro rail projects are using pre-cast viaducts etc. for speedier construction. Quite a few of the metro stations have been built with pre-fabricated steel structures.

Many factory buildings are also being constructed by using this technique. A fairly large amount of ware houses etc. are also being done this way. Some of the bridges & fly-overs are also being constructed by using pre-engineered, pre-fabrication/pre-cast technology.

However, only a very few residential houses have been constructed by using this technology.

## Situation Overseas

Technological improvement over the years has contributed immensely to the enhancement of quality of life through various new products and services. One such revolution was the pre-engineered buildings (PEB) [3]. Through its origin can be traced back to 1960s, its potential has been felt only during the recent years. This was mainly due to the development in technology, which helped in computerizing the design.



**Fig. 1 Pre-engineered Building Systems(3)**

PEB is ideal for construction in remote & hilly areas. A recent survey by the Metal Building Manufacturers Associations (MBMA) shows that about 60% of the non-residential low rises building in USA are pre-engineered buildings [4].

PEB (Pre-engineered buildings) concept has been very successful and well established in North America, Australia and is presently expanding in U.K and European countries, and in Singapore, Korea etc. [5]. PEB construction is 30 to 40% faster than masonry construction. PEB buildings provide good insulation effect and would be highly suitable for a tropical country like India. PEB is ideal for construction in remote & hilly areas.

Buildings & houses are one of the oldest construction activities of human beings. The construction technology



has advanced since the beginning from primitive construction technology to the present concept of modern house buildings. The present construction methodology for buildings calls for the best aesthetic look, high quality & fast construction, cost effective & innovative touch.

India being a developing country massive house building construction is taking place in various parts of the country. Since 30% of Indian population lives in towns and cities, hence construction is more in the urban places. The requirement of housing is tremendous but there will always be a shortage of house availability as the present masonry construction technology cannot meet the rising demand every year. Hence one has to think for alternative construction system like pre-engineered steel buildings.

The production of crude steel in India in 2018 was 106.5 million tonne & this has gone up to 138 million tonne in the year 2019. The annual steel consumption is much lower. Thus, there is a surplus capacity of flat steel products available in India particularly of hot and cold rolled sheets. These steel components can be utilised in the construction of pre-engineered building components.

In pre-engineered building concept the complete designing is done at the factory and the building components are brought to the site in knocked down condition. These components are then fixed / jointed at the site and raised with the help of cranes. The pre-engineered building calls for very fast construction of buildings and with good aesthetic looks and quality construction. Pre-engineered Buildings can be used extensively for construction of industrial and residential buildings. The buildings can be multistoreys (4-6 floors).

## Pre-engineered construction

Steel industry is growing rapidly in almost all the parts of the world. The use of steel structures is not only economical but also eco-friendly at the time when there is a threat of global warming. Time being the most important aspect, steel structures (Pre-fabricated) is built in very short period and one such example is Pre-Engineered Buildings (PEB). Results show that these structures are economical, reduce construction cost and time, are energy efficient and have flexibility of expansion [6]. The scientific-sounding term “pre-engineered

buildings” came into being in the 1960s.

Typically, a pre-engineered building is a metal building that consists of light gauge metal roof panels on steel purlins spanning between rigid frames with light gauge metal wall cladding. In other words, it has a much greater vertical and horizontal deflection. Thus, in pre-engineered buildings, the total design is done in the factory, and as per the design, members are pre-fabricated and then transported to the site where they are erected in a time less than 6 to 8 weeks.

**PROS:** Reduced construction time, light weight, affordable, easy to construct, fast erection time, flexibility of expansion, clear spans, long durability and low maintenance, energy efficient, no waste during construction [7].

**CONS:** Cheaper option might compromise strength of structure, requires building permit & needs added insulation [7].

During the year 2020 to 2021 the spread of Coronavirus has led to speedy construction of hospitals, laboratories & other health care facilities at many locations all over the globe to take care of the patients, in a record time. This has been possible by using the pre-engineered construction. The time taken was less than two weeks at a few locations.

Types of pre-engineered structures:

- Buildings
- Non-building structures

**Buildings:** Residential houses, schools, clinics & hospitals, club houses, ware houses, factories, workshops, aircraft hangars, shopping malls, etc.

