

HELMET

 Environment  Health  Safety

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Anupam Kumar

Vice President & Head
(Metallurgical & Material Handling - SBG)

Foreword

“ For a sustainable business model, construction should be planned and carried out in a socially responsible manner, augmenting tenets of health and safety at various phases including engineering, procurement and execution.

Managing safety well commences with leadership commitment and involvement. MMH has adopted the strategies of 'VISION ZERO' in 2017 to align its efforts to achieve international standards in Safety. This has enabled in the smooth up-gradation of our Occupational Health and Safety Management Systems, certification from OHSAS 18001 to ISO 45001:2018 as well as recertification towards the revised ISO 14001:2015 Environmental Standard.

Our business processes must proactively align with occupational safety and health standards in line with the good practices of global corporations in the EPC space. At MMH, we have adopted a structured approach towards the improvement of safety compliance through individual objective setting to inculcate the importance of safety in one's life. While such objective setting makes an individual more responsible and vigilant for his acts, it also demonstrates the management's commitment towards the safety and occupational health of its employees, and for the company at large.

Over the years, several internal initiatives have been taken up for safety cultural transformation, which is instrumental in improving our collective commitment across our operations, in India and abroad. We need to further strengthen these efforts to match with the global eco-system and establish our prominence in the international market. As we proceed, this would require adoption of innovative methods and application of advanced technologies like digitalization, artificial intelligence, Building Information Modelling (BIM), etc. We believe in making Safety 'live through digitalization to create a safe eco system in every project location.

Taking cognizance of the data on types of accidents in the Indian industry, of the 130 deaths every single day due to occupational accidents across various sectors, 38 occur in the construction sector alone! Each precious human life lost impacts not only the families but the society as well. The only way to stop this agonizing loss is to constantly develop and upgrade our systems and procedures as well as competency of all team members to make the EHS process more robust and to institutionalize best practices.

For a sustainable business model, construction should be planned and carried out in a socially responsible manner, augmenting tenets of health and safety at various phases including engineering, procurement and execution. A strong safety culture is a key element to attain global benchmarking of socially sustainable construction that can only be realized through collaborative efforts of all stakeholders including industry, academia, government and the public at large.

“ As we move forward, implementation of BIM would help project visualization, hazard identification, efficient scheduling and improvement in safety. Soon, this will enable us to migrate from labour-intensive to equipment intensive operations to reduce exposure of workers to hazards.

This invariably includes workmen repository, awareness through e-learning, app-based work permits and checklists, workmen tracking (restricted entry to unsafe zones), sensors / gas detectors and beacons, online incident reporting and real time feedback to top management.

It is imperative that during the initial engineering stage, the constructability and ease of installation is given paramount importance. Accordingly, the design needs to address modularisation of work in order to increase groundwork, reduce work

at heights and exposure to adverse weather conditions/environment. As we move forward, implementation of BIM would help project visualization, hazard identification, efficient scheduling and improvement in safety. Soon, this will enable us to migrate from labour-intensive to equipment intensive operations to reduce exposure of workers to hazards.

Workmen are key to the success of any project. Enhancement of their skill sets, job specific training and recognition will lead to more motivated workmen thereby creating a safer work environment.

“ A committed approach and the adoption of new technological solutions will help us to standardize processes, improve overall quality of the products and services rendered and thereby drastically reduce unsafe acts that result in Loss of Time and Cost.

A committed approach and the adoption of new technological solutions will help us to standardize processes, improve overall quality of the products and services rendered and thereby drastically reduce unsafe acts that result in Loss of Time and Cost.

Adoption of a 'zero tolerance' policy for safety violation is very important to effectively deal with these deviations and minimize recurrence. A structured approach towards 'consequence management' can play a pivotal role in this matter, establishing a culture of compliance.

Let us all take a resolve to adopt Safety as a core value, which is non-negotiable.

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WHY IS IT SO IMPORTANT TO MIND YOUR HEAD?

The helmet - a lifesaver!

In November 2014, the cricketing world was plunged into gloom at the sad demise of young Australian cricketer, Phillip Hughes. Hit on the back of his head when ducking into a nasty bouncer, he collapsed on the field and later died without regaining consciousness. While the incident triggered frenzied re-designing of cricket helmets by introducing neck pieces, it yet again underscored how critical it is to keep one's head well protected. The head is perhaps the most vital part of the human body housing all our

major sensory organs, most important being the brain, that plays the role of a centralized conveyor of all information. An unhealthy brain renders one pretty much useless and hence it pays to mind your head!

Day in and day out we read about fatal road accidents, largely involving bikers, not wearing helmets. Very often, people foolishly do not wear helmets either because they are too uncomfortable in our warm climes or are too cumbersome to carry; some just



N Ramesh Kumar
EHS In-charge,
Medigadda Barrage
project

We lead by example; our workmen are always watching us and will emulate whatever we do and so by strictly following safety protocols, we ensure that they follow them too.



don't think its stylish enough to have this head gear. The consequences can be very serious. Such foolhardiness must be avoided at construction sites at all costs. "Everyone, and we mean everyone, has to have a helmet at site," declares Head - EHS, WIPRO SEZ site, R V Sudhakar, "because by allowing

some people not to follow our rules is perhaps the worst way to impose discipline." EHS In-charge, N Ramesh Kumar, who recently successfully completed the huge Medigadda Barrage project incident free, echoes similar sentiments. "We lead by example; our workmen are always watching us and will emulate whatever we do and so by strictly following safety protocols, we ensure that they follow them too."

The evolution of the ubiquitous Helmet

Although helmets had been in use for several decades, its earliest avatar in the construction industry was the 'Hard Boiled' hat introduced in the 1920s, which itself was a variation of the tin hats worn by American soldiers during the first World War. Made of

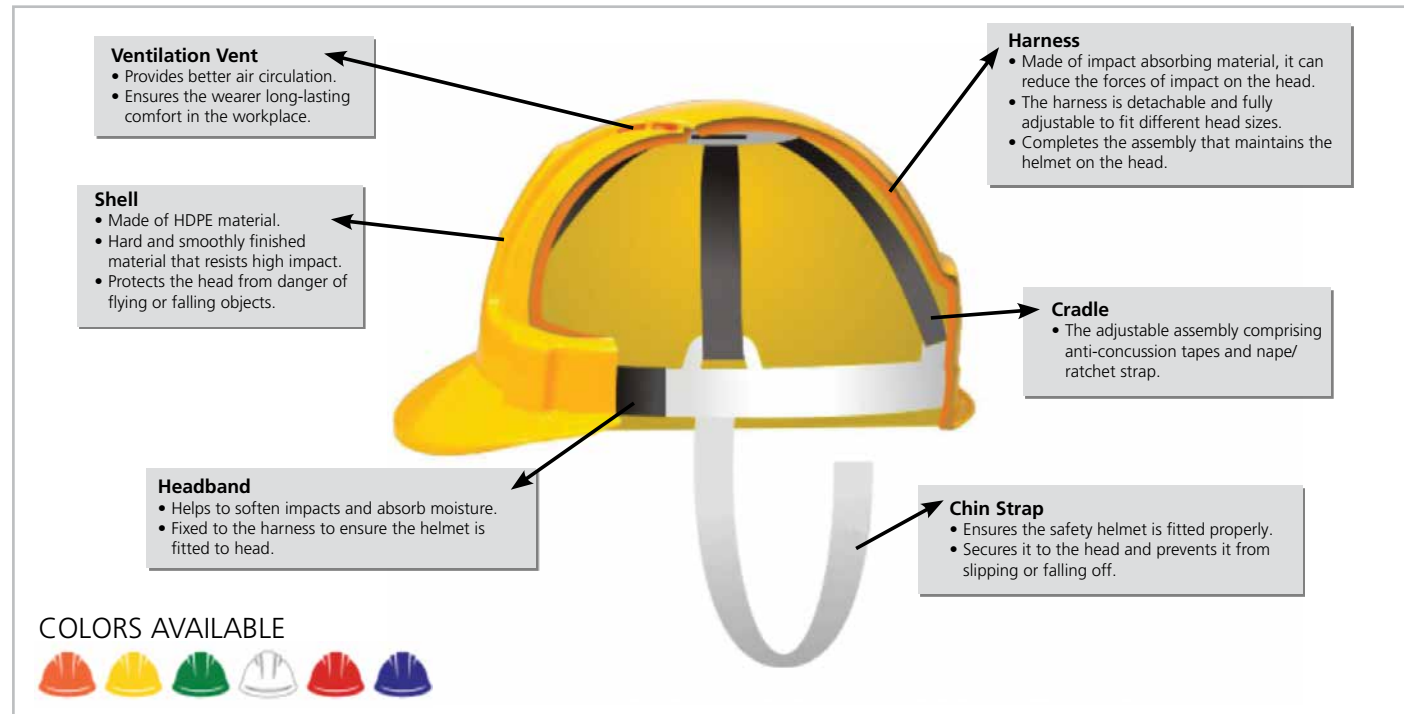
steamed canvas, glue, a leather brim and black paint, hard boiled hats were first made compulsory at the Golden Gate Bridge project in San Francisco, USA. A couple of decades later, entered the aluminium hard hats. These were, however, short-lived as aluminium, being a good conductor of electricity, was a poor choice and hence was replaced by three-rib, heat-resistant fiberglass hard hats that were later replaced by thermoplastics, a better and more economical alternative. Since the early 1980s, hard hats have evolved with the use of lightweight, durable polyethylene plastic that conduct electricity. These were later fitted with easy-lock snaps, enhanced brow pads and even vented hard hats. In fact, there are some helmets that come with built-in fans and even 3D hologram capability!

THE ANATOMY OF A HELMET

- **Top shell:** The most critical part, it weighs 300 grams (the entire helmet weighs 390 grams) and is made of virgin A-grade HDPE (High Density Poly Ethylene). "Material Flow Index plays an important role," informs M Kamarajan (MK), Advisor EHS, B&F IC, "and we have selected 8MFI that is best suited for our industry."
- **Head band:** Almost as important as the top shell, it softens the impact and absorbs moisture. Made of a mix of virgin HDPE and LDPE, the distance between the two is a vital 9 mm that is critical to absorb the shock of a heavy material falling on the helmet. The ideal HDPE-LDPE mix is 50:50, that is determined by the hardness required in the headband and its locking strength with the top shell. It is fixed to the harness to ensure that the helmet remains fitted to the head. Helmets at L&T Construction cover

the entire range of head foam circumference from 520 mm to 600 mm and therefore are ideal for our workforce: for both thin and sturdy people.

- **Harness:** Made of impact-absorbing material, it reduces the impact of forces onto the head. Easily detachable, it can be adjusted to sit comfortably on different head sizes.
- **Cradle:** Is an adjustable assembly comprising anti-concussion tapes and nape/ratchet type straps.
- **Ventilation vents:** are for better ventilation to make working more bearable in our hot and humid conditions.
- **Chin strap:** Is 20 mm in width that can withstand a weight of 10 kgs for 10 minutes which is the maximum strength it should be able to bear and comes with a chin guard.



“**Chances of survival of accident victims with helmets are significantly better. Helmets come in very useful during tunnelling activities too as a bright headgear is far more visible in the relatively dark and dust-filled work environment underground.**

Stephen Phillip Storey
Head – EHS, HCl IC

Helmets used at L&T Construction are specially designed and are of two types: Nape and Ratchet types both of which are made of HDPE, with chin straps and sweat bands and ISI certified (IS 2925:1984).

How helmets save lives

Helmets protect heads from falling objects or falling from a height or to cushion the head hitting against a hard surface to the best possible

HOW TO TAKE CARE OF YOUR HELMETS

If one's safety depends on it, then it is very important to maintain one's helmet.

- Clean it regularly:** as often as you inspect it using mild soapy, warm water. Avoid harsh detergents.
- Avoid dropping or throwing or even using it as a support to sit on.** Construction helmets are not to be used for travel or for sports.
- Don't use it as a storage place** for cigarettes, earplugs for these can be dangerous in the event of something falling on the helmet.
- Avoid using paints, solvents or hydrocarbon-type cleaners** for these can cause damage that remains unnoticeable.
- After a day's work, store it in a clean, dry place,** not exceeding 120 degrees Fahrenheit.
- Establish and maintain a replacement programme for your helmets and PPE.** Keep detailed purchase records and damage reports to keep track of equipment lifecycles.



Safety demonstrations on the importance of wearing helmets

“**The importance of wearing a helmet at a construction site cannot be over-emphasized, at the end of the day, if workmen are convinced that not only their lives but the livelihoods of their families depend on them staying safe and healthy, they will not mind putting on helmets.**

M Kamarajan
Advisor EHS, B&F IC

extent. “Chances of survival of accident victims with helmets are significantly better,” opines Stephen Storey, Head – EHS, Heavy Civil IC. “Helmets come in very useful during tunnelling activities too as a bright headgear is far more visible in the relatively dark and dust-filled work

environment underground.” Helmets shield you from the sun's direct UV rays, give comfort in stuffy conditions and different coloured helmets make it easy to identify personnel.

Riding the digital wave, RFID-tagged helmets are helping safety managers

keep workmen safe by tracking them, preventing them from entering ‘no-go’ zones or stopping them from venturing into areas where they are either not authorised or medically unfit to enter like at heights or in a marine environment. It comes in most handy when workmen are working alone at times either at odd hours or away from the main centres of activity.

