



आत्मनिर्भर भारत



सत्यमेव जयते



**Nirman Bharati**  
Central Public Works Department

**निर्माण भारती**  
केन्द्रीय लोक निर्माण विभाग



**Celebrating**  
**167<sup>th</sup> CPWD**  
**DAY**  
12 July, 2021

**Sustainable Development**  
**for Atmanirbhar Bharat**



## *The Genesis of* **Central Public Works Department**

The Public Works Department was formally established in the year 1854 in the sixth year of Lord Dalhousie's tenure as Governor General. In the minutes of a meeting held on 12th July, 1854, the Governor General resolved that a Central Agency be provided by creating an office of Secretary to the Government of India in the Department of Public Works. The note recorded by Lord Dalhousie was as under:

“...The organization of the Department of Public Works in the Indian Empire will be incomplete unless there shall be provided for the Supreme Government itself some agency by which it may be enabled to exercise the universal control confided to it over Public Works in India with the best of scientific knowledge with authority and system.

I have, therefore, now to propose that such an agency shall be provided by creating an office of the Secretary to Government of India in the Department of Public Works. The person who holds it should always be a highly qualified officer of the Corps of Engineers. He should have the aid of an Assistant Secretary, also an officer of the Corps of Engineers. His salary I think should not be less than that of the Secretary to the Govt. of Bengal, namely Rs. 3,000 per month and the salary of the Assistant should not be less than that of the Assistant Secretary in the Military Department...”

Indeed, the court of Directors approved Lord Dalhousie's proposal and also appointed the first Chief Engineer of Public Works Department as recommended by Dalhousie. They mentioned: “We do not object, to the appointment, in the first instance, of Major W.E. Baker.”

Thus, 'PUBLIC WORKS DEPARTMENT' came into existence in a systematic and formal reorganized way by bringing all works - both civil and military inclusive of roads, irrigation and railways- under the administrative control of one department.



हरदीप एस पुरी  
HARDEEP S PURI



आवासन और शहरी कार्य राज्य मंत्री (स्वतंत्र प्रभार)  
नागर विमानन राज्य मंत्री (स्वतंत्र प्रभार)  
वाणिज्य एवं उद्योग राज्य मंत्री  
भारत सरकार

Minister of State (I/C), Housing & Urban Affairs  
Minister of State (I/C), Civil Aviation  
Minister of State, Commerce & Industry  
Government of India

### MESSAGE

It gives me immense pleasure to learn that Central Public Works Department is celebrating its 167<sup>th</sup> Annual Day on 12 July 2021, and bringing out '**Nirman Bharati**' highlighting the activities and achievements of the Organisation.

In this span of 167 years, CPWD has grown into a large central government engineering organization catering to the requirements of central/state governments, PSUs and other public bodies. This eventful journey of CPWD from its inception to the present glory has been achieved because of the dedication, commitment, exemplary leadership and teamwork which built strong foundations in scaling such heights.

I congratulate CPWD for adopting '**CPWD: Sustainable Development for Atmanirbhar Bharat**' as the theme this year. I am happy to note that it has taken many initiatives in the recent past and adopted sustainable and innovative construction practices across the nation.

I once again congratulate the entire CPWD fraternity on the occasion of 167<sup>th</sup> Annual Day.

New Delhi  
02 July 2021

  
(Hardeep S Puri)

DURGA SHANKER MISHRA



SECRETARY  
MINISTRY OF HOUSING AND URBAN AFFAIRS  
GOVERNMENT OF INDIA



### MESSAGE

On the occasion of 167<sup>th</sup> Annual day of Central Public Works Department, I convey my warm greetings and best wishes to entire CPWD family. It is encouraging to learn that '**Nirman Bharati**' is being published by CPWD highlighting the activities and achievements of the Department.

I am happy to note that CPWD is performing very well in all spheres of its activities and transforming expectations of its large clientele with regard to their built requirements into a tangible reality, with emphasis on quality and fiscal prudence.

The need for sustainable development and reducing the carbon footprint of the building industry is of paramount concern for policy makers in India. CPWD has been adopting innovative technologies and sustainable practices over the last few years and its continued efforts in sustainable development and reducing the carbon footprint are indeed laudable.

It is a matter of great satisfaction that CPWD at present is on the path of rapid progress and has maintained an edge in the construction domain due to its large number of multidisciplinary technical professionals and pan India presence.

I wish CPWD all success on the occasion of its 167<sup>th</sup> Annual Day and call upon all CPWD officers and staff to work with full commitment and dedication and take their Department to greater heights.

(Durga Shanker Mishra)



Vinit Kumar Jayaswal  
Director General



सत्यमेव जयते

भारत सरकार  
Government of India



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निर्माण भवन, नई दिल्ली-110011  
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## MESSAGE

It is a matter of pride that our Department is completing 167 years of glorious service to the nation on 12<sup>th</sup> July 2021. On this auspicious occasion, I convey my best wishes to each member of CPWD fraternity. Let us rejoice our industrious and progressive journey of achievements and success together on this auspicious Day.

I also extend our heartiest thanks and gratitude to our large esteemed clientele for reposing their faith in us. I am confident that CPWD shall continue to serve them and earn their satisfaction.

Our achievements and activities in the recent past have been significant in terms of works performance, speedier and quality construction, adoption of new technologies, human resource management, e-governance initiatives and ERP implementation, new policy and reform measures for the growth of Department. We have brought new Schedule of Rates, Green Rating Manual and many other useful publications which are followed by the entire construction sector.

This year we have chosen '**CPWD: Sustainable Development for Atmanirbhar Bharat**' as the theme. We are committed to keep pace with the technological advancements and adopt sustainable, energy efficient and new emerging green and clean technologies in our construction activities for nation building.

I am happy to note that the Department is bringing out 'Nirman Bharati' on the occasion of this 167<sup>th</sup> Annual Day. I congratulate Shri Devendra Kumar Sachan, Director (Tech & PR) and Smt Mitali Saikia, Architect (Tech&PR), CPWD for their efforts.

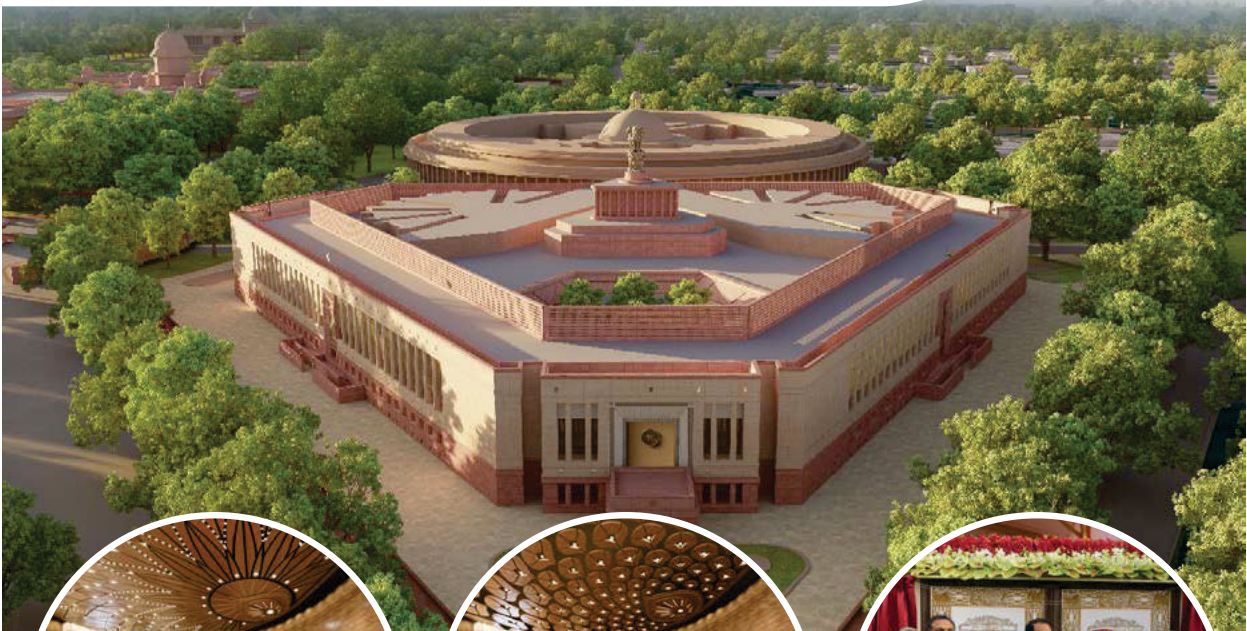
  
(V K Jayaswal)

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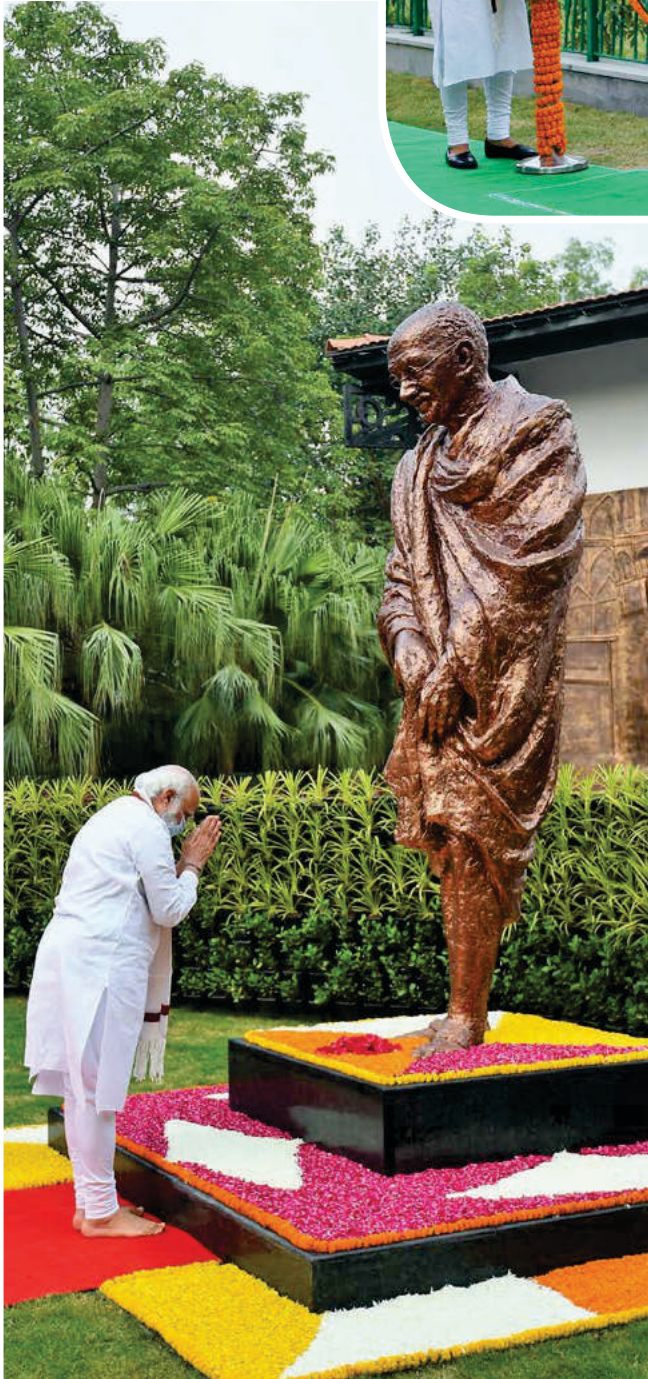
## IMPORTANT EVENTS

Hon'ble Prime Minister of India lays the foundation stone of prestigious New Parliament Building at Sansad Marg, New Delhi on December 10, 2020



## IMPORTANT EVENTS

Hon'ble Prime Minister of India inaugurates 'Rashtriya Swachhata Kendra' at Gandhi Darshan, Raj Ghat, New Delhi on August 08, 2020



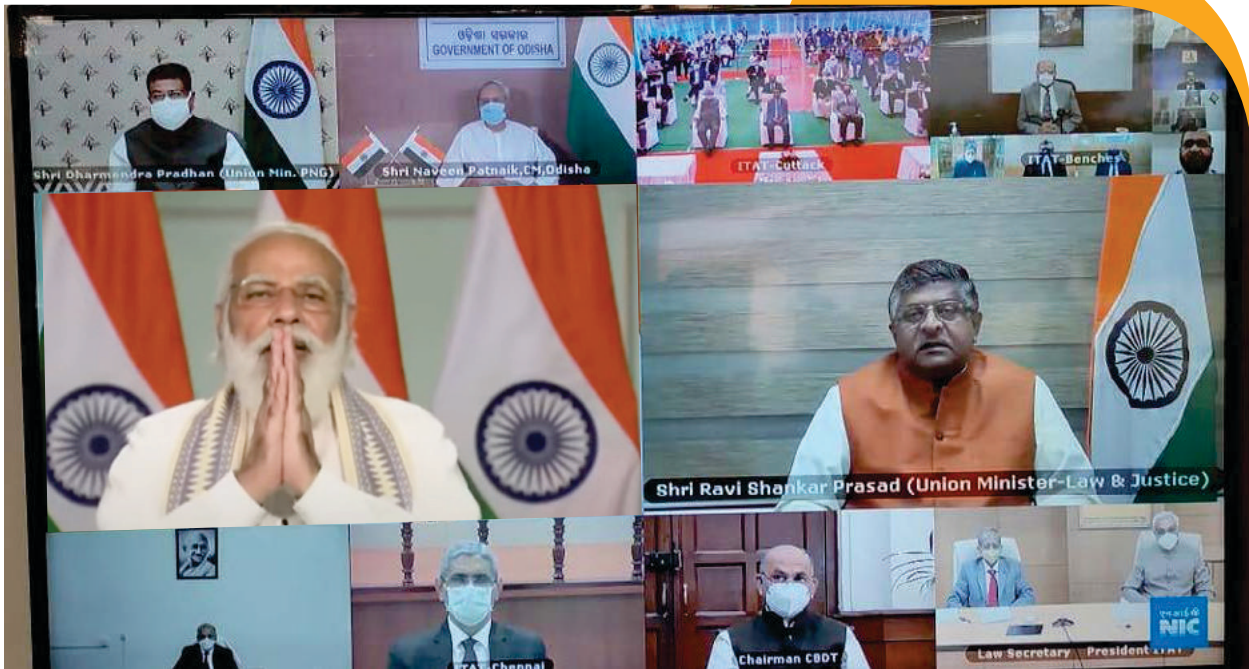
Hon'ble Prime Minister of India inaugurates 76 flats for Hon'ble Member of Parliaments at Dr. BD Marg, New Delhi on November 23, 2020



Hon'ble Prime Minister of India virtually inaugurates JIPMER Blood Centre and lays foundation stone for the construction of JIPMER Karaikal Campus at Puducherry on February 25, 2021



Hon'ble Prime Minister of India virtually inaugurates Income Tax Appellate Tribunal Building at Cuttack, Odisha on November 11, 2020



## IMPORTANT EVENTS

Shri Amit Shah, Hon'ble Home Minister lays the foundation stone of Headquarter of Rapid Action Force, CRPF at Bhadravathi, Karnataka on January 16, 2021



Shri Hardeep Singh Puri, Hon'ble Minister of Housing and Urban Affairs performs bhumi puja for the redevelopment of Central Vista Avenue at India Gate Lawn, New Delhi on February 04, 2021