**Non-building structures:** Flyovers, bridges, airports, metro rail projects, sports stadia, packaged water treatment plants, etc.

**PPVC (Pre-engineered, pre-finished volumetric construction):** “Prefabricated Prefinished Volumetric Construction (PPVC) means a construction method whereby free-standing volumetric modules (complete with finishes for walls, floors and ceilings) are [8]:

- constructed and assembled; or
- manufactured and assembled, in an accredited



**Fig. 2 Prefabricated Prefinished Volumetric Construction**

fabrication facility, in accordance with any accredited fabrication method, and then installed in a building and building works.

The wider development and construction industry now recognize that the adoption of offsite or modular manufacturing for on-site assembly is a key part of the larger construction productivity agenda. Modular is a broad term used in construction to describe the use of technology that facilitates off-site manufacture. The term can be used to describe simple stickframe systems such as pre-cast concrete or prefabricated bathroom pods and up to and including fully prefabricated and pre-finished volumetric constructed (PPVC)[9].

PPVC is a very recent development. Not too many countries are, at present, using this technology but the day is not far when this technology shall have to be adopted to achieve faster construction. There are a very few projects currently being done in Europe, USA, Canada & Australia by using PPVC. Singapore is one of the pioneers.

The Government of Republic of Singapore has issued instructions that in future this technology should be used for construction. Accordingly, the BCA (Building Construction Authority of Singapore) has very recently embarked upon the PPVC mode of construction & a few projects are under execution in Singapore. These include construction of hotels, student's hostels, nursing centres, residential houses, ware-houses etc.

Modular PPVC construction can provide many benefits, some of which are summarized below[9] [Fig.1]:

- **Speed:** Adopting a modular approach can lead to shorter construction durations on site

which can yield an overall shorter design and construction schedule.

- **Quality:** PPVC delivers the majority of the final product from the controlled environment of a factory which yields higher quality.
- **Safety:** More construction off-site means less time on-site and less individual man-hours working at height.



**Fig.3 Modular Technology like PPVC is a viable tall building solution (9)**

- **Weight:** The logistical requirements of PPVC drive the design to be up to 30-40% lighter.
- **Sustainable:** The better quality provided by Modular manufacture also can provide better thermal performance for a more sustainable end product.
- **Reduction in Noise and Waste:** More production in the factory yields less waste on-site which another environmental benefit is.
- **Innovation:** Modular design allows the prototyping and testing new technology in the factory which encourages and de-risks early adoption of new technology.

## PPVC WITH BIM [BUILDING INFORMATION MODELLING]

Designing and constructing the PPVC modules with BIM has enabled the design coordination process to be more comprehensive and the construction management more effective. Using BIM has also reaped the following benefits [10]:

BIM use	Benefits
3D Visualization	<ul style="list-style-type: none"> <li>Facilitates the design coordination of PPVC modules and reduces errors and adjustments on site</li> <li>Facilitates the demarcation of the PPVC modules with the conventional construction and the integration of the various design parts/packages</li> </ul>
Standardisation of BIM Families	<ul style="list-style-type: none"> <li>Facilitates the design of the PPVC modules and enhances the design production</li> <li>Eases the quantification of building parts/materials and hence, the cost analysis due to modularisation and repetition</li> </ul>
On-site Coordination	<ul style="list-style-type: none"> <li>Eases the technical coordination and integration in the off-site assembly of parts and on-site installation of the PPVC modules</li> </ul>
Construction Planning & Management	<ul style="list-style-type: none"> <li>Facilitates the construction planning, sequencing and management on site, particularly in integrating and coordinating the works for PPVC and conventional construction</li> <li>Enhances logistics and inventory management of PPVC assembly parts throughout the fabrication process from manufacturing plants to local off-site assembly yards and on-site installation</li> <li>Enhances the effectiveness of documentation during construction</li> <li>Allows for monitoring of progress, particularly the production rate of off-site PPVC module fabrication and work rate of on-site PPVC installation</li> </ul>

## PPVC Acceptance Framework

To ensure that the different PPVC systems being used at the mandated development sites are reliable and durable, the local government authorities including BCA have set up an acceptance framework consisting of building regulatory agencies as well as industry experts to ensure that the design and materials used are robust and can meet the minimum standards set [11].