“The importance of wearing a helmet at a construction site cannot be over-emphasized,” offers MK, “and, at the end of the day, if workmen are convinced that not only their lives but the livelihoods of their families depend on them staying safe and healthy, they will not mind putting on helmets,” he concludes. ■

POWERFUL EARLY WARNING DEVICES



High voltage tester with discharge rod



Helmet mounted induction tester

PT&D IC's Utility Power Distribution team was vexed by two hazards that their fitters frequently encountered. "One was unknowingly touching or climbing 'live' towers," explains G Kartik, Project Manager, Rural Electrical Work under DDUGJY (WESCO) PK-4, "and the other was having to face sudden power surges when stringing lines."



G Kartik
Project Manager, Rural
Electrical Work under
DDUGJY (WESCO) PK-4

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With the situation assuming alarming proportion, mitigation measures were an imperative and the team came up with two timely innovative solutions to overcome both these safety hazards.

Helmet Mounted Induction Tester (HMIT) is a device that is attached inside a standard helmet (IS 2925) with a small antenna sticking out that detects 'live' towers and alerts the fitter when he is still a few feet away. It protects the head from electrical hazards of up to 2 kV and mechanical hazards of up to 40 KN.

High Voltage Detector with Discharge Rod: Robust, lightweight and made of unbreakable ABS material with extremely good insulating properties, the High Voltage Detector with an attached discharge rod sends audio and visual alerts in the event of a



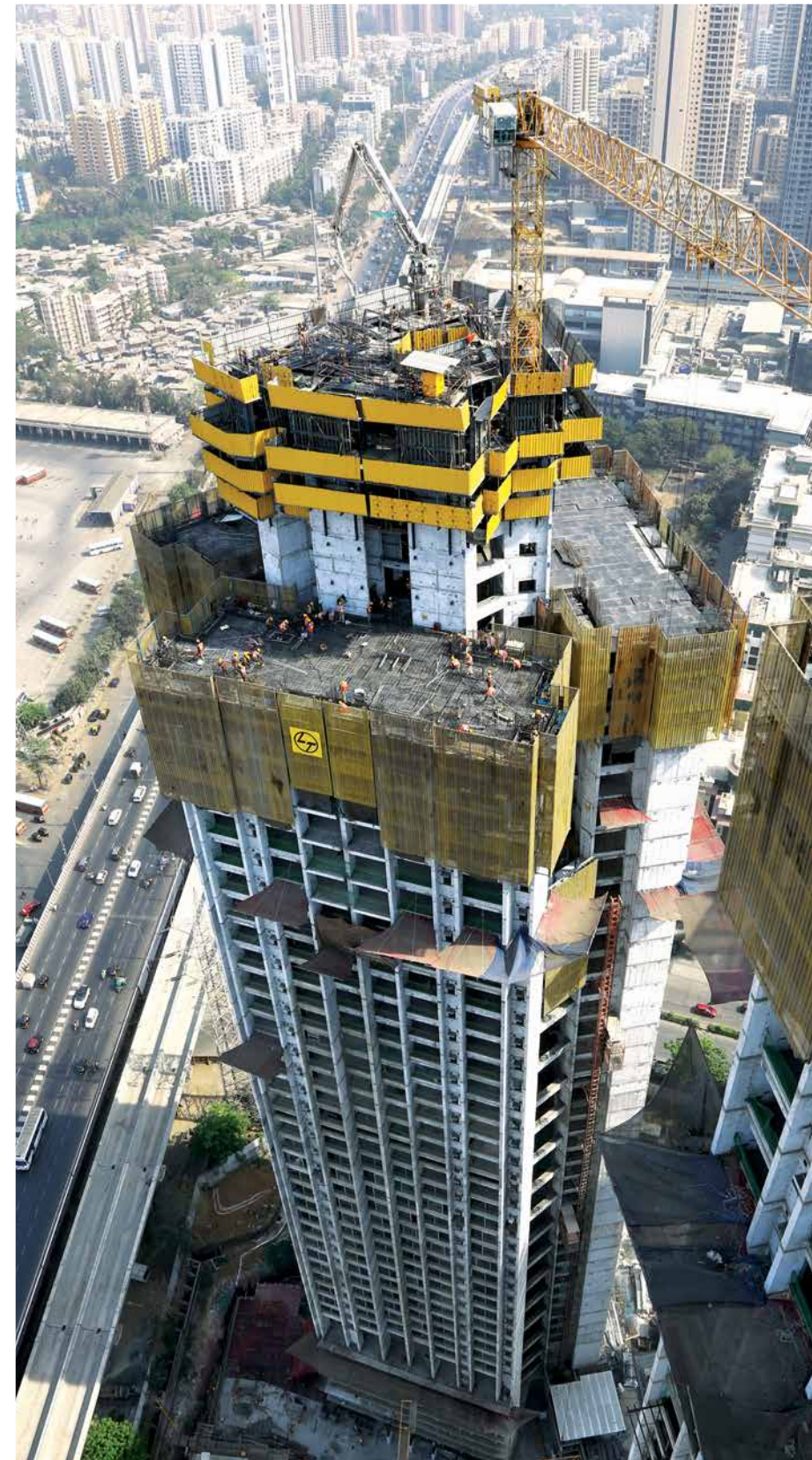
Jayakrishnan
EHS Coordinator

With powerful early warning devices, it has become so much safer for our fitters and our safety quotient has improved multifold.



sudden power surge thanks to the connection of the discharge rod cable to earthing points.

"With these innovations, it has become so much safer for our fitters and our safety quotient has improved multifold," shares a visibly happy Cluster EHS Coordinator, Jayakrishnan.



BREAKING THE FALL!

The vital importance of the harness

A workman, on one of the top floors of a high-rise tower being constructed by L&T in Mumbai, was clearing debris accumulated inside a partially open safety net. Suddenly, perhaps because of the weight of the spill-over wet concrete and other debris, the net went over the edge dragging the workman along with it. What saved his life was his full body harness anchored to a lifeline. Even then, he was suspended in mid-air 21 m off the ground, his life virtually hanging by a thread. The safety team swung into immediate action: safety nets were spread on the ground while other workmen held on to the lifeline to arrest any further fall. While the hanging workman was counselled to remain calm, a rescue cage and tower crane were pressed into service and the 45-minute rescue operation ended successfully.

This incident is enough to send chills down our spine but lamentably, the sight of workmen perched high up on a skyscraper or atop a tall pole, stringing a powerline with legs dangling in thin air, often without fall protection devices, is a common sight. Therefore, it is hardly surprising that most accidents causing injuries and fatalities that occur at construction sites are due to FFH (Fall From Heights). FFH includes falling through fragile roofs, falling from ladders, slipping, tripping, falling from heights and falling objects, material or tools. Surprisingly, this holds true the world over. Regrettably, although the quality of present day fall protection methods and devices have improved immeasurably, incidents of FFH have not significantly reduced strongly hinting at human error or carelessness as primary causes.

EHS Heads and managers at L&T Construction have a firm mandate to bring FFH down to zero. "There are many ways through which safety can be assured while working at heights

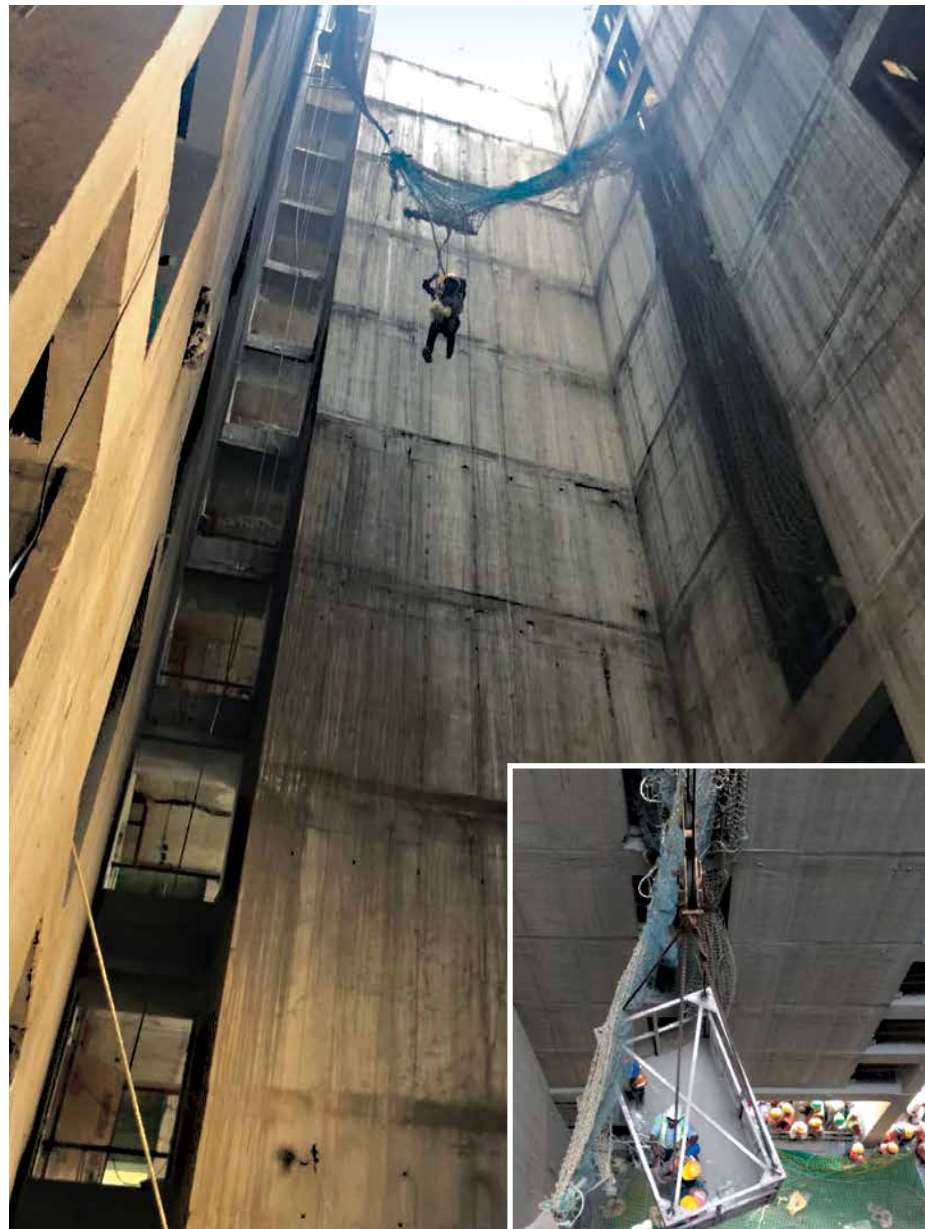


P Nagarajan
Head - EHS, B&F IC

There are many ways through which safety can be assured while working at heights ranging from proper planning and inspection of the job site to wearing appropriate and properly functioning personal protective equipment, and one of the most recommended types of PPE when working at heights is the full body harness.



ranging from proper planning and inspection of the job site to wearing appropriate and properly functioning personal protective equipment," says P Nagarajan, Head - EHS, B&F IC, "and one of the most recommended types of PPE when working at heights is the full body harness." Unfortunately, a lot of construction workers or people who work at heights don't usually see the importance of wearing a full body



The rescue act in progress

harness until they suffer a fall and are lucky to live to tell the tale. "Our aim therefore is prevention rather than cure," affirms Nagarajan.

