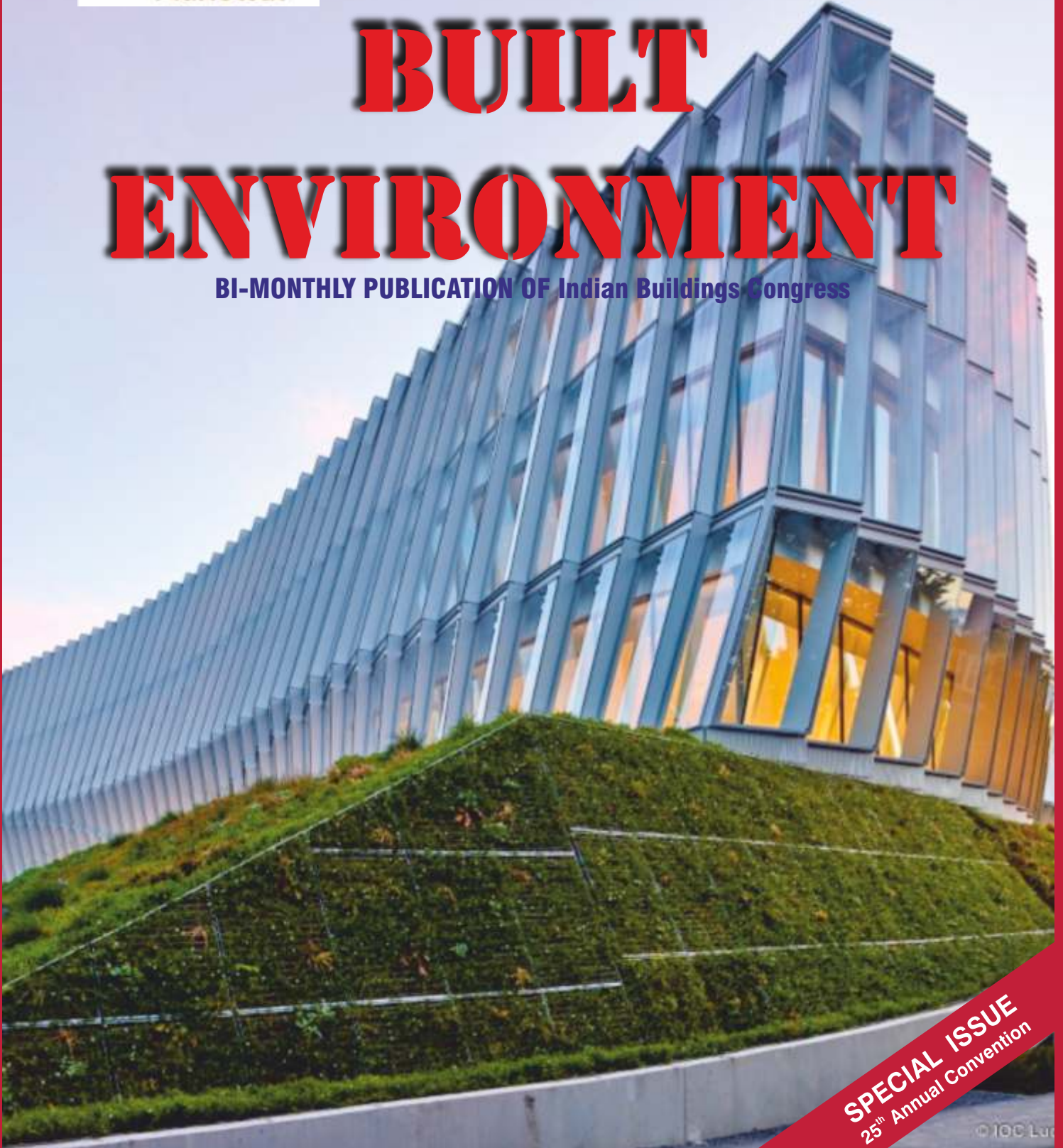




BUILT ENVIRONMENT

BI-MONTHLY PUBLICATION OF Indian Buildings Congress



SPECIAL ISSUE
25th Annual Convention

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From President's Desk



There has been great degree of transformation of water quality at the Delhi segment of the River Yamuna over the past couple of decades. The Yamuna river which provided the base for the development of capital city Delhi since ancient times as Indraprastha to Modern Days Delhi has become the dead river and sewage system network. For the survival of any civilization, water is one of the crucial resources and by understanding its significance the sustainable development goal number six emphasise the importance of clean water.

The reason of deterioration of Yamuna River water quality in Delhi stretch especially after Wazirabad barrage is due to unabated discharges of wastewater predominantly from industrial and domestic sources into it from 22 drains downstream of Wazirabad. The other reason is the non-availability of fresh water in the river after Wazirabad barrage especially during non-monsoon period, which is essential to maintain self-purification capacity of the river. The water quality monitoring of 22 drains in Delhi indicates that except Khyber pass drain, other 21 drains are not meeting the criteria for BOD, which makes water unfit for any purposes.

Formation of coliform bacteria is very high due to presence of sewage in water. While the optimum pH for river water is around 7.4, the study found that mean pH of the Yamuna water varies from 7.5 to 11.8 at different sampling points. The level of Dissolved Oxygen (DO) at the entrance site Palla in Delhi is 9mg/itre, which can be said satisfactory but after that point, it decreases sharply and reaches at a very low level of 0.7mg/litre at Okhla bridge (an inlet of Agra Canal). This adversely affects the aquatic life and ecosystem of the river. The study also found major groundwater pollution in the Yamuna riverbed. The type of water in Yamuna in Delhi falls under 'dead water quality', thereby making it unfit for irrigation, bathing or any other domestic or industrial purpose or even for use in construction.

It is high time for the authorities to take urgent action in mission mode by associating the community at large to rejuvenate the Yamuna River in Delhi segment for its sustainable development.

The steps that the authorities and communities can take for rejuvenation of River Yamuna includes: stopping pollution through discharge of domestic and Industrial waste; regulated mechanism of sand mining; checking migration of population into Delhi; use of modern technologies including setting up required number of additional STPs and ETPs all along the drains to treat waste water before entry into river;

upgradation and enhancing capacities of existing STPs/ETPs; stringent control on quality of water at discharge point of STP of Individual industry before permitting entry into centralised STP and before discharging into river from the Centralised STP set up by Government; developing greenosphere along the entire course, complete ban on immersion of idols, flowers; and most importantly creating awareness among masses.

Indian Buildings Congress which is involved in Built Environment is very much concerned at the present condition of Yamuna River. Let us all join in this pious mission to rejuvenate River Yamuna in Delhi and in other locations through community participation.

I wish to express my deep gratitude to the Indian Buildings Congress for permitting me for a full term of more than two years to perform the responsibility of the President, IBC. It is indeed a matter of esteemed privilege and honor for me. On this occasion, I convey my best wishes and warm greetings to each and every member of the IBC family.

Immediately after I assumed the office of President of Indian Buildings Congress in January, 2020, the pandemic of Covid-19 spread globally including our country and affected the life of everybody. World over Economy slumped and all the industries including construction industry came to grinding halt. Indian Buildings Congress was also affected badly as all its physical activities also came to halt.

As President of the IBC, I considered it as my personal endeavour in the time of pandemic to promote the Vision, Mission and ongoing activities of the Organization through virtual mode. Therefore with active support of all the stake holders in the industry, I could continue IBC's technical activities during the pandemic time by holding large number of online webinars which got your over whelming response. Thus IBC continued to play active role of major contributor in Nation Building and help achieve the aim of the Government in development of infrastructure in the country.

I had long association with IBC as Honorary Secretary and Vice President before assuming the role of President. It has been a matter of immense satisfaction that IBC since its inception in the year 1992 has been tirelessly working to provide a very positive and fruitful support in creation of affordable, environment friendly, cost effective & competitive technology driven Built Environment in the Country. The IBC has made path breaking progress and shaped itself as a very potent and effective forum in bringing the professionals connected with built environment on a single platform so as to develop consensus on subjects related to Building Industry and to pursue them to the conclusion to enable develop speedily a sustainable and affordable built environment in the country.

Now the new Governing body with new office bearers will assume the responsibility to lead IBC, I therefore wish the IBC to reach a greater height of success and glory with your support and cooperation.

(Pradeep Mittal)

Celebrations by the IBC in the 75th year of Independence of Atam Nirbhar Bharat

As a part of celebrations in the 75th year of independence of 'Atam Nirbhar Bharat', IBC jointly with NBCC (I) Ltd. organised a Seminar on **"Contribution of Construction Industry in Building of Independent India"**, on 30th March 2022 in Jacaranda Hall of India Habitat Centre, Lodhi Road New Delhi. The Seminar was attended by large number of professionals from construction Industry.



Shri Kamran Rizvi IAS, Additional Secretary, MoHUA Chief Guest being welcome with floral bouquets



Lighting of Ceremonial Lamp

The inaugural function started with lighting of the lamp by the Chief Guest Shri

Kamran Rizvi, Addl. Secy, MoHUA, who was also joined by all the dignitaries on the dais



Dignitaries on the Dais

Shri Kamran Rizvi, IAS, Additional Secretary, Union Ministry of Housing and Urban Affairs, Govt. of India was the Chief Guest of the Seminar. Besides, the Chief Guest, Shri Pradeep Mittal, President, IBC; Shri O.P.Goel, Founder President, IBC & Former DG(W),CPWD; Shri Parimal Rai, IAS(Retd.), Past President, IBC and Former Chief Secretary, Govt. of Goa; Shri P.K.Gupta, CMD, NBCC (I) Ltd. and Vice President, IBC; Shri Vivek Bhusan Sood, CEO, IRSDC; Shri Shailesh Agrawal, ED, BPTPC; and Shri H.P.Gupta, Honorary Secretary, IBC were present on the dais. All the dignitaries on the dais were welcomed by presenting floral bouquets.

Presidential address was delivered by Shri Pradeep Mittal, President, IBC. The President, IBC welcomed and thanked the Chief Guest for sparing his valuable time for

the Seminar from his busy schedule. He also thanked all the dignitaries on the dais; all past presidents; EC & GC Members; and other participants who had come to attend the Seminar.



Presidential address by Shri Pradeep Mittal

In his presidential address, the President, IBC informed that India has come a long way since independence, leaving behind a long list of landmarks that define its journey from the agony of partition to a strong, powerful and developing Nation. The enormity of development could be gauged from the increase in the total estimated expenditure of Rs. 197.29 crore in first budget of Independent India in 1947 to an estimated expenditure of Rs. 34.83 lakh crore of Union Govt. and that of state Governments Rs. 49.13 lakh crore during financial year 2021-22 besides the expenditure by private sector. In its 74 years of independence, it has built a modern economy (second fastest growing economy), remained a democracy, lifted millions out of poverty, has become a space and nuclear power and developed a robust foreign policy. Besides self dependence in foodgrains, india has achieved tremendous progress in its overall development including construction sector in providing

housing, water, energy and related infrastructure for the welfare of common man.



Shri O.P. Goel, Founder President addressing the gathering

Shri O.P. Goel, Founder President IBC and former DG(W), CPWD, in his address informed about the Journey of IBC since its inception in 1992 and its contribution in the promotion of built environment which is sustainable, affordable, green and energy efficient.

Shri Kamran Rizvi, Addl. Secretary, MoHUA, the Chief Guest of the function, by referring to the Indus valley civilization and the shelter being taken by habitants in basements and bunkers during the present day war between Russssia and Ukraine, in his address, underlined the importance of Civil Engineering being the oldest and mother branch of the Engineering, in development of the Nation. He informed that the real challenge before the Nation is



**Shri Kamran Rizvi, Addl. Secretary, MoHUA,
the Chief Guest addressing the gathering**

the non-availability of enough skilled manpower including the skilled contractors for implementation of various modern developmental schemes of the Government. For the 'JAL JIWAN MISSION' where the Government intends to spend approximately Rs. 3.00 lakh crore so as to reuse 20% of waste water, it is mulling to find out the most appropriate technology for treatment of water and the skilled agencies. For fulfilling the aspirations of people, he also emphasised the need for training of engineers, contractors and the workers in Government as well as Private sector for ensuring Speed, Scale and Safety in construction industry, as the Government alone cannot succeed in its endeavour without the involvement of private sector. He also expressed that IBC can play a vital role in training the manpower and tying up with research institutes on the lines similar to IRC. If suitable proposal containing its action plan

in this direction to build modern India, is initiated by IBC, the ministry can look into to consider assisting IBC.