## How to bridge the gap

As some of the developed countries have been able to embark on faster mode of construction, we, in India, have to shed our inhibitions, and use the proven technologies used abroad to speed up construction. We must adapt ourselves to the changing situation and derive benefit from the exemplary work done by the engineers & builders in different parts of the world to reduce the gap between demand & supply. For this, there has to be a concerted effort on the part of all stake holders-the government, the statutory authorities, the designers, and the constructors, the public at large (to change their mind set for accepting the new technology).

The following are the important gaps at present:

- Absence of any standards or codes for PEB. For this The Bureau of Indian Standards (BIS) should be involved to develop standard code of practice for both the products as well as for the implementation processes.
- Non-availability of adequate number of designers to work out standard designs and detail technical hand books/ manuals and standard operating procedures. For this a large number of design professional teams shall have to be built up for effective implementation of the PEB processes.
- To create a pool of human resources for effective development of manufacture of elements for PEB, erecting and commissioning of the completed structures.
- To identify and mobilise required equipment's for fabricating/ manufacturing/ transportation and erection of the various elements of PEB.
- To take necessary action to popularize the absorption, adoption and acceptance of pre- engineered,

prefabricated products and work processes. This could be done through involving all stake holders.

## Training of construction workers:

The total number of construction work force in the country is approximately 40 million & many of them are unskilled. There is an acute shortage of trained skilled man power in the construction sector. There has to be a regular & sustained effort to train the work force. We shall have to build up the skills of the construction workers, by imparting training-both quantity wise & quality wise.

Some of the construction companies & institutions like CIDC have set up training centres for enhancing the skills of the construction workers but there is a large gap between the number of skilled workers required to be trained & the numbers being trained.

The Govt. of India has embarked on a plan to train the work force under "Skill India Programme". This needs to be implemented in the shortest possible time frames.

## Limitations

We, in India, still have very conservative attitude towards mechanized construction. We hold on to our individual views and are either resistant to/ or very slow in agreeing to change. The age-old perception in our minds is that one builds a house once in his/her life time & we continue to hold on to the traditional construction. That means, buying & bringing materials ourselves to the work site, engaging & employing workers, at the most petty contractors or piece rate workers, supervising ourselves to ensure quality etc. We don't believe in bringing in a specialized agency to do the work for us. This attitude needs to be changed as soon as possible. In the developed markets, PEB is already being used for low rise structures (G+5) such as offices, hospitals, retail malls, housing and resorts whereas in India, PEB is yet to venture in these areas.

## Delimitations

The construction process actually needs a lot of time for making of a building, whether it is made of concrete or steel or wood. The time is considered as the major aspect by most of the companies in the construction processes and it has been proven that time is more important thing which needs to be monitored apart from the cost. Hence, the idea of pre-engineered buildings has been

brought out on the field. The concept of pre-engineering in the construction industry has brought a strong focus on people to look for such previously manufactured buildings which are also reliable and durable. It is also proven that pre-engineered buildings are also lighter than the normal steel buildings with more or less 30 to 35 percent and they can also be set up at the construction site so easily. Nowadays many companies which depend on the strength and efficiency of the steel buildings will prefer to opt for pre-engineered buildings.

Modular construction and PPVC have many advantages that are well suited for high rise construction. The modular approach has only been successfully implemented on a small handful of projects which break the 30 storeys barrier. This barrier or modular ceiling is there for many reasons. Pure market forces of supply and demand which limit the availability of tall buildings focused on modular technologies and experienced contractors and manufactures. All of these challenges can be solved and will be solved in the next decade. In the future of tall buildings, modular design will have a big role to play.

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## From Editor-in-Chief Desk

Till yesteryears we have been hearing and talking about climate change and its effect on living conditions of human society. Other countries did experience effects of climate change. In our country, it has given live demonstration this year. The rainfall experienced in India was much more than average and the intensity was high. The impact was felt in rural areas of Uttar Pradesh, Bihar and West Bengal. The human misery was unprecedented. To stop such miseries of human beings, comprehensive corrective measures will be necessary, that too in planned manner.