The evolving harness

A safety harness is a crucial component of the personal fall arrest system that keeps a user suspended upright in case of a fall, supporting the person till rescue arrives. It was originally inspired by the



Santhosh Bhaskar
EHS In-charge,
SOU Project

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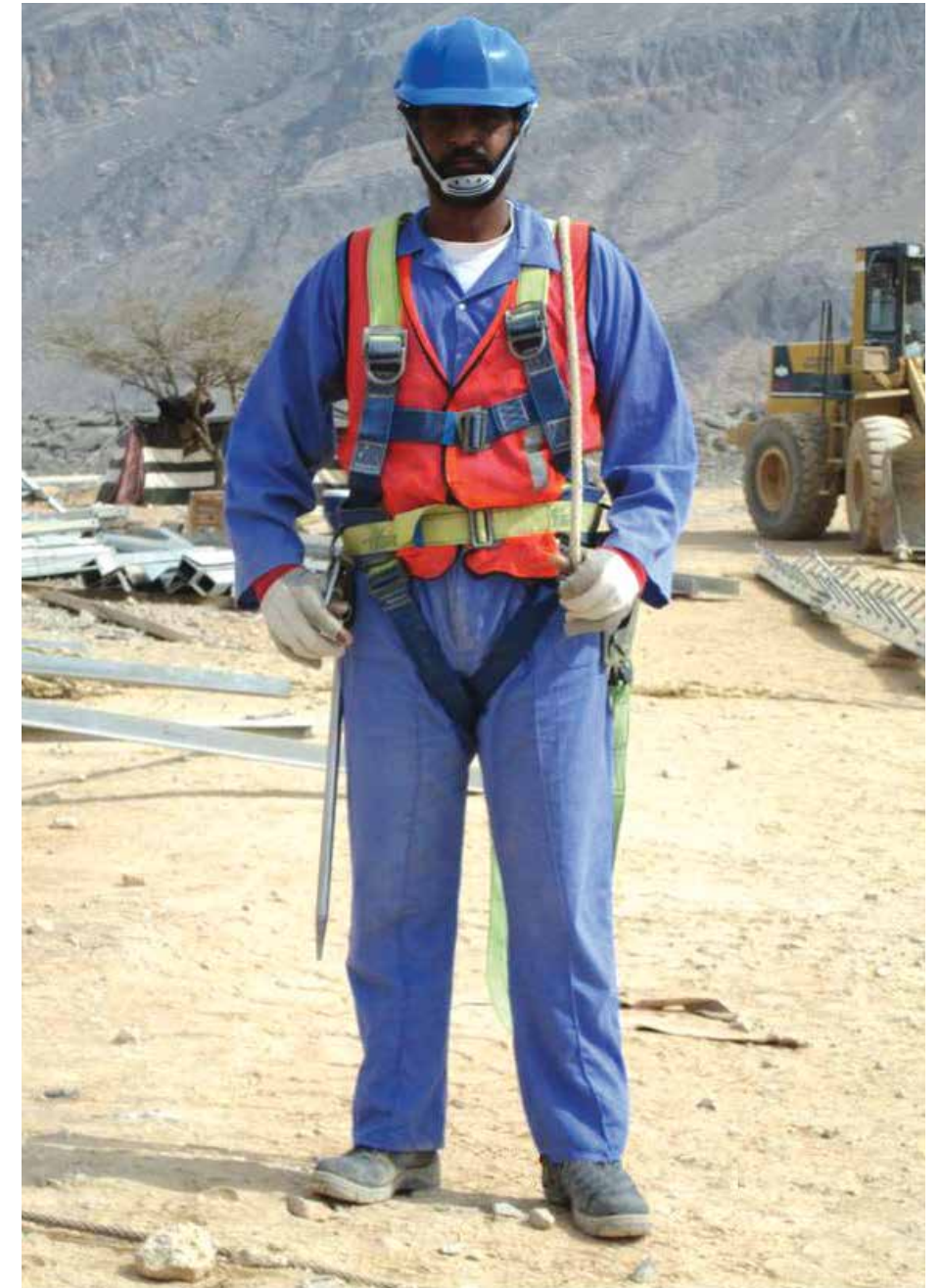


parachute, designed to keep the falling person upright. Earlier, body belts were used but these are discouraged because the fall forces are usually concentrated on the abdomen, spine or mid-section; in fact, in some cases, the person could be thrown off by the jerk of the fall. In the case of a full body harness, these forces are distributed throughout the body thereby dramatically reducing the risk of injury. Since the spine is always vertical, the impact of the fall is lessened thus increasing the level of safety.

The earliest avatar of the harness was made of different types of fabric webbing sewn together in various configurations made from synthetic fibres with material characteristics consistent with polyamide and polyester.

Tailor-made harnesses for L&T Construction

The full body harness webbing used at L&T Construction is made of nylon, with a front-D ring to arrest falls. It has a Class-L attachment with a double lanyard (Polyamide Rope -12mm) with a shock absorber, double scaffold hooks, shoulder & thigh adjustable straps and a tool pouch near the thigh. It is also equipped with a fall Indicator and is ISI or CE Certified.



Preparing the ground

Start with the anchor: The harness should be connected to an anchorage point, which is above the shoulder height of the workman and strong enough to bear a weight of 5000 lb per employee attached to the point.

"At the end of the day, even with the best equipment, proper training and awareness are what keeps workmen safe at sites," shares Santhosh Bhaskar, the safety head at Statue of Unity, for whom FFH was an ever-present danger. "It is essential to first discuss with your co-workers and determine



The more you wear a harness, the more you will feel comfortable with it.

M Muruganatham
EHS In-charge



the kind of safety equipment required right at the beginning,” he says. “Of course, they have to be well trained to know how to use their safety equipment,” he adds with a tight smile. It is important to scan the work area for potential hazards before starting the job, ensure all the equipment are steady at ground level, be aware of the weather conditions especially if inclement weather is predicted and use the correct tools for the job. “This is all common sense but then that is not very common at construction sites.” Santhosh’s dry wit is characteristic of him.

Ladders are an important piece of access equipment when working at heights and it is very important to ensure that stepladders have a locking device to hold the front and back open. Workmen need to always have a three-point contact while using ladders (two hands and one leg or two legs and one hand). A straight or extension ladder should be at least a foot away from the surface it rests on, for every 4 feet of height, extended to at least 3 feet over the top edge and fastened to an upper support. Care should be taken to prevent the base of the ladder from slipping. Apart from wearing slip-resistant shoes, a workman should avoid



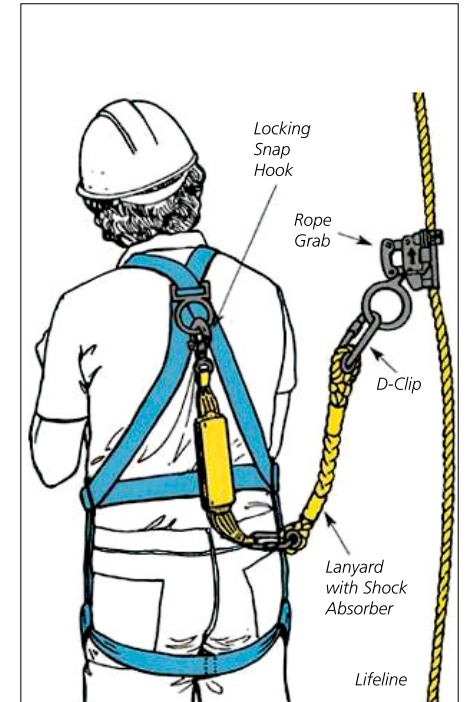
standing higher than the third rung of a ladder from top, avoid leaning or stretching too far when on it, always have someone to support the ladder from below and never make do with damaged equipment.

It pays to remain harnessed

Harnesses need to be carefully chosen with the correct add-ons and worn by workmen throughout the entirety of

TO ENSURE THAT ONE IS HARNESSSED CORRECTLY

- Hold the harness by the back D-ring and shake it for all the straps to fall into place
- If the leg, chest or waist straps are already buckled, release the straps and then unbuckle them
- Slip the straps over the shoulders; the D-ring should rest at the back in the middle between the shoulder blades
- The leg strap should then be pulled between the legs and then connected to the opposite end. Repeat the procedure with the other leg. If your harness has a belt, take this opportunity to connect the waist strap
- Connect the chest strap and position it in the mid chest area; tighten it to one’s level of comfort
- Tighten all the buckles
- The safety harness should fit well while allowing full range movement. Excess straps should be passed through the loop keepers.



the job. “The more you wear a harness, the more you will feel comfortable with it,” offers M Muruganatham, an EHS professional having completed several successful tenures at high-

rises including Omkar 1973, the tallest residential towers built by L&T. Harnesses often come in universal sizes and need to be adjusted to fit a workman properly to suit individual

heights and weights. Some come with quick-connect, pass-through, and tongue buckles that are suitable if the harness needs to be shared between co-workers. ■

COMBATING ‘SUSPENSION TRAUMA’

Suspension Trauma (ST) is the medical effects of being immobilized in a vertical position without moving one’s legs for an inordinately long period of time and it is serious enough to cause death! It is therefore critical to train workmen working at heights and using harnesses to recognize, manage and prevent ST for its onset as progress is both rapid and unpredictable. The symptoms are general feeling of unease, dizziness, increased pulse and breathing rates, sudden drop in blood pressure and instant loss of consciousness.

Interestingly, the human body has NOT been designed to stand upright but rather to crawl on all fours! Evolution has taken care of this issue to a certain extent, but it is very important to ensure that there is always adequate supply of fresh blood to the brain. When suspended and immobile for long, gravity pulls the blood into the legs where it starts

to accumulate. The heart can only pump, not suck, but the muscles can, so in this case, when the leg muscles are flexed, the veins will ‘push’ the blood back to the heart. If one is unable to flex his/her leg muscles, the brain gets no fresh blood which can then virtually shut down!

Once rescued, the victim should be made to sit for at least 30 minutes to avoid the danger of ‘reflow syndrome’. Blood trapped in the legs goes stale after 15-20 minutes so it should NOT be allowed to flow back immediately into the heart or brain.

To prevent ST when ‘harnessed,’ it is important to keep moving the legs and flexing the leg muscles as much as possible. It is important to try and get into a sitting position or at least get the knees above the height of the hips to aid blood flow. Eat and drink normally, if possible, till rescue arrives.



on a normalised scorecard to objectively compare the performance of diversified projects in terms of scope, value, activities and man-power deployment. All the activities and sub-activities in WET and SWC have been mapped comprehensively with their respective hazards, risks, SOPs, checklists and permits.” The 5 KPIs being: IMS Implementation and Documentation, Training & EHS Review Meets, Incident Communication, Investigation and CAPA, Audit Inspection Outcomes and Compliances, Pro-active Measures.

The system does not rely merely on the number of incidents or document compliance but on overall EHS performance based on implementation of IMS systems and achievement of EHS objectives. “Our first purposeful step towards digitalization was therefore taken in early 2015 with the development of four online systems.”

1. **EHS Online Observation System** uploads observations and compliance reports at site level of Unsafe Acts/Unsafe Conditions/Unsafe Behavior noticed by the site EHSO with an escalation matrix, wherein if observations and NCs are not promptly closed by the Site Engineer, a mail is triggered to the next five levels i.e. Project Manager, Cluster Head, BU Head, SBG Head and IC Head. It also enables analysis of type of hazards and risk levels at site. “Even the EHS performance of the Project Manager, Section In-charge, Site Engineer, Sub-contractor and EHSO can be tracked,” smiles Sudheesh.
2. **EHS Home:** The portal where the site EHSO registers all the monthly statistical reports on Environment, Health and Safety as per the KPI elements such as training,

document compliance, SOPs, SEC implementation, incident reporting, engineering control, campaigns, environment & CSR Initiatives, etc.

3. **Audit Module** facilitates the entire audit process starting with planning, scheduling, notifying, conducting, raising/closing of NCs and observations digitally with the provision to escalate open observations and NCs. It can churn out various analysis reports such as ageing analysis of NC/ Obs, IMS, ISO, OHSAS clause analysis and root cause analysis.
4. **Confirmation on Action Taken Module** captures observations registered by the CEHSM’s during visits as per the approved MAP, project pre-start undertakings signed by Project Managers during project kick-off meetings, observations/complaints received



ViewEHS -

A fresh perspective to safety

‘ViewEHS’ is a significant digital safety solution developed by WET IC that captures EHS data, compares it with baseline data and assigns Key Performance Indicator (KPI) scores to analyse EHS performance of sites in real time. With 150+ ‘live’ sites across WET IC and SW&C BU, mostly linear in nature, a standard system was required to address safety comprehensively.

Having played a key role in its development, K S Sudheesh Kumar, Head - EHS, WET IC & SWC BU, traces the evolution, birth and journey of ‘View EHS’. “It is basically a consolidated rating system for each project aligned to 37 objectives under the ‘5 Arms of EHS’ that monitors day to day EHS implementation



K S Sudheesh Kumar
Head - EHS, WET IC & SWC BU

ViewEHS is basically a consolidated rating system for each project aligned to 37 objectives under the ‘5 Arms of EHS’ that monitors day to day EHS implementation on a normalised scorecard to objectively compare the performance of diversified projects in terms of scope, value, activities and man-power deployment.



We logged 1,78,115 online observations and corrected them in time to prevent site incidents having successfully implemented modules that were reactive measures in the system. Our next focus was to digitalise the proactive measures to further reduce risks during execution to eliminate incidents and thus began our digital enhancement to create 'ViewEHS'.

K S Sudeesh Kumar
Head - EHS, WET IC & SWC BU

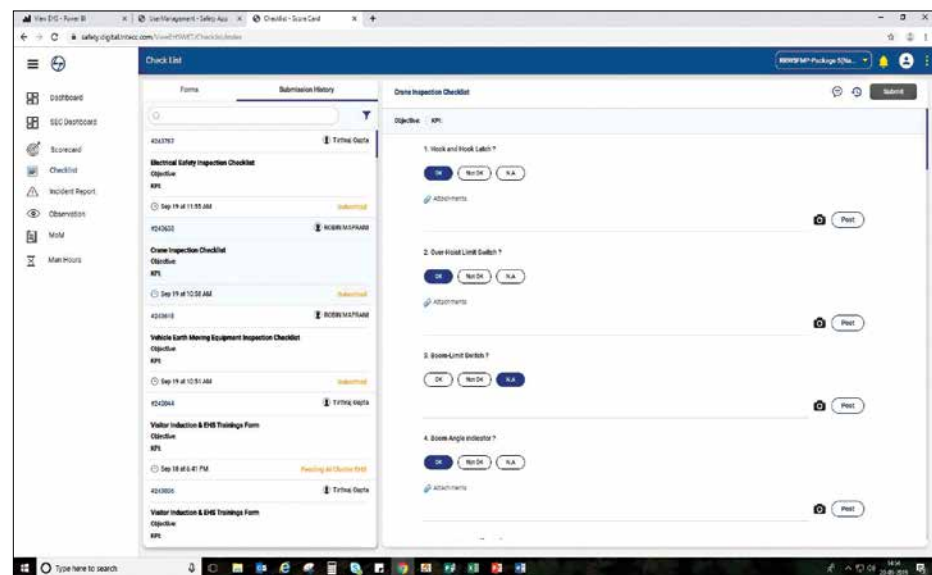
through the iVRS-SIS based Toll Free number, project committee meeting minutes, PM walkthrough reports and/or incident reports with a provision for escalations.