## IMPORTANT EVENTS

Shri Hardeep Singh Puri, Hon'ble Minister of Housing and Urban Affairs, Shri Prahlad Singh Patel, then Hon'ble Minister of State (I/C) for Culture and Tourism jointly inaugurates refurbished Janpath Building for IGNC A at New Delhi on July 01, 2021



Shri Ramesh Pokhriyal 'Nishank', then Hon'ble Minister of Education inaugurates IIT Ropar Campus, on October 22, 2020



## IMPORTANT EVENTS

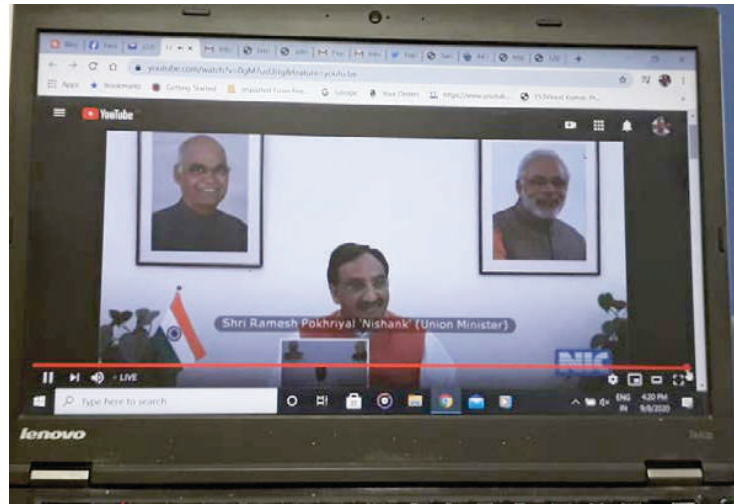
Shri Ramesh Pokhriyal 'Nishank', then Hon'ble Minister of Education virtually inaugurates 'Diamond Jubilee Lecture Hall Complex' at NIT Jamshedpur on October 20, 2020



Shri Ramesh Pokhriyal 'Nishank', then Hon'ble Minister of Education, Shri Jai Ram Thakur, Hon'ble Chief Minister, Himachal Pradesh and Shri Anurag Thakur, then Hon'ble Union Minister of State for finance jointly lays the foundation stone of IIM campus at Sirmour, Himachal Pradesh on August 04, 2020



Shri Ramesh Pokhriyal 'Nishank', then Hon'ble Minister of Education inaugurates boys hostel, Wi-Fi park, seminar hall and engineering workshop at Central University of Haryana, Mahendragarh on September 8, 2020



Shri Ramesh Pokhriyal 'Nishank', then Hon'ble Minister of Education inaugurates 200 Teachers Flats at Banaras Hindu University, Varanasi on August 27, 2020



Shri Ramesh Pokhriyal 'Nishank', then Hon'ble Minister of Education, lays the foundation stone for development of main campus of IIT Palakkad and Shri Pinarayi Vijayan, Hon'ble Chief Minister of Kerala inaugurates transit campus of IIT Palakkad on October 23, 2020



## IMPORTANT EVENTS



Shri Ratan Lal Nath, Hon'ble Minister for Education, Government of Tripura inaugurates guest house, boys and girls hostel of Central Sanskrit University at Ekalavya Campus, Agartala on August 10, 2020



Shri Santosh Kumar Gangwar, then Hon'ble Minister of State for Labour and Employment inaugurates Shram Bureau Bhawan at Chandigarh on September 11, 2020



Shri R Madhavan, Chairman and Managing Director, Hindustan Aeronautics Limited inaugurates ATC building at Helicopter Factory Complex, Tumkuru on January 13, 2021



Shri G V S Bhaskar, CEO, Helicopter Complex, Hindustan Aeronautics Limited inaugurates Helicopter Flight Hangar at new Helicopter Factory Complex, Tumkuru on September 12, 2020



## IMPORTANT EVENTS

Shri V K Jayaswal, Director General, CPWD inaugurates Holiday Home for Central Government Employees at Rameswaram on March 06, 2021



Prof. Neelesh Kumar Jain, Director, IIT Indore inaugurates Learning Resource Center and Vikramshila Seminar Hall at IIT Indore on September 5, 2020



Shri Sanjay Dhotre, then Hon'ble Union Minister of State for Education, Communications and Electronics & Information Technology virtually inaugurates mega hostel building for NIT Calicut at Kozhikode on February 26, 2021



## GLIMPSES OF COMPLETED PROJECTS

GST Bhawan at Panchkula



Renovated Seminar Hall of National Academy of Audit and Accounts at Shimla

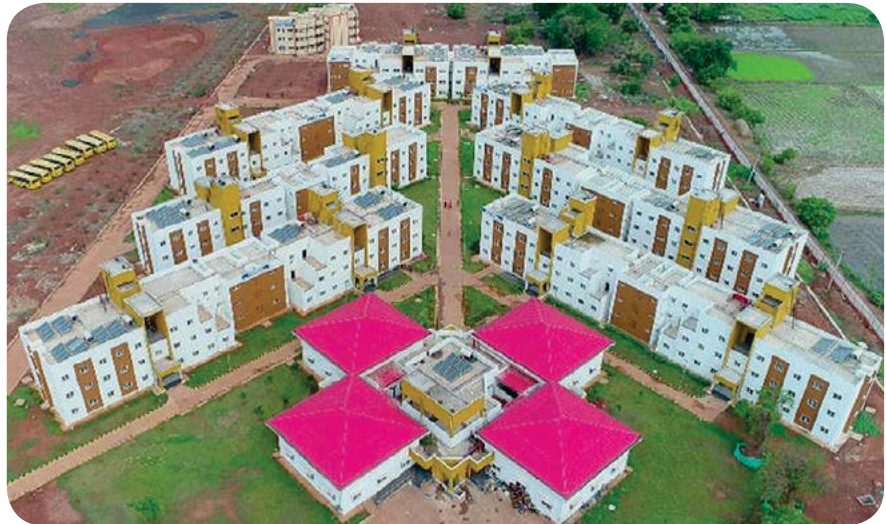
Officer's Mess, SO's Mess and main gate for CRPF at Group Centre Sambalpur, Odisha





Guest House for Central University of Kerala at Kasaragod

Phase 1A buildings of National Institute of Technology Andhra Pradesh at Tadepalligudem



Engineering Block for Indian Institute of Technology, Dharwad

40 Residential quarters  
for BSF at  
Thiruvananthapuram



Administrative Building for  
CRPF at Arang, Raipur

93 Type III married  
accommodation of Indian  
Coast Guard at  
Indian Coast Guard Enclave,  
Visakhapatnam



Utility buildings and residential quarters at BSF Campus, Hazaribagh



Administrative and training block at SSB TTC, Shimla



Physical Training Facility at CIAT School, CRPF Chittoor



Pesticide Formulation and Residue Analytical Centre for NIPHM at Rajendranagar, Hyderabad

Renovated office space for department of Animal Husbandry, Dairying and Fisheries at Chanderlok Building, New Delhi



Office and residential building of CAT at Jabalpur

## GLIMPSES OF ONGOING PROJECTS



Academic Block  
and Administrative  
Block for AIIMS, Raipur

Hostel Block  
IISER, Berhampur



Institutional Block,  
IIIDEM Dwarka,  
New Delhi



Residential Quarters for  
CAPFIMS  
at Maidangarhi,  
New Delhi

GST Building at Lucknow



Engineering Block at IIT Delhi

Commercial Industrial  
Warehouse at KIADB  
Hi-Tech Defence &  
Aero Space Park  
near International Airport,  
Bengaluru



AG Office Building  
at Bhubaneswar

Hospital Building  
for PMSSY  
at Bhagalpur

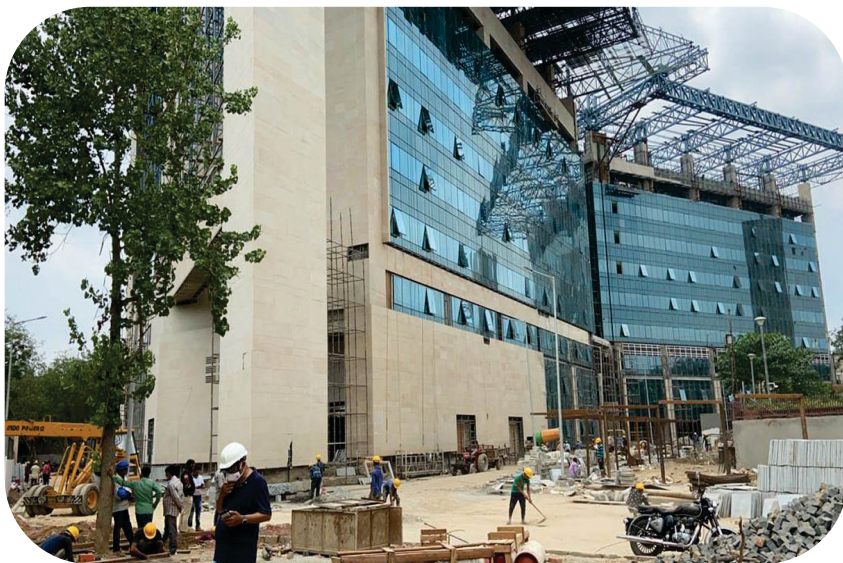




National Center for Integrated Pest Management for ICAR at Mehrauli, New Delhi



2x180 men barracks for Group Center CRPF at Sambalpur



Atal Akshaya Urja Bhawan at New Delhi

## SOME IMPORTANT NEW MoUs

MoU signed with  
Indira Gandhi National  
Open University  
on July 21, 2020 in  
New Delhi for  
undertaking all  
construction and  
maintenance works  
of IGNOU



MoU signed with  
Police Department,  
Ladakh UT  
on July 21, 2020  
at Leh for construction  
of their works

MoU signed with  
Indian Institute of  
Science, Bengaluru  
on August 17, 2020  
for construction  
of additional  
infrastructure works



## SOME IMPORTANT NEW MoUs



MoU signed with Guru Ghasidas Viswavidyalaya Bilaspur, Chhattisgarh on August 25, 2020 for construction of infrastructure works

MoU signed with Kerala Veterinary and Animal Sciences University on October 16, 2020 for construction of laboratory and other ancillary buildings at Thrissur, Kerala



MoU signed with Central Institute of Plastics Engineering & Technology on November 09, 2020 at Kochi, Kerala for construction of additional two floors in the existing building of administrative block and 100 bedded boys hostel of CIPET

MoU signed with Indian Society of Lighting Engineers (Delhi State Center) on December 10, 2020 in New Delhi



MoU signed with Rajiv Gandhi Centre of Biotechnology, Thiruvananthapuram on December 31, 2020 for construction of Animal Research Facility and other works at Akkulam, Trivandrum

MoU signed with National Fisheries Development Board, Hyderabad on January 22, 2021 for development of Coastal Aquaculture Infrastructure facilities at Srikakulam, Andhra Pradesh



## SOME IMPORTANT NEW MoUs



MoU signed with Canara Bank, Kolkata on February 05, 2021 for construction of residential complex at Jadavpur, Kolkata

MoU signed with Central Institute of Petrochemicals Engineering & Technology on February 25, 2021 for construction of Technology Centre at Chennai



MoU signed with IEST, Shibpur on March 03, 2021 for construction of 1000 capacity single bed boys hostel at IEST, Shibpur

MoU signed with University of Ladakh on March 03, 2021 for construction of buildings of the University at Leh



MoU signed with Central University of Gujarat on April 15, 2021 at Vadodara for construction of their campus

MoU signed with Shri Mata Vaishno Devi Shrine Board on March 18, 2021 at Jammu for the construction of Durga Bhawan at Shri Mata Vaishno Devi Premises, Katra



## GLIMPSES OF UPCOMING PROJECTS



IIT Bhilai  
at Chhattisgarh

Office Building  
for Directorate  
of Revenue  
Intelligence  
at Rajarhat,  
Kolkata



Academic Block  
at IIT Patna

Income Tax Office  
Building at  
Nariman Point, Mumbai



Indian Coast Guard  
Building at Worli, Mumbai

Holiday Home at  
Thiruvanthapuram





Central GST Bhawan at Boisar, Maharashtra

48 Faculty Quarters at MNNIT, Allahabad



IIT Jammu

New Hostel Building of  
Ali Yavar Jung National  
Institute of Speech and  
Hearing Disabilities at  
Bandra West, Mumbai



National Academy of  
RUDSETI, Bengaluru

IGNOU Regional  
Centre at Rajkot



## e-GOVERNANCE INITIATIVES

- Upgradation of CPWD Sewa mobile application, VIP reference module and Tender Wizard Portal
- Arbitration awards
- New dashboard on PMS Module
- Service associations details module
- Online reporting module for procurement done through GeM
- Online module for issue of 'Labour Clearance Certificate'
- Contractor's Enlistment Management System



## ENTERPRISE RESOURCE PLANNING INITIATIVES

Enterprise Resource Planning (ERP) implementation in CPWD is a reform to radically transform functioning of CPWD and to propel it on a high growth trajectory by improved transparency, accountability, faster and effective decision making, improved client interfaces and satisfaction and to unlock its latent productivity and efficiency.

1.
  - Automation of estimate preparation
  - Standardization of NIT Tender documents
  - BOQ generation from 3D drawings

2.
  - Collaborative platform for all stakeholders Vendors, Clients, Allottees, Consultants etc.
  - User specific dashboards for monitoring

3. Request for Inspection (RFI)
  - Automation of Measurements
  - Automation of Billing
  - Automation of Physical & financial progress

4.
  - Mobile App enabled e-MB,
  - Progress monitoring, feedback
  - Verification of work progress to ensure real-time data with photos and GPS co-ordinates

5.
  - System Driven process
  - In-built business-rules as per Works Manual and other relevant rules /guidelines for ensuring compliance

6.
  - Common Data Environment with features to consume data coming from – BIM BMS, SCADA, IoT, Imaging/ AR/ VR, Geospatial Tools, Analytics, AI/ ML.

## SUSTAINABLE DEVELOPMENT ACHIEVEMENTS

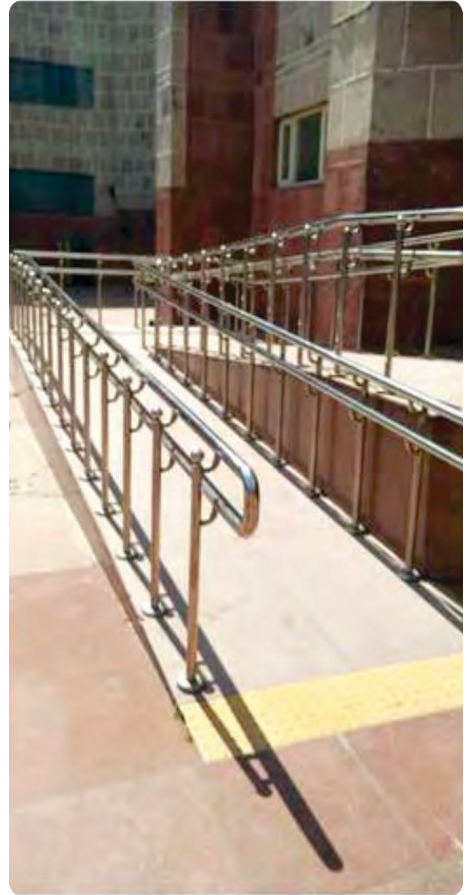
- ❖ CPWD has taken firm initiatives for generation of renewable energy in government buildings. Roof Top Solar PV Plants have been made mandatory in all new projects of CPWD. So far, solar plants totalling to 7.75 MWp and 12.23 MWp have been installed in GPOA and Non GPOA Buildings respectively.