Urban areas were also subjected to unprecedented rainfall and the life was disrupted. During heavy rains, the traffic movement in Delhi practically stopped. It is worth to recall some specific incidents.

On Mehrauli Badarpur Road, the water logging was unprecedented and on first day of heavy rainfall a person on scooter lost his life. I talked to Assistant Engineer-in-Charge who mentioned that the pumping capacity was inadequate and discharge from adjoining unauthorized colonies was unprecedented. It was not possible to arrange pumps of required capacity and there was suffering. Near Minto Bridge, there was flooding and pumping capacity was inadequate. Remedy is to provide pumps of adequate capacity at these and similar other locations. Pumps can be purchased overnight and installed, if emergency is understood.

At number of locations, there was water logging during rains. After rains stopped, in less than one hour, the stagnated water was drained. Its shows that the capacity of outfall drains was inadequate. Persons travelling by scooters, motorcycles and motor cars, could not move on account of stagnation of water. As an immediate measure, information system should be developed, to avoid journey on such stretches and if possible suggest alternate routes. Presently there is no information system and public suffer. Besides, capacity of outfall drains should be increased. The work of increasing capacity of outfall drains can be done on top priority, instead of waiting indefinitely.

During rains, pot holes and cracks develop on roads. Public suffers and they do not know, what should be done. Besides, there are number of agencies for maintenance of roads. Here also it is necessary that centralized reporting system should be developed and repair work should be attended on top priority. In fact coordinating agency should also keep a watch. There is no such system.

Tree cutting, falling of trees, delay in removal of roots etc. causes inconvenience and stop traffic. Here also for horticulture departments there has to be centralized control system. At times horticulture departments become helpless because permission of forest department is required for cutting of trees. This administrative hurdle is required to be sorted out. Agencies should be made responsible and public should know who should be contacted

In city like Delhi, if proper system can be developed to face challenges of rains, it can become model for others.



(K.B. Rajoria)

## CALL FOR PAPERS

### 25<sup>th</sup> Annual Convention & National Seminar on “Sustainable Built Environment for Future” January, 2022

Indian Buildings Congress will be holding its 25<sup>th</sup> Annual Convention & National Seminar in January, 2022. The Annual Convention, apart from conducting business like holding of AGM, Governing Council Meeting & appointment of office bearers for ensuing term, will also include a National Seminar. The theme of the Seminar will be “**Sustainable Built Environment for Future**”. Members of the Indian Buildings Congress and professionals of Government Departments, Housing Boards, Development Authorities, Town and Country Planning Organisations, State PWDs, Teaching & Training Institutes, Technical Universities, Builders, Developers and all others interested in building management are requested to contribute papers for the Seminar.

#### Objective of the Seminar

Developed countries over the past few decades have become synonymous with higher consumption. Rapid growth of population, low height construction of buildings with larger foot print area coupled with unprecedented urbanisation has multiplied the consumption many fold. Use of large variety of manufactured building materials, high level of mechanisation consuming enormous energy, fossil fuels, and emitting pollution has put a lot of strain on the natural resources. To meet the demand of ascending development of human civilization, the existing rate of consumption of resources and land would increase, causing further shortage of land, pollution of environment and depletion of its resources that cannot be sustained in future.

The main purpose of this Seminar is to bring together all stakeholders including Researchers/ Academicians/ Engineers/ Architects / Planners/ Industrialists / Builders Estate management agencies/ Technocrats/ Administrators and Financiers to discuss major challenges and best practices in '**Sustainable Built Environment for Future**'. It is accordingly planned to deliberate on the subject broadly under the following sub-themes including the case studies:

- Planning & Designing for sustainable Built Environment for Future.
- Sustainable Materials and Green Buildings; Management of Water, Solid and Liquid Waste with application of Zero Waste Technologies.
- Alternative Energy Resources with Net Zero demand / Energy Plus technologies and Indoor as well as Outdoor Environment / Climate Concerns.
- Life Cycle Cost; Legal Issues/ New Regulations and reforms required.

While full text of paper can be submitted by Dec.15, 2021, authors should communicate their intention of submitting the Paper along with a brief abstract by Nov. 30, 2021 to

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