"We logged 1,78,115 online observations and corrected them in time to prevent site incidents having successfully implemented modules that were reactive measures in the system," highlights Sudeesh. "Our next focus was to digitalise the proactive measures

to further reduce risks during execution to eliminate incidents and thus began our digital enhancement to create 'ViewEHS'."

Defining a paperless process with 'SafeArmZ'

The existing system was literally overwhelmed by paperwork with supervisors and site engineers having to fill various checklists, refer to manuals



and SOPs to deliver pep-talks and ratify processes through counter-signed approvals. Digitalization eliminated this paperwork entirely. 'SafeArmZ', the earlier avatar of 'ViewEHS', was developed to complement EHS requirements and improve the overall Proactive Risk Control Measure Process with inputs from sites identifying major activities, sub-activities and associated risks and hazards to arrive at the best possible control measures as per IMS standard procedures.

To align these well-defined documented procedures with digital systems for a seamless, user-friendly and EHS-compliant final product was the next challenge. Working with sound logic, the app was conceived to work on an algorithm to determine the documents to refer and checklists to fill before starting any site activity that brought uniformity to data collection. A user had to login only once to view risks, hazards, SOPs, fill Safe Execution Cards, permits and activity-specific checklists.

A dashboard, accessible at various levels across the organization, displays EHS risks, quantum of activities carried out and closures, tracks EHS compliance by monitoring activities and sub-activities, workmen deployed, current risk rating of the project, critical activities, major hazards and physical progress that empowers the team to identify activities requiring greater attention to improve productivity. "Apart from being a huge success with our site engineers, we received the copyright for 'SafeArmZ', a first-of-its-kind solution in India to meet a site's requirement of Environment, Health & Safety data irrespective of size of location," enthuses Sudeesh.

SafeArmZ© was launched in 2018 and recorded **1,20,612** Safe Execution Cards, **5,07,566** PTWs and Activity Specific Checklists.

Going forward, 'View EHS' is envisioned to act as a single point of engagement for all safety-related data analytics and business intelligence.

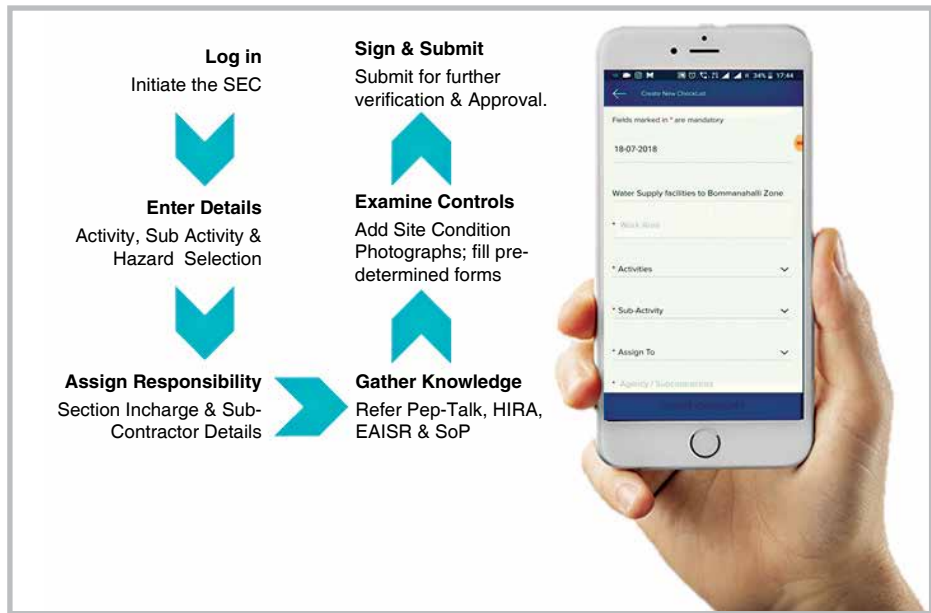
Krithika Venkatesh
Senior Manager - Digital

Integrating safety systems

With a range of reactive and proactive modules in operation, it was time to tie the strings together. "Enhancements are comprehensive in digitalization," shares Minhaj Ahmed Ansari, Asst. Manager (EHS), SW&C, "so we sought a module that could play a similar role for EHS as EIP does for the organization; a single platform beginning with the EHS objectives aligned with a SMART Approach i.e. Specific, Measurable, Attainable, Realistic, Time bound." Measurables and quantitative targets were set against each objective and scores awarded based on the achievement against each target for an insight into the overall performance of the site based on KPIs. Duplication of data was avoided by ensuring the unique interconnection of the various EHS Activities," he adds.

Welcome 'ViewEHS'

After detailed testing, 'ViewEHS' was launched on 23rd April 2019 and Sudeesh proudly shares that **189 projects** and **3565+ end users** have already been inducted into the digital ecosystem. 'ViewEHS' extends the SafeArmZ programme by being faster, smoother and more user-friendly. "It is a complete package encompassing analytical features the entire spectrum



'View EHS' - Many firsts

- A normalized system of grading construction sites based on proactive and reactive EHS performance
- Can predict potential risks and hazards for upcoming projects
- Can analyse behaviour of individuals based on proactive and reactive parameters
- Meets all statutory, regulatory and standard requirements by ensuring regular reporting
- Can track and manage individual EHS performances

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Minhaj Ahmed Ansari
Asst. Manager (EHS), SW&C

The uniqueness of 'View EHS' is in the intricate interplay between sub-systems by exchanging information, transacting and validating data that steams 'live' onto dashboards accessible to every level of management with visuals in web as well as on Android and IOS platforms. "It is a perfect, custom-made system packed with inputs and analytical features with insights to various risks that helps us to maintain an incident-free work zone," shares Anantha Prasanna Venkatesh, BU EHS Coordinator, WSD department.



Implementation has become more seamless for the likes of E Kumaresan, BU EHS Coordinator. "Now, it is easy to track the process with real time data across various levels and speed up proactive measures."

Going green too

According to Sudheesh, 'View EHS' represents a definitive step towards 100% digitalization of EHS systems and by avoiding paper, productivity improvement is translating into a saving of approximately **56,000 INR**. "We have stopped consuming some **1020** sheets of paper, reduced **135** man-days, and considerably cut the frequency and severity rates per month which means that in WET IC itself we are able to save almost **10 Cr. INR** and **1.8 Million Sheets of paper that translates roughly into 220 trees!**"

What the future holds

With a huge data bank derived from more than 200 sites involving 35000 workmen, analysing it is the next challenge and Sudheesh is already crystal ball gazing. "Imagine a system, in which just by pointing your phone camera towards a site, you can identify the hazards, perceived risks, related incidents, alerts and repetitive unsafe acts/unsafe conditions/unsafe behaviours. A system that can analyse the behaviour of every project manager, construction manager, site engineer and EHSO. We are already in discussions with stake holders to further integrate advanced data mining and analytics methods such as Artificial Intelligence and Natural Language Learning techniques with 'ViewEHS' that will transform the operations of the EHS department into a completely Digital Driven Predictive System to achieve our vision of 'ZERO HARM,'" he rounds off. ■

“ We have stopped consuming some 1020 sheets of paper, reduced 135 man-days, and considerably cut the frequency and severity rates per month which means that in WET IC itself we are able to save almost 10 Cr. INR and 1.8 Million sheets of paper that translates roughly into 220 trees!.

K S Sudheesh Kumar
Head - EHS, WET IC & SWC BU

The proof of the pudding. Some voices from site...



On site observations are now seamlessly listed and discussed with the execution team as well as sub-contractors to reduce unsafe practices.

Santosh Kumar Potnuru
Project Manager, Raipur Smart City Project

Through ViewEHS it is easy to track the process with real time data across various levels and speed up proactive measures.

E Kumaresan
EHSM - BU EHS Coordinator, I&LWS BU EHS Department, WET IC



ViewEHS is a perfect custom-made system packed with a lot of inputs and analytical features with insights to various risks that facilitates aligning to an incident-free work zone.

Anantha Prasanna Venkatesh S
EHSM - BU EHS Coordinator WSD, EHS Department, WET IC


View EHS app has made life easy for all front-line engineers with the updation of SEC / work permit being digital and is effectively measurable at any point of time.

Amit Kar
Project Manager, Barrackpore Sewerage integration work



ViewEHS' has improved the IMS requirements towards EHS implementations across sites as it is very useful to reduce the UA/UC/UB in minimum time.

Hemkant Sharma
Project Manager, LE170977 - RRWSFMP-Package 5 (Nagaur CDS-02)-Makrana



- Poor access in between protruding rods
- No edge protection on the floor opening
- Poor platform without handrail
- Poor walkway without handrail
- Protruding rod in the walkway can trip
- Electrical cable on the access ladder can lead to electrocution.



CLOSE CALL

Crane boom deflection during a lift

Scenario

During one of the lifting activities carried out by a 75 t crane, the boom got deflected and fell from a height of 10 m. Fortunately, no workman was standing or working within the reach of the boom and hence no one was injured.

What was the cause?

1. Lifting above the crane's specified load bearing capacity.
2. Lack of supervision to control the activity.

What precautions need to be taken to prevent a recurrence?

1. As a general safety guideline, check the crane's load capacity before any operation begins.
2. Operators should be well versed with the lifting process - the further a load is moved from the center of the crane, the less weight it can lift.
3. Regular awareness through training.
4. Ensure close supervision during lifts.



Crane boom fallen on rear side.

PHEW!



2.6 million text messages, 43,000 volunteers, nearly 1,000 emergency workers, television commercials, coastal sirens, buses, police officers, and public address systems blaring the same message in a loop, in local language, in very clear terms: "A cyclone is coming. get to the shelters."

CYCLONE FANI CAME. AND, WE SAVED A MILLION LIVES!

1.2 million safely moved in 24 hours
with EWDS!

It was by far, the largest mass communication exercise undertaken in India, a unique technology driven initiative by the Odisha Government. It witnessed the biggest human evacuation in history – a record 1.2 million people evacuated to safety in 24 hours as Cyclone Fani, one of the strongest cyclones in the last 20 years made a landfall in the state. The United Nations hailed India's efforts to act speedily and effectively manage the crisis through the early warning system. A large part of transforming this safe vision to reality was engineered by L&T's Smart



World & Communication's Business Unit by integrating a state-of-the-art emergency response system that is now considered a secure solution to make India disaster-ready. "The EWDS or the Emergency Warning Dissemination System is a unique and first-of-its-kind project in which we have smartly used technology to save lives," is how R Srinivasan, Executive Vice President & Head – Smart World & Communication describes this initiative, "involving the development of robust, ready-to-use solutions including infrastructure, technology design and precise solution integration. It was our first attempt and it has paid rich dividend in terms of the number of lives we were able to save. It is eminently scalable and replicable in any emergency warning situation and our full-fledged technology team has the capability to conceptualize holistically and deliver end to end."



Integrated Command & Control centre is the nerve centre of EWDS rescue operations management



R Srinivasan
Executive
Vice President & Head -
Smart World &
Communication

A unique and first-of-its-kind project in which we have smartly used technology to save lives, involving the development of robust, ready-to-use solutions including infrastructure, technology design and precise solution integration.



Engineering an automated response system

An offshoot of the emerging smart infrastructure solutions, the EWDS is a customized automated response system, for Odisha, that has been in operation since March 15th, 2019, monitored round the clock from the State Emergency Operation Centre, Bhubaneswar. The entire EWDS project is integrated around five major components which were extensively used and instrumental for the evacuation during the cyclone.

Alert Tower System – featured a series of 122 alert towers, installed in six districts covering around 480 km of the Odisha coastline with pre-recorded messages and live announcements, in multiple languages, that helped to mass evacuate people to the nearby shelter homes.

Mass Messaging System – One of the most advanced messaging systems that sent out warning alerts via LBAS text and voice messages to nearly 2 crore subscribers, during and after Cyclone



30 meter spun concrete tower for Alert Siren System



Ground coordination with multiple stakeholders

Fani. The system comprises GBAS (Group Based Alert System) & LBAS (Location Based Alert System) for sending messages to a pre-defined set of recipients as well as to all the mobile phone subscribers in any geographical area in the state. The selected area can be as small as a building or as large as a state. Besides, alerts can also be circulated via facebook, twitter, etc. which is in sync with the Mass Messaging System.

SBMDVT System – An advanced version of the satellite phone, through which smart phones can be converted to a satellite phone by using the connectivity of a satellite terminal. It has an added facility of net browsing even when normal communication fails and proved beneficial during the crisis, helping the state authorities to keep in touch with the officials in the concerned coastal regions.



Digital Mobile Radio (VHF radio) proved to be a handy tool, deployed post the disaster when conventional communication systems were down. It works through a separate network establishing communication between the SEOC and all DEOC/BEOC/FLC/ATS locations.

Universal Communication Interface – A portable device, used exclusively for voice conference calls that can aggregate with land phones, satellite phones, mobile phones and DMR. High level meetings were organised where participants used this technology to connect from remote locations.