- ❖ All new constructions are being done with energy efficient fittings and fixtures. Bureau of Energy Efficiency (BEE) has star rated 37 CPWD Buildings on Energy Efficiency ranging from 2 star to 5 star up to December, 2020.
- ❖ LED based lighting fixtures have been installed in 150 GPOA Buildings and 397 Non-GPOA buildings.
- ❖ To address the problem of depleting ground water resources, CPWD has made it mandatory to install Rain Water Harvesting system and Waste Water Recycling plant in all its major projects. So far over 1100 Rain Water Harvesting Systems have been installed.
- ❖ New campuses by CPWD are being developed with zero discharge and zero waste concept.
- ❖ Towards 'Catch the rain and greening' campaign, CPWD planted over 10,000 medicinal and fruit bearing plants at various residential colonies and office complexes in Delhi and other places, maintained by it, across the country.
- ❖ To save water, dual piping system has been mandated in all new CPWD projects, wherein waste water after treatment shall be used for flushing.
- ❖ Comprehensive outsourcing of maintenance has been adopted, which has been found about 28% more economical than conventional maintenance with work charged staff. It has also increased user's satisfaction level from 95% to nearly 99%.

## ACCESSIBLE INDIA ACHIEVEMENTS

Under the 'Sugamya Bharat' Mission, CPWD has undertaken the massive task of making public buildings accessible. Under mandate, CPWD has completed accessibility works of 211 Buildings of MoHUA and 800 Buildings of other Ministries.



## OTHER KEY ACTIVITIES

CPWD organized 'Former Senior Officers Meet' on March 17, 2021 under the chairmanship of Shri V K Jayaswal, Director General, CPWD at Nirman Bhawan New Delhi. The event was a great success and was also attended virtually by large number of former and serving senior officers of CPWD from across the country.



## OTHER KEY ACTIVITIES

A webinar on 'Constitutional Values and fundamental Principles of the Indian Constitution' organised by CPWD on November 26, 2020 at Nirman Bhawan, New Delhi in the presence of Shri Durga Shanker Mishra, Secretary, MoHUA and Shri V K Jayaswal, Director General, CPWD. The eminent speakers during the functions were Justice Mr Iqbal Ahmed Ansari, Chairperson, Punjab Human Rights Commission, Justice Mr Adarsh Goel, Chairperson NGT, Principal bench and Smt. Rashmi Bansal, Advocate, Supreme Court of India.



## PLANTATION DRIVE

As a part of 'catch the rain and greening' ongoing drive, a plantation event was organized on August 3, 2020 at Nirman Bhawan, New Delhi. On the occasion, Shri Durga Shanker Mishra, Secretary, Ministry of Housing & Urban Affairs and Shri Vinit Kumar Jayaswal, Director General, CPWD planted medicinal plant saplings.



Shri V K Jayaswal, Director General, CPWD during his official visit to Dehradun on September 12, 2020 planted a tree sapling at CPWD Campus, Dehradun.





Smt. Smriti Irani, Hon'ble Minister of Textiles and Child Development planting a medicinal plant sapling at her residence 28 Tughlak Crescent, New Delhi

Shri G Kishan Reddy Garu, Hon'ble Union Minister of State for Home Affairs planting a medicinal plant at GPOA Kavadiguda, Hyderabad



Shri V K Jayaswal, Director General, CPWD during his official visits to Ajmer, Jodhpur and Jaisalmer from February 05 to 09, 2021 planted tree saplings at the various locations as part of the ongoing plantation drive

## WEBINARS ORGANIZED BY CPWD

CPWD organised a webinar on 'Design competition for Iconic Structure at Nav Bharat Udyan' to commemorate 75th year of Indian Independence in Nirman Bhawan on November 11, 2020 to explain the various aspects of the competition. Shri Durga Shanker Mishra, Secretary, Ministry of Housing and Urban Affairs, Shri Vinit Kumar Jayaswal, Director General, CPWD, Smt. D Thara, Joint Secretary (Land & Estate), Ministry of Housing and Urban Affairs, senior CPWD officers and participants from various institutes from all across the country attended the webinar.



CPWD in collaboration with FCDO organised a two days webinar and knowledge exchange workshop on 'Draft Strategy for Construction & Demolition (C&D) Waste Management' in Nirman Bhawan from November 04 to 05, 2020. Shri V K Jayaswal, Director General CPWD chaired the webinar, which was attended by many CPWD officers and representatives from MoHUA, MoEFCC, BMTPC, Minister Counsellor Development Foreign etc.



A webinar on 'Construction technologies for winters in Ladakh' was organized by CPWD on December 17, 2020 at Nirman Bhawan, New Delhi in the presence of Shri Radha Krishna Mathur, Hon'ble Lt. Governor of Ladakh, Shri Tashi Gyalson, Hon'ble Chairman LAHDC, Leh, Shri Feroz Ahmed, Hon'ble Chairman LAHDC, Kargil, Shri V K Jayaswal, Director General CPWD, Shri Umang Narula, Advisor to HLG, Shri Shailendra Sharma, Special Director General CPWD, Shri Ajeet Kumar Sahoo, Commissioner Secretary, PWD Ladakh and representatives from BMTPC, CSIR-CBRI, ICT, IIT etc.



CPWD in collaboration with Indian Society of Lighting Engineers organised a webinar on 'Introduction to National Lighting Code (Rev.2020)' on April 06, 2021 at Nirman Bhawan in the presence of Shri V K Jayaswal, DG, CPWD, Shri Kamlesh Kumar, ADG, CPWD, Shri Ranjit Singh, ADG, CPWD



## COVID-19 PREVENTIVE MEASURES TAKEN IN CPWD CONSTRUCTION SITES



Covid-19 awareness training



Thermal scanning at entrance



Frequent daily sanitization



Mask and social distancing

## OTHER KEY ACTIVITIES



Ambulance facility



Labour camps and basic facilities at site



Isolation wards



RT-PCR Test at Site



Vaccination at site



Occupational Health Centre

## USE OF ECO-FRIENDLY AND ENERGY EFFICIENT MATERIALS IN CONSTRUCTION

**Rajesh Kumar Kaushal**

SDG, Project Region Chennai

### Introduction

Is it possible to built or construct something new, without any cost to the nature earth, the answer would be 'NO', but can this environmental cost be mitigated, the answer would definitely be 'Yes'. Interestingly when this answer is Yes, we win the race by going a step backward and realizing the true value of nature. Winning this race by going a step back, is an idea for the professionals of the building industry for respecting the nature and being a partner in the overall progress. The fact, that nature has provided everything for every living creature, but as human beings we have been continuously challenging this fact. Of course, there are efforts to mitigate losses to the nature by way of technological advancement in the construction industry and use of eco-friendly materials but now this tug of war has become more prominent because of the intensity of human intervention and urbanization.

Historically, the large scale constructions like forts, palaces, temples etc. were rebuilt centuries ago with the materials available within its surroundings. There was hardly any material transportation from far distances in these constructions. Stone and wooden palaces of north India, sand stone forts and palaces of Rajasthan and granite construction of south India are examples of large scale vernacular construction of past. There are also examples of smaller construction at local level in every part of the world. However, with increase in demand due to the increase in population, there was pressure to find ways and means to invent new material / products that could meet the needs. Industrialization expedited this process but not without a cost to nature.

**Ashok Kumar Dhiman**

Sr. Architect, Project Region Chennai - II

The construction industry has been progressive by nature and has developed new technologies and new products for the construction of buildings which are contemporary and suitable for the period they were used. In this league, eco-friendly and energy efficient materials can definitely be seen as positive efforts.

Progressive societies working for the betterment of civilisation, cannot keep silent when the very existence of human race is at stake. More than just introduction of new materials, there shall also be constant focus on use of materials in more judicious ways to reduce wastage which in turn can bring down the requirements of construction materials, itself.

### Urbanization, High Rise Construction

As we all are aware, the first and foremost reason for environmental degradation is urbanization. Studies have shown that urbanization is a major reason for increase in demand for building materials in the developed world for about 20 to 25 years. Faster pace of development generates quicker demand which results in faster environmental degradation. We in India, not only require to focus on urbanization to fulfil the aspiration of our young population but it is our responsibility to look for better options by learning from the experiences of developed countries. The additional new infrastructure, housing, institutional and commercial buildings, in any new place would cause environmental distress. This can be partly addressed by developing smart and sustainable cities which are in tune with local socio-economical requirements of the people and designed by adopting sustainability measures and use of locally available eco-friendly materials.

We must also talk about reducing our ecological foot print and high-rise construction can be a medium for reducing it. Although, the studies have shown high-rise buildings are more energy-consuming building type, during their construction as well as during their operational life span but it has also been proved that high-rise buildings can help in producing its own energy requirements by use of solar panels on their exterior skin, energy harvesting rope elevators and energy efficient materials with LED lighting fixtures. It is also important to find a balance between high rise construction and horizontal spread of urban area to achieve our environmental goals along with our urbanization goals. High-rise buildings, in accordance with principles of sustainable architecture, have to play greater role in this endeavour.

Secondly, use of eco-friendly and energy efficient materials must be encouraged in the urban areas. A new policy framework can play an important role to achieve energy efficiency in buildings and this framework can be physically implemented at every level instead of it being just part of submission documentation required at the building approval stages. Energy audit of building shall be made mandatory at regular intervals during life span of such buildings. In High-rise building, although, there may be choices available for eco-friendly materials but focus should be more on the energy efficient materials that are used more in their operations and maintenance stages rather than the construction stages. Selection of electrical materials, fixtures, equipment which are energy efficient, is more important in this regard.

### **Challenges in use of Eco-friendly Materials**

There are many eco-friendly building materials available in the market today. Many Eco-friendly building materials have very good insulation qualities. They are cheaper to produce than any factory made

materials. However it is important to differentiate between eco-friendly materials and energy efficient materials and use them in right places to have desired results.

Getting eco-friendly material is itself a challenge and procurement in large scale for public project is even more challenging. For public projects, there is also need to use materials which are not only economical but longlasting with less maintenance. Selection of eco-friendly material is in fact first step to realize larger goals of environmental mitigation efforts.

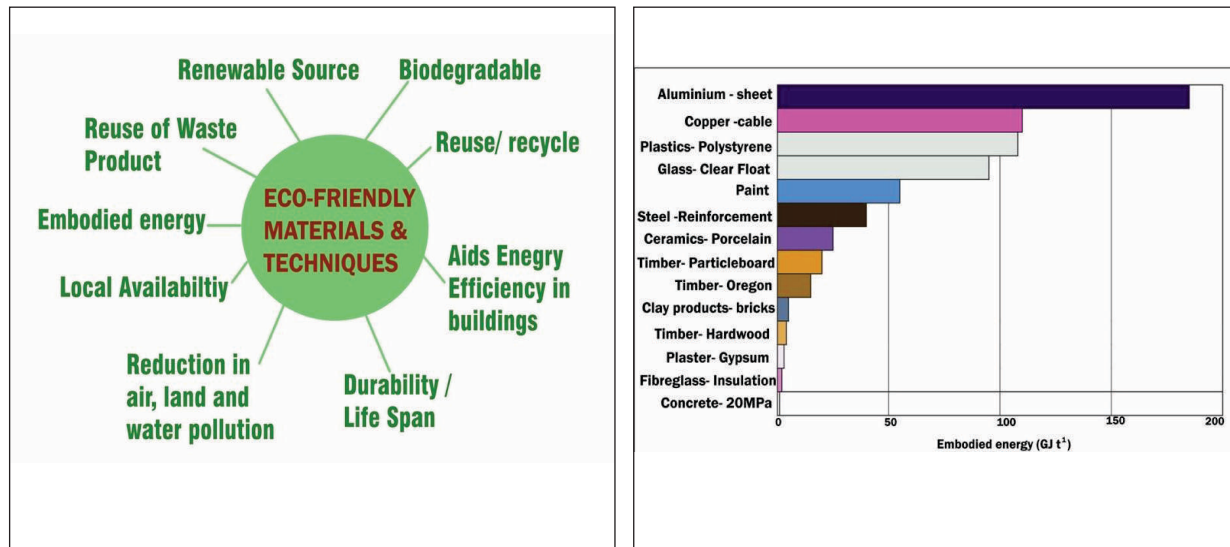
### **What are eco-friendly and energy efficient materials**

Any material that can be used, from foundation to exterior or interior finishes can be eco-friendly, if used in a way that has least impact or effect on the environment. The material that exist within the vicinity of the project or the construction site and requires least cost on its transportation. It is also important to understand that most of the materials are produced in the factories these days, has certain environmental impact due to its embodied energy and therefore not necessarily be called as Eco-friendly. While if the same material is reused it can be termed as eco-friendly.

Even a conventional materials can become eco-friendly based on the construction technique that is used. Materials can be also be eco-friendly if such materials can assist in reduction of the energy used in the building during operation and maintenance. Many vernacular architectural techniques and practices have produced good habitable environment without much use of energy. For Example; Rat-Trap Bond by Lauri Baker, the famous Architect who lived in Kerala, requires less number of bricks but provides more heat insulating than normal walls is a good example of eco-friendly results from a conventional material. However such practices may not be applicable at all situations.

## Properties of Eco-Friendly Building Materials

Any material which is having any of the following characteristics can be considered eco-friendly



Images Source: The Constructor

## Eco-friendly materials and techniques that could be used in different components in Building Construction

S. No.	Utility Area	Material Description	
1	Foundation	i)	Ready Mix Cement Concrete, Fly Ash Cellular Concrete
		ii)	Recycled steel forms and reinforcement bars
		iii)	Fly Ash Lime Cellular Concrete
		iv)	Portland Slag Cement
		v)	Faswal
2	Superstrucure	i)	Recycled steel forms and reinforcement bars
		ii)	Bricks sun dried, Fly-ash Sand Lime Bricks
		iii)	Cellular Lightweight Concrete Blocks, Aer ated concrete blocks
		iv)	Precast walling roofing components
		v)	Lato Block (Laterite + Cement)
		vi)	Bricks from Coal Washery Rejects
		vii)	Insulating Bricks from Rice Husk Ash
		viii)	Compressed Earth Blocks
		ix)	Building Blocks From Mine Waste
		x)	Bagasse Board
			xi)
3	Plastering	i)	Stone dust plaster
		ii)	Non Erodible Mud Plaster
		iii)	Earth plaster and milk paints

S. No.	Utility Area	Material Description	
4	Slabs & Roofs	i)	Recycled steel forms and reinforcement bars
		ii)	Micro Concrete Roofing Tiles
		iii)	Ferrocement Roofing Channels
		iv)	Clay roofing tiles
		v)	Bamboo & Bamboo Matting
		vi)	Bamboo Matt Corrugated Roofing Sheets
5	Flooring	i)	Terrazzo floor for terraces and semi covered areas
		ii)	Marble Mosaic Tiles
		iii)	Cork flooring, bamboo, and recycled wood flooring
6	Door Frames	i)	RCC Door Frames
		ii)	EPS Composites and Door Shutters
		iii)	Timber from trees such as Poplar, Rubber, Eucalyptus
		iv)	Ferrocement boards for door and window shutters
7	Paints & Finishes	i)	Use of Cement Paint / Epoxy Resin Paint for external surface
		ii)	Low VOC, Cement Paint Painting, Polishing, Priming and similar surface finishing
8	landscaping	i)	Fibre Reinforced Concrete Precast Elements, Wall Panels Blocks, Manhole Covers
		ii)	Paver Blocks\Bamboo, Bamboo & Bamboo Matting
		iii)	Concrete grass pavers and grasscrete for drive - ways
9	Building Interiors	i)	Partitions of Particle Board & Ply Board, Calcined Phosphogypsum Wall Panels, Particle Boards & MDF Boards for Moulding
		ii)	False Ceiling in Calcium silicate boards & Tiles, Gypsum Board, Laminated Wood Plastic Components
		iii)	Use of Water based paints, enamels, primers and polishes
		iv)	Recycled plastic
10	Lighting Fittings and Fixtures	i)	LED lamps
		ii)	Use unplasticized PVC or HDPE products Recycled aluminium and brass components
11	Water proofing materials, chemicals, additives, and sealants	i)	Use of water based chemicals instead of solvent based
		ii)	Epoxy resins instead of tar felt / pitch
		iii)	Straw bale & Cotton insulation
		iv)	Polymerised waterproof compound
12	Misc.	i)	Water, polyurethane & acrylic based chemical admixtures for corrosion removal, rust prevention,
		ii)	Epoxy Resin System, Flooring, sealants, adhesives and admixtures, Gypsum plaster fibre jute/sisal and glass fibre composites, Polymer, Powder etc.