**Shri Parimal Rai, IAS (Retd.), Past President,
IBC & Former Chief Secretary, Govt.
of Goa delivering the lecture**

Shri Parimal Rai, IAS (Retd.), Past President, IBC & Former Chief Secretary, Govt. of Goa, in his address while informing that construction is the base of anything and everything, underlined the necessity of introspection to know the adequacy of development and to take the corrective actions for covering the demand and supply gap. He mentioned that Bhakhra Nangal dam was constructed manually as mechanisation had not taken place at that time in construction, but presently, despite lot of mechanisation and availability of everything, still lot is required to be done. He also expressed the need of skilling of the manpower. Every scheme should be formulated and implemented in such a way so that each affected person gets the benefit without differentiating its status, rich or poor, caste or religion. He expressed the need for wide consultation among all the

stake holders before implementing any project for getting the intended benefit. He also expressed the IBC to think, how it can contribute positively in skilling of the manpower?

Shri Vivek Bhusan Sood, CEO, IRSDC, gave a detailed presentation about the contribution of railways in making Atam Nirbhar Bharat by way of addition of new railway lines, conversion of the railway tracks from existing narrow and meter gauge to broad gauge; change over from steam engines to diesel and now electric locomotives; electrification of track; electronic automatic signalling; more comfortable passenger friendly coaches; Increase on speed of trains; laying dedicated freight corridors; connectivity of far distant places in North Eastern states and J&K etc and many more.



**Shri Vivek Bhusan Sood, CEO, IRSDC
delivering the lecture**

Dr. Shailesh Kumar Agrawal ED, BMTPC, in his presentation outlined the importance of emerging construction

systems and technologies for faster, safer, efficient and affordable construction with least life cycle cost, so as to quickly provide accommodation to the needy persons in urban and rural areas across the country. He while apprising that more than 16 lakhs houses are being constructed using innovative technologies, underlined the importance of 3S i.e Skill, Scale and Speed in construction. He also explained in detail the six emerging technologies recently approved by the Government which are being adopted for construction of 6000 dwelling units (Light Houses), 1000 houses with each technology at 6 different places in the country. These 6 technologies of Light house scheme for construction of 6000 houses are live laboratories for all the stake holders who can visit the site, learn the technology and contribute his/her views, if any, for improvement.



**Dr. Shailesh Kumar Agrawal
ED, BMTPC delivering the lecture**

**There is nothing impossible to those, who will try.
-Alexander the Great**



Shri P.K.Gupta, Vice President, IBC and CMD of NBCC (I) Ltd delivering the lecture

Shri P. K. Gupta, Vice President, IBC and CMD of NBCC (I) Ltd., in his address informed that the modern greener construction materials are substituting the traditional construction materials like, brick, cement, wood and steel etc. and mechanisation is substituting the manual construction activities for enabling faster and quality construction, sustainable in every respect. He also expressed the need of training and skilling of workers and adoption of efficient precast technologies with digital integration of all the processes involved in construction for minimising the C & D waste and ensuring faster construction. He suggested the IBC to take up the training and skilling of Architects and Engineers.

To mark the occasion, the Mementoes were also presented to the Chief Guest and the Speakers.

At the end of the seminar, Shri H.P.Gupta,, Honorary Secretary, IBC presented the vote of thanks.



Shri Pradeep Mittal, President, IBC Presenting the Memento to Shri Kamaran Rizvi, Addl. Secy, MoHUA



Shri H.P. Gupta, Honorary Secretary, IBC delivering the vote of thanks

The most beautiful things in the world can Not be seen or even touched. They must be felt with the heart.

Meeting of President IBC with MD, NHIDCL

Shri Pradeep Mittal, President, IBC on 14th March, 2022 met Shri Chanchal Kumar, MD, NHIDCL in his office and congratulated him on his appointment as the Managing Director, National Highways & Infrastructure Development Corporation Ltd (NHIDCL), under the Ministry of Road Transport & Highways (MoRTH). Shri Chanchal Kumar is a 1992 batch IAS officer of Bihar cadre. Before joining as MD, NHIDCL he was Principal Secretary of Bihar's Chief Minister.



Sh. Pradeep Mittal congratulating Sh Chanchal Kumar

During the meeting, the MD, NHIDCL assured the President, IBC to extend all necessary assistance to endeavour for development of Built Environment.

In 2018, Shri Chanchal Kumar who was Principal Secretary, PWD, BCD, Bihar Patna had also organised IBC's 23rd Annual Convention and National Seminar at Patna and had extended all required assistance.

Meeting of President IBC with E-in-C, Delhi PWD

Shri Pradeep Mittal President, IBC on 7th April, 2022 met Shri Anant Kumar, Vice President, IBC in his office and congratulated him on taking over as the Engineer-in-Chief, Delhi PWD. President, also conveyed to him the best wishes on behalf of Indian Buildings Congress (IBC).



Sh. Pradeep Mittal congratulating Sh Anant Kumar

West Bengal State Centre-Kolkata

8th and 9th Annual General Meeting (Combined)

8th and 9th Annual General Meeting (Combined) of West Bengal IBC State Centre was held on 27th December, 2021 in the premises of IBC office at Baburam Ghosh Housing Estate, 21 Baburam Ghosh Road, Tolly Gunj, Kolkata.

During the meeting, besides transaction of routine business of reading

out the Annual Report, placing audited accounts before the house; appointment of auditor for the year 2021-22; technical Presentation on “**Rehabilitation and Restoration of National Library Building, Alipore**” was also made by Shri Shiladitya Basu, Joint Secretary of IBC West Bengal State Centre..

Election was also held to elect new Managing Committee for the year 2022. The members of newly elected Managing Committee of West Bengal IBC State Centre, Kolkata are as follows:-

Chairman-Shri B.K. Dam, Former Chief Engineer, P.W.D.; Co-Chairman- Shri Sudhis Kumar Nandy, Former Engineer-in-Chief, Housing Department; Vice-Chairman- Shri Kalyanmoy Mitra, Executive Director, EPIL; Secretary- Smt. Nupur Banerjee, Former Chief Government Architect, P.W.D.; Joint Secretary- Shri Shiladitya Basu, Vice-President (Technical), Hind Chemicals; Treasurer- Shri Supriya Dutta, Former Executive Engineer, P.W.D.; Asstt. Treasurer- Shri Rathin Pal, Former Executive Engineer, Housing Department; Members-Shri Muztarab Hussain, Chief Engineer, P.W.D. (Roads); Shri Bipul Chakraborty, Former Superintendent Engineer, Housing Department; Shri Rajib Gupta Sarma, Superintending Engineer, P.W.D. (Electrical); Shri Jahnabi Konar, Superintending Engineer, P.W.D.; Shri Dilip Kumar Baidya, Chief Engineer, P.W.D.; Shri Sushil Kumar Bhowmik, Former Executive Engineer; Shri Biswajit Guha, Consultant.

Jaipur Local IBC Centre

Meeting of IBC Jaipur Chapter



Sh. Pradeep Mittal chairing the meeting of IBC Jaipur Chapter

A meeting of IBC Chapter Jaipur was convened on 16th April 2022 under the Chairmanship of Shri Pradeep Mittal, President, IBC, in Conference Room, Rajasthan Housing Board, Jaipur. Engineers /Architects/Builders from PWD, RHB, JDA, PHED, CPWD, JVVNL, RUDSICO etc. were present in the meeting.



Sh. K.C. Meena CE, RHB welcoming Sh Pradeep Mittal

Sh. K. C. Meena, Chief Engineer, RHB and Secretary, IBC Chapter Jaipur welcomed Sh. Pradeep Mittal, President, IBC and other participants present in meeting. Sh. K. C. Meena, Chief Engineer, Housing Board briefed about the various projects and activities of Rajasthan Housing Board. A brief presentation on introduction of ultra high performance

fibre reinforcement concrete in the field of advanced concrete technology was made by Sh. C. L. Verma, former Chief Engineer & Additional Secretary, PWD Rajasthan and Member of Executing committee, IBC.

Sh. Pradeep Mittal in his address said that projects of Rajasthan Housing Board are the subject of discussion all over the country due to the good architecture and construction quality. Sh. Mittal also informed about the innovation in the construction sector. He also said that just as doctor are updated about the new medicine and equipments and other new medical technology, in the same manner Engineer's should also be updated about the new construction technology and material. He further stressed that all the technical department should share technical knowhow frequently. He also requested chapter should meet often and also increase the membership of IBC.

During meeting, the working Committee of Jaipur Chapter was also reconstituted as follows.

Chairman –Sh. C.L. Verma, Former CE & AS PWD Raj; Vice Chairman –Sh. K. C. Meena, CE, RHB, Jaipur; Vice Chairman – Sh. Ajay Prakash Meena, ADG, CPWD; Secretary- Sh. Nagesh Chandra Sharma, SE (Retd.), PWD; Treasure- Sh. Anil Vijayvergiya, SE, PWD; Members- Sh. M.L. Choudhary, CE, UDH; Sh. Pardeep Kumar Garg, CE, RUDSICO; Sh. B.S Meena, ACE, PHED; Shri Ashok Kumar Chodhary, Director Eng. (JDA); Sh. Suresh Chandra Meena, ACE RVNPL / JVVNL; Sh. Amit Agarwal, DS, RHB; Sh. Vinod Kumar Sharma, RE, RHB; Prof. Nand Kumar, HOD

(Architecture) MNIT, Jaipur; Sh. Ramesh Kumar, Arch., Space Wizard; Sh. Manver Ali, ACE, PWD, Jaipur; Sh. R. S. Saxena, ACE (Electrical) (Retd.), PWD.

Odisha State Centre - Bhubaneswar

General Body Meeting of IBC Odisha Centre held on 12.04.2022



Sh. Pradeep Mittal chairing the meeting of IBC Odisha State Centre, Bhubaneswar

The General Body meeting of I.B.C. Odisha Centre was held on 12.04.2022 in the second floor conference hall of Nirman Soudha at Bhubneswar. The meeting was presided over by Sh. Satya Ranjan Sethi, Acting President of IBC Odisha Centre. The meeting was chaired by Sh. Pradeep Mittal, President, Indian Buildings Congress. The meeting was also attended by Sh. M.R. Misra, Special Secretary to Govt works department, Odisha; Sh. U.K. Mund, Special Secretary to Government, Rural Works, Odisha; Sh. G.C. Sahu, Chief Engineer (Buildings), Odisha; Sh. Susant Kumar Patra, Chief Architect, Odisha; Sh. P.C. Mohapatra, Additional Chief Engineer, O.B. & C.C., Odisha; Dr. P K Padhy, HOD CET; Sh. P.P. Karmakar, Professor CET, Odisha among others. Sh. S.R. Sethi, Chairman, I.B.C.,

Odisha Centre welcomed Shri Pradeep Mittal, National President, IBC, all members present in the meeting and informed the audience about the activities I.B.C., Odisha Centre. In the meeting each dignitary emphasized the importance of increasing the membership base of IBC and assured to enroll new life members from their departments/institutions in near future.

The President, IBC in his address while underlining the importance of increasing the membership base of IBC and technical activities of local centre stated that IBC local chapter should conduct regular workshops for capacity buildings among those institutions which are actively involved in building sector. He advised the local chapter to open a bank account to be operated by the local chapter and also to have Hon'ble Minister Works and Secretary Works Department, Govt. of Odisha as its patrons. He also requested the Engineer-in-Chief to allot space for the office of local IBC Chapter.