Getting safer for a smarter world

After the cyclone subsided, the project team continued assisting the authorities with the damage assessment, working in tandem with the state officials during their meet ups with the State Government, the World Bank, the UNICEF and the National Geographic Channel that covered the crisis. The experience has provided invaluable learnings for India to be effectively disaster-ready and for SW&C it was all about continuing to engineer smart systems to enhance quality of life and make cities safer and smarter. ■



If you have spotted the hazards, rush them to ngfernandez@intecc.com.





ONLY FIRE IN THE BELLY IS WELCOME AT CONSTRUCTION SITES!

Evolving strategies to keep sites safe from fires

With huge tracts of the Amazonian forests in Brazil presently ablaze, the huge threat of fire to human life and property is very relevant today. Fires happen at construction sites too and, some would say, too often for comfort. The reason is simple: sites are full of stuff like plastics, panelling, paints, gases, refuse, other combustible material, electricity, open flames, hot works, etc. that are all prime candidates for triggering and feeding fire. For EHS managers, the accent is more on prevention as controlling a fire is very difficult and, once started, can not only cause great harm and loss to a particular site, but also endanger habitations and people in the vicinity

especially if the construction is taking place in the heart of teeming cities.

Break this triangle; avoid a fire

A most interesting thing about fires is that it normally happens if three things combine:

1. **Heat** (hot surfaces, naked flames, smoking butts, electrical equipment),
2. **Fuel** (flammable liquids, gases, solids, combustible solids) and
3. **Oxygen** (air, oxygen from piped systems, chemicals)

Remove one of these from the equation and the chances of fires are reduced significantly. Most fire mitigation plans at construction sites therefore are to prevent a meeting of this dreaded threesome! That, however, is easier said than done. In fact, fuel and oxygen are in contact with each other and hence the only option to avoid fire is to keep the “heat” (the sources of ignition) away from the fuel!

Identify risks and hazards

Perhaps, the first and most important first step to prevent fires is to identify all that could set one off like flames, sparks, heat sources or sources of ignition, malfunctioning electrical installations, friction generating and oxy-fuel equipment, lighting equipment, flammable liquids and gases, paper, cardboard, trash, debris,

shavings, sawdust and even self-igniting things like oil-soaked rags. “In addition, most of our P&M and hot work are very likely fire-causing candidates,” shares P Nagarajan, Head – EHS, B&F IC. “How careful can you be when all it needs is one workman to light up a beedi and carelessly flick a half-lit matchstick to send all our safety systems up in smoke!” His anguish can be well understood for even natural airflow can cause and fan fires. Sheer carelessness, acts of omission or commission or even deliberate acts of arson can also trigger fires.

Reduce what burns

It stands to reason that if material that can catch fire is either reduced or removed, the chances of fire are reduced or prevented but as Stephen Phillip Storey, Head – EHS, Heavy Civil IC elaborates, there is a whole lot more



K P Ravinath
Head – EHS, L&T
GeoStructure

There should be designated areas for waste at every site, it should be an integral part of daily housekeeping at sites, regularly cleared, never allowed to build up and, avoid burning trash because such bonfires can very easily get out of hand.



to fire safety. “It involves meticulous material planning, careful procurement of alternate material, wherever possible, that are less inflammable, shrewd management of inventories by reducing stored quantities of combustible material, spot on housekeeping and a whole lot more.”



Fire safety involves meticulous material planning, careful procurement of alternate material, wherever possible, that are less inflammable, shrewd management of inventories by reducing stored quantities of combustible material, spot on housekeeping and a whole lot more.

Stephen Phillip Storey
Head – EHS, HCI IC



Fire-fighting drills



Explaining the perils of burning refuse at site

The ease with which fires can be lit is highlighted by Madhava Kumar, Cluster EHS Manager, B&F IC, when sharing an incident from one of his sites. “A batching plant had been commissioned about 10 days before and a lot of dry weeds had grown around the area. As advised by the EHS department, the P&M team decided to hard barricade the area around the batching plant and welders were engaged for the work. Even before the EHS inspector could reach and certify the area for welding work to commence, the welders started work and almost at once the dry weed caught fire from the sparks and the fire started to spread rapidly!” Fortunately, the EHS inspector, being well-versed in fire-fighting techniques, quickly operated a DCP-5 kg portable fire extinguisher to avert a major incident. Investigations later revealed traces of

mineral oil on the unburnt weeds that were spillages from the P&M vehicles previously operating to commission the batch plant.

“Hot work is one area that can easily cause fires and hence should always be controlled by a ‘permit to work’ system,” emphasizes Gopi Krishnan, EHS Manager, B&F IC. A check list before commencing hot work should include surveying and clearing the surrounding area of all flammable material or at best cover them to prevent ignitions from sparks. Ideally, hot work should be stopped at least an hour before the end of a shift to be followed by regular fire checks to stamp out all the smouldering fires, if any.

Trash at sites can only be ignored at one’s peril. “There should be designated areas for waste at every site,” advises K P



Madhava Kumar
Cluster EHS Manager,
B&F IC

Smoke from fire causes difficulty in breathing, obscures vision and thereby blocks off escape routes. Well-marked and easy-to-find escape routes are essential along with proper ventilation shafts and fire-retardant walls and doors whereby the spread of fire can be checked till help arrives.



Ravinath, Head – EHS, L&T GeoStructure. “It should be an integral part of daily housekeeping at sites, regularly cleared, never allowed to build up and,” he stresses with his hand, “avoid burning trash because such bonfires can very easily get out of hand.”

SOUNDING AN ALERT TO SAFETY

Imagine: you are sound asleep at home and in the middle of the night there is an electrical short circuit. Sounds frightening! But then the reality is that in such cases, our reaction time is crucial to move to safety for within a few minutes a spark would have become a fire causing severe damage to property and even life. An alert through a fire alarm system is the quickest way to safety.

For homes, the fire alarm system is a straightforward one while for larger establishments, it is essential to install a well-designed system with a range of components covering key areas of establishment. Here’s an insight on how the system tracks and prompts timely safety hoots:

Fire Alarm Panel – Is the brain of the entire system monitoring inputs and the system’s integrity, controls outputs, and relays information across every connected device. Ensure that your fire alarm panel meets all the needs of your system and connects to all necessary devices.

Primary and Secondary Power Supplies – Typically controlled by the power company, the primary power supply is usually a non-switched 120 or 240-volt AC source. Most commercial applications use dedicated branch circuits that supply power solely to the fire alarm system. The secondary power supply is usually lead-acid storage batteries, generators, and/or other emergency power sources that ensure that your fire alarm keeps working even if a power outage affects your building.

Initiating Devices – These act as inputs for the fire alarm panel and can be activated manually or automatically. Manual initiating devices include



Emergency break glass



Smoke detector



Fire alarm control panel



Alarm

break glass stations, pull stations, and buttons; these devices are installed near exits and are easily identified and operated. Automatically initiating devices respond when physical changes associated with fire are detected in the atmosphere, including, smoke, heat, flames, carbon monoxide, and other combustion products.

Notifications Appliances – Include audio devices, like speakers and bells which alert various establishments to facilitate a safe and quick exit. These notification methods are designed to be distinct and universally understandable to ensure that they are not confused with other kinds of signals.

Smoke kills more than fire!

It may sound strange, but it is true! Smoke contains toxic gases (carbon monoxide) that are harmful to people. "Normally, smoke from fires at sites is thick and black because what's burning are all the modern fittings and stuff," warns Madhava Kumar. "It causes difficulty in breathing, obscures vision and thereby blocks off escape routes. Well-marked and easy-to-find escape routes are essential along with proper ventilation shafts and fire-retardant walls and doors whereby the spread of fire can be checked till help arrives." Sometimes, in unfinished buildings, void spaces can create a wind tunnel effect during a fire, intensifying the flames. In other cases, firefighters may find it difficult to safely enter unfinished buildings, which may have unprotected stairwells and other dangerous conditions.

Learn from experience

Experience is a wonderful teacher always throwing up new situations or pointing towards slips and near-misses, which if not heeded, could have disastrous consequences later. "Today's near miss is tomorrow's accident," says young Swarup Kumar Mohanty of TI IC and hence it is critical to record all near misses and use them as learning opportunities. "It is imperative to record all findings



Kannan Subramaniam
Manager EHS,
WIPRO SEZ

At end of the day, creating a safe work environment is all about checking and re-checking and ensuring that nothing is amiss.



“It is again about training and more training and building what I call, ‘site awareness’ especially among my EHS managers to sense and spot potentially dangerous situations and instantly take preventive measures because in case of fire, prevention is infinitely better than cure!”

Stephen Phillip Storey
Head – EHS, HCL IC

and necessary action taken,” says M Kamarajan, EHS – Advisor, B&F IC. “Of course, all the records must be honest and accurate and an EHS officer has to constantly ask himself if he has removed or reduced all perceivable risks. Lastly, it is important to instruct and brief the work force of how the emergency plans work and ensure that they are trained and drilled in all aspects.”



M Kamarajan
EHS – Advisor, B&F IC

It is imperative to record all findings and necessary action taken. It is important to instruct and brief the work force of how the emergency plans work and ensure that they are trained and drilled in all aspects.



Checks, counter checks and more checks

“At end of the day, creating a safe work environment is all about checking and re-checking and ensuring that nothing is amiss,” shares Kannan Subramaniam, Manager EHS, from the WIPRO SEZ site in Bengaluru that figures high for its safety performance. “We have to constantly control, inspect and monitor fire hazards; sometimes they are so basic as keeping lighting fixtures away from combustible stuff or ensuring equipment that has been installed, is being used and maintained as per the manufacturer’s instructions.”

Often, it helps to have a ‘third eye’, someone not directly involved in a particular task to oversee and ensure that nothing untoward is happening. “It could

be as simple as spotting that a workman has forgotten to switch off an equipment after use,” cautions G Divakar, Senior Manager EHS, Heavy Civil, “or watching over a person carrying out gas fittings in the vicinity of pipes that contain flammable gas. Of course, it is prudent to have a safe smoking policy and people should be allowed to smoke only in designated areas,” he adds with a smile.

“In the final analysis,” sums up Stephen, “it is again about training and more training and building what I call, ‘site awareness’ especially among my EHS managers to sense and spot potentially dangerous situations and instantly take preventive measures because in case of fire, prevention is infinitely better than cure!” ■

CLOSE CALL

Mobile Elevated Work Platform Handling

Scenario

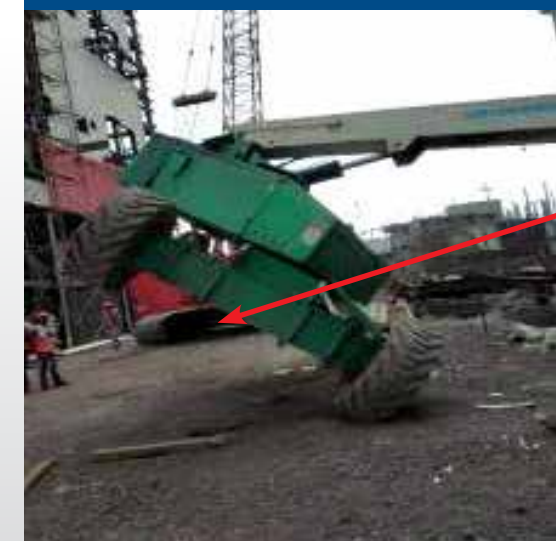
Two operators were deployed for some bolt tightening activity at a height of 14.3 m using a Mobile Elevated Work Platform (MEWP) that was being operated from ground level. After completing the work, the workmen signalled the operator to lower them to the ground. The operator started to swing the boom away from the building for better clearance to lower it. Suddenly, with a jerk the boom with the MEWP fell from a height with the workers on it. The MEWP toppled sideways and the boom crashed to the ground but fortunately the workmen escaped with only minor injuries.

What was the cause?

1. The operator continuously pressing the boom extension button instead of the ‘down’ button that led to the instability of the MEWP
2. Lack of mindfulness of the operator during operation
3. Non-functioning of auto-cut off switch

Precautions to be taken

1. Check the fitness of the MEWP with safety gadgets
2. Deployment of a competent person to operate the MEWP
3. Operators to be thoroughly screened
4. Strict adherence to equipment preventive maintenance schedule as well as daily safety checklist
5. Adequate training program on safe operation of MEWP by the manufacturer
6. Effective supervision



Position of the MEWP after the fall



Position of the boom and platform after the fall

PHEW!



SEE NO HAZARDS! HEAR NO HAZARDS!

A closer look at essential protection for the eyes and ears

According to NASA, a spacesuit is more than just the clothes astronauts wear. It is, for all practical purposes, a small spacecraft protecting the astronaut from a variety of hazards. In the construction industry, although there is nothing akin to a space suit, it is imperative in a risky environment to protect every part of a workman's body from harm or injury.

A few years ago, an enterprising team at one of the Chennai Metro project sites led by Project Director, S V Rao, conducted an interesting exercise as part of the Hand Injury Prevention Day. For half a shift at all station locations, everyone was asked to work with one hand tied behind their backs! "It was difficult for me to attend a meeting with



V Ramanathan
EHS - Head, PT&D IC

At a construction site, the eyes can be assailed by a variety of hazards, mechanical, thermal, chemical, electrical and even radiation.



the CMRL MD with one of my hands tied," recalls Rao but the message was clear to everyone who participated in that exercise just how important every part of the body is for us to lead normal lives. Helmets protect the head which has been dealt with in detail elsewhere in this issue, so this article looks at protecting the eyes and ears.