## RESTORATION OF OLD LIGHT HOUSE AT PUDUCHERRY BY CPWD

**C K Varma**

ADG, Region Chennai

**Abhishek Gopal**

Executive Engineer, Puducherry

### Introduction

Restoration works are normally very much time-consuming. But the real challenge lies in giving the original shape and shine to the original structure without disturbing its inherent nature. One such work is under progress in Chennai Region under Puducherry Central Division. Lighthouse being a building having tower or minaret type of structure designed to emit light from a system of lamps and lenses in order to serve as a navigational aid for maritime pilots at sea or on inland waterways is a very different and specialised type of work. This article highlights different facets of an age old structure and challenges faced while carrying out the work.



### About the Light House

One of the Puducherry's well-known landmarks, 184-yr-old lighthouse constructed in 19th century by the then French Rulers is being restored by CPWD. It is situated just opposite to the Promenade beach of Puducherry. The project was taken up during the tenure of Governor Saint Simon in 1835. This light house first beamed light on 1st September 1836 and was one of the modern ones of those times, because of its unique round tower. These historic buildings are prone to deterioration due to their location on rocky outcrops of land near the water, as well as severe weather events, and the continued rise of sea levels. Given these conditions preservation and conservation efforts have to be increased as Lighthouses in the country act as a physical representation to maritime history and advancement. The lighthouse was erected by French Engineer L. Guerre. It started off with 12 oil lamps as the source of light and later was changed to a rotating beam having a range of 25 miles in 1931. By 1931, a 1KW electric bulb powered the tower with a rotating beam of 28 miles range and taking 36 seconds for one full rotation. The tower formerly had six oil lamps helped by silver reflectors to guide the light beam for a range of 16 miles. Due to frequent issues with the light source, a new lighthouse was built at Kirapalayam Village in 1970.

### Intricacies and Challenges of the Work

Strong winds and sea waves cause land erosion around lighthouses. Hence, carrying out any major restoration work along the coastline is a great challenge. The work has to be initiated cautiously by surveying the area surrounding the lighthouse first. The binding strength of the soil of the plot and adjoining areas also has to be tested for its strength to carry out the conservation work.

The Lighthouse building is load bearing lime mortar brickwork structure built in a French Colonial style. The fluted (corrugated) tapering tower is standing tall at a height of 29 metres. The foundation has a depth of 9 meters. This structure was originally built on a square base with a room for a watchman and an inner staircase leading to the top where the light was placed. The light beam was visible from a distance of 15 to 17 miles. The structure

is crowned by a copper dome and has a two storied base to reduce the wind pressure. The ground floor circular building was added in 1886, probably when the light was changed. The upper storey was added during mid-20th century.

Having understood the basic features of the building, its restoration requires detailed examination as to what repairs and replacements are required. Further, a variety of techniques and considerations are prerequisite for the restoration of structure. There are buildings in the vicinity from other time periods also. The types of buildings, their relationship to one another, location and potential archaeological sites (if they have been identified), are all aspects that are required to be considered during conservation process.

Outbuildings of the main structure are more prone to deterioration because of their use for storage and non-maintenance to the same standards as the lighthouse. Earlier repairs to buildings may not have used proper material and might have used inexpensive materials as a temporary measure. These materials degrade faster with passage of time, making the building unstable. Materials, colours, and details are all representative of the lighthouse and are often considered during the preservation process.

The lighthouse interiors of that era were used to be simple in construction and decoration. Hence, issues on the exterior are required to be examined and addressed first to protect the inside of the structure well. It has been found that majority of the lighthouse interior's issues arise from moisture, condensation, neglect and inappropriate treatments. Neglect reflects in the lack of cleaning, regular maintenance of windows, stairs, floors as well as painting which subsequently has leads to further deterioration.

The seasons, prevailing weather and

geographical location of the lighthouse are also very important factors to be considered because, it determines what type and how often air exchanges take place within the lighthouse. Moisture ingress can be reduced by repairing leaks around windows, doors, and the roof at regular intervals. Doors and windows should be repaired with care taken not to damage historic mouldings and entry features of the lighthouse. If irreparable then wooden or steel doors can be used without altering the original shape of fenestration.

#### **Preparation of the Work**

Preparation for the restoration included assessment of deterioration and risk assessment in carrying out the work. Following damages/deteriorations was observed during assessment of the structure:

- ❖ Dry rot, fungal attack and insect attack on the rafters were mainly noted and needed to be replaced. In this connection, all timber members –



- rafters, girders, columns, posts, doors and windows were checked.
- ❖ Structural strength of the walls was checked and found to be okay as per Study carried out by NCSHS, IIT-Madras.
  - ❖ Fungal growth and efflorescence was identified.
  - ❖ Water seepage from various sources was identified.
  - ❖ Detached and damaged plaster was located.
  - ❖ Wall cracks were examined.
  - ❖ Unserviceable Madras-terrace roofing was identified.
  - ❖ Damage of the compound wall and gate was found.
  - ❖ Poorly planned and executed toilets and non-functioning plumbing lines were observed.
  - ❖ Extensive damage to flooring was also observed.

Based on the above examination and identification, a risk assessment was performed regarding structural vulnerabilities. In addition, land evaluation in which the lighthouse is located was done including availability of materials for restoring the lighthouse assessed. The type of storms or other natural disasters that occur in the area was also taken into cognizance

### Scope of Work

The old damaged/ loose plastering from the walls/ceilings has to be dismantled under controlled conditions. Similarly, dismantling of pressed terrace tiles and lime concrete from terrace has to be done under controlled conditions. The walls and ceilings are to be plastered in lime mortar 1:2 with 35-40mm thick in 2 to 3 layers. On terrace, pressed clay tiles and lime concrete in terrace are to be laid. Cast iron gate of matching style has to be provided in the entrance. Flame finished granite slab flooring in Verandah and pathways are required while in rooms oxide flooring is required.



Removing damaged rafters/beams, providing and fixing new teakwood rafters/beams in all roofs are also a task to be done under intense supervision. Painting with lime based paint in all areas with primer coat, dismantling existing teak wood circular handrail in rooftop railing, and reconstructing verandah wall with masonry pillar has also been added. Repairing damaged circular wooden steps was resorted to in order to preserve old style of wooden moulding. Anti-termite treatment to entire complex is to be done.

After having done with the scope of the work, the conditions were to be attached along with the tender documents. These conditions are to be specially framed for this type of work.

### The Work Begins.....

The work began when Central Excise having office in the premises of the light house decided to renovate this very old structure. The detailed project report was prepared by INTACH Puducherry Chapter. Afterwards the work was assigned to CPWD in the year 2018. The work was initially not taken up by the previous incumbents for the fear of structural vulnerabilities with the passage of time. However, when work was undertaken by the present management, the agency who took the work initially, backed out on the pretext of Covid 19. Nevertheless, the

agency was reselected after rescinding the contract of earlier agency. Presently, the work is progressing steadily barring the slowdown of work due to lockdown imposed in Puducherry. It is expected that the work will be completed by July 2021 if conditions improve.

#### **What lies ahead.....**

This light house though not in use is a heritage structure and is of historical importance. After renovation, if properly maintained and prevented from deterioration on account of moisture and other agents like fungus, algae etc., the structure will have a longer life given the sound construction techniques of the tester years.

#### **Conclusion**

This kind of work, though of small quantum takes more time. Nevertheless, challenges are worth taking as the satisfaction derived out of the work at the end is tremendous.

Also exposure and experience of carrying out such works also adds up to the personal profile of the Engineers responsible for execution and supervision.

#### **Recommendation**

Being heritage monuments of the colonial era, their preservation is of utmost importance. Carrying out this kind of works should be given special multiplication factor in the calculation of work load, because such works add very little to work load while require more attention. The assessment of structural integrity and selection of agency are very important for such type of projects and need be given due recognition and thought at the central level.

#### **Acknowledgement**

Intach Puducherry- The detailed Project Report was prepared by the INTACH Puducherry. It has brought out the deplorable conditions and damage to the interior and exterior of the structure.



## CLEAN ROOMS: A SIMPLE OVERVIEW

**S N Rai**

Chief Engineer, Bengaluru

### WHAT IS A CLEAN ROOM ?

A clean room is a controlled environment that has a low level of pollutants such as dust, airborne microbes, aerosol particles, and chemical vapours. To be exact, a clean room has a controlled level of contamination that is specified by the number of particles per cubic meter at a specified particle size.

### WHY A CLEAN ROOM ?

There are a wide variety of reasons that a company may need a clean room. If you're manufacturing something that is easily affected by contaminants or particles in the air for example, it's likely that you'll need a clean room. Some common industries that regularly use clean rooms are:

- Precision Manufacturing Companies
- Advanced Research Facilities
- Pharmaceutical Companies
- Medical Laboratories
- Electronic (IC and semiconductors) Part Production
- Aerospace Industry

- Nanotechnology production
- Optics and Lens Manufacturing
- Military Applications

### HOW TO CLASSIFY CLEAN ROOMS ?

Clean rooms are classified on the basis of number of particles per cubic meter at a specified particle size. The ambient air outside in a typical city environment contains 35,000,000 particles per cubic meter, 0.5 micron and larger in diameter. ISO 14644-1 Clean room Standards classify clean rooms as given below:

### HOW DOES A CLEAN ROOM WORK ?

A clean room is any given contained space where provisions are made to reduce particulate contamination and control other environmental parameters such as temperature, humidity and pressure. The key component is the High Efficiency Particulate Air (HEPA) filter that is used to trap particles that are 0.3 micron and larger in size. All of the air delivered to a clean room passes through HEPA filters, and in some cases where stringent cleanliness performance is necessary, Ultra Low Particulate Air (ULPA) filters are used.

Class	maximum particles/m <sup>3</sup>						FED STD 209E equivalent
	>=0.1 µm	>=0.2 µm	>=0.3 µm	>=0.5 µm	>=1 µm	>=5 µm	
ISO 1	10	2					
ISO 2	100	24	10	4			
ISO 3	1,000	237	102	35	8		Class 1
ISO 4	10,000	2,370	1,020	352	83		Class 10
ISO 5	100,000	23,700	10,200	3,520	832	29	Class 100
ISO 6	1,000,000	237,000	102,000	35,200	8,320	293	Class 1,000
ISO 7				352,000	83,200	2,930	Class 10,000
ISO 8				3,520,000	832,000	29,300	Class 100,000
ISO 9				35,200,000	8,320,000	293,000	Room Air

The diagram provided brings out general layout of a clean room. It can be seen that process area (say ISO 2) is the innermost core in the clean zone, enclosed by lesser stringent clean room (say ISO 4) and outer area (say ISO 6) is also a controlled environment with even less cleanliness. By maintaining positive pressure gradient of 10 to 15 Pa in the cleaner area compared to surrounding area, entry of contamination is prevented.

Movement of men and material has a specific protocol depending upon the class of cleanroom to avoid contamination. For entry of persons, proper dress code and passing through air showers is required. For entry of the material, airlock /pass-box/ robotic conveyance/ conveyors can be used.

### WHAT ELSE CAN BE CONTAMINATION?

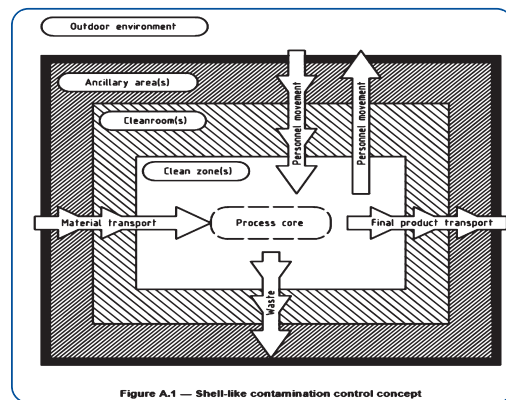
Besides the particulate count in the air, there may be many other factors which can be considered contamination or undesired environment depending on the process in the clean rooms. Some of them are

#### Relative humidity

Different processes need different levels of relative humidity and definite level of variation which could be +/- 1% to 5%. Most of the clean rooms require RH from 30% to 50%. Tyre industry may need RH as low as 40%. Humidity can be increased by humidifiers and decrease by heating elements which could be synced with the HVAC arrangements.

#### Temperature

Different clean rooms have different requirement of temperature and its variation range. Most of the clean rooms require temperature close to 20°C. Pharma industry may require a temperature



variation of +/- 0.2°C and lithographic lab may require variation of +/- 0.1°C.

#### Noise level

Higher decibel level inside the clean room can affect the processes. Desired levels can be obtained by properly locating the clean room, improving the acoustic insulation of the room, AC ducts (which is the prime source of noise and reducing the inlet and return air velocity.

#### Electromagnetic field

Electromagnetic field may also disturb the processes. This can be brought to the desired level by reducing the inductance in various fixtures.

#### Vibration level

Some of the processes like nano manufacturing can also get affected due to increased level of vibrations which could be induced from outside vehicular movements. These levels can be reduced by separating the cleanroom structure from the contact of the adjoining ground. The

levels can be further controlled by providing suitable vibration isolation measures like dampeners and suitable foundation of the equipment.

**Ultraviolet radiation**

The electromagnetic radiation can also affect the processes. Normal visible light range is 400 nm to 700 nm. In a typical lithography lab the stronger radiation is reduced and the lighting range is 490nm to 560nm.