In the General body meeting following persons were unanimously elected as office bearers:

President- Er. Jibana Nanda Nayak, Chief Engineer (Buildings); Vice Presidents- Er. P.C. Mohapatra, Addl. C.E., O.B. & C.C.; Er. Susant Kumar Patra, Chief Architect; Ch. G. Samal, Zonal In-charge, N.B.C.C.(I)Ltd.; Er. J.J. Patra, S.E., Electrical; General Secretary- Er. B.K. Nayak, S.E., Asst. to C.E.(Buildings); Joint Secretary- Er. T. Behera, S.E. Bhubaneswar (R&B) No-I; Treasurer- Er. Dipanjali Malla, A.E.E.; Asstt. Treasurer- Er. Pratik Priyadarsi, A.E.E.; Advisors- Er. M.R.

Misra, EIC-cum-Special Secretary to Govt., Works Dept., Odisha; Er. S. R. Sethi, Chief Engineer (Buildings) Retd.; Er. P K Acharya, Addl. C.E. (Buildings); Er. Soumendra Mohanty, Civil Engineer; Prof. P K Padhy, HOD CET.

Newly elected office bearers were congratulated by all members present in the meeting.

NATIONAL NEWS

Statue of Equality in Hyderabad

Unveiling the 216-foot tall 'Statue of Equality' commemorating the 11th-century Bhakti Saint Sri Ramanujacharya in Hyderabad's Shamshabad, Prime Minister Shri Narendra Modi on 5th February 2022 said that the statue is a symbol of the saint's knowledge, detachment, and ideals, which will inspire the future generations and strengthen the ancient history of India. The smaller golden statue inside the base building was inaugurated by President Ram Nath Kovind on 13th February 2022.



A 216 foot tall statue of Saint Ramanujacharya at Shamshabad

At 216-feet tall, the statue is among the tallest metallic sitting statues in the world and the inauguration of the Statue of Equality was a part of the 12-day Sri Ramanuja Sahastrabdi Samaroham, the ongoing 1000th birth anniversary celebrations of the saint.

Born in 1017 in Sriperumbudur in Tamil Nadu to mother Kanthimathi and father Asuri Kesava Somayaji, Saint Ramanujacharya was revered as a Vedic philosopher who revived the Bhakti Movement. Considered to be one of the timeless icons of equality for social reformists around the world, his teachings are known to have inspired ancient poets like Annamacharya, Bhakt Ramdas, Thyagaraja, Kabir, and Meerabai. His devotees have vouched that, Saint Ramanujacharya liberated millions from social, cultural, gender, educational, and economic discrimination with the foundational conviction that every human is equal regardless of nationality, gender, race, caste, or creed.

Saint Ramanujacharya is known for his regard for all human and being against practices that differentiated between people. He was responsible for opening temple doors to people 1,000 years ago, even to those marginalized and discriminated against in society.

The foundation stone for the statue was laid by Chinna Jeeyar an Indian ascetic known for his spiritual discourses on Sri Vaishnavism. He is the designer and planner of the Statue of Equality. Aerosun Corporation, a Nanjing-based company,

was contracted in August 2015 for the construction of the statue. 14 models were designed according to Agama Shashtra and Shilpa Shastras. 3 models were shortlisted and improvements were made using 3D scanning technology. It was named 'Statue of Equality' by the trust.

700 tonnes of panchaloha, a five-metal alloy of gold, silver, copper, brass and zinc was used to build the statue. It was built in China and later shipped in 1600 individual pieces to India via Chennai Port in 54 shipments. Around 60 Chinese specialists including workers, engineers and welders assembled the segments on site. The assembly progressed during 2017 and 2018 and took 15 months to complete and was assembled on site at Muchintal, Hyderabad. Aerosun Corporation provided a guarantee of 20 years for the golden hue of the statue. The whole temple complex is beautifully designed and constructed by keeping in view the sustainability and green parameters of built environment. The statue was built with an estimated cost of 1,000 crore (US\$130 million), which is majorly collected from donations by the devotees.

Spread in 27,870 square metre, the temple is meant for daily worship. The base building under the statue named Bhadra Vedi is 54 feet (16 m) tall and three-stories high. The Bhadra Vedi that holds the statue is a work of art, with 18 stone carved sankhas and, further, 18 stone-carved chakras. Atop the building lies a lotus of 27 feet (8.2 m) in diameter having 54 beautiful lotus petals, and is carried by 36 crafted elephants, over which the statue sits. The

27-foot dimension of the lotus represent 24 tattvas, and the remaining 3 representing soul, god and the guru.

The statue has a concrete core which is surrounded by a panchaloha sheet with a thickness varying between 10mm and 20mm. The base building has a meditation hall where a 54 inches (1.4 m) statue of Ramunuja made of 120 kg of gold, representing the years he lived, is installed. 108 Divyadesams (model temples), built in stone, surround the statue. The Statue of Equality is the second tallest sitting statue in the world. The base building hosts a vedic digital library, research centre, ancient Indian texts, theatre and a gallery. Ramanuja's works are presented in the gallery.

Replacing Wooden Logs with Cow Dung- A Great Step towards Greener Environment

Bhopal-based Dr. Yogen Saxena is doing his bit to reduce pollution caused by wood by replacing it with cow dung logs.



Dr. Yogen Saxena with Cowdung logs

Being the first-ever energy source to be harnessed by humans, wood fuel can be used in various forms for purposes such as cooking food; heating or drying things;

making ceramics, tiles, and bricks; and generating power. However, wood has some disadvantages as well. Burning of wood produces soot, smoke and ash which causes air pollution. Additionally, wood is also a non-renewable resource considering that we are running out of space for trees due to urbanisation projects. Therefore, its consumption needs to be carefully monitored and we need to come up with alternatives that will not cause as much pollution but could still provide the same functions as wood.

Dr. Yogen Kumar Saxena seems to have found a solution. A renowned scientist from Bihar, he is known for developing a technique that produces logs from cow dung. He has built a machine for this, and these logs are ready to use as fuel. The machine uses dry cow dung mixed with some water as a paste as raw material. It then compresses the mixture and gives the output the form of cow dung logs. These logs are then sundried for 4–5 days before they are ready to use.

These cow dung logs have numerous benefits. First is that they make use of something we usually consider waste. In general, cow dung generated in cowsheds are disposed of in nearby water bodies and causes water pollution. Reusing cow dung reduces this kind of water pollution. Second, using cow dung logs does not require deforestation for the purpose of fuel wood, so tree-cutting for that purpose can be avoided. Third, burning cow dung logs also generates 43.9 per cent less particulate matter, 55.18 per cent less sulphur dioxide, and 24.8 per cent less

carbon monoxide as compared to wooden logs, and overall, causes 35 per cent less air pollution than if wooden logs were used. Fourth, cow dung logs are also meant to be used in a smaller quantity than wooden logs so they are quite cost-effective. Fifth, manufacturing cow dung logs also generates revenue for cowsheds and provides care for several cows in nearby areas, thereby promoting domestic businesses.

With this impressive list of benefits of using cow dung logs, Dr. Saxena has successfully built a network of owners of cowsheds and cremation grounds, through which communication is facilitated regarding the use of cow dung logs in Bhopal. The network's prime focus is on cremation grounds as using these logs is more environment friendly and causes less hassle than if wooden logs were used. However, increasingly, the use of cow dung logs is also extended in cultural celebrations like Holika Dahan, industrial boilers, and making handicrafts like diyas.

In the initial phase of this project, people had their reservations about this venture and refused to use cow dung logs instead of wooden logs. But with consistent efforts, Dr. Saxena and his team have been able to install these machines in 18 cowsheds in Bhopal, and have also extended this in cities like Jaipur and Raipur. Cow dung logs have also been recognised by the government of India as a reliable energy source.

With the numerous benefits these cow dung logs offer, no wonder Dr. Saxena is

gaining popularity as Gaukashth Man of India!

IIT-Madras's Tvasta can print Sustainable Homes in just a few weeks

Inside the 3D-printed house built by Tvasta Manufacturing Solutions, a startup by three alumni of IIT-Madras, lies a solution for India's and the world's housing problems.



3D-Printed House by Tvasta Manufacturing Solutions

To own a house is a dream for many but cost and durability are major worries. Tvasta Manufacturing Solutions, a startup by three alumni of IIT-Madras, has come up with a successful solution. The trio has built India's first 3D-printed house within 21 days. This apartment comprises a bedroom, hall and a kitchen with a built-up area of 600 square feet. Other than being fast and budget-friendly, the construction took place by generating minimum waste.

Another major advantage of the houses constructed using 3D printers is that they can also be customised as per geographical and climatic conditions. This

minimises the use of additional heating or cooling equipment thereby reducing energy consumption.

The standard 3D printer can build a 2000-sq-ft house in less than a week. Traditional methods of construction take at least two months for the same.

“The focus is to make the process available to all sections of the construction industry, including affordable housing and large-scale infrastructure building,” said Adithya VS, the CEO of Tvasta to The Better India. Undoubtedly, this startup is the beginning to solve housing problems faced by India and the world at large.

NTPC to promote Nano Concrete as Substitute for Natural Stone

The project uses nano concrete aggregate (stone) with high content of 76% fly ash as an alternative to 50MPa strength natural stone aggregate.



Nano Concrete that has been patented by Bhanumatidas and N. Kalidas of Institute for Solid Waste Management and Ecological Balance (INSWAREB) won first prize at the Grand Challenge National

Competition of innovative scientific ideas conducted by NTPC in December, 2018.

There is an acute scarcity of natural stone in the Gangetic plains due to lack of hillocks and the stone brought from the neighbouring states is very costly 3 to 4 folds in the originating place.

“This scarcity of stone in the North India can be overcome by utilising nano concrete and 70% of fly ash as supplement to cement in concrete mix that has a compressive strength of 30 to 40MPa” Shri Kalidas pointed out.

In the laboratory tests, the results were good. In the properties and compressive strength, it is as good as natural stone and it has now been tested by executing real work at ground by NTPC.

To translate the idea into reality, a two storied demonstration building measuring 700sqft was taken up by NTPC, Simhadri and developed a first-of-its-kind, unique model building using nano concrete aggregate (NACA), demonstrating the immense potential of fly ash utilisation.

Nano concrete is an innovative construction aggregate that replaces regular stone with 70 per cent fly ash, a key derivative of thermal power generation. With this, the research and development wing of the NTPC has achieved hundred per cent utilisation of power industry by-products.

The innovation may resolve the poignant ecological concern of fly ash disposal. The nano concrete is cast as stone and broken in jaw crushers to make it ideal

for better bonding. It attains better compressive strength than regular construction material through hydration.

In tune with the sustainable development goals, its composition requires minimum usage of water and sand, compared to a regular stone aggregate. With a high specific gravity in the range of 1.8 to 1.9 gm/cc, it exhibits low porosity with water absorption.

In the process, use of stone for construction and land for fly ash disposal can also be minimised, leading to an ultimate solution for natural resource conservation. Even at just 50 per cent penetration into the natural stone market in the country, it is capable of consuming 81.5 million tonnes of generated fly ash. It has replaced the natural stone right from the stage of foundation footing, columns to RCC slab of the building.

A practical construction substitute for terrains with scarce and dwindling natural resources, the innovation is capable of revolutionising the market dynamics. It is a major leap towards an optimistic ecological and industrial co-existence.

Kavach, the Indian Technology to prevent head on collision of Train on Same Track

It is India's very own automatic protection system in development since 2012, under the name Train Collision Avoidance System (TCAS), which got rechristened to Kavach or "armour".

Simply put, it is a set of electronic

devices and Radio Frequency Identification devices installed in locomotives, in the signalling system as well the tracks, that talk to each other using ultra high radio frequencies to control the brakes of trains and also alert the drivers, all based on the logic programmed into them. One of its features is that, by continuously refreshing the movement information of a train, it sends triggers when a loco pilot jumps signal, called Signal Passed at Danger (SPAD), a grave offence in railway operations with respect to safety, and the key to accidents like collision. The devices continuously relay the signals ahead to the locomotive, making it useful for loco pilots in low visibility, especially during dense fog.