See the threat!

The wonderful career of South African wicket-keeper-batsman, Mark Boucher ended abruptly when a flying bail hit him in the eye during a match. Multiple

“It’s a case of horses for courses, for one type of safety glasses will not protect you from all types of hazards.”

M Kamarajan
EHS - Advisor, B&F IC

operations later, he couldn't regain his complete eyesight or resume playing! In fact, it is after Boucher's injury that wicketkeepers have started to don helmets when standing up to the stumps. Although Boucher's was a freak incident, the sad fact is that thousands of workmen across construction sites sustain eye injuries every year.

Use eyewear: The eyes are perhaps the most delicate sensory organ positioned perfectly in the head, naturally protected by eyelids and eyelashes. "This natural protection is inadequate at a construction site," warns V Ramanathan, EHS - Head, PT&D IC, "where the eyes can be assailed by a variety of hazards, mechanical, thermal, chemical, electrical and even radiation." Safety glasses, face shields, welding goggles and shields are some of the protective eyewear that are recommended specially during activities like welding work, gas-cutting, chipping, grinding, carpentry, chemical handling operations that can create a wide array of hazards like sparks, harmful & intense rays, flying particles &

| Activity | Possible Hazards | Recommended Protective Glasses |
|---|--|--------------------------------|
| Gas Cutting & Gas Welding | Sparks, harmful rays, molten metal, flying particles | |
| Electric (arc) Welding | Sparks, Intense Rays, Molten Metal | |
| Chipping | Flying Particles | |
| Grinding | Flying Particles | |
| Chemical Handling | Splash, Acid Burns, Fumes | |
| Woodworking | Flying Particles & Dust | |
| Cleaning & Other Operations Creating Dust | Dust | |

debris, concrete particles, nails, screws, molten metal, splashes, burns and dust. OSHA standards require that employees and workmen should be provided with effective eye protection, adequate to combat these multiple hazards.

Use the right kind of eyewear: "It's a case of horses for courses," remarks

M Kamarajan, EHS - Advisor, B&F IC, "for one type of safety glasses will not protect you from all types of hazards. For example, glasses to be worn during welding work are not the same that you wear when working on top of a bridge or a high-rise tower buffeted by strong, dusty winds." The onus on EHS managers





is therefore to ensure that workmen are wearing the appropriate eyewear for their activity they are involved in.

Wear it right! Having chosen the right kind of eyewear, it needs to be worn right fitting snugly and comfortably on the face with gaps to allow for air circulation and sturdy straps to keep them in place.

“Often PPE does not include safety glasses which is asking for trouble,” says Ramanathan, “for imagine if one of my men when stringing on top of a transmission tower is suddenly blinded by some wind-borne foreign particle entering his eye?”

Maintain it to see right! It is equally important to maintain eyewear and keep it free from scratches, dirt, for that can blur the vision and reduce its effectiveness. Bent or broken eyewear should be immediately replaced.

Treat eye injuries immediately! “The danger with eye injuries is that they are not always immediately obvious,” cautions K P Ravinath (KPRn), Head EHS – L&T GeoStructure. “Early detection and treatment are crucial because delay in medical attention can result in long-lasting damage.” Pain in the eye, cuts on the eyelid, enlargement of the pupil, blood spots, difficulty in moving the eye, presence of any foreign particle should

immediately be referred to a doctor, preferably an ophthalmologist. Avoid self-medication, rubbing, applying ointments or administering self-prescribed eye-drops.

Reduce, move or block that din!

At the best of times, a construction site is a noisy place! The 3 best ways to reduce the din: 1) **Reduce it** by using the quietest equipment available; 2) **Move it** by locating noisy equipment as far away as possible from workmen and 3) **Block it** by erecting temporary barriers to block the noise from reaching workmen. “Or, managing it by the **I SAID** ways,”

adds KPRn, “that involves Isolation, Silencing, Absorption, Insulation and Damping.”

I SAID is at play at the Mumbai Trans Harbour Link project where EHS – In charge, Sanjay Mishra and his team have a serious, contractual obligation to reduce noise. “The mudflats of Sewri in Mumbai are the habitat of some rare species of birds including flamingos and we had to plan our construction without disrupting their lives,” he smiles, mentioning the several measures that they have taken at site to dampen sound and reduce light so that their feathery neighbours are undisturbed. The ICC Towers team in the heart of Mumbai had another ticklish issue about noise creation as Project Manager Ranjeet Kumar shares. “Initially, all noise creating work had to stop by 9 pm which was later relaxed to 10 pm but the bigger problem was that the client, Bombay Dyeing’s MD stays in a penthouse in the adjoining tower and we used to receive his sms messages at times if we made too much noise at night!”

Apart from causing a disturbance to the neighbouring populace, high decibel noise at sites can be injurious to employees and workmen too. “Consistent loud noise on the eardrums is a silent killer,” says MK, quickly adding with a chuckle, “pun totally unintended!” The problem is that workmen are rarely aware that their hearing is getting progressively impaired. A simple thumb rule to check if one is being ‘noise-polluted’ is to try and converse with a fellow workman standing 2 m away. The need to raise one’s voice is a warning sign. OSHA recommends that workplace noise levels be kept at 85 decibels over an 8-hour shift; anything over

“**Effective noise management is ensured by the I SAID ways, that involves Isolation, Silencing, Absorption, Insulation and Damping.**”

K P Ravinath
Head EHS – L&T GeoStructure

the 100-mark level is dangerous. EHS managers need to conduct regular checks to ensure that noise levels are maintained within permissible levels and initiate immediate corrective measures if they are not.

Constant noise pollution can lead to acute and chronic disorders including acoustic trauma or gradual noise-induced hearing loss that can make it difficult for one to hear normal conversations, trouble in speaking or hearing on the mobile, difficulty to catch all the words, being confused by similar sounding words, a constant ringing, buzzing or humming in the ears, depression and loss of sleep. “It can reduce productivity,” warns KPRn, “and can cause accidents at the workplace if one is unable to hear warning sounds.” Noise can affect other parts of the body as well as a recent study reveals that workmen constantly exposed to noise show greater likelihood of suffering from heart disease that those who are not. Hearing can be lost also due to a sudden, powerful loud sound like an explosion.

Safe earwear: Foam earplugs or earmuffs are the best way out, made of sound-attenuating material and soft ear cushions that fit around the ear, with hard outer caps. Again, like in eyewear, one type cannot combat all noise hazards. EHS managers should help workmen choose the right kind of earwear depending on their activity and help them wear the protective gear right. The choice of earwear is also dictated by the communication needs, convenience, comfort, hygiene and the individual’s hearing ability. Avoid earwear that are worn, dirty or broken. Music-player headphones are not protective earwear by any stretch of imagination! If routinely exposed to hazardous levels of noise, then it is important to have one’s hearing checked for any loss of hearing.

Like eyewear, earwear needs to be maintained too; frequently checked, cleaned regularly to avoid infections and replaced whenever required. If damaged or dirty, it would be a sound idea to replace them.

Planning: One way to reduce noise pollution is to plan, eliminate noisy activities to the extent possible with different, quieter equipment perhaps, equip workmen with the right kind of earwear to combat unavoidable high noise levels and limit hours of exposure.

At the end of the day, we have only one set of eyes and ears! Let’s guard them as well as we all can! ■



The South Asian River Dolphin (*Platanista Gangetica*) is an endangered freshwater or river dolphin found in and around South Asia. The river dolphins have two subspecies: the Ganges River Dolphins (*P. g. Gangetic* with a population of around 3,500) and the Indus River Dolphins (*P. g. minor* with a population of around 1,500) and are among the four 'obligate' freshwater dolphins. The Ganges River Dolphins can only live in freshwater and are blind. They hunt by emitting ultrasonic sounds, that bounce off fish and other prey, enabling them to 'see' an image in their mind.

SAVING LIVES! EVEN OF AN ENDANGERED SPECIES OF DOLPHINS!

A project team from L&T GeoStructure have recently completed constructing the IWT Terminal at Sahibganj, Jharkhand. A partial offshore construction project, it involved a 270-meter jetty along the River Ganga using the end on piling gantry method in which the pile casing is driven using vibro hammers of high frequency that generates heavy vibration throughout the river depth.

"Our project location on the banks of the Ganges is an ecologically sensitive area and the habitat for many aquatic and endangered species including the Gangetic Dolphins that inhabit a 6000 km stretch of the rivers Ganges and the Brahmaputra," informs Suresh Balu, Senior Engineer – EHS, Sahibganj Project, for whom this project within a project had assumed great relevance. Being blind, these dolphins hunt by



We had both contractual and moral obligations to preserve the endangered species for which we adopted a two-pronged approach of an engineering control and an administrative one.

K P Ravinath
Head – EHS, L&T GeoStructure

emitting ultrasonic sounds to 'spot' their prey and any deterioration of their hearing capability could endanger their very survival. "This was a major issue because we had to do 187 piles over the river and the dolphins could go deaf with the vibrations of our piling activity."

"Our clients, IWAI and the World Bank, were very keen that none of the aquatic species in the Ganges, especially the Gangetic Dolphins, should be disturbed by our construction activities," shares K P Ravinath, Head – EHS, L&T GeoStructure, "and so we had both contractual and moral obligations to preserve the endangered species for which we adopted a two-pronged approach of an engineering control and an administrative one."

Dropping an air bubble curtain

To prevent the entry of dolphins into the piling area and to suppress the piling vibrations at the location itself, an 'air

bubble curtain' was conceptualized along the upstream side of the piling zone that suppressed the vibration waves in the river. As its name suggests, the air bubble curtain generates artificial air bubbles in the water by means of passing compressed air into a perforated U-shaped pipe that both reduces the propagation of shock waves during pile driving operations and diverts the movement of fish and aquatic animals away from the area of operations.

The setup consists of a U-shaped perforated pipe, an air compressor, compressor pipeline and a pipe lowering mechanism. The setup is lowered into the river along with the pile casing to the required depth and compressed air is passed into the perforated pipe that produces air bubbles around the opening of the pile casing that will act as a barrier, preventing the entry of the dolphins into the vicinity of piling area.



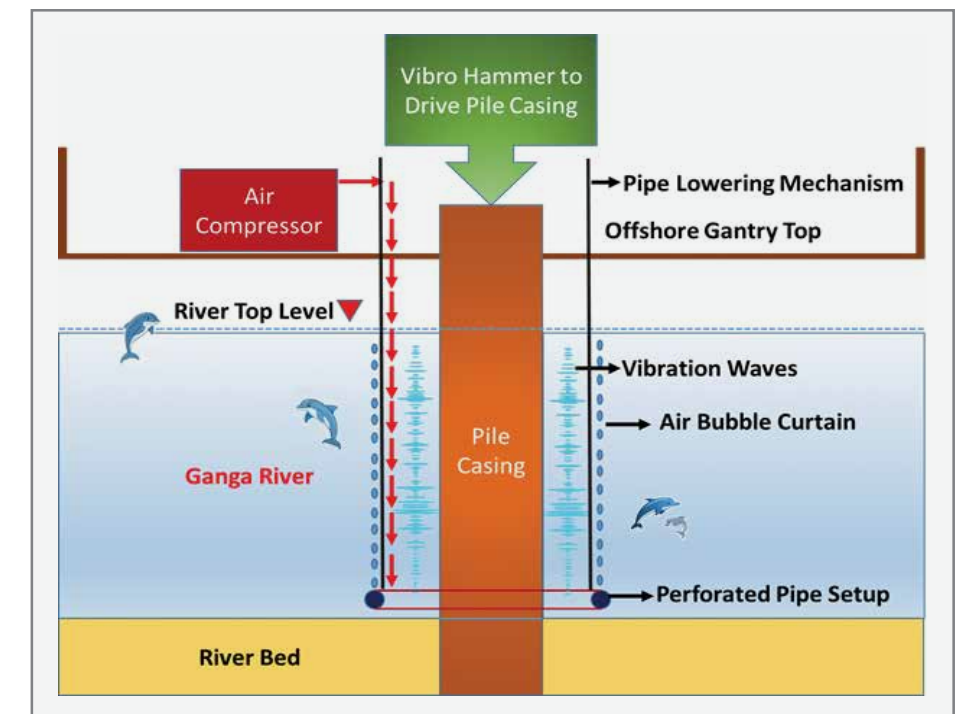
Suresh Balu
Senior Engineer – EHS,
Sahibganj Project

While using the air bubble curtain was the engineering control, forming the Dolphin Conservation Committee to take the ecological and environmental hazards out of our operations was the administrative control we adopted.