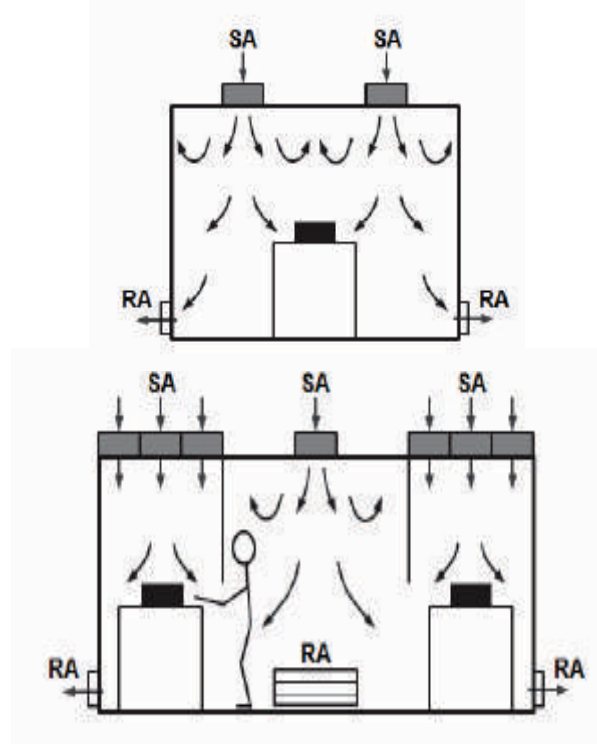
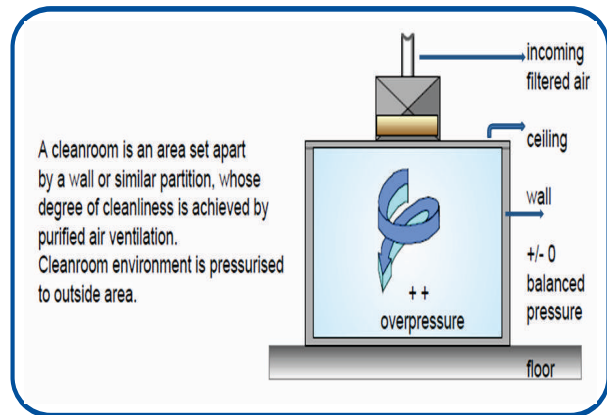
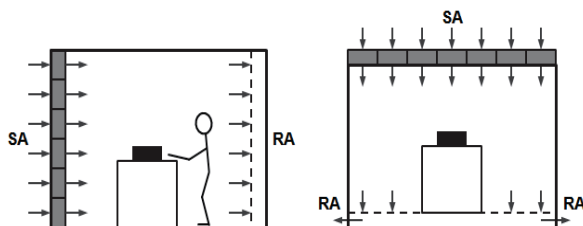
**AIR FLOW ASPECTS**

The treated air movement inside a clean room can be either laminar or turbulent depending upon the classification of the clean room and end usage.

The picture provided depicts laminar flow pattern (usually required in class ISO 1, 2 & 3) horizontal and vertical. In horizontal pattern source air is pumped through one wall panel and the return air goes back from the opposite wall panel. In vertical flow SA comes from plenum at ceiling and RA is taken back from false floor at bottom.

The picture provided depicts vertical turbulent flow pattern (usually required in class ISO 4 & above) where SA comes from plenum at ceiling and RA is taken back from wall panels.

Normally following air changes per hour are adopted for different class of clean rooms:



Classification ISO Class	Air Changes per Hour (Range)
8	5-48
7	60-90
6	150-240
5	240-480
4	300-540
3	360-540
2	360-600
1	

## UPGRADATION OF SAI TRIVANDRUM GOLF COURSE

**Sandeep Mehta**

Chief Engineer, Trivandrum

The Trivandrum Golf Club is the second oldest Golf Course in India and its rich history & heritage is well known. The course has a mature & distinct Character and can be termed as an “old-style golf course” wherein the main emphasis is on accuracy and not on distance. The total area of the course is around 26 acres. In comparison to most modern day courses that are being built in the country, the Trivandrum club is different in many ways as the tree lined fairways call for accuracy off the tee and the greens provide small targets for approach shots.

The Objective of this renovation project was to develop the Golf Course in a holistic manner that covered all aspects of the Golf Course & looked to improve all Golf features on the course without taking away its existing Character & Charm. A detailed study was conducted by M/s KITCO Consultants, appointed by SAI. As per the report the project planned to cover all aspects/ features of the golf course

consisting of the following:

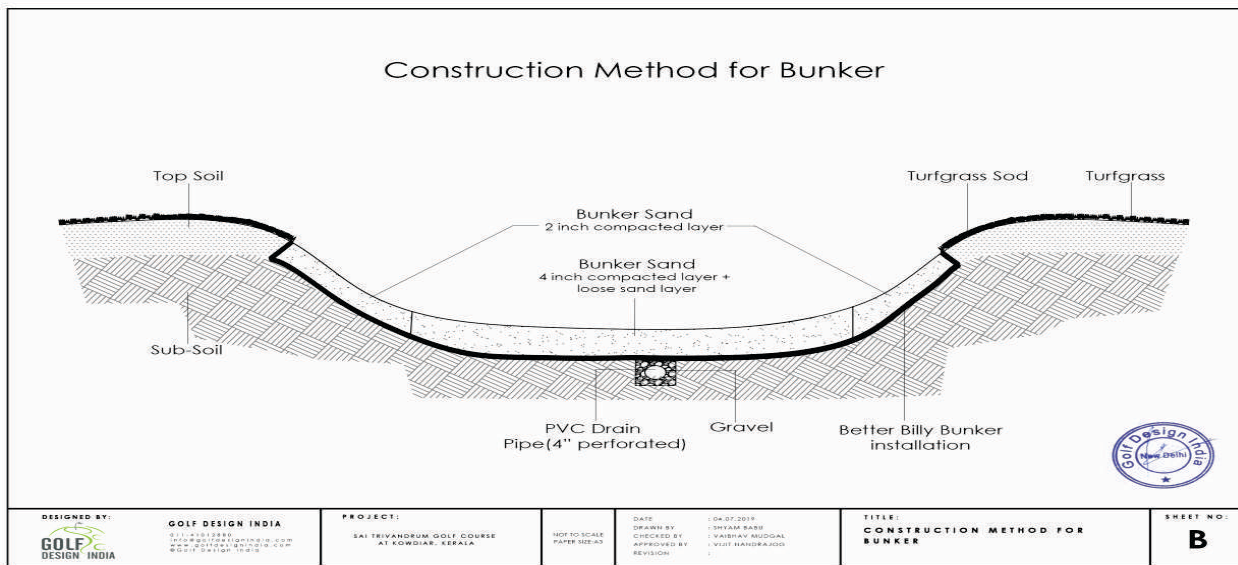
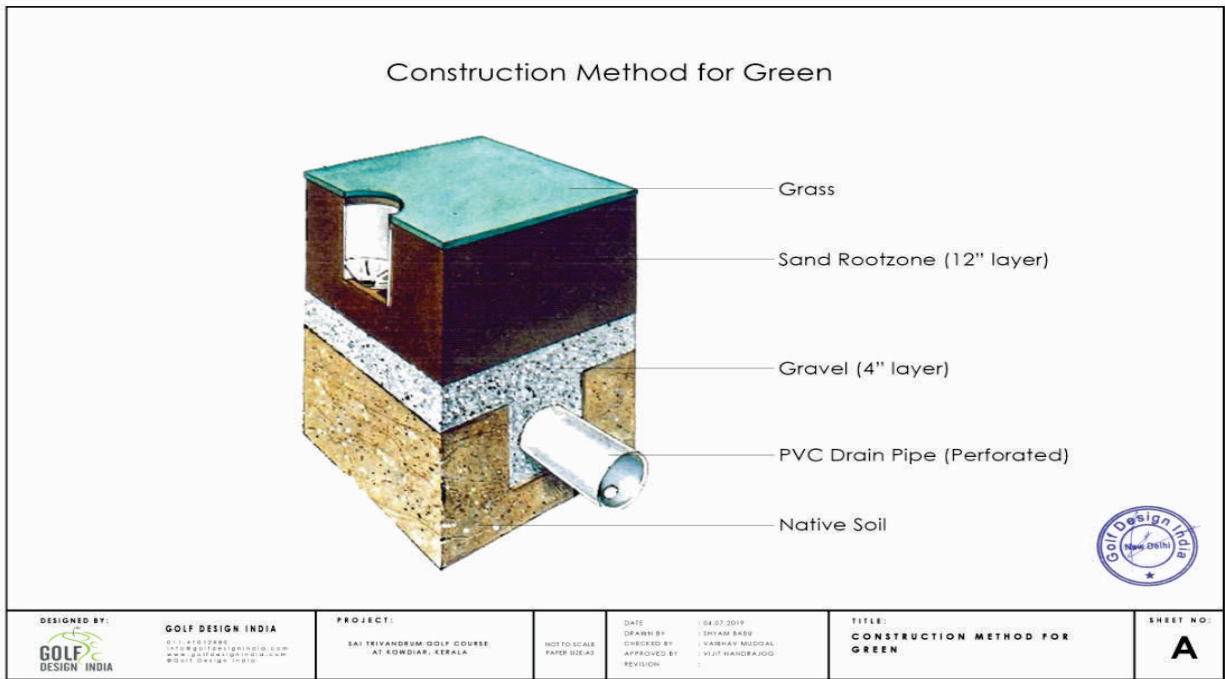
**New Greens:** Greens are the most important features on a golf course & the existing Greens at the Trivandrum Golf Club were very weak in terms of design, playability, aesthetics & maintenance.

**Construction of Greens** Rough shaping was to be accomplished according to “Grading Plan”. This consisted of Basic Earthwork, Rough shaping as per the design and contours, Drainage of Greens, Flush Out, Drain Gravel Blanket, Greens Root zone mixture, Fine Finish Grade, Preparation for grass planting.

After green sub grades were shaped drainage has been provided through 4 inches perforated pipes with lateral lines placed at 3.5–4 meters apart.

The contours of the green putting surface are designed to provide a maximum surface drainage gradient of 12% and a minimum surface drainage gradient of 1%.





**New Tees:** The existing tees were very small and were not designed and constructed in a manner that makes them appear very unnatural, aesthetically unpleasant and difficult to maintain.

**Construction of Tees:** This consisted of Rough Shaping as per the design, Grading of the Subsurface including shaping as per field sketches. Proper drainage

arrangement with minimum fall of 1% is maintained. Root zone mix of minimum 6" laid over it and fine grading of Tee surface and side slopes and shoulders have been done. Once the sand is evenly spread within the bunker cavity, the sand was compacted by regular light spray with water and running a plate/roller. 1/5 to 1 inch of sand has been placed uniformly over the compacted sand layer.



**Lighting post**

**Bunkering:** The existing bunkering was very weak as bunkers on the course are poorly positioned & designed and provide very little strategy in play and were aesthetically unpleasant.

**Construction of Bunkers:** This consisted of Shaping, drainage, Better Billy Bunker and sand installation, Sand compaction. Shaping of Bunkers has been done in accordance with Plans. Slopes and bottoms of the sand areas of the bunkers have been shaped carefully to a clean, smooth and uniform surface, concave in nature. Once the sand is evenly spread within the bunker cavity, the sand was compacted by regular light spray with water and running a plate roller. 1/5 to 1 inch of sand was then placed uniformly over the compacted sand layer. Shaping of Bunkers has been done in accordance with Plans and as directed by the Designer. Slopes and bottoms of the sand areas of the bunkers are shaped carefully to a clean, smooth and uniform surface, concave in nature.



**Cleaning of fairways**

**New Irrigation System:** The golf course improvement program included the installation of a new irrigation system for the course which is designed using latest modern methods and tools for precise, efficient irrigation at the course to cover all areas of the golf course with complete coverage of water. The system provides for a fully automatic mode of functioning with central control systems including satellite we ather monitoring for easy & efficient functioning.

**Improvement of Fairways & Roughs and Water Management:** The improvement program include a complete redevelopment of the fairways & roughs wherein the existing turf would be completely cleared and topsoil of desired quality would be laid over the soils on the site. After careful grading & shaping of the fairways to make the areas more playable & drain better, the entire area was planted with new grass to provide a desirable turf cover that is sustainable. Overall, the existing topography has been respected & enhanced to improve playability & turf growing conditions.

**Golf Course Lighting:** Golf course Improvement project included illumination of specific areas of the course using LED flood lighting. The areas that illuminated were entire first hole, short game practice areas, driving range hitting area near tee 3, fairway & green for hole no 9.

**Other Improvements:** In addition to the above mentioned works, the project included the following improvements to enhance the playing experience. (1) Creation of driving range in the play area which could be used in late evenings with flood light support, when the golf course is not being used for normal play. (2) Installation of Golf Simulator in the main building complex for indoor use. The simulator provides projector system to closely simulate the playing environment of several famous Golf Course of the world and can be used in all conditions day and night.



**Surveying and staking**

#### **PRESENT STATUS OF WORK**

The works was awarded to Continental Fairways and started in September 2020. The work was carried out in the following process.

- All clearing and the necessary cleanup operations.



**Rough shaping of area**

- Top soil excavated from marked area and stored in stockpiles in designated areas



**Gravel layer on green**

- Surveying and Staking was done as per plan prepared by the Golf Consultant



**Surveying and staking**

- Rough shaping and contouring of areas were performed to create required profile



**Rough shaping of area**

- Green area constructed by excavation of 0.4m depth and bottom was graded to provide smooth parallel surface. Drainage was installed with 4 inches perforated pipes as per approved pattern. Bottom layer Gravel of 4 inches and next layer of 12 inches of sand root zone consisting of 95% Sand and 5 % neem cake along with fumigant Basamid G. It was left for more than 30 days covered and this process is known as sand capping. Grassing of green is done by Bermuda Tif dwarf. Regularly clearing weeds and watering for more than 30 days was done.

- Tees and surrounds are prepared and shaped as tee complexes & the subsurface was made smooth. Sand root zone consisting of 95% sand and 5% neemcake of 4 inches layer was provided. No drainage was provided for this.



**Grassing of Tee Box**



**Drainage line**

- The bunkers that forms a part of the green complex are to be shaped. Drainage has been provided for bunkers in accordance with plan.

- Construction of Synthetic Turf putting green. Proper graded surface was prepared. Drainage line was laid after that Geo textile layer was laid at last synthetic turf was done.



- As of now Grow-in-period is in progress. This includes the activities of removal of weeds, frequent mowing of lawn, fertilizer application to enhance the growth of grass, patch grassing in vacant patches, top dressing of sand/soil etc.



## FLOOD LIGHTING ALONG INDO-PAK BORDER

**Shahabuddin Ahmad**

Chief Engineer (Elect), Border Flood Lighting Zone

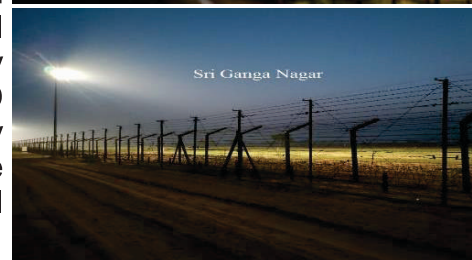
Flood lighting along the borders with Pakistan has been undertaken with fence and road works in different phases since 1990. Floodlighting during night time helps BSF to keep strict vigil in the forward areas and check attempts of infiltration by terrorists and illegal immigrants.

Floodlighting over a distance of 1,983km along the Indo Pak Border has so far been completed. In Punjab, Border Flood Light system (BFL) along 495 km stretch was completed during the period 1990-1995 and in Jammu 186 km BFL was completed during the period 2001-2006. In Rajasthan BFL in 1022 km stretch was completed during the period 1993-1998 and in Gujarat 280 km stretch has been completed.

All the BFL poles were MS tubular poles and 2 nos. 250 W and 1 no. 500 W HPSV fittings were installed on it. Since the installations had completed their useful life, works for replacement of BFLs in phases in Punjab and Rajasthan were commenced in 2016.