Railway Minister Ashwini Vaishnaw during the live testing of Kavach,

On the 4th March, 2022, live testing of Kavach was done when the locomotives carrying Railway Minister, Ashwini Vaishnaw and another with Railway Board Chairman, V.K. Tripathi raced towards each other on the same track, but due to an automated system, brakes got applied when locomotives were 200 meters apart, thus avoiding a collision. Kavach, the indigenously developed Automatic Train

Protection System showcased on South Central Railway is earmarked for aggressive rollout on 2,000 km track in 2022-23, according to the Budget proposals.

TCAS or Kavach includes the key elements from already existing, and tried and tested systems like the European Train Protection and Warning System, and the indigenous Anti Collision Device. It will also carry features of the high-tech European Train Control System Level-2 in future. The current form of Kavach adheres to the highest level of safety and reliability standard called Safety Integrity Level 4.

In the new avatar, India wants to position Kavach as an exportable system, a cheaper alternative to the European systems in vogue across the world. While now Kavach uses Ultra High Frequency, work is on to make it compatible with 4G Long Term Evolution (LTE) technology and make the product for global markets. Work is on to make the system such that it can be compatible with other already installed systems globally. The Research Designs and Standards Organisation (RDSO) in Lucknow along with private vendors are developing the system. India wants more private players to take up the development and subsequent production.

In the next phase, the Kavach system will also be able to recalibrate as per temporary speed restrictions en-route, something the system does not yet have.

So far, Kavach has been filled on over 1,098 km and 65 locomotives in ongoing projects of the South Central Railway. In

future it will be implemented on 3000 km of the Delhi-Mumbai and Delhi-Howrah corridors where the tracks and systems are being upgraded to host a top speed of 160 kmph.

In addition to a trial section of 250 km, at present Kavach is under implementation on 1200 km of South Central Railway, on Bidar-Parli Vaiinath-Parbhani and Manmad-Parbhani-Nanded, Secunderabad-Gadwal-Dhone-Guntakal sections.

Further, over 34,000 km on the High Density Network (HDN) and Highly Utilized Network (HUN) on the Golden Quadrilateral have been included in its sanctioned plans.

First-Ever 3D Printed Houses for MES

For the very first time, the Indian army has constructed 3D printed houses for soldiers in Gujarat. The Military Engineering Services (MES) completed the first-ever 3D printed houses at South Western Air Command at Gandhinagar. According to ANI, using the 3D rapid construction technology helped the MES construct two fully 3D concrete printed, modern-day dwelling units with green building concepts in only four weeks. These 3D printed houses were inaugurated in presence of Engineer-in-Chief Lt Gen Harpal Singh.

3D printing is an automated manufacturing method for constructing three-dimensional real-life structures. The technique utilises a concrete 3D printer

that accepts computerized three-dimensional design files from the user and fabricates a 3D structure in a layered manner.



3D printed house

Last year, the alumni of the Indian Institute of Technology Madras (IIT-M) built India's first 3D printed house inside the campus, which was inaugurated virtually by Union Finance Minister, Nirmala Sitharaman. The single-storey home has a built-in area of 600 sq. ft. and a functional space comprising a single bedroom, hall, and kitchen.



Inauguration of 3D printed house

गाजर घास से बायो प्लास्टिक बनाने में मिली सफलता

गाजर घास अमेरिकी मूल की वनस्पति है। यह देखने में गाजर की पौध जैसी होती है। माना जाता है कि वर्ष 1950 से 1955 के बीच इसके बीज भारत पहुंचे। उस समय खाद्य संकट से जूझते हमारे

देश ने अमेरिका से गेहूं आयात किया था। इसके साथ गाजर घास के बीज भी देश में आए और तेजी से फैले। इसे चटक चांदनी के नाम से भी पुकारा जाता है। गाजर घास ऐसा खरपतवार है जो मनुष्य में दमा, एलर्जी, त्वचा रोग और खुजली उत्पन्न करता है। इससे फसलो के उत्पादन में भी कमी आती है।

फसल, मनुष्यों और पशुओं के लिए लंबे समय से परेशानी का कारण रही गाजर घास, भविष्य में प्लास्टिक के खतरनाक कचरे से मुक्ति दिलाने में सहायक बन सकती है। गाजर घास से बायो प्लास्टिक बनाने में सफलता मिली है। भारतीय प्रौद्योगिकी संस्थान (आई.आई.टी.) इंदौर के संरक्षण में निजी कालेज के प्रोफेसर डा. मुकेश कुमार पाटीदार व उनके सहयोगी ने यह उपलब्धि हासिल की है। यह बायो प्लास्टिक डेढ़ से दो महीने में प्राकृतिक रूप से नष्ट हो जाती है।

यह तकनीक सिद्धांत से आगे बढ़कर अब उपयोग के लिए तैयार किए जाने के स्तर पर है। भारत सरकार के विज्ञान और तकनीकी विभाग (डीएसटी) ने प्रोजेक्ट को आगे बढ़ाने के लिए 20 लाख रुपये का अनुदान दिया है। शोधकर्ता प्रयास में हैं कि दो वर्ष में यह प्लास्टिक उपयोग के लिए बाजार में आ सके।



गाजर घास से बनी बायो प्लास्टिक की फिल्म दिखाते हुए डा. मुकेश कुमार पाटीदार

महाराजा रणजीत सिंह कालेज आफ प्रोफेशनल साइंसेज के बायोसाइंस विभाग के प्रोफेसर डा. मुकेश कुमार पाटीदार ने गाजर घास (वानस्पतिक नाम पार्थोनियम हिस्टेरोफोरस) से जुलाई, 2000 में बायो-प्लास्टिक बनाने का काम शुरू किया था। उनकी सफलता की कहानी अमेरिकी जर्नल एनवायरमेंटल केमिकल इंजीनियरिंग में प्रकाशित हो चुकी है। शोधार्थी शाश्वत निगम इस परियोजना में सहयोगी हैं। आई.आई.टी. के रसायन विभाग की प्रोफेसर अपूर्वा के. दास बायो प्लास्टिक के रासायनिक परीक्षणों में जुटी हैं।

डा. पाटीदार के अनुसार गाजर घास के सेल्युलोज यानी रेशों से बायो प्लास्टिक बनाने में सफलता मिली है। यह सामान्य प्लास्टिक जैसी ही मजबूत है। इसकी जो फिल्म तैयार हुई है वह पारदर्शी है। खास बात है कि यह नमक और 10% सल्फ्यूरिक एसिड के घोल में भी बरकरार रहती है। यानी यह खाद्य पदार्थों की पैकिंग में काम आ सकती है। लैब में यह 35 दिनों में 80% तक नष्ट भी हो गई। इसका पर्यावरण पर दुष्प्रभाव नहीं है। मौजूदा बायो प्लास्टिक के स्वरूपों से इसकी लागत भी आधी होगी।

नारियल के छिलके से बने फ़ैब्रिक से सड़कें अधिक मजबूती बनेंगी

सूखे नारियल के छिलके के रेशे (क्वायर) को धरती का सबसे मजबूत रेशा माना जाता है। क्वायर-जियो टेक्सटाइल एक प्राकृतिक पारगम्य (जिससे द्रव-गैस आरपार हो जाए) फ़ैब्रिक है, जो बेहद मजबूत होने के साथ अत्यधिक टिकाऊ, टूट-फूट, मोड़ एवं नमी प्रतिरोधी है। सूक्ष्मजीव (माइक्रो आर्गेनिज्म) के हमले से मुक्त है। क्वायर-जियो टेक्सटाइल में लिगनिन नामक पदार्थ 20% होता है, जिसमें मिट्टी को बांधे रखने की क्षमता होती है। इसका उपयोग नदी तटबंधो, खादान की ढलानों का स्थिरीकरण करने और मिट्टी के कटाव को रोकने में भी किया जा सकता है।

नारियल के छिलके के रेशे से बने विशेष

फ़ैब्रिक 'क्वायर-जियो टेक्सटाइल' से अब उत्तर भारत के ग्रामीण इलाकों की सड़क को टिकाऊ बनाने की तैयारी है। इसके लिए सूक्ष्म और लघु उद्यम मंत्रालय (एम.एस.एम.ई.) के तहत आने वाले क्वायर बोर्ड ने तैयारी शुरू कर दी है।



नारियल के रेशे से बनाई जा रही सड़क

उत्तर भारत में इस योजना के केंद्र में बनारस होगा। इसके लिए यहां एक क्वायर (नारियल के ऊपरी हिस्से से प्राप्त खुरदुरा रेशा) बैंक स्थापित किया जाएगा। इसमें नारियल के छिलके में मौजूद रेशे से जियो-टेक्सटाइल समेत अन्य उत्पाद तैयार किए जाएंगे। इंडियन रोड्स कांग्रेस (आई.आर.सी.- जोकि देश में राजमार्ग इंजीनियरों की सर्वोच्च संस्था है) ने ग्रामीण सड़कों के निर्माण के लिए क्वायर जियो टेक्सटाइल को मान्यता दे दी है।



क्वायर-जियो टेक्सटाइल

केंद्र सरकार ने 2020 में ही सड़कों की दशा में स्थायी सुधार के लिए प्रधानमंत्री ग्राम सड़क योजना (पी.एम.जी.एस.वाई.) के तीसरे चरण में ग्रामीण इलाकों में क्वायर-जियो टेक्सटाइल के प्रयोग को स्वीकृति दी थी। इसका प्रयोग केरल के कोच्ची स्थित राजीव गांधी इंडोर स्टेडियम में किया गया। तकनीक किफायती और संतोषजनक पाई गई। विदेश में सड़कें बनाने में क्वायर-जियो टेक्सटाइल तकनीक का काफी प्रयोग होता है।

सेंट्रल क्वायर रिसर्च इंस्टीट्यूट, केरल और इंडियन जूट इंडस्ट्रीज रिसर्च एसोसिएशन, कोलकाता के निदेशक रहे डा. यू.एस. शर्मा का कहना है कि क्वायर जियो टेक्सटाइल से केरल व तमिलनाडु में कई सड़कें बनी हैं। इस तकनीक के प्रयोग से सड़क बनाने की लागत में 15 प्रतिशत तक कमी आती है। सड़क की उम्र भी लगभग दस साल बढ़ जाती है और बार-बार सड़क बनाने से छुटकारा मिलने के कारण सड़कों की ऊंचाई बहुत नहीं बढ़ती है।

क्वायर-जियो टेक्सटाइल की गुणवत्ता पर भारतीय प्रौद्योगिकी संस्थान (आई.आई.टी) मद्रास ने सहमति प्रदान की है। क्वायर बैंक के लिए एम.एस. एम.ई. मंत्रालय को प्रस्ताव दिया है। ग्रामीण विकास मंत्रालय ने ग्रामीण क्षेत्र की सड़कों में क्वायर-जियो टेक्सटाइल के उपयोग के निर्देश दिए हैं। तकनीक के प्रयोग से हजारों लोगों को रोजगार मिलेगा।

कूड़े से कमाई, सीवर के पानी से सिंचाई

गुरु नानक देव यूनिवर्सिटी (जी.एन.डी.यू.) अमृतसर जीरो डिस्चार्ज यूनिवर्सिटी बनने की दिशा में अग्रसर है। यूनिवर्सिटी प्रबंधन इसके प्रयास में जुट गया है। कैंपस में प्रतिदिन सीवर के दो लाख लीटर पानी को साफ किया जाता है, जिससे लगभग डेढ़ सौ एकड़ जमीन की सिंचाई होती है। कैंपस में गीले व सूखे कूड़े को अलग-अलग करके हर महीने तीन क्विंटल जैविक खाद तैयार होती है। इसको कैंपस के ही पेड़-पौधों के लिए इस्तेमाल किया जाता है। जी.