The Dolphin Conservation Committee

"While using the air bubble curtain was the engineering control, forming the Dolphin Conservation Committee to take the ecological and environmental hazards out of our operations was the administrative control we adopted," says Suresh Balu, with obvious passion. "The





Air bubble curtain set up being lowered close to pile location



Contained air bubbles generated out of controlled vibration during piling operation

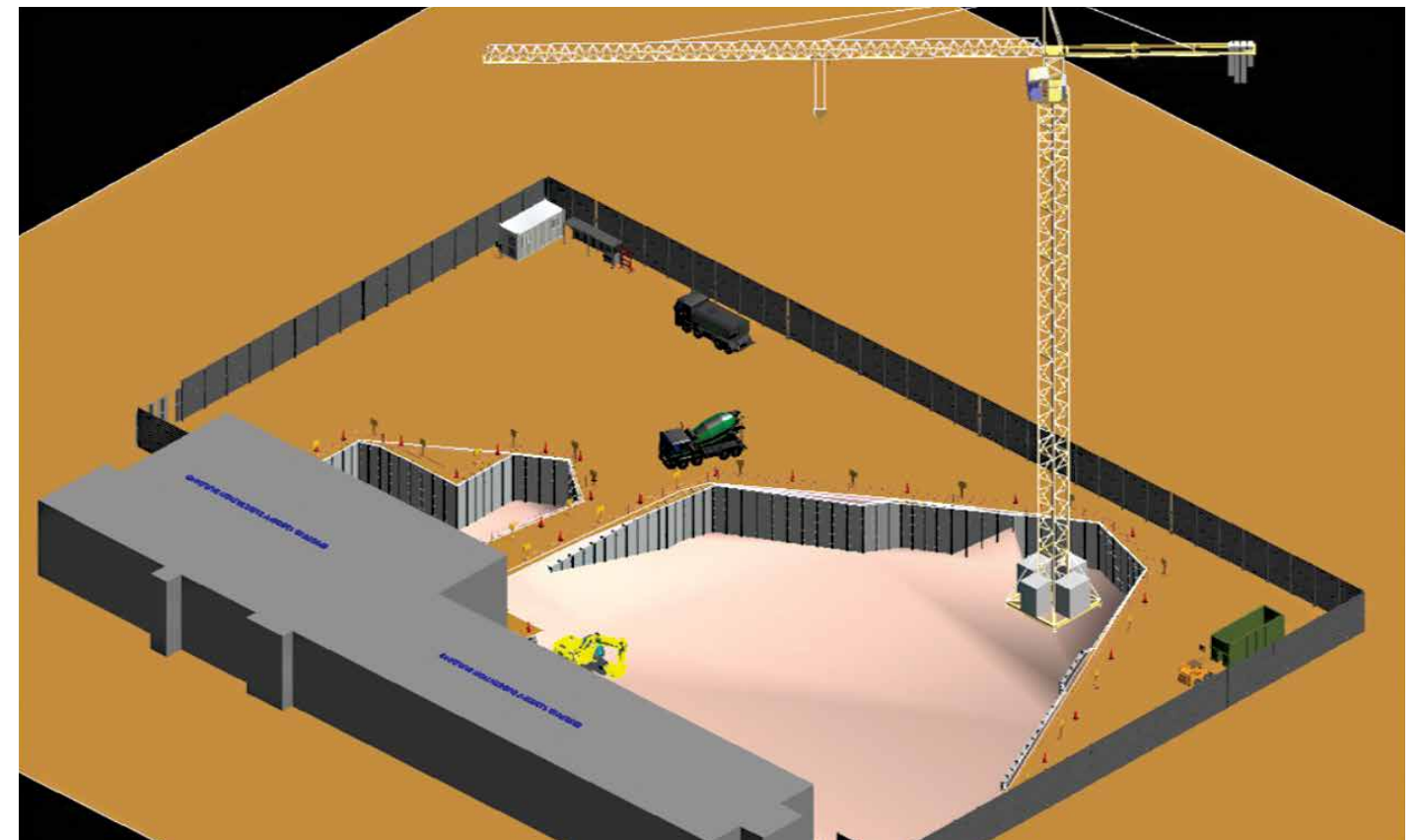
“
We had to do 187 piles over the river and the dolphins could go deaf with the vibrations of our piling activity.
 Suresh Balu
 Senior Engineer – EHS,
 Sahibganj Project

committee has a chairman, secretary and four of our staff members with specified roles and responsibilities to protect the Gangetic Dolphins.”

In the committee, it was decided to halt the piling work on gantry (over the river) for a period of 20 minutes from the time of a dolphin sighting and use the air bubble curtain setup during the piling activity. A separate register for dolphin sighting has been maintained and every sighting recorded for future reference.

Suresh Balu is a happy and relieved man for by implementing these two control measures at site, he and his team have ensured that the dolphins were protected. “Instituting the Dolphin Conservation Program was one of our environmental safeguard measures that resulted in zero harm to the endangered Gangetic dolphins and other aquatic species of the Ganges,” he concludes with a hugely satisfied smile that he has been able to save some precious lives. ■

At the time of going to print, the IWT Terminal at Sahibganj was inaugurated by the Hon'ble Prime Minister of India on 12/9/19 and the Gangetic Dolphins can continue their lives peacefully.



Barricade planning for site excavation

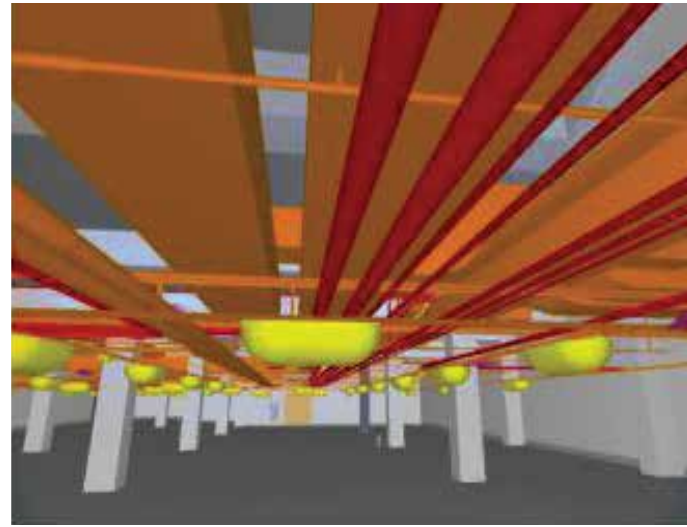
SAFETY MANAGEMENT IS CHANGING FAST THANKS TO BIM

The scope, expanse and complexity of construction projects always pose EHS managers and their teams several difficult questions about how to keep their men and material safe. Project ICC Towers in Mumbai is spread over some 26 lakh square feet in which the team has built two 50+ storied towers. For EHS Manager, Gopi Krishnan the task of maintaining safety across “several basements, podium areas, non-tower areas, multiple work fronts at various levels all active simultaneously,” has been a tall order and he says with feeling, “Even an army would have found it difficult to man and effectively monitor all the areas.” Rail or road projects that stretch for thousands of kilometres, pipe-laying water projects, underground metro alignments all severely test EHS capabilities.

Now, imagine a scene: the EHS manager is seated in his cabin at site office comparing the design model of the project on a screen with a virtual simulation of what has already been constructed. By having a schedule linked model which is superimposed on the already constructed model, he can easily and quickly identify upcoming activities, trouble spots, spot incomplete safety installations and instantly plan corrective steps sitting right there. That’s how BIM (Building Information Modelling) is already transforming the lives of EHS managers and helping them to significantly enhance the safety performance of project sites. Automated safety inspections with robots are minimising errors and reducing time spent on manual inspections.



Boston dynamics robot dog



Constructing the BIM way

“While the traditional methods of safety management are proving to be time-consuming, laborious and sub-optimal, BIM is ushering in a new age of superior communication, better and more systematic interdisciplinary

collaboration,” remarks P R Surendhrababu (PRS), Vice President & Head – Digital Engineering, “which is facilitating rapid decision-making, more precise evaluation and thereby better safety management. Perhaps, the most defining advantage of BIM is that it can influence a project before, during and post construction.”



P R Surendhrababu
Vice President & Head,
Digital Engineering

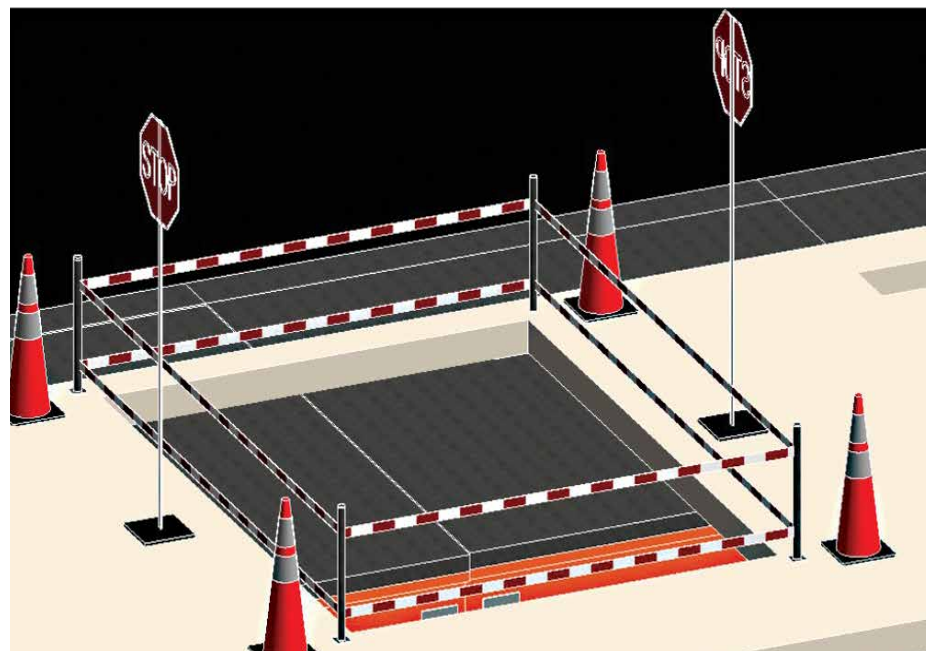
BIM is ushering in a new age of superior communication, better and more systematic interdisciplinary collaboration, which is facilitating rapid decision-making, more precise evaluation and thereby better safety management.



The goals of safety management are to control safety actions and procedures in the workplace, to establish safety management processes, to prevent the occurrence of accidents, incidents and injuries at site. BIM does all that and more: it even helps identify possible flaws in design or construction to minimize loss of time and cost.

Synthesizing design and construction

Hitherto, designers designed, engineers and workmen constructed based on the drawings, each often operating within



Planning cutout protection

their respective silos. Design flaws, if any, were rectified at construction stage often involving rework and a steep price for the contractor; construction flaws often led to even bigger headaches. BIM is the vital link between design and construction, breaking the silos and paving the way for greater collaboration and communication.

The positive impact that BIM can make at design stage is being experienced by the PT&D IC design team. “We have modelled safety components for two pilot projects in our substation BU,” informs Ms. Geeta Hariharan, Head – Engineering, PT&D ASEAN, “and the benefits are already evident.” Their pilot projects are the 132 / 11 kV substation at Garhoud for DEWA, UAE for the Middle East BU and the 400 kV GIS substation at Guindy, TANTRANSO. BIM is playing a key designing role for TI IC in their expansion project of the Bengaluru



S Mohan Babu
Digital Officer –
Heavy Civil

BIM was introduced to address 3 main objectives - to assess preconstruction risks, to implement safety provisions on a day to day basis and to use a ‘prevention by design’ approach.



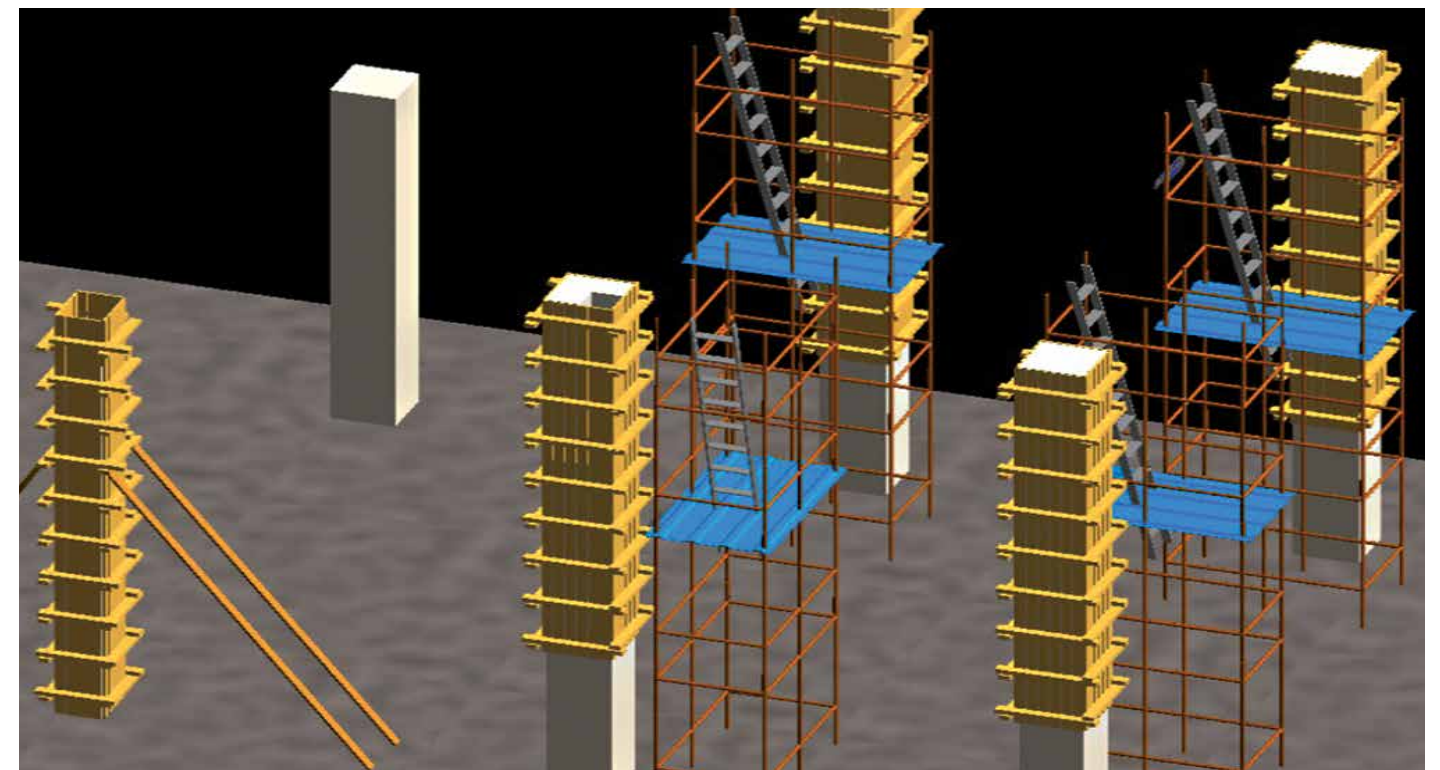
International Airport as well as in their BIDKIN and Dholera SIR projects.