In Rajasthan, under Phase-1 & 2, so far 300km stretch of old BFL infrastructures i.e BFL Poles i/c HPSV flood lights, cables, panels etc. have been replaced. In Punjab replacement work is being undertaken in the entire stretch of 495 km. Besides BFL poles, high mast lighting with LED flood lights have been installed in riverine gaps in Jammu as well as in Punjab along the border to cover the unfenced gaps. The sanction for balance 715 km of BFL stretch in Rajasthan has also been accorded by MHA which shall be taken up along with border road work. A challenging work of providing BFL system in shifting sand dunes area over 35 km stretch in Jaisalmer sector, Rajasthan is recently awarded.

In these replacement works, poles have been installed adjacent to fence (i.e. between road and fence) instead of being on the other side of road. Number of fittings and pole height was suitably designed to achieve minimum 2.0 lux with Uniformity Ratio > 0.5 at a distance of 140 m from the BFL poles (towards international border). GI octagonal poles with warm white (CCT 3000 K) energy efficient LED flood light sare being used. The use of LED light fitting has reduced the electrical load of BFL by around 55% and it has also resulted in reduction in size of cables and DG sets besides reduction in electricity bill as well as diesel consumption for DG sets.



# CONSTRUCTION OF ENERGY SUFFICIENT BUILDINGS UTILIZING RENEWABLE ENERGY RESOURCES IN LADAKH: AN OVERVIEW

**Pradeep Gupta**

Chief Project Manager, ICBRZ, Leh

## Introduction

CPWD is actively engaged in development of border infrastructure while executing the works of border fencing, border roads, BOPs and border flood lighting works along international borders with various adjoining countries in difficult terrain under hostile conditions. CPWD is also entrusted with the work of construction of Permanent Integrated Buildings along Indo-China border for ITBP.

Detailed Project Reports (DPRs) has been prepared by CPWD for construction of 67 Permanent Integrated Buildings (PIBs) at high altitudes ranging from 13000 ft. to 17000 ft. for ITBP along the Indo China Border across Ladakh, Himachal Pradesh and Uttarakhand. Of the total 67 PIBs, 32 PIBs are to be constructed in Ladakh Region.

- These buildings are planned to be off-grid, self-sustainable using renewable energy sources and having all green building features.
- These PIBs are designed for providing sufficient security to the users as well as comfort with sufficient living cum office area, a multi-purpose hall with storage capacity for arms and ammunition.
- Latest technologies for renewable energy systems including solar, wind and geothermal have been incorporated.

## Challenges in Ladakh

- Winters in Ladakh are extremely harsh with temperatures falling well below the freezing point and chilly winds blowing at great speed. This leads to multiple problems viz. enhanced energy needs, over reliance on fossil fuels and forest



wood for meeting these energy needs, freezing of water supply lines, inefficient operation of sewage system, and above all several related environmental & health problems.

- The situation worsens in far-off locations which are off-grid and at locations which are at higher altitudes in Ladakh.
- Any development work including that of construction can't be taken up due to hostile environment.

**Aim:** To provide high performance building which will cut down the dependence on the fossil fuels without compromising on the availability of the energy needs and ensuring comfortable living for its inhabitants.

On this basis, following principals have been adopted:

- Adoption of accurate and quicker survey technique as site temperature is quite low and chilly-icy wind blow during most part of the day. Differential Global Positioning System (DGPS) has been used to save time and increase accuracy as it gathers the data from multiple satellite and gives levels in Global Coordinates System.

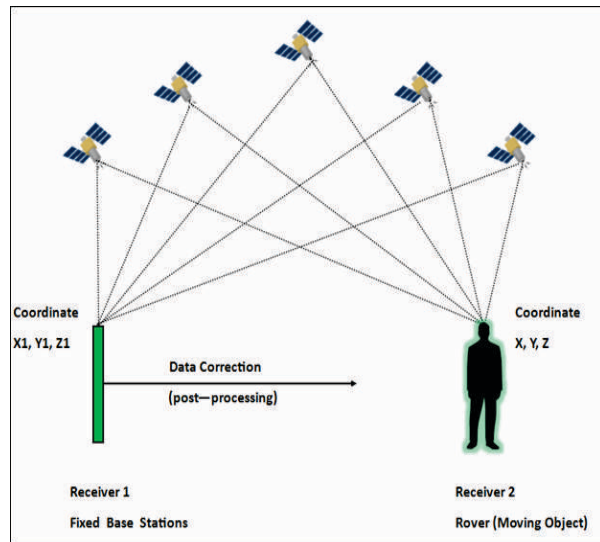
- Identifying various sources of renewable energy such as solar, geothermal or wind energy that are appropriate as per the given site conditions. Optimum hybrid mix of the renewable energy sources such as Solar, Wind and Geothermal coupled with non-renewable energy sources to meet any gap in energy requirement availability 24x7.
- Trap maximum heat from sun (which Ladakh is already blessed by nature) and minimize heat dissipation from building envelope using vernacular architectural concepts.
- Use of innovative technologies to reduce the consumption of scarce resources at high altitudes such as water.
- Use of innovative techniques for efficient working of sewerage systems and disposal of the same in an environment friendly manner.

**Solar energy potential in Ladakh:**

An independent study using Solar resource assessment has been done using meteorological data from three different sources i.e., Meteonorm 7.2, NASA-SSE, and NREL NSRDB-TMY software by CPWD at 32 different locations in Ladakh for establishing solar irradiance data to assess the solar potential of the place. It was concluded that annual average Global Horizontal Irradiance (GHI) is in the range of 1400-2400 kWh/sqm at all these locations which is more than double the national average and can be extensively used for meeting energy demands in Ladakh.

**Solar Data of a few sites assessed by CPWD**

Location	Avg. daily Irradiance
Loma	6.59kWh/m <sup>2</sup>
Chummar	6.16kWh/m <sup>2</sup>
Dan Singh	6.08kWh/m <sup>2</sup>



**Wind Energy potential in Ladakh**

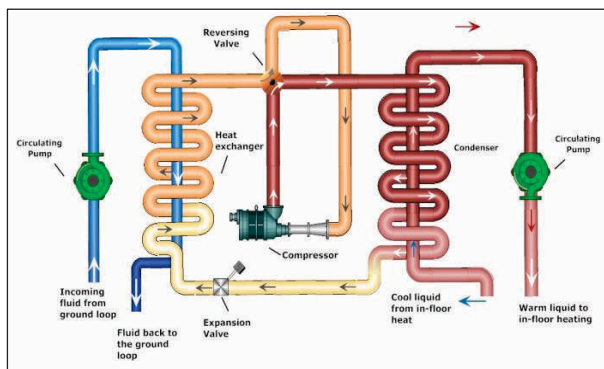
It was found that annual average wind speeds at these locations is in the range of 4-6 m/sec at 20 m above ground level. This wind speed data is not very suitable considering low density of air in Ladakh (40% lower as compared to other areas of India) but still good enough with large wind turbine systems only installed at higher heights above 20m. The study indicated that only at a few locations, wind turbines can be useful at a height of 20 m. This resource can be augmented with solar energy systems to give more reliable source of energy generation.

**Geo-thermal energy potential in Ladakh:**

The geo-tectonic environment of the Ladakh region is very conducive for the availability of abundant geothermal energy resources that can be exploited. The availability of hydro-thermal manifestations and granitic plutons at its various locations is indicative of presence of geo-thermal energy. Geo-thermal based technologies have earlier been used in Ladakh successfully for the purpose of space heating in the buildings in extremely cold situations in Lukung and Chumathang.

### Utilising Geo-thermal resources using Ground Source Heat Pump (GSHP) System for space heating of buildings

- GSHP systems utilize a loop of piping laid in the ground to gather heat from the soil, and then uses a reverse refrigeration cycle to step up that heat to a temperature that can be used inside the building.
- A freeze-protected fluid gathers heat from a piping loop in the ground and passes that heat to the refrigerant fluid cycling within the heat pump, which boils at low temperatures into a gas that can be compressed.
- A compressor concentrates the heat, which is passed on to the radiant floor heating system in the building.



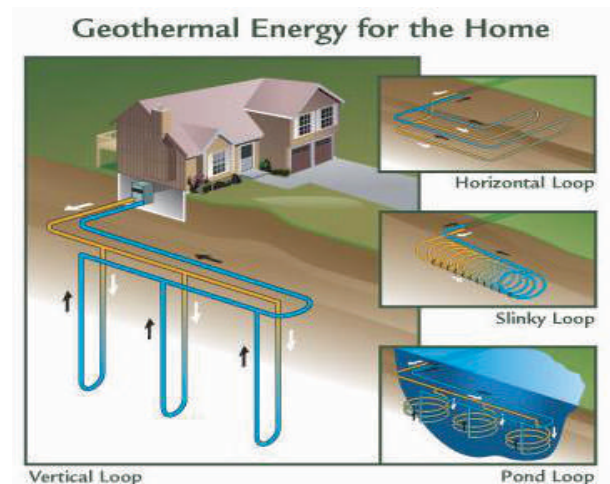
### Special pre-construction practices suggested in cold climate for building construction

- Exhaustive soil and geophysical investigation should be carried out at site to determine the sub surface condition including details about the permafrost.
- Since the working season for construction activities is between May to October, construction planning needs to be done accordingly. The structural and external works should be executed in working season only and the inside finishing works can be executed during non-working season.
- Correct determination of snow and temperature load.

- Frost heaving must be considered in both permafrost and non-permafrost areas.
- Piling must be imbedded in the ground to a depth sufficient to resist the upward pull created by the freezing of the active layer.
- Local material should be used to the extent possible

### Radiant Floor Heating System used for space heating using source of Geo-thermal & Solar PV

The heat energy can be extracted from earth using geo-thermal loop and installed in the building using Radiant Floor heating loops made of PEX tubing (flexible pipes) as depicted below



### Conclusion :

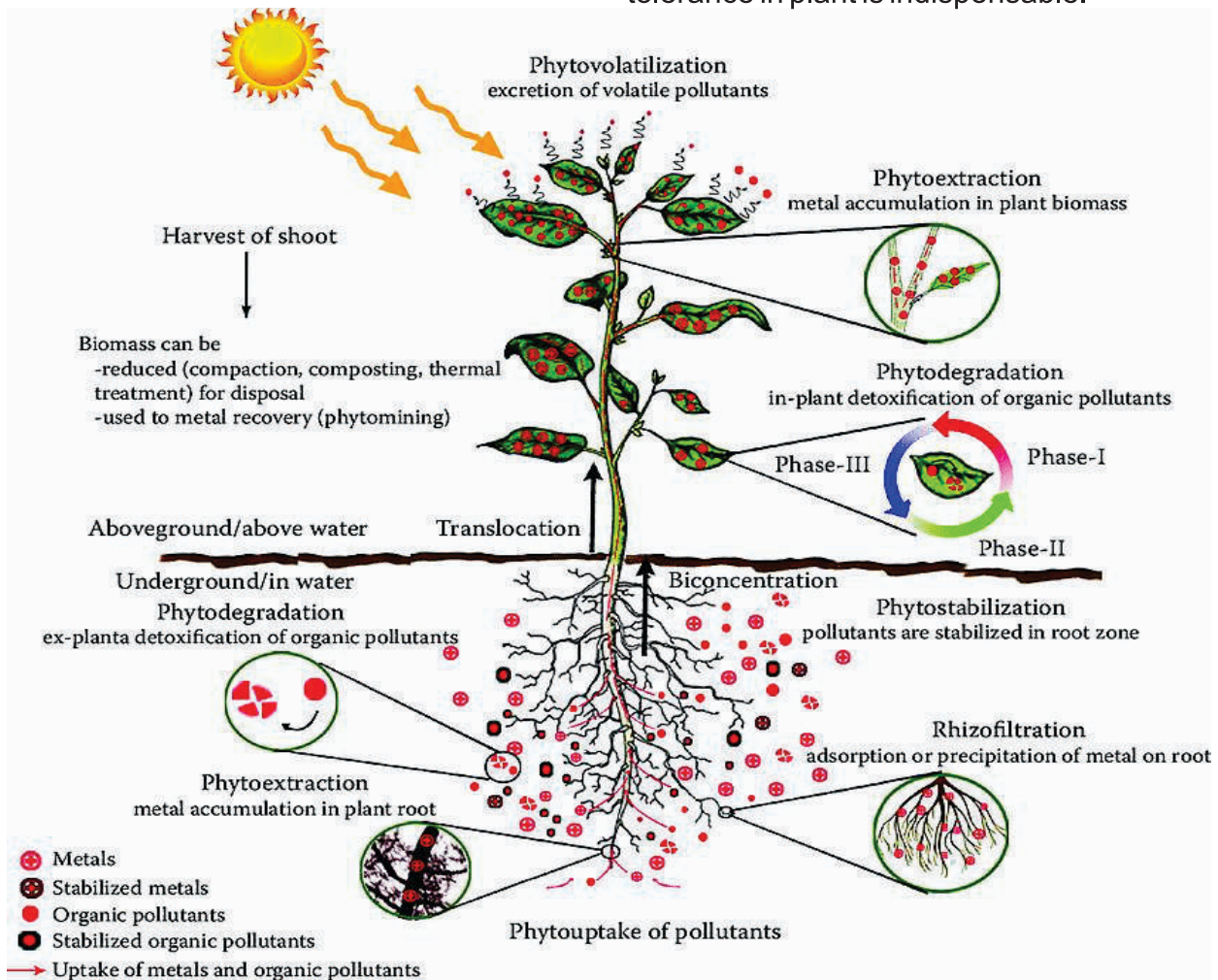
In the study conducted by CPWD, it was found that solar energy is the cheapest and most economical form of renewable energy resource for this region. Usage of wind energy and geothermal energy for producing electricity and heating purposes respectively is limited to some isolated pockets locally and therefore, cannot be utilized universally. In conclusion, the potential of renewable energy to power buildings has just scratched the surface and needs to be explored at a bigger scale further.

## PHYTOREMEDIATION

**Dr. P.K.Tripathi**  
DDG (Hort.)

Phytoremediation is a bio remediation process that uses various types of plants to remove, transfer, stabilize, and/or destroy contaminants in the soil and ground water. Heavy metal accumulation in soil rapidly increases due to various natural processes and anthropogenic (industrial) activities. As heavy metals are non-biodegradable, they persist in the environment and have a higher potential to enter food chain through plants. It may eventually accumulate in the human body through bio magnification,

owing to their toxic nature. Heavy metal contamination has posed a serious threat to human health as well as the eco system. Therefore, remediation of lays contamination is of paramount importance. Phytoremediation is an eco-friendly approach that could be a successful mitigation measure to re-vegetate heavy metal polluted soil in a cost effective way. To improve the efficiency of phytoremediation, a better understanding of the mechanism underlying heavy metal accumulation and tolerance in plant is indispensable.



There are several different types of phytoremediation mechanisms, such as:

**Rhizosphere biodegradation:** In this process, the plant releases natural substances through its roots, supplying nutrients to micro-organisms in the soil. The microorganisms enhance biological degradation.

**Phyto-stabilization:** In this process, chemical compounds produced by the plant immobilize contaminants, rather than degrade them.

**Phyto-accumulation (also called phyto-extraction):** In this process, plant roots absorb the contaminants along with other nutrients and water. The contaminant mass is not destroyed but ends up in the plant shoots and leaves. This method is used primarily for wastes containing metals. At one demonstration site, water-soluble metals are taken up by plant species selected for their ability to take up large quantities of lead (Pb). The metals are stored in the plants aerial shoots, which are harvested and either smelted for potential metal recycling/recovery or are disposed of as a hazardous waste. As a general rule, readily bio available metals for plant uptake include cadmium, nickel, zinc, arsenic, selenium, and copper. Moderately bio available metals are cobalt, manganese, and iron. Lead, chromium and uranium are not very bio available. Lead can be made much more bio available by the addition of chelating agents to soils. Similarly, the availability of uranium and radio-caesium 137 can be enhanced using citric acid and ammonium nitrate, respectively.