एन.डी.यू. प्रबंधन को इससे वार्षिक सात लाख रुपये की बचत होती है। यह काम सालिड लिक्विड रिसोर्स मैनेजमेंट प्रोजेक्ट के तहत हो रहा है।

प्रोजेक्ट में दो महिलाओं सहित सात लोगो को रोजगार मिला है। कूड़ा उठाने के लिए एक ट्रैक्टर-ट्राली चालक व एक सहायक, दो सफाई कर्मचारी और कचरा छानने के लिए दो महिलाओं सहित तीन कर्मचारी रखे गए हैं। ये गीले व सूखे कूड़े को छांटते हैं और गलने योग्य कूड़े को खाद बनने के लिए गड्डे में भर देते हैं। केंचुओं से तैयार होने वाली जैविक खाद एक महीने में एक क्विंटल तैयार हो जाती है। वहीं, गोबर, सूखे पत्तों और गीले कूड़े से पांच महीनों में दस क्विंटल खाद तैयार होती है।

वाटर ट्रीटमेंट प्लांट के जरिये प्रतिदिन सीवर का दो लाख लीटर पानी साफ किया जाता है। साफ पानी का इस्तेमाल सिंचाई में होता है। इससे ट्यूबवेल पर खर्च होने वाली बिजली की भी बचत हो रही है। पानी का कुछ हिस्सा बोटेनिकल गार्डन में बने एक तालाब में जाता है। तालाब में यह देखने के लिए मछलियों को डाला गया कि क्या वे उस पानी में जीवित रह सकेंगी। प्रयोग सफल रहा। मछलियां साफ किए गए पानी में जीवित रहीं, इसलिए अब तालाब में मछलियों को पाला जाएगा। इस प्रकार मछली पालन से भी विश्वविद्यालय को कमाई होगी।

जी.एन.डी.यू. कैंपस को जीरो डिस्चार्ज बनाने के लिए गठित कमेटी के चेयरमैन डा. दलबीर सिंह सोगी व सदस्य डा. विक्रमा संधू ने बताया कि बायो गैस प्लांट का ट्रायल जारी है। पहले चरण में यहां से दस परिवारों को नो प्रोफिट-नो लास पर मीथेन गैस का एक-एक सिलेंडर दिया जाएगा। हर माह सौ सिलेंडर गैस तैयार करने का लक्ष्य निर्धारित किया गया है। जी.एन.डी.यू. के वी.सी. प्रो. डा. जसपाल सिंह संधू के मुताबिक यह प्रोजेक्ट 2017 में शुरू किया गया था। इसमें जी.एन.डी.यू. के प्रोफेसरो ने मेहनत की, जिससे विश्वविद्यालय प्रदूषण मुक्त हुआ है।

लुधियाना के पंजाब कृषि विश्वविद्यालय में भी सीवर का 15 लाख लीटर पानी साफ कर सिंचाई में

इस्तेमाल होता है। पटियाला स्थित पंजाबी यूनिवर्सिटी में 4.5 लाख लीटर व राजीव गांधी नेशनल यूनिवर्सिटी आफ ला मे दो लाख लीटर सीवर का पानी साफ किया जाता है। इस पानी का इस्तेमाल सिंचाई के लिए होता है।

पर्यावरण संरक्षण नायक बना भुम्मा गाँव (मध्य प्रदेश)

मध्य प्रदेश के छिंदवाड़ा जिले का भुम्मा गांव पर्यावरण संरक्षण का अनूठा उदाहरण है। यह गांव रसोई गैस के मामले में पूरी तरह से आत्मनिर्भर है। यहां पर्यावरण के अनुकूल ईंधन का प्रयोग भोजन पकाने में होता है। गांव के हर घर में गोबरगैस का प्लांट है। इससे लकड़ी जलाने पर धुएं से होने वाले प्रदूषण से राहत मिली है। कई घरों में एल.पी.जी. पर होने वाला खर्च भी समाप्त हो गया है। यही नहीं हर किसान यहां जैविक खेती भी कर रहा है। गांव में खेती लायक भूमि का 550 एकड़ रकबा है, जिसमें 40 एकड़ में जैविक खेती की जा रही है।



गोबर की बायोस्लरी से खाद का निर्माण

गांव के किसान सुदामा बताते हैं कि 11 साल पहले किसान मटरलाल डोंगरे ने गोबरगैस प्लांट लगवाया था। इसका फायदा देखकर दूसरे किसानों का ध्यान भी इस ओर गया। किसानों ने सरकारी योजना का लाभ लेकर गोबरगैस प्लांट लगाए। घर में गोबरगैस प्लांट लगाने से महिलाओं को धुएं से मुक्ति मिली तो

वहीं स्वजन भी ईंधन के लिए लकड़ी जुटाने को लेकर परेशान नहीं होते। गोबरगैस प्लांट से निकलने वाली बायोस्लरी (अपशिष्ट) से केंचुआ खाद तैयार कर गांव के किसान इसका खेत में प्रयोग कर रहे हैं।

भुम्मा गांव के किसानों ने अब इसे आगे ले जाने का निर्णय किया है। तीन साल के भीतर पूरी खेती जैविक तकनीक से करने के लिए 50 किसानों की समिति बनाई गई है। किसान सुदामा ने बताया कि जैविक खेती को बढ़ावा देने वाली भारत सरकार की पार्टिसिपेटरी गांरटी स्कीम के तहत गांव में खेती की जा रही है। इसमें 120 किसान जुड़े हैं। वर्तमान में हल्दी प्रमुख जैविक उत्पाद है।

गेहूँ के डंठल एवं धान के पुआल से निर्मित कंप्रेसड एग्री फाइबर पैनल

युवा वैज्ञानिक और आर्किटेक्ट श्रिति पांडेय इन दिनों अपनी नई सोच और अभिनव सृष्टि के लिए पूरी दुनिया में चर्चा में हैं। उन्होंने गेहूँ के डंठल और धान के पुआल से ऐसा कंप्रेसड एग्री फाइबर पैनल बनाया है, जिसके इस्तेमाल से निर्मित मकान ज्यादा टिकाऊ तो होता ही है, निर्माण में खर्च भी कम आता है। इस पैनल की एक और खासियत यह भी है कि वह फायर प्रूफ होते हैं।



श्रिति पांडेय, गोरखपुर

गोरखपुर से शुरुआत के बाद श्रिति अपने एग्री पैनल से अब तक चार कोविड अस्पताल बना चुकीं हैं।

इस प्रयोग के लिए वह बतौर युवा वैज्ञानिक 2019 में संयुक्त राष्ट्र संघ द्वारा सम्मानित हो चुकी हैं। यही नहीं मशहूर अमेरिकी बिजनेस पत्रिका 'फोर्ब्स' में एशिया की सर्वश्रेष्ठ युवा वैज्ञानिकों में से श्रिति को स्थान मिल चुका है। श्रिति पांडेय ने कोरोना काल में बिहार के पटना और उड़ीसा के गंजाम जिले में काफी कम समय में एग्रो पैनल से कोविड अस्पताल बनाया है। साथ ही वह नागालैंड में 70 बेड के कोविड अस्पताल का निर्माण करा रही है।

गाजियाबाद से बीटेक करने के बाद श्रिति ने न्यूयार्क विश्वविद्यालय से निर्माण प्रबंधन में मास्टर डिग्री प्राप्त की और वहां कुछ दिन नौकरी भी की। 2016 में भारत लौटकर उन्होंने 'यंग इंडिया फेलोशिप' के तहत आगा खां फाउंडेशन के साथ मध्य प्रदेश के आदिवासियों के विकास के लिए काम करना शुरू किया। इसी दौरान उन्होंने पराली के इस्तेमाल पर शोध करना शुरू कर दिया। चेक गणराज्य में पराली से बोर्ड बनाने की जानकारी ली और 2018 में उन्हें कंफ्रेंस एग्री फाइबर पैनल बनाने में सफलता मिली। श्रिति की कामयाबी पर पूरे देश को आज गर्व है।

देश में पहली हाइड्रोजन फ्यूल सेल कार की लांच

सड़क परिवहन और राजमार्ग मंत्री श्री नितिन गडकरी ने भारत में पहली हाइड्रोजन फ्यूल कार लांच की। टोयोटा कंपनी की पायलट प्रोजेक्ट के तहत लांच की गई इस कार में एडवांस फ्यूल सेल लगाया गया है, जो आक्सीजन और हाइड्रोजन के मिश्रण से बिजली पैदा करता है। उत्सर्जन के रूप में इस कार से सिर्फ पानी निकलता है। इससे किसी तरह का प्रदूषण नहीं फैलता है।

ग्रीन हाइड्रोजन को भविष्य का ईंधन बताते हुए श्री नितिन गडकरी ने कहा कि इसे रिन्यूएबल एनर्जी की मदद से आसानी से बनाया जा सकता है और इसके लिए देश में बायोमास प्रचुर मात्रा में उपलब्ध है। रिन्यूएबल एनर्जी से बनने वाला ग्रीन हाइड्रोजन पूरी तरह से पर्यावरण के अनुकूल है और आने वाले समय में इसमें देश की एनर्जी जरूरतों को पूरा करने में सक्षम है। बैटरी को चार्ज करने में लगने

वाला अधिक समय और बैटरी के वजन और आकार की वजह से ट्रक और बस जैसी बड़ी गाड़ियों में इसका इस्तेमाल मुश्किल होता है। जबकि इनमें हाइड्रोजन का इस्तेमाल आसानी से किया जा सकता है। हाइड्रोजन फ्यूल कार बनाने वाली टोयोटा के अधिकारी ने कहा कि इस कार में पांच मिनट में हाइड्रोजन टैंक फुल हो जाएगा और एक बार टैंक फुल कराने के बाद 600 किलोमीटर तक आसानी से चलाया जा सकता है। ऊर्जा मंत्री श्री आर.के.सिंह ने कहा कि एन.टी.पी.सी. को दिल्ली से आगरा और दिल्ली से जयपुर के बीच हाइड्रोजन फ्यूल पर आधारित अल्ट्रा लक्जरी बस चलाने को कहा गया है। इस अवसर पर भारी उद्योग मंत्री महेंद्रनाथ पांडेय भी उपस्थित थे।



देश में पहली हाइड्रोजन फ्यूल सेल कार टोयोटा मिराई लांच करते केंद्रीय सड़क परिवहन एवं राजमार्ग मंत्री श्री नितिन गडकरी

पेट्रोलियम मंत्री श्री हरदीप सिंह पुरी ने कहा कि सरकार ग्रीन हाइड्रोजन की कीमत को एक डालर तक लाने का प्रयास कर रही है। हालांकि यह बड़े पैमाने पर उत्पादन के बाद ही संभव हो सकेगा। देश में ग्रीन हाइड्रोजन की उत्पादन क्षमता बढ़ाने के लिए सबसे पहले सभी रिफायनरी को ग्रीन हाइड्रोजन का इस्तेमाल सुनिश्चित करने को कहा गया है। अभी रिफायनरी में ग्रीन हाइड्रोजन का इस्तेमाल हो रहा है।

**Kind Words can be short and easy to speak,
But their echoes are truly endless**

- Mother Teresa

INTERNATIONAL NEWS

Whirlpool Turbine Creates Fish-Friendly Hydropower

New Belgian energy company uses a simple turbine construction to create round-the-clock water-powered electricity for remote communities without harming the environment.

Turbulent's goal is to provide sustainable energy for remote communities in a manner that causes no harm to the environment. Using the consistency of the flow of water as the power source, Turbulent's hydropower generators work round-the-clock. With only one moving part, maintenance costs are minimal. Installation is relatively easy within a week, with many locations generating power.

The deep drop structures created by controversial damming projects often alter the course of the water's path. The Belgian team's design, on the other hand, requires only a 1.5 meter height difference to work. Placement of the turbines in the correct location in turn becomes easier to find while also helping to keep additional construction to a minimum.

The flow of the water creates a vortex that turns the rotor which extracts the energy from the water. The small pressure required for the movement of the turbine allows for the construction of the system in areas of fairly shallow, slow-moving water. Crucially, the Turbulent design allows fish and other animal life to

pass through the turbine unhurt. 15 kilowatts are currently available for small communities. However, the capacity of the turbine is being expanded to allow for 30 and 100 kilowatts of energy output. The team asks that anyone interested in the system to get in touch to discuss the specifics of the task and location.