BIM was introduced by the Heavy Civil team for their Chennai Metro project to address 3 main objectives shares Digital Officer – Heavy Civil, S Mohan Babu. “To assess preconstruction risks, to implement safety provisions on a day to day basis and to use a ‘prevention by design’ approach.” From a purely

safety perspective, they focused on coordinating site logistics, syncing temporary works with permanent design, tracking obvious safety provisions that open and close during a project like floor penetrations for lift shafts and ensure clear communication of on field safety risks and hazards to the entire team.

Detecting and resolving clashes

BIM brings together two crucial activities of project execution and safety planning addressing the issues of lack of communication and difficulties that safety engineers face to analyse the what, when, why, and where safety measures are required to prevent accidents. “With 3D exchange of information through BIM, safety management is happening both at design and construction



Column formwork planning



Dr C B Amarnath
Head - BIM
Strategy

With 3D exchange of information through BIM, safety management is happening both at design and construction stages with clashes resolved at both junctures and with efficient data management, there is earlier, easier identification and mitigation of hazards resulting in better safety management.



stages with clashes resolved at both junctures,” informs Dr Amarnath CB, Head – BIM Strategy. “With efficient data management, there is earlier, easier identification and mitigation of hazards resulting in better safety management.”

In the realm of engineering design, BIM can identify possible chances of collision of equipment at site and mitigate them even before construction. “With tracking and sensing technology, working fatalities and injuries like being struck by moving construction vehicles can be dramatically reduced,” shares Suryakanta Kabi, Manager – BIM, TI IC, referring to a hazard that TI IC has been wrestling with to control.

The rapid strides BIM is taking in this sphere is reflected by the statistic that in 2018-19, 3000+ clashes across various

projects were detected, addressed, resolved and reported to site by the BIM clash detection process to measure potential savings and ensure safety and Suryakant ventures that “every clash detected can make significant savings.”

Addressing specific safety issues through BIM

Keeping a site safe from incidents: By creating an actual visualization of the project before construction, BIM enables designers and engineers to identify and eliminate safety hazards and by linking to project schedule, both short term issues and those with the potential to create bigger problems later can be addressed. Once complete, a BIM model becomes a quick reference

guide about everything at a project for everyone by which one can identify construction risks, prepare specific work plans and complete tasks efficiently and safely. “During the project, BIM takes the unpredictability out of construction,” says PRS. “The 3D drawings are more accurate, potential pain points can be foreseen, floor and roof penetrations checked and protected.” The BIM model can visualize risks, provide reports and maps of site conditions, help evolve sequential plans to detect and overcome hazards, even validate dimensional and informational relationships between items like number of equipment per square feet of space, distance between fire extinguishers, pedestrian protection measures and the like.

“With tracking and sensing technology, working fatalities and injuries like being struck by moving construction vehicles can be dramatically reduced.”

Suryakanta Kabi
Manager – BIM, TI IC

Making surveys easier and safer: Drones and LiDAR are go-to tools for geospatial data acquisition that captures data 4X times faster than conventional survey methods. Combining photogrammetry techniques, all 2D and 3D features of the project site can be collected and measured accurately even to the level of a centimetre by using well-established ground control points. Apart from topographic surveys, progress, smart monitoring,

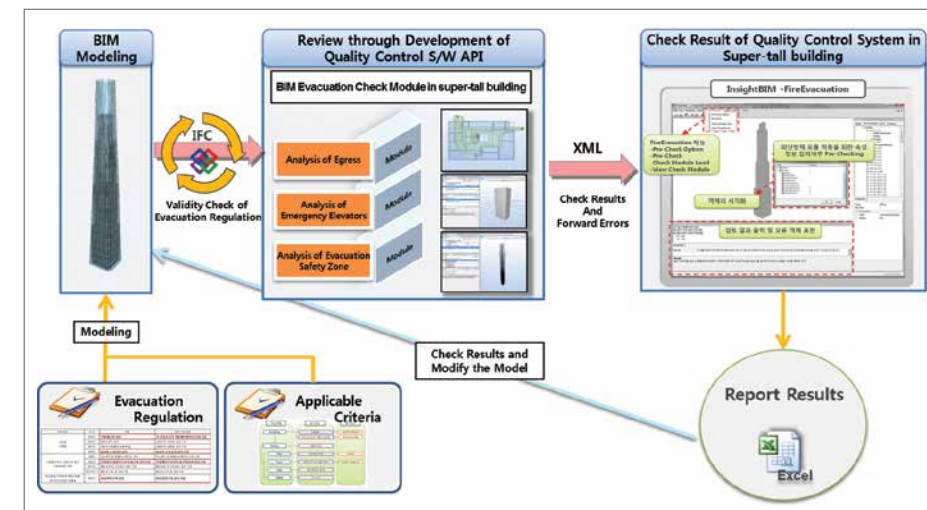
“During the project, BIM takes the unpredictability out of construction.”

P R Surendhrababu
Vice President & Head,
Digital Engineering

quantity estimations are all possible with these geospatial technologies that reduce human intervention and make surveying easier, quicker, more accurate, more economical and safer. Suryakanta informs, “we used drones and LiDAR extensively for the Mumbai-Nagpur Expressway Project at pre-bid and post bid stages, aerial LiDAR survey for the Mauritius Metro project at post bid stage and drone survey for the Vadodara-Bombay Road project at the pre bid stage.” He adds that the effort for field survey operations has been reduced by anywhere between 30-80% and labour costs cut by a good 20-25%.

“BIM has evolved as an intelligent repository of data that is of significance to all stakeholders, empowering them to take informed decisions.”

P R Surendhrababu
Vice President & Head,
Digital Engineering



Quality control system in super-tall building

Safeguarding the edges: Fall from height of workmen and material is one hazard that keep EHS managers across L&T Construction awake at nights. Instances of people or things slipping over the edges or falling through openings are primarily due to missing barricades. BIM detects and identifies missing fall protection installations in staircases, slab edges, slab openings and the like to alert site teams to install temporary safeguards or railings around dangerous locations.

Keeping fires at bay: Both during and post construction, fires remain an ever-present threat and BIM can prove to be a great foil to prevent the occurrence of one. The model is equipped with data to identify proper safety materials, fire zones, fire escape routes, etc. that can go a long way to mitigate fire hazards.

BIM is set to change the face of construction

Foreseeing is being forewarned and BIM is the ideal tool to literally foresee the future to pre-empt safety issues. “BIM has evolved as an intelligent repository of data that is of significance to all stakeholders, empowering them

to take informed decisions,” elaborates PRS. “The flexibility of the BIM platform allows overlaying of data related to construction activity sequentially on the design data which means that we are creating a virtual construction environment involved what is to be built, what goes to build it and the inter relation. This is the power of BIM technologies and, needless to say, the safety aspects and the necessities to create a safe environment are available in precise detail. We can and should harness this BIM capability. BIM is the way forward to eliminate human error in both design and construction stages to ensure incident-free and safe project progress,” he emphasizes.

Businesses across L&T Construction are gradually understanding and appreciating the difference to construction that BIM can bring but PRS feels that the rate of adoption is not yet proportionate to its enormous benefits. “BIM can influence almost every aspect of construction; all it needs is a change in mindset to embrace and experience it. I am sure its time has come, and it is only a matter of time before BIM starts to make a marked and positive difference to the way we build,” rounds off PRS. ■

| The BIM Revolution | |
|--|--|
| BEFORE | NOW |
| 2D drawing | 3D intelligent model |
| Text, photo and video | ‘Life-like’ experience in 3D |
| EHS knowledge resides only with the Safety Manager | Collaboration is active across design & construction |
| Difficult to predict EHS in design & operation | EHS procedures validated virtually & interactively |
| EHS & engineering data are segmented | 3D intelligent model captures operation performance data |
| ‘Push’-based training | Interactive training & learning |



PRECASTING IS EASY; LIFTING PRECAST ELEMENTS NOT SO!

Understanding the hazards and safety measures to lift heavy precast elements

Several engineeringly challenging structures are taking shape with speed and precision thanks to the advantages of precast engineering. Be it the Motera Stadium, soon-to-be the world's largest cricket stadium, or the Al Rayyan stadium in Qatar being made ready for the FIFA 2022 Football World Cup or a series of metro rail systems, high-rise residential towers or factories, L&T has certainly taken precasting to the next level.

Advantage precast

"We had all of 43 columns each 30 m in height, 2.7 m width and weighing 285 tonnes to erect," shares Project Director, Subrata Dutta (SD), of the Motera Stadium project. "Casting them insitu would have taken us at least 2 months per column but by precasting the columns we were able to complete each column in a cycle time of about 10-12 days with the required strength."

Economical, quicker to produce, requiring less skilled labour, precasting is truly rewriting the rules of the game. "Most importantly, since precast elements are manufactured in a controlled casting environment, it is easier to control the mix, placement and curing and get exactly what the design prescribed to the quality we seek," explains the CMPC In-charge of the Motera project, Maulik Shah. What's more, precast elements can be standardized, repeated, eliminates waiting time for erection at site, takes weather out of the equation because in a factory, elements can be cast in rain or shine and curing can even be accelerated by heating certain parts.

The project team at Lucknow Metro can thump their chests for constructing some of the fastest built metro systems in the country thanks to precast girders and structures. Project Director, Sanjay Singh Gangwar fondly recalls planning the alignment at one of the busiest sections in the heart of Lucknow "where



G Divakar
Senior Manager EHS,
HCIIC

A careless crane operator or inattentive workman can spell danger for all, hence, it is extremely critical to have a proper lifting plan in place, that is clearly communicated to all involved and the workmen need to be specially trained if the lift is a complicated one.



even finding parking space for a jeep was an issue!" The original plan of in-situ viaduct slabs was shelved in favour of "7 precast, curved 'U' girder spans, first-of-their-kind in India, aligned to a 90 degree curve along a minimum radius of 120 m as per Indian Railway standards that saved us a lot of time earned the good will of the people as not a single public property was disturbed." Precasting gave the team flexibility too for where the conventional 'U' girder



format was difficult to execute, they could quickly switch over to steel 'T' or box girders to proceed with execution.

Hazards of lifting precast elements

Lifting these huge precast girders or columns or any other big structure come with several attendant risks. Overloading of cranes, gantry cranes failing during tandem lifting of loads or when shifting the heavy load, loads getting shifted with the gantry, failure of the lifting accessories or even a collision of either the lifting equipment or the loads are some common hazards that lifting and EHS managers have to deal with. Over and above all these, is the crucial consideration of human intervention. "A careless crane operator or inattentive workman can spell danger for all," cautions G. Divakar, Senior Manager EHS, HCI "hence, it is extremely critical to have a proper lifting plan in place, that is clearly communicated to all involved



Santhosh Bore
EHS In-charge, Motera

Certainly, no lift should even be planned without knowing the exact weight of the load and it is important to consider aspects like weight of the lifting gears, spreader pieces, crane hook and fall ropes when calculating the total weight to be lifted.



and the workmen need to be specially trained if the lift is a complicated one."

Ensuring safe lifting of precast elements

Plan a lift

An hour of planning can save one hours of doing. Like in any activity at site, a lift should also be carefully planned considering all loads involved, site

conditions, risks both seen and unseen and the 'Executive Supervisor' (ES) should prepare a complete Lift Method Statement that becomes the ready reckoner for all lifts.

"Ideally, it is advisable to perform a trial lift on empty condition to check the conditions like load capacity, obstructions and the like, after verifying the dimensions with the design drawings," cautions Santosh Bore, EHS In Charge at the Motera site after his experience of performing several complicated lifts in fairly confined spaces. "Certainly, no lift should even be planned without knowing the exact weight of the load and it is important to consider aspects like weight of the lifting gears, spreader pieces, crane hook and fall ropes when calculating the total weight to be lifted."

The lift plan determines and incorporates the position of the crane starting from unloading the load from trailer to the ground, moving it closer to the erection



Gabrial Fernandez
Manager EHS

Cranes with the same configuration are best suit for tandem lifts but in case they are unavailable, then those with similar configurations in terms of type, make, winch speed and breaking efficiency need to be mapped before making the choice and it is prudent to de-rate the crane capacity by 25% in case of a tandem lift.