**Hydroponic Systems for Treating Water Streams (Rhizofiltration):** Rhizofiltration is similar to phyto-accumulation, but the plants used for cleanup are raised in greenhouses with their roots in water. This system can be used for ex-situ groundwater treatment where groundwater is pumped to the surface to irrigate these plants. Typically hydroponic systems utilize an artificial soil

medium, such as sand mixed with perlite or vermiculite. As the roots become saturated with contaminants, they are harvested and disposed of.

**Phyto-volatilization:** In this process, plants take up water containing organic contaminants and release the contaminants into the air through their leaves.

**Phyto-degradation :** In this process, plants actually metabolize and destroy contaminants within plant tissues.

**Hydraulic Control:** In this process, trees indirectly remediate by controlling groundwater movement. Trees act as natural pumps when their roots reach down towards the water table and establish a dense root mass that takes up large quantities of water. A poplar tree, for example, pulls out 30 gallons of water of the ground per day, and a cottonwood can absorb up to 350 gallons per day.

The plants most used and studied are poplar trees. The U.S. Air Force has used poplar trees to contain trichloroethylene (TCE) in groundwater. In Iowa, EPA demonstrated that poplar trees acted as natural pumps to keep toxic herbicides, pesticides, and fertilizers out of the streams and groundwater. The US Army Corps of Engineers has experimented with wetland plants to destroy explosive compounds in the soil and groundwater. Submersed and floating-leafed species (coontail and pondweed, and arrowhead, respectively) decreased trinitrotoluene (TNT) to 5% of original concentration. Submersed plants were able to decrease Royal Demolition Explosive (RDX) levels by 40%, and when microbial degradation was added, RDX decreased by 80%. Sunflowers, using rhizofiltration, were used successfully to remove radioactive contaminants from pond water in a test at Chernobyl, Ukraine.

## ENTERPRISE RESOURCE PLANNING

**Manu Amitabh**

DDG (ERP)

CPWD is a 167-year-old organization, with a proud legacy of being the mother department for the entire public works execution and administration throughout the country. The vast and varied organizational learning of CPWD spread over the past 167 years finds expression in the innumerable technical guidelines /publications which have become the de-facto standards for Public Works Administration throughout the country.

CPWD has been using several bespoke IT systems such as WBPMS, ERS, NIJ, PIMS, e-Tendering, CPWD e-Sewa, PFMS, OCMS, LIMBS, Pragati etc. for monitoring and control of its works. However, all these IT applications work in silos with no exchange/ seamless flow of data from one application to another. Therefore, for seamless integration and process workflow, CPWD needs a state-of-the-art end-to-end IT solution.

ERP implementation is in progress to fully automate the work-flow processes of CPWD



### What is ERP & e-NIRMIT

e-NIRMIT - The proposed ERP solution for CPWD will be a modular software system designed to integrate all functional areas of CPWD's work processes and all its stakeholders into an unified system.

#### Features:

- ❖ An Integrated System
- ❖ Real Time Operation

- ❖ Centralized Database
- ❖ Leading Practices
- ❖ Standardized Modules

### e-NIRMIT logo and acronym

The CPWD logo is intact in highly disciplined tiles to keep the sense of proud legacy of 167 years of service to the nation.

Vibrant colors in the restructured tiles depicts the business process re-engineering within CPWD for seamless integration of information and workflow to meet the aspirations of a DIGITAL INDIA.

Connected dots with network nodes denotes the ERP application's capacity to provide a seamless working environment and online connectivity between engineers, clients, contractors, consultants, vendors, arbitrators etc.



e-NIRMIT will enable capturing the valuable in-process online data from its vast operations, E&M and construction equipment involving all its stakeholders such as contractors, consultants, vendors, clients, arbitrators, officials, project managers etc. for holistic and effective solutions cutting wastage, improving safety at work site, and ensuring adherence to standard operating procedures by contractors and officials through modern IT tools such as data analytics, machine learning and artificial intelligence.

Moreover, because most of the CPWD processes have been offline so far, CPWD

has been unable to leverage its vast organizational learning for preparation of designs, estimates, tender documents and standards quickly and efficiently as per the

requirements of the clients on a real-time basis. The ERP solution will enable the department to perform these functionalities accurately and efficiently on real time basis

Region 1	Region 2	Region 3	Region 4
<ul style="list-style-type: none"> <li>Delhi</li> <li>Chandigarh</li> <li>Lucknow</li> </ul>	<ul style="list-style-type: none"> <li>Mumbai</li> <li>Bhopal</li> </ul>	<ul style="list-style-type: none"> <li>Kolkata,</li> <li>Ranchi</li> <li>Guwahati</li> </ul>	<ul style="list-style-type: none"> <li>Chennai</li> <li>Bengaluru</li> <li>Hyderabad</li> </ul>
UAT (User Acceptance Testing) followed by Training & full Go - Live for Region 1	Followed by Training & full Go-Live for Region 2	Followed by Training & full Go-Live for Region 3	Followed by Training & full Go-Live for Region 4



The ERP solution is under development and the UAT and rollout of various applications and modules will be starting in coming weeks.

The e-tendering application's UAT and Training has been completed successfully. It is in its final stages of STQC certification which is a mandate for Government e-procurement applications. It is ready and will be rolled out soon.

The Learning Management System's UAT and training are completed in progress and it is in advanced stages for a pilot Go-live /Go-live.Refreshers Training module is planned to be inaugurated on CPWD's foundation day i.e. 12 July 2021.

Human Capital Management related processes are in UAT stage and under customization / development as per CPWD's requirement.

Implementation website, a dedicated web portal for the CPWD e-NIRMIT users, that will be the key channel of communication for all the ERP implementation related activities.

Works Lifecycle Management, Maintenance and Other modules are under development and customization stage. Owing to the timelines being impacted by the Covid-19 Pandemic, a detailed roll-out plan will be communicated to all the stakeholders in coming months.

#### Summary

Implementation of a comprehensive ERP application for CPWD will rejuvenate the department by unlocking its latent productivity and efficiency. It will be an important step in realizing our Hon'ble Prime Minister's dream of a Digital India and serve as a lighthouse ERP Project for the entire Public Works ecosystem of the country to emulate. CPWD will continue to play its stellar role in building a "New India" as it has been doing since the past 167 years - now using IT as a strategic tool.

ERP will radically transform CPWD by unlocking latent productivity and efficiency - propelling the department on a high growth path.

## THE USE OF INCLINED ANCHORS IN DEEP EXCAVATION

**Gaje Singh**

Chief Engineer cum ED, Thyagraj Marg Project Zone

Many under ground constructions are going on each year for utilizing as car parking, shops in basement of building, basement in residential and office building, underground Delhi Metro transit stations etc. Due to proximity of some of belt of this capital city to the Yamuna River bed encounter existence of ground water table varying from 02 m to 07 metres. Therefore, innovative Engineering Solution to site specific location have to be evolved and plans executed to counter the problems of excavation in water table near ground during construction and after construction. This paper discusses the methods of Inclined Anchors Work done in the diaphragm wall and H-Pile as Soldier pile to counter the effect of lateral earth pressure to protect the adjoining side slopes from collapse and thereafter safe excavation in deep earthwork excavation for construction of basement.

### Introduction

Any excavation whose depth is more than 6 m is considered as a deep excavation. However, with the advancement in construction technology and the use of computer programming makes it possible to analyse and design the excavation support system for all depths. The selection of excavation support system mainly depends upon the subsurface conditions, excavation depth, adjacent structures, space within the site for machinery movement, access to the site for the machinery and economics.

### Necessity of Shore Pile at CRPF HQ Site

Shoring piles bolster the encompassing burdens until the under ground components of the structure are built. The shoring pile prevents surrounding structure or soil from

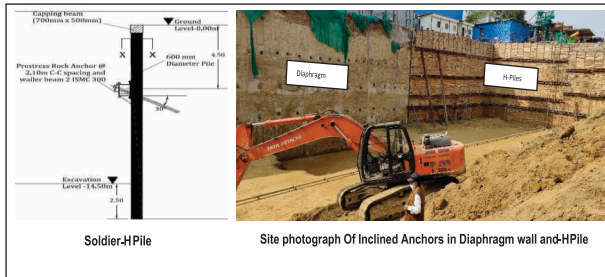
collapsing, protecting from seismic waves, providing support to superstructures. In case of deep excavation, shore pile may get collapsed. To prevent collapsing of shore pile, soil anchoring becomes necessary to uncover profundity or additional charge is higher, cantilever shore heap needs to be secured at one or different levels.

The advantage of using diaphragm wall as a vertical shaft against heaving resistance. The current paper comprises a case study of deep excavation supported by diaphragm wall in CRPF Hq at CGO Complex Delhi. Inclined anchors of various lengths are being used to restrict the horizontal movement of the diaphragm wall.

Diaphragm wall is used as one of the options to support deep excavation for the construction of basements in areas facing constraints of space due to nearby structures. CRPF Headquarter Building comprises of 03 basements, Ground floor+ 11 floors adjacent to CBI HQ building. The planned excavation depth for the three basements is 16.20m. The subsurface ground consisted of made ground/fill material up to 04 metre depth and thereafter the naturally consolidated good earth prevails all along the depth of excavation in vertical continuum. Ground water table at a depth of 07 metre which rise up to 05 metres during rainy season. It is apparent that ground anchors necessitate to limit the deflection of the wall within the allowable deflection limit.

In addition, flanking of the building footprint to the busy Lala Lajpat Rai Marg on one side and Jawahar Lal Nehru Stadium on other side inclined anchors on H-Pile shoring work with waler beam were

considered in these section. The structural section waler beams were used to evenly distribute the lateral load to the H-Piles and facilitate the work of inclined anchors in the H-Piles.



### Construction Methodology of inclined anchors

- i. These inclined soil anchors are provided at different levels as per the site condition at a depth of 3.3 mtr, 6.6 mtr, 10 mtr & 14 mtr respectively in the H-Pile arrangement provided at spacing of 1.75 mtr centre to centre.
- ii. Soil anchors are driven into soil length (4.5 mtr free length and varying length of 5.7 mtr for anchor-1 & 2 at depth of 3.3 mtr and 6.6 mtr)+(4.5 mtr free length and varying length of 9 mtr for anchor-3 & 4 at depth of 10 mtr and 14 mtr respectively for holding up shore pile.
- iii. After drilling soil anchor placing of steel bars or strands take place.
- iv. Soil anchors hard rock length is then grouted using suitable grouting material as per the design grout mix with hardener to attained early strength of the inclined anchors.
- v. After soil anchoring is completed, waler beam is fabricated using standard channel for holding up shore pile.
- vi. Once the grout material has attained its strength, the strands are stressed using stressing machine up to the design anchor lock force.



Post Tensioning of inclined soil anchors

The earthwork excavation was carried out in phases by top-down excavation methodology after the inclined anchors attained 45 ton load and tested for proof load check of 1.5 times the anchors design load. The excavation was carried out by mechanical equipments and the transportation from site to outside was dumpers by creating the ramp from excavated area. The excavation target of 16.2 mtr below the ground level was achieved successfully by this shoring pile work in a period of 4 months due to the entry and exit at one point only owing to the proximity of site to the sensitive CBI Hqr and busy arterial roads.

## HEALTH, SANITATION AND SAFETY OF WORKFORCE AT THE CONSTRUCTION SITES

**T S Vivekananda**

ADG, Region Hyderabad

**N N S S Rao**

Chief Engineer, Hyderabad

### Introduction

Covid-19 pandemic has caused catastrophic effect on both human lives and many countries' economies across the world. All sectors of the economy, including the construction sector, which significantly contributes to employment and a country's Gross Domestic Product (GDP), have been severely affected by COVID-19. It is no secret that construction is one of the sectors where health and safety is a concern. The COVID-19 pandemic aggravates construction site worker's exposure to risk and danger. In the light of our Honorable Prime Minister, Shri Narendra Modi's vision to make our country a \$5 trillion economy, it is important for the construction sector to revive as early as possible. One of the important factors for the revival of construction sector is the workforce management. Robust procedures/methodologies shall be adopted to ensure the good health and safety of the workforce employed at the construction sites.

### Objective

Symptoms associated with the Covid-19, i.e. if a person test positive, are the common cold, fever, cough, shortness of breath (for mild cases); or pneumonia, acute respiratory distress syndrome causing respiratory failure, septic shock, kidney failure or multi organ failure (for severe cases). Some people show little or no symptoms at all (asymptomatic) or any other symptoms as declared by the competent authority.

Effective means of reducing the chances of infection include social distancing, the use of masks, frequent and thorough hand washing, avoiding touching eyes, nose and mouth, avoidance of public activities/mass gatherings, following good respiratory hygiene.

The primary objective for any employer or employee is to ensure that

- ❖ The workforce shall not be exposed to the virus COVID-19 and necessary measures shall be adopted to ensure the same.
- ❖ If exposed, measures to be adopted to break the chain of infection.

Central Public Works Department (CPWD), Region Hyderabad had been religiously adopting various measures aiming to avoid the workforce getting exposed to COVID-19.

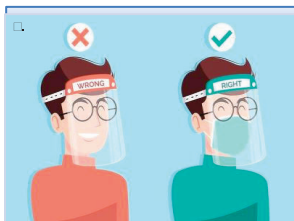


### Health, Sanitation and Safety Measures.

By ensuring the above three factors at every stage, following measures have been adopted at construction sites.

Establishing temporary colonies by ensuring following .

- ❖ Providing separate bathing facilities.
- ❖ Separate Toilets for women and men.
- ❖ Providing langars for workforce within the site managed by contractors.
- ❖ Supplying ration to workforce inside the construction site.
  - ❖ The provisions are being purchased and kept in isolation for one week and then supplied to site.
  - ❖ Direct contact with vendors is avoided at site.
- ❖ Ensuring mandatory quarantine of mandatory period for new incumbents at a separate location (Isolation areas) before they enter into the camp
- ❖ Providing Isolation rooms.
- ❖ Daily Temperature checks for workforce entering in and out of the construction sites
- ❖ Sufficient supply of Masks, sanitizers/ soaps etc.



### Site Specific Measures

- ❖ Tyre wash /Sanitization of vehicles entering the workspace.
- ❖ Assessing the risk level of the works and accordingly taking up the works Risk levels can be categorized as below based on the exposure.
- ❖ Segmentation of workers.
- ❖ Daily temperature checks.

- ❖ Working with 50% workforce.
- ❖ Inspection of works through video conferencing with contractors and sensitizing them on regular basis.



### Training work force

In addition to technical training provided to the workforce at site following are ensured:

- ❖ Educating the do's and don't's during these covid times.
- ❖ Sensitizing the contractors and the workforce to ensure safety precautions.
- ❖ Counseling workforce aiming to reduce social stigma in them.

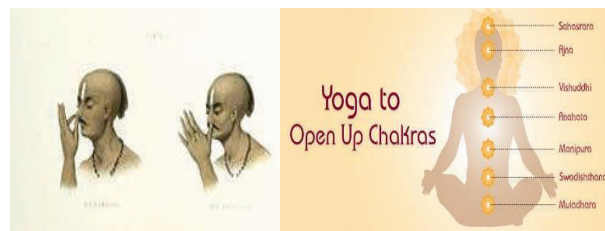
### Wellness of Workforce

Yoga is a Ray of Hope and a source of strength in the midst of the COVID-19 pandemic. Yoga shows the way from Stress to Strength and from negativity to positivity. Yoga plays a preventive as well as promotive role in health care.