Whirlpool Turbine

Obviously, should the water freeze over, the energy supply will stop, and that reliance on weather remains one of the main challenges to the worldwide adoption of sustainable energy. Two ways those problems have been overcome is through application of a new material and a combination of sustainable energy sources. Graphene-coated solar cells allow for the production of electricity from rain, and in Germany, the world's first integrated wind-hydro power plant allows for the production of energy in all weather conditions.

Paper Battery: Unveiling a New and Unprecedented Source of Energy

Batteries have today become ubiquitous in today's digital century, and

are the most complacent solution of energy storage. Due to the digitization era, portable electronics devices like mobile phones, laptops, i-pads, etc. have achieved great heights of popularity because of their compact size, and light weight properties. However, a new type of battery is challenging the traditional sources of energy and is upping the ante to take centre stage in the world of energy storage- paper battery.

As the name suggests, a paper battery has a paper like resemblance- from where it gets its name. Scientifically, it is a flexible, light weight device made up of carbon nano-tubes emboldened on cellulose paper. It consists of infusion of carbon nano-tubes with paper consisting of an ionic liquid as an electrolyte.

Paper Batteries are foldable devices, which can be cut or shaped for required applications without incurring any damage to their integrity and efficiency. They can be operated like super capacitors, high-energy batteries and as self-rechargeable. A paper battery is made to a single unit, using a group of many components, which makes it more energy efficient.

Thick carbon nano-tubes are the main components of a paper battery. The reason behind the thick black colour of the battery is the presence of carbon in it. The carbon nano-tube films act as electrodes, which are embedded in cellulose based paper, soaked in ionic electrolytic liquid. There is no water content on the electrolyte, so there is nothing to freeze or evaporate and it is adaptable to any

environment. Interestingly, the battery has a potential to produce power even if it is folded or cut.

Once the paper of the battery is dipped in electrolytic liquid, the battery starts working when the electricity is generated by the movement of electrons from cathode terminal to anode terminal. This is due to the chemical reaction between the electrodes of paper battery and liquid. Due to the quick flow of the ions within a few seconds, energy will be stored in the paper-electrode during recharging. By stacking various paper-batteries up on each other, the output of the paper battery can be increased.

Presently, electrochemical battery is mostly used for everyday electronics, but having some problems such as limited life time, leakage and environmental concerns. On the other hand, a fuel cells battery is costly and faces portability issues. Similarly, a solar cell battery is not versatile and adaptable in emergency power back-up situations

Unlike the traditional types of batteries, a paper battery is far away from all basic problems, and is considered to be the more eco-friendly option. It is an ultra-thin, flexible energy storage device and has advantages over other conventional batteries by being light in weight, rechargeable, biodegradable, leak proof, non-toxic, light weight, cost-efficient and reusable & recyclable.

Energy crisis is a major problem and energy experts think that the paper battery can be an altogether path-breaking

solution to this big problem. Its biodegrading, light weight, non-toxic and flexible properties have potential adaptability to power the next-generation of electronics, medical devices and hybrid vehicles, allowing for radical new designs and medical technologies.

Here are few paper battery innovations, in which people from different corners of the globe have achieved great success in the creation of paper batteries in the best possible way out:

Paper Battery powered by Saliva:

In 2017, researchers from Binghamton University of the US, developed a new high-performance, paper-based battery powered by human saliva, that can be used in extreme conditions where normal batteries do not function. The battery generated reliable power from one drop of saliva, supplying on-board power that could be used by the next generation of disposable, paper-based Point of Care (POC) diagnostic platforms, researchers said. The battery has competitive advantages over other conventional power solutions because the biological fluid for on-demand battery activation is readily available even in the most resource-constrained settings.

Bacteria Fuelled Paper Battery:

Made up of printed thin layers of metals and other materials onto a paper surface, the bacteria fuelled paper battery was developed last year, by US based scientists, by using freeze dried exoelectrogens. The battery has unique advantage as a material for biosensors. The

battery may power disposable and flexible devices in the remote areas of the world where there is a lack of electricity.

Biodegradable Paper Battery:

In August 2018, US based scientists, invented a new type of Biodegradable paper battery. The battery uses a hybrid of paper and engineered polymers, which provides it the biodegrading properties. The battery is a big contributor to electronic waste pollution.

Applications of the Paper Battery:

Due to the facilitation of various advantages such as twisting, folding, crumpling, molding, cutting and shaping, the paper battery could be used for various applications. The combination of carbon nano-tubes and cellulose paper enables the paper battery to have long term usage, steady power and bursts of energy. For paper battery, there are numerous applications in various fields. As it is the latest technology, it can reduce the size and weight of the modern technologies. In electronics, medical sciences, automobiles and aircrafts, and so on.

Electronics: In electronics, paper batteries are mainly used in the electronic devices such as mobile phones, calculators, laptop batteries, digital cameras and also in the wireless communication devices like mouse, Bluetooth, keyboard, speakers and headsets. With the replacement of the alkaline batteries with the light-weight paper, there could be a weight reduction of laptop batteries, mobile batteries etc. Paper batteries could also be used in calculators, wrist watch and other low

drain devices. Moreover, the paper batteries also have a usage in enhanced Printed Circuit Board (PCB), wherein both the PCB sides: one for the circuit and the other side, having the components, would contain a layer of customized paper battery. This would result in the elimination of heavy step-down transformers and in the need of a separate power supply unit for most electronic circuits.

Internet of Things: Paper Batteries charged by bacteria could power the Internet of Things (IOT). Researchers at the University of New York at Binghamton, have developed a bacteria powered paper based single-use battery that relies on bacteria both to generate an electric current and also to devour the battery at the end of its useful life. It is capable of powering billions of sensors and devices by a cheap and sustainable manner.

Medical Sciences: Paper batteries have various uses in medical sciences such as making pacemakers for heart, artificial tissues using carbon nano-tubes, drug delivery systems in cosmetics. These batteries are also used in bio-sensors such as Glucose meters, sugar meters, etc. The paper battery is set in iontophoresis patch, and it helps to deliver drugs, local anesthesia, anodyne, antichloristic, etc into the skin.

Automobiles and Aircrafts: Paper batteries are used in automobiles and aircrafts such as in light weight, guided missiles, hybrid car batteries, long air flights and in satellite programs for powering electronic devices. Paper battery could one day power motor vehicles and

aircrafts and replace the conventional fossil fuel based engines with electric motors.

Micro Hydraulic Power Unit for Electricity Generation in Small-scale, Low-head Environments

Clean energy from even a trickle of water! SUMINO Masaya from Gifu Prefecture has developed an ultra-small, water powered generator that weighs just under 40 pounds. At that size, it can be placed anywhere there is running water to generate electricity, even in remote locations!



Microhydraulic Power Unit

Spiral PicoPica Hydraulic Power Unit is a promising pico-hydro power generation equipment which has potential for dissemination in non-electrified areas, with its characteristics including low-head generation and dust-resistance. There are two types of units, "PicoPica10" and "PicoPica500". "PicoPica10" is a unit that enables around 10W generation by securing a flow of 10 L/Sec and a head of 0.1m. This product can be manually assembled and utilized as security lighting, drawing power from a nearby waterway. "PicoPica10" has already been sold over 500 sets within Japan as an environmental education material.

On the other hand, “PicoPica500” enables around 500W generation by securing a higher flow rate of 100 L/Sec and a head of 0.7m. The generated energy can be equivalent to an average Japanese household's electricity consumption. If this product is implemented in developing countries where electrification is an issue, people's lifestyle can be modernized, resulting in providing enormous social and cultural impact. This product can generate electricity with lower head compared to other hydraulic power generation units. Besides having an open-type and simple structure for easy installation, the spiral shape of the watermill prevents the unit to be clogged with floating substances or dusts.

Stadium 974 - The First ‘Transportable’ highly sustainable Stadium

The 2022 FIFA World Cup will register several firsts for the 22nd quadrennial competition. It'll be the first World Cup held in the Arab World, the first time the tournament has been held outside of late spring or early summer, and the first time a World Cup game will be played in a “transportable” stadium.

Stadium 974 in the Qatari capital, Doha, was completed in late November 2021 and used for the Arab World Cup in preparation for the global competition. Its name comes from both the international dialing code for Qatar and the number of recycled shipping containers used in construction. The modular design will

allow the 40,000-person stadium to be disassembled following the conclusion of the World Cup and then transported and reassembled for further use. Qatar's plan is to donate it to underdeveloped countries which may be in need.



Stadium 974

“It is the ultimate legacy achievement,” Mark Fenwick, one of the partners of the architectural firm that designed the stadium, said in a video interview. “What would be fantastic, personally, is that it would be in the next World Cup, and that the stadium would be on another location across the ocean.”

The stadium structure is highly sustainable. Modified shipping containers sit within the steel framework of the stadium and provides the spaces for the bathrooms, concessions, skyboxes, and media rooms. Natural ventilation created through the design of the stadium eliminates the need for air conditioning, while water-efficient methods used during construction saw a 40-percent reduction in water usage compared to conventional stadium development.

Stadium 974 is one of eight stadiums in Qatar that'll be used for the World Cup and its ability to travel may prevent it from the sad fate of prior stadiums. Within just a year of the 2014 World Cup in Brazil, a \$550 million stadium in the capital, Brasilia, was being used to store buses, according to a report from NPR. Another stadium in the

more remote city of Manaus has largely become unused, and the Olympics has historically scattered its own share of abandoned venues around the world.

The 2026 World Cup — which will be hosted jointly by the U.S., Canada, and Mexico hasn't solidified its final list of venues yet, but each of the finalists is a stadium already in use by local sports teams. Subsequent World Cups, however, as well as the Olympics, could use Stadium 974 or the precedence it has set to avoid such wasteful construction for an all-too-brief event.

Solar Panels made from Food Waste produce Energy without sunlight

Solar panels are a cornerstone of the clean energy revolution, and yet, they have one great flaw: when the clouds roll in their productivity dives. Now, a new type of solar panel has been developed by an electrical engineering student at Mapua University that harvests the unseen ultraviolet light from the sun that makes it through even dense cloud coverage.

Carvey Ehren Mague, who in 2020 won the James Dyson Sustainability Award for his creation, hopes it will soon be used on the windows and walls of large buildings, turning them into constant sources of energy. Mague says the system could be applied to entire buildings such as the Montreal Convention Centre.

The concept, called AuREUS (which stands for Aurora Renewable Energy and UV Sequestration), uses luminescent particles from fruit and vegetable waste that absorb UV light and convert it into visible light. A solar film then converts that visible light into energy. "It's similar to how

we breathe in oxygen and we exhale carbon dioxide," Mague said. "It takes in ultraviolet light, and then after some time it would shed it as visible light."



Food waste Solar panels on window face of building

Mague's prototype for AuREUS is a single 3x2 foot lime green-tinted panel that he installed in the window in his apartment. In his demonstration for the James Dyson Award, he showed that his test panel can generate enough electricity to charge two phones per day. Scaled up, Mague says these panels would enable buildings to run entirely on their own electricity.

The creator also says the flexibility of the material — the resin can even be applied to fabric for clothing — allows designers to use the panels in a variety of different, innovative designs that could help more people to understand and adopt renewable energy solutions.

"If we can democratize renewable energy, we can bring it both physically closer to people as well as psychologically closer," Mague explained. "It would give them a sense of access to it, that they are closer to it, that they don't have to be large institutions that have the capability to harvest solar energy with their rooftops."

Mague's next step is to develop his first building installation of AuREUS at a small medical clinic on the island of Jomalig, off the Philippine mainland, that is frequently left without power during storms.

IBC Congratulate



IBC congratulates Shri Vinay Kumar Tripathi on his appointment as Chairman and Chief Executive Officer of Railway Board. Before his elevation to the post of Chairman of Railway Board he was working as General Manager, North eastern Railway. Shri Tripathi has attended higher Management training programmes in Switzerland & USA. He had played a key role in commissioning of state-of-art three-phase locomotives and their indigenization, which are now the workhorse of Indian Railways. Shri Tripathi holds wide experience in Railway Management and Administration.



IBC congratulates Shri Manish Kumar Gupta on taking over as Vice Chairman, DDA. Shri Gupta a 1991 batch IAS officer was Principal Commissioner, Land Management, DDA before getting elevated to the post of VC, DDA. Shri Gupta had also worked earlier as Additional Commissioner of South Delhi Municipal Corporation and as Commissioner from 2011 to 2014.



IBC congratulates Shri Vikas Kumar on taking over as Managing Director of the Delhi Metro Rail Corporation (DMRC). Shri Kumar is an officer of the 1988 – batch of Indian Railway Traffic Service. He is an Electrical Engineering graduate from IIT-Roorkee and M. Tech. from IIT-Delhi. He was Director (Operations) in DMRC before his elevation to the post of M.D. He has a working experience of around 32 years including 14 years with Indian Railways and nearly 18 years with Delhi Metro.

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Checklist for Integrated Planning & Design of E&M Systems for Large Building Complex & Checklist for Checking BOQ and Tender Documents Submitted By Consultant

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Generally, designs and tender documents are prepared by engaging a competent consultant with proven track record. These designs are done under the direction and approval of the Client and the Project Team. Based on my past experience, I have prepared a check list so that no essential E&M items are left out which are required for proper functioning of the building. Particular attention has been given here for the following items which constitute the most important components of the E&M Works;

- *Reducing power demand and reducing TR of the AC System*
- *By passive architecture method and technology to reduce power demand of E&M Systems.*
- *Check list of items to be covered for AC System*
- *Checklist for items to be covered for Substation and power distribution.*

Special attention is required on these services to ensure that each specialised job is executed by a specialised competent contractor on turnkey basis till completion and subsequent operation and maintenance for 5 years. The contents in this paper can be taken as guidance only and suitably amended as per specific requirement. Kindly note that CPWD PLINTH AREA RATES are available for quick estimation of the specialised E&M Services. Checklist saves lot of time and ensures that relevant points and items are not lost because of oversight.

INTRODUCTION

A modern building unlike buildings built in the past is equipped with a large number of E&M Services to make it safe, efficient and user friendly. These services are highly specialised in nature. As per recent trends, the cost of E&M Services constitutes about 40 % of the building cost and the trend is on the rise. While the normal building life is about 50-75 years the average life of electrical systems is 25 years and electronic services is 5-7 years. Therefore, during the life span of the

building, the E&M Systems will have to be changed more than two times. Also, the E&M systems require continuous, often round the clock operation & maintenance and involve very high energy cost. Most of new buildings are centrally air-conditioned for efficiency and comfort of the people. The electronic systems working inside amounts to substantial expenditure. In the recent past, increasingly, many modern safety, control, monitoring and automation systems are being provided for reliability and economy. Considering the

above, the Life cycle cost of the E&M systems is much higher than the civil cost.

E&M SYSTEMS IN A BUILDING

The E&M services as per checklist given in this paper are to be integrated into the building. The civil work of building is to be completed with simultaneous fitment of E & M service to avoid delay in occupation and utilisation of the building, waste of money and architectural disfigurement of the building. First requirement is therefore to ensure that no essential/ desired service is left out on account of oversight.

ATTENTION TO SOME IMPORTANT CONSIDERATIONS

Attention is required to some vital considerations which make a very big difference to the cost and power requirement of the project as they effect the efficiency, economy and reliability of the respective services.

Reducing Capacity of Substation and Central AC Plant with Energy Saving Measures

- The entire campus is planned for a certain maximum power demand which may come in phases. In absence of specific guidelines, each consultant will estimate his own maximum demand. Generally, it may be higher than the actual demand. For example, one Consultant may estimate it as 10 MVA and the other consultant may estimate it as 15 MVA. To overcome this, recently issued "CPWD Guidelines for Substations and Power Distribution systems of Buildings 2019" for estimating load demand may be followed.
- As per these guidelines, the maximum demand may be 25-30 watt per sq meter of built-up area for Electrical loads. For Centrally AC, it may be 30-40 watt per sq meter of AC Area.
- With application of passive architecture measures, the heat ingress to the

building can be reduced by as much as 50 %. The AC power requirement can also be reduced by 50 %. These measures are: Building shape and Orientation, Envelope Insulation, Surrounding greenery, Shading, Double glazing of windows, Roof Insulation, natural ventilation etc. With the above provisions, the power requirement for AC can be reduced to about 20 watts per sq meter.

- In a modern AC Building as a thumb rule, 50 % of power is consumed by AC and the other 50 % by Electrical loads to include all loads other than AC. We can call these as E&M Loads. E&M loads can be further reduced by about 50 % by applying following methods:
 - i. Use of highest star rated appliances like transformers, motors, fans, luminaires and other E&M devices.
 - ii. Cable sizes to keep volt drop within permissible limit as per ECBC Code.
 - iii. Task lighting to reduce lighting load.
 - iv. Day lighting to reduce artificial lighting.
 - v. Occupancy sensors to cut off AC and lighting in case of non-occupancy.
 - vi. Lighting automation for overall lighting control to reduce power consumption.
 - vii. Use of IBMS for overall monitoring and control.

Reducing AC Power Input

AC power input per TR of AC can be further reduced by about 40 % with the application of following measures:

- Use of most energy efficient chillers with VFD Drive for chillers, pumps, cooling

towers, AHUs, Auto tube cleaning and incorporating other design features which are available in the market, The KW per TR can be reduced from 1KW/TR to 0.6 KW/TR.

The power requirement of the campus can be easily reduced by more than 50 % by better design and use of technology.

- For example, for a campus of built area of 200,000 sq meter, the maximum demand can be reduced from 10 MVA to 5 MVA with reduction in capital cost of AC Plant by about 25 Crores and Substation by about 20 Crores. The energy saving will be about 7 crores per year.
- The E&M Designer should be asked to incorporate the Energy savings measures as detailed here in this paper.
- The AC Designer should be asked to coordinate with the architect to incorporate passive architecture into the building to minimise heat ingress.
- Generate on site solar power to the maximum extent to save on energy bills. For example, a typical IIT campus will require 5 MVA of power, which can be generated with an area of 7 acres, to save electricity bill of 7 crores a year to make the campus entirely electric bill free. It saves about 400 crores in 30 years.

Financial implications of the measure

- Additional cost to provide the additional measures discussed above will be about 10-12.5 % of building cost. But the additional cost will be paid back in 6-7 years and thereafter there will be huge annual savings on account of substantially reduced energy bills.

PROVISIONS FOR THE FUTURE EXTENSION OF SUBSTATION AND AC PLANT

The Electricity demand goes up every year. After 10-15 years it may become necessary to provide for additional power. Therefore, Each Substation shall have

provision of at least one transformer and extension of LT Panel. Similarly, The AC Plant shall have provision of at least one or two chillers. Otherwise, we have to go for new substation and AC Plant which will be very costly and land may not be available.

DISTRICT COOLING FOR AC PLANT FOR THE ENTYRE CAMPUS

The National Building Code 2016 recommends use of district cooling for AC Plant to reduce capital cost and running cost. While substation can feed radially up to 200 to 250 meters to reduce voltage drop and cabling cost, AC Plant can supply chilled water up to Kilometres at economical cost. This has become a standard international practice.

WATER REQUIREMENT OF AC PLANT

Water cooled chiller plant requires water. As a thumb rule, it is 10 litres per ton per hour. A 3000 Ton AC Plant working 10 hours a day at average load of 50 % will require 1,50,000 litres of water per day which is a substantial requirement. It is better that a dedicated water tank of one day requirement capacity should be provided near the AC Plant. Chiller requires conditioned water so that condenser tubes are not corroded. Generally treated water from ETP/WTP is provided for the AC Plant. This aspect of conditioned water requirement, which is vital for proper running of the AC Pant should be coordinated.

OPERATION OF CENTRAL AC INSTALLATION THROUGH BMS

Intelligent operation of the AC installation through BMS is a must for optimised operation of all equipments to ensure lowest power consumption. The BMS monitors, controls and schedules operation of the entyre installation. Various operating parameters can be programmed for ensuring most efficient operation. A manual operation is a poor substitute and energy wasteful.

INDOOR AIR QUALITY, AUTOMATICALLY ENSURED

The centrally AC building is entirely sealed from the outside. It draws only about 5 to 10 % of the air requirement as fresh air and the rest is recirculation of inside air after rerun to the AHU and re-cooling. The supply air from the AHU is filtered, cleaned and fed into the conditioned areas. The inside PM 2.5 level can be maintained at 20-30 as against outside pollution level of more than 200 which is quite common in India. The AC Scheme should provide for automatic monitoring and maintenance of IAQ with necessary support system.

CHILLERS ON ESSENTIAL ELECTRICAL SUPPLY

Some critical areas require uninterrupted AC. The client will project such requirements in details and the AC design will provide for such Chillers to work on essential DG Supply in case of mains power failure. Therefore, this aspect requires careful detailed planning. The AC main LT Panel will have two sections, one essential and the other non-essential. Backup DG sets should be properly worked out.

DAY AND NIGHT TIME AC DEMAND

Generally, the night time AC demand is reduced compared to day time. For example, the day time peak load may be 2000 TR and night time may be 200 TR. Suitable designs can be built into so that during night time a small chiller works. For such a reduced demand we can go for air cooled chillers also to reduce dependency on water.

VRV SYSTEM VRS CENTRAL WATER CHILLING SYSTEM- LIFE CYCLE COST

VRV system life is about 10 years compared to useful life of 25 years for central chilling plants. VRV power consumption will be about 25 % more. Life cycle cost of VRV will be about 40 % higher. Therefore, before selecting an AC scheme, go for life cycle cost comparison.

PREFERRED LOCATION OF THE CENTRAL AC PLANT

AC plant should be a part of the Service Building consisting of ESS, DG Sets, preferably at ground floor of independent building. AC plant consumes almost 50 % of total power; hence should be adjacent to the transformers to minimise power connectivity cost.

CENTRAL AC INSTALLATION TO BE EXECUTED ON TURN KEY CONCEPT

The AC contractor should be a highly reputed AC Firm with proven technical and financial capacity and record of having executed similar jobs. The work to be executed by the firm on turnkey basis, i.e. execution of the entire job, testing, commissioning and subsequent operation and maintenance.

CHECK LIST OF E&M SERVICES

All specialized E & M services to be executed by a competent specialized contractor on turnkey basis by engaging skilled workers, supervisors and engineers

Substation and Power Distribution

- Receiving substation to receive and distribute power with incoming substation and distribution substations with HT Panels, Incoming Transformers, LT Panels, APFC Panels Interconnection with Bus Ducting, Earthing, Substation protection, HT cabling etc.
- Each substation back up with DG sets and UPS for ensuring uninterrupted electric supply for essential/critical loads.
- Power distribution from substation to individual buildings through UG cabling of proper sizes to ensure permissible voltage drop.

Internal Electrification of each Building

- To include main LT Boards Essential-Non-Essential-UPS, Rising mains/cables, Distribution LT Panels, Wiring, DBs, Fans, Light Fittings, Lightning conductor, Earthing, surge Protection, Power

outlets, lighting automation etc.

HVAC to include : Central Air-conditioning, Ventilation, Smoke Exhaust, Pressurisation system

Lifts and Escalators

Comprehensive Fire Protection system to include : Wet riser/Down Comer/ Sprinkler/ Automatic Fire detection and Alarm System/ PA System/Fire signage.

Water Supply System to include Pumps and Automation

Electronic Systems to include : LAN system/ WIFI system/ Electronic Surveillance system/ Access Control system/ CC TV system/ EPABX/ Communication system.

External Lighting : To include Road Lighting, Compound Lighting, High mast- Semi high mast lighting/ Pathway lighting/ Façade Lighting, Illuminated Fountains.

Auditorium : Specialised lighting, Stage Lighting, motorised curtains, Projection System, Sound System.

STP/ETP Plants: Should include all necessary machineries including disposal arrangement of treated effluent.

Solar Power/ Solar Water Heating/ Solar Lighting

Car Parking system including automated parking.