As part of efforts to ensure the wellness, healthy mental status of the workforce, weekend yoga has been introduced through online workshops/classes for the workforce in the construction site.

Following aspects are included in the work shops/classes:

- ❖ Simple Yoga
- ❖ Pranayama / Breathing exercises
- ❖ Surya Namaskara etc.



### Material Management

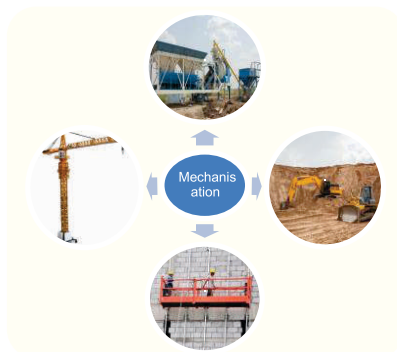
- ❖ Advanced planning for the requirement of material for every stage and ensuring their procurement well at least 1-2 months prior.
- ❖ Materials and equipment are disinfected before use where possible
- ❖ Material and equipment are delivered to designated areas after mandatory detention period in isolated location at site.
- ❖ Keeping 3-4 sources of supply for every type of material as an alternative measure.

- ❖ Only one team handles delivery
- ❖ Additional storeroom provided as a holding store

### Manpower Management

- ❖ Advanced planning for manpower requirement (trade wise requirement).
- ❖ Ensuring their safe transit into the work site.
- ❖ Ensuring their stay inside the Construction site by ensuring above COVID-19 measures and wellness measures.
- ❖ Pooling of manpower from different work sites for different activities as per the requirement.

### Mechanization



### Additional Measures

- ❖ Vaccination of work force
- ❖ Adopting Good Construction practices.
- ❖ Tying up with local authorities for sanitization/fumigation of sites on regular basis.
- ❖ Tying up with local authorities for garbage collection and ensuring waste management.

compared to the loss that they might be incurring to delay in the project which might result in the migration of labour fearing Covid-19 due to meager arrangements made at site.

It has been observed that, owing to the effect of above measures taken at site, there has been an approximate decrease of 30% in the labour at site during 2nd wave of Covid as against a 90-100% decrease in labour during 1st wave of Covid-19 pandemic.

### CONCLUSION

It can be iterated that the expenditure that would be incurred for adopting the above measures will not be of substantial amount in case of projects and construction works ranging between 5-50Cr when

(There is no force greater than our enthusiasm and spirit in this world.  
There is nothing in the world that cannot be achieved with this force.)  
Let's come together to defeat corona and make India prosper  
**Stay Safe Stay Healthy**

## CENTRE OF EXCELLENCE FOR DISABILITY SPORTS, AT GWALIOR, MADHYA PRADESH

**Biplab Nath**  
Senior Architect

**Pushpraj Kashyap**  
Architect, O/o ADG Region Bhopal

### Introduction:

Regarding relevance of sports Nelson Mandela aptly stated, "Sport has the power to change the world. It has the power to evoke emotions. It has the power to join people together like few other things in the world. It speaks to young people in a language they understand. Sport can create hope where once there was only despair. The sport laughs in the face to any kind of discrimination".

### Effects of sports in differently abled:

Any kind of disability adversely affects people in their interaction with society and in all other spheres like education, employment etc. Often, they are seen as dependent and incapable. In this context, sports can help resolve this problem to a substantial extent.

**Aim:** The main aim is to create this inclusion by integrating disability sports within mainstream sports. In a nation that is yet to make its basic infrastructure accessible to persons with disability, being a disabled sports person or even wanting to take up sports can be an experience in battling physical and physiological barriers. Indeed, a handful of sports persons with disabilities have produced tales of struggle, and even triumph. But these are scattered instances, which fail to make sports accessible to citizens of our country.

### Sports for Disabilities in India:

Sport has positive effect in everyone's life, it is even more so in the life of a person with a disability. This is because of the rehabilitative influence sport can have not



only on the physical body but also on integrating people with a disability, into society. Furthermore, sport imparts spirit of independence. Nowadays, people with disability participate in high performance as well as in competitive and recreational sport. We have to promote sports for the disabled of our country, duly identifying the disabled sports persons at all India level, and then imparting necessary training to them and preparing them to take part in State, National and International Sports meets. Currently there are no such comprehensive sports facilities including residential facility, dedicated for disabled sportspersons in India.

In above context CPWD has undertaken construction of Centre of excellence for disability sports at Gwalior. The project is at foundation stage and likely to be completed on June 2022.

**Objective of project:**

The objectives is to establish international Centre Of Excellence for Disability Sports (COEDS), enabling the right facilities to be provided, based on robust and up-to-date assessment of needs for all levels of disabled sports and all sectors of the disabled community.

**Goals:**

1. To be a prime source unlike any other, to train indian paralympians, coaches, technical officials and volunteers who will advance paralympic sport.
2. To build respect for the achievements as athletes and further develop the opportunities for disabled people by changing society's perceptions.
3. Creating a campus which is accessible, environmentally sustainable, technologically possible and economically feasible.

**Project Description:**

The project has Indoor Sports Halls, Aquatic Centre (Swimming Pool), Outdoor Athletic Stadium and Residential Facility. Centre of Excellence for Disability Sports is situated in Gwalior (MP). The site is about 5km from Gwalior City and about 10 km from Rajmata Vijaya Raje Scindia Airport. The proposed site has been divided into 3 zones (I) Outdoor fields, (ii) Indoor sports complex, (iii) Living facility- hostel. These three components are interrelated and due considerations have been taken to locate various activities, functions with reference to site and surroundings, climatic considerations and other locational aspects.

Brief area statement:

Permissible area:

- a) Total plot area- 17 Acres (68796.6 sqm)
- b) Permissible F.A.R- 1.5
- c) Permissible built up area-103194.9 sqm

Proposed Area:

- 1) Indoor sports = 16805.00 sqm
- 2) Aquatic centre = 3530.00 sqm
- 3) Hostel building = 9150.00 sqm.
- 4) Spectator stand= 3360.00 sqm
- 5) Outdoor sports field= 17234.00 sqm

All the buildings have separate entrance with inter connected roads, pathways and landscaping. Tot-lots and green area with lighting has been provided. All drainage services have been designed according to contour of the site.

The outdoor fields are oriented in north-south direction (ideal orientation) with the support facilities like player's changing rooms located in the indoor sports building.

Outdoor sports have the facilities for sports like football, athletics etc. Some salient features of Outdoor sports are: An IAAF approved 400m 8-lane track with 10 lanes of 100m straight track, 2 tennis courts as per standards prescribed by ITF, football field conforming to FIFA standards, football 7-a-side field, Archery, Javelin throw, Discuss, hammer and shotput throw, Steeplechase, High jump, Pole vault, Triple jump etc.



**Indoor Sports Complex-** Two multi sports halls are provided. Classrooms and library are provided as part of sports education. Medical Centre, Sports Science Centre and Physiotherapy Centre are provided as part

of Centre of Excellence. Toilets and changing room facilities are designed as per accessible standards. Spectator viewing areas are provided with sufficient accessible seating areas.



Following Facilities are provided in Indoor Sports Complex:

- i) 3 badminton courts
- ii) 1 Wheelchair basketball court
- iii) 4 table tennis courts
- iv) 1 sitting volleyball court
- v) 1 taekwondo court
- vi) 4 wheelchair fencing courts
- vii) 3 boccia courts
- viii) 1 Goalball court
- ix) 1 football 5-a-side court
- x) Para dance and Para power lifting etc.



**Spectator Viewing Areas-** 8500 spectator seating are provided out of which Indoor Spectator seating in multipurpose hall is for 1000 viewer and in swimming pool is for 500 viewer and in outdoor spectator seating in west stand is for 1000 viewer and in east stand is for 6000 viewer.



Two outdoor pools as following have been provided.

- a. 1 Olympic size pool (50X25m) complying with FINA Olympic standard category pools with two approach ramps & pool lifts.
- b. 1 practice pool of size 25X17m
- c. Seating capacity of 500 people has been provided

Hostel building for 208 players with facility of dining, kitchen and recreation has been provided.

Other landscape features and plantation are provided in relation with building elements to develop the site into an Integrated Campus of Excellence.

### Sustainability Features

India is one of the leading countries in infrastructure and construction development, it is growing at almost double the rate of global average. The ecological footprint of India is continuously increasing as compared to its bio-capacity. Construction industry being one of the largest resource consuming sector, needs the greater attention to optimize the use of natural resources.

**COEDS** is passionately adopting the sustainability measures to minimize the disturbance to nature while developing a training institute for a greater cause. In line with this, COEDS has been registered with Indian Green Building Council for getting Gold rating. All the significant features of green buildings are incorporated in the design and construction practices in the COEDS campus. All the buildings have been designed as per Accessibility guidelines, NBC standards and fire Norms.

## ACTIVITIES OF OFFICERS' WIVES ASSOCIATION

CPWD Officers' Wives Association, a Socio-Cultural Organization, founded in the year 1971 and registered under societies Act XXI of 1860, is actively engaged in the relief and welfare of needy personnel of CPWD. It is run by the wives of officers of Central Public Works Department. The association reaches out not only to the employees and their families but also to the workers/staff temporarily engaged by the department. It is a cohesive and dynamic organization where the ladies work diligently for a number of socio-welfare activities, under the leadership of the incumbent President, to support the under privileged sections of the society.

The association is presently being headed by Shri Archana Jayaswal, the wife of Director General of CPWD.

The Association also runs Bal Baseras (Creches) at construction sites, Vocational Training Centre for underprivileged women, Day Care Centre and a Pre-nursery School. Health check-up camps are regularly

organized for the labourers working at construction sites. At the time of any national calamities, it also provides help to the affected people.

Other prime activities of the association are as under:

- ❖ Scholarship for degree and diploma courses on merit-cum-means basis for the wards of Group C and work charged employees of CPWD.
- ❖ Special donation for the education of under privileged students to help them in pursuing their studies.
- ❖ One time ex-gratia payment to needy Group C and work charged employees of CPWD in the event of untimely death, accident, long illness
- ❖ Donations for humanitarian causes like flood affected areas, Blood Banks, Red Cross Society, Schools for Blinds, Missionaries of Charity, PM Relief Fund, CM Relief Fund etc.





- ❖ “Parivar Ki Har Beti Apne Bharose” scheme to provide aid to the girl-child of Group C and work charged employees of CPWD with the object to make them economically independent in their life.
- ❖ Special donations in cash or kind to support financially deprived people or to organizations sharing same objective.
- ❖ Satya Goel Memorial Trusts Scholarship for meritorious wards of Group C and work charged employees of CPWD who score high in their X and XII exams through CPWD OWA.
- ❖ Crèches at construction sites under the name 'Bal Basera' for the children of laborers who are engaged by the contractors at the various construction sites. These crèches provide informal education, nutrition, medical care and a safe environment for children of 1-7 years age group. Presently, these crèches are being run with around 20-25 children
- ❖ Day Care Centre, Nursery and a Play School at its Head office building premises for children of 6 months to 12 years age group at a very nominal fee.
- ❖ Vocational Training Centre with the sole objective of providing training and empowering women economically. The

Centre conducts different diploma courses like tailoring and embroidery recognized by Usha Sewing School, computer courses and many short-term hobby classes from time to time.

❖ Cultural, recreational programs and

workshops are conducted for the children at Day Care, Vocational Training Centre and at the crèche sites.

❖ Health check-up camps are regularly organized for the construction workers.



### BEST COMPLETED PROJECTS

S No	Region	Name of Building	Prize
1	ADG Region Bengaluru	Software Technology Parks of India (STPI) at Electronic City including interior works, Bengaluru	1 <sup>st</sup>
2	ADG Project Region New Delhi	Renovation repair, rehabilitation, addition, alteration and aesthetic improvement and other misc. Civil & Electrical works at Hotel Janpath, New Delhi	2 <sup>nd</sup>

### BEST SERVICE CENTRES

S No	Region	Name of Building	Prize
1	ADG Region Chennai	Service Centre -1373 (Elect), GPRA KK Nagar, Chennai	1 <sup>st</sup>
2	ADG Region Bengaluru	Service Centre -350 (Elect), GPRA HSR Layout, Bengaluru	2 <sup>nd</sup>
3	ADG Region Lucknow	Service Centre -957 (Civil), GPRA Colony, Sector-10, Vidhyadhar Nagar, Jaipur	3 <sup>rd</sup>

### (A) Officers selected for Director General Medal

S No	Name of the Officer	Category	Post held
1.	Shri Bihari Prasad Singh	Chief Engineer (Civil)	Chief Engineer, Border Fencing Zone, New Delhi
2.	Shri Mukesh Kumar	Superintending Engineer (Civil)	Superintending Engineer, Jammu Circle, Jammu
3.	Shri Vijay Prakash Rao	Senior Architect	Senior Architect, Project Region New Delhi
4.	Shri S. Dharanidharan	Executive Engineer (Civil)	Executive Engineer, IITM Project Circle, Chennai
5.	Shri Devendra Kumar Sachan	Executive Engineer (Elect)	Executive Engineer (Elect), ERP Unit, New Delhi

**(B) Officers selected for Certificate of Merit**

S No	Name of the Officer	Category	Post held
1.	Shri Pradeep Gupta	Chief Engineer (Civil)	Chief Engineer, Indo-China Border Roads Project Zone, Leh
2.	Shri Shambhu Nath Rai	Chief Engineer (Civil)	Chief Engineer, Bengaluru
3.	Shri Neeraj Kumar Vasandani	Superintending Engineer (Civil)	Superintending Engineer, Parliament Civil Works Circle, New Delhi
4.	Shri Praveen Kumar Agrawal	Superintending Engineer (Civil)	Superintending Engineer, Goa Project Circle, Goa
5.	Shri Ashok Kumar Dhiman	Senior Architect	Senior Architect, O/O SDG PR, Chennai
6.	Shri Pardeep Kumar	Executive Engineer (Civil)	Executive Engineer (Civil) ERP Unit, New Delhi
7.	Shri Sudhir Kumar Tiwari	Executive Engineer (Civil)	Executive Engineer (Civil), Central Vista Project Division-2, New Delhi
8.	Shri Jyothi Shankar Behera	Executive Engineer (Civil)	Executive Engineer (Civil)-II, Bengaluru
9.	Shri Gaurav Mittal	Executive Engineer (Elect)	Executive Engineer (Elect), Cochin
10.	Shri Abhilash Kiran	Architect	Architect, O/O CE, Trivandrum
11.	Shri Robin Gautam	Architect	Architect, O/O SA-1, Region Chandigarh
12.	Shri V. S. Chaitanya	Architect	Architect, O/O RTI Chennai



**Shri V K Jayaswal, Director General, CPWD inaugurates foundation training programme for Assistant Executive Engineers (Civil, E&M) and Deputy Architects at National CPWD Academy on November 19, 2020.**



**Central Public Works Department**

**Sustainable Development for Atmanirbhar Bharat**



Floral Tableau of CPWD on the theme 'Amar Jawan' showcased during RDC -2021 at Rajpath, New Delhi on January 26, 2021 won Special Prize