IBMS: To monitor, control, data record all specified E&M systems

Any other specialised system required by the client: Carefully add additional services required by the Client based on specific building use like Hospitals, Medical College, Data Centre etc.

CHECKLIST FOR AIR-CONDITIONING

For Architectural and Structural Coordination To provide space for:

- Plant Room, (preferably part of ESS Service Building) to accommodate chillers, pumps, Electrical Panel, BMS,

Piping and Valves.

- Cooling Towers on the terrace of Plant Building, including structural arrangement for erection of cooling towers and staircase approach to the terrace.
- AHUs in vertical alignment (As per CPWD HVAC specifications) so that chiller pipes from the Plant can be taken inside AHU without passing through the corridors.
- Adequate corridor width/ height for AC Ducting.
- Structural provision for entry of chiller pipes and cables from plant room to AHU.
- Provision of air tight doors/ windows. Double glazing windows with required U Value and SHGC Value
- Envelope/ ceiling insulation
- Orientation of the building to reduce heat ingress.
- Surrounding greenery planning.
- Structural loading for various equipments.
- AC Water Ground tank and make up water tank for cooling tower
- Air Curtains
- AHU Room: fresh air opening. Drainage arrangement, Acoustic Lining
- Insulation of wall/ ceiling between AC non-AC Areas.
- Entire building to be airtight. No connection with outside except through fresh air openings in AHU Room.

Check list for Documents from AC Consultant

- Based on Heat Load Calculation, peak load calculation for day and night.
- Selection of number and capacity of chillers.
- Chillers required on essential (DG) electric supply.

- Electrical Coordination: Capacity and number of transformers with voltage correction, APFC Panel, number and capacity of back up DG sets. In coming supply ACB rating from substation LT Panels, Essential/Non-essential for termination into AC Main Panel.
- Space for future chillers.
- Provision for stand by chillers.
- Essential supply to Chillers and all AHUs provided.
- BMS for monitoring and control of the entire AC installation provided.
- Water requirement for AC Coordinated.
- Provision of Ground tank for AC water tank and make up water tank for each cooling tower.
- Water conditioning for water to be used for cooling tower.
- Water from WTP/ETP for AC Plant?
- All AHUs in vertical alignment for entry of chilled water pipe and cables from Plant Room without passing through corridors.
- Chilled water pipe and cable route from plant room to the building coordinated.
- VF Drive for chillers, pumps, AHUs, C Tower included.
- AHU: fresh air opening.
- Envelope insulation, Roof insulation.
- Indoor Air Quality, automatic control included.
- Clients detailed functional requirements included.
- For all the areas, inside conditions to be maintained, specified.
- Winter heating provided?
- Space provision for plant room, terrace (for Cooling Towers), AHU Rooms, corridor width and height adequate.

Consultant Design to include

- Heat Load Calculation
- Detailed Design Sheet
- Technical summary of steps taken to reduce Heat Ingress.
- Technical steps taken to reduce IKW/TR from 1 KW to lowest possible level. Specify the target IKW with summary of steps taken.
- Plant equipment layout drawing with dimensions to include chillers, pumps, AC Electrical Panel, VFDs, Cabling, Piping, and Valves etc to ensure that space is adequate.
- Space for future chillers.
- Terrace layout drawing for cooling towers.
- Chiller pipe/ cable route from Plant to the Building.
- AHU Room: AHU layout with Panel, piping, valves.
- Ducting drawing from AHU to conditioned areas through corridors.
- AR for rates adapted
- BOQ for complete job with all associated works included.
- If any exclusion, Specify.
- Approved Makes of materials, equipments.
- Governing specifications.
- List of equipments which require factory inspection: Chillers, AHUs, Cooling Towers, Electrical Panels and any other item to be specified.
- 5 years comprehensive operation and maintenance to be included in BOQ.

CHECKLIST FOR SUBSTATION AND POWER DISTRIBUTION

Maximum Demand Assessment

- Total built-up area of the campus: Sqm.

- Total air-conditioned area.....sq meters
- Assessed maximum demand
- Electrical KVA
- Air-conditioning..... KVA
- Special equipment loads, hospitals/ labs etc... KVA
- Total Maximum DemandKVA
- Load per sq meter.....kw/Sq meter.
- If it is more than 25 watt/sq meter for Electrical and more than 30/sq meter for AC, then the design is deficient with reference to energy conservation and efficiency. Look into it and improve the designs.

Receiving Substation for the campus

- Assessed Maximum Demand:.. MVA.
- Transformer number and capacity,
- nos. working,nos stand by, capacity in KVA

Distribution Substations

- How many?
- For minimising volt drop and cabling cost,substation can feed radially up to 200-250 meters.
- Above criteria met?
- For each Substation:
- nos transformers and capacity.

- DG Backup ... nos and capacity.
- Repeat for all Substations.

Summary

- Total number of transformers and aggregate KVA....
- Total number of DG sets and aggregate KVA.....
- Provision of future load growth.....
- Spare capacity provided... specify.
- Each Substation: space provided for transformer for future yes/No

UPS Backup

- Total UPS KVA Provided.
- Centralised or decentralised
- Give Location wise KVA

Solar Power Provided

- KVA.....
- Roof top area provided with location..... sq meters.

Summary

- Total 33 KV Power KVA
- Total 11 KV Power KVA
- Total DG Backup KVA
- Total UPS Backup KVA
- Total Solar Power proposed KVA



Lessons learnt from Public Housing Projects

K.B. Rajoria*

*Former E-in-C, Delhi PWD & Past President, IBC

Almost forty years back, the period after Asiad 82, the administrative authority, asked the author of this article to inspect a housing project, meant for public, which was completed sometime back. The problem was heavy leakage from toilet and kitchen blocks. The Engineer-in-Charge was asked to visit the housing project, which was already occupied partly. It was noted that most of kitchens and toilets were leaking. The slabs and walls were fully damp and at places water was dripping. The Engineer-in-Charge was asked to open the flooring and remove filled material to check the condition of fittings and fixtures. After a few days, these toilets and kitchens were inspected, it was found that slope was not proper and joints were not properly filled. Instruction was given to attend properly and use the system to check that defective work properly repaired. Thereafter, the system was got checked in the author's presence. It was proper and without any leakage.

The most important issue was how such bad work was done and nobody checked. Enquiries revealed that officers of the organisation even upto the level of Junior Engineer did not even see the drawings. They did not check the plumbing work, during execution or even after completion. The same was the position of contractor's engineer and his supervisor. It was the history of sub-contractor who did the work as he deemed fit and the outcome was with us. The sufferers were occupants of these flats.

In order to attend to defective work systems were formed. The record of checking at different stages of work by contractor's representatives and departmental engineers

was kept. The Executive Engineer was asked to check, after completion of each and every block and record for the same was kept. The outcome was leakage free public housing colony. Residents were satisfied.

During the same period, for another housing colony, there was a news that in this colony, foundation less houses were constructed. These houses were still under construction. The responsibility to inspect, strengthen and make these houses safe was also given to author. After inspection, it was noted that houses were not foundation less, but the foundation in some blocks were having less than required dimensions. Lot of money was spent on this project and simply declaring it unsafe would have meant wastage of public fund. After detailed investigation and in consultation with a foundation expert, unique solution for strengthening of foundations was found. Under reamed piles were laid with horizontal beams for interconnection with existing foundation. Thereafter load test was done to check the strength of foundations. These structures were found safe. In fact the design was also got checked from professor of I.I.T. Delhi, who accepted and agreed with our solutions.

All allottee knew the fact that size of foundations was less than required and houses were unsafe. They were requested to wait and our strengthening measures were shown to them. Secondly, it was also explained that no signs of failure were visible. A number of allottees were civil engineer and they were convinced that after retrofitting these houses were safe. These houses were thereafter occupied by them. And they continue to live

happily, in these houses, with no complaint of structural disorder.

Thereafter, Vasant Kunj Housing project was implemented. A number of packages were made and work was awarded to several contractors. A systematic approach was evolved to ensure total quality and proper working of services. The purpose was that quality should be seen and experienced by allottees. To ensure this, the checking systems were evolved, implemented and documented. Steps were taken for systematic approach, for testing of materials. A field laboratory was established for testing, according to CPWD Standards. Besides, smoking machine and pressure pumps were also procured for testing of sanitary, drainage and plumbing pipes. Testing of materials was done at Project site laboratory and materials were used only after test results were found satisfactory. A few samples were sent to approved testing laboratories.

Under each contract packages, a few blocks were awarded to contractors. A block had two dwelling units on each floor, making eight units for each block. The construction of block was divided under following stages (i) Foundation upto plinth level, (ii) Brick work and R.C.C. work upto ground floor lintel level and further beyond for first, second and third floor level and from top floor lintel level and above. Stages of different blocks were correlated with materials brought. So when materials testing were done, the samples were identified with particular location in each block. For record of material testing a master register was kept. Depending on quantity of materials used in each stage, the number of tests to be done were decided and conducted accordingly. Wherever tests not found satisfactory, material was rejected, before it could be used for the project, thus only duly approved materials were used. Wherever available, only ISI marked materials were used.

Workmanship was controlled by employing well experienced workers. Departmental engineers kept a watch and asked contractor to remove workers, who were not capable to produce quality work. The structural work (brick work and R.C.C. work) was inspected at each stage. If it was not found proper, either repaired or removed and redone.

The work of services was allowed only after structural work was completed and defects/deficiencies removed. Pipes for water supply lines, drainage pipes, sewerage pipes, electrical conduits and telephone conduits were laid by cutting chases and making holes in R.C.C. work. Services were individually checked and approved after these were found proper. Thereafter repairs of chases and holes were attended.

The final finishing was done only after services were found in order. After completion of finishing work, each block was inspected by Civil Wing, Electrical Wing, Architect and representative of housing department. Defects and deficiencies were fully attended. Record of all stage checking was kept.

For external services, in order to attend these in systematic matter, a combined services plan was prepared. It had details of roads, water supply lines, sewer lines, drainage lines, electrical cables, telephone cables etc. Location of existing trees was also marked. The reduced level of all the services were decided jointly and recorded in combined services plan. All external services were tested and record kept.

Finally Senior and Top level Engineers, Planners and Housing department officers jointly inspected the project. Defects and deficiencies wherever noticed were set right.

The work for this project was appreciated by allottees and nothing adverse was reported.

From Editor-in-Chief Desk

Public Housing – Failure and Responsibility

For last more than half century, public housing projects are developed, particularly in Urban areas of the country. The demand is generally being fulfilled by Development or Housing Authorities of the Government, Undertaking/Construction Corporations of Government and private developers. They are expected to deliver, houses with proper specifications, quality standards and according to approved plans by local authorities, these houses should have services in proper and working condition. The safety of structural work, particularly R.C.C. work is also to be ensured.

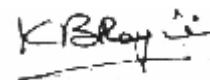
In recent past, at Gurugram; Haryana, there was structural failure in an occupied building constructed by private developer. Besides, there was news about poor quality of construction by N.B.C.C., a Govt. of India undertaking. It can be concluded that developing agencies did not ensure delivery according to specifications and structural plans. It will be necessary to analyse as to how things went wrong and who is responsible. Of course, the total and final responsibility is that of agency. Besides, whether agency has adequate records to show that proper material was used and structural work was systematically checked.

For the Gurugram Building-Chintels Paradiso, the newspaper report revealed collapse of 6th floor slab of the flat of Shri Arun Kumar Shrivastava, who survived but his wife lost life in the collapse. It was an incident of 10th February, 2022. The accident was on account of the fact that the structure was unsafe. The legal aspects are to be seen by law makers.

It will be desirable to analyse and find solutions, for this particular incident. However, we should watch the outcome after law makers and courts take decision on this accident.

Unfortunately, the problems are not new but engineers and builders have not found solutions. No system has been worked out. Such accidents continue to add to human miseries.

In fact, the public housing was approved and controlled by Housing Boards and Development Authorities. It will be interesting and informative to know, how such projects were granted occupancy certificate besides, whether comprehensive system were developed, not to merely ensure quality but to even record the implementation of quality assurance.



(K.B.Rajoria)



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With Best Wishes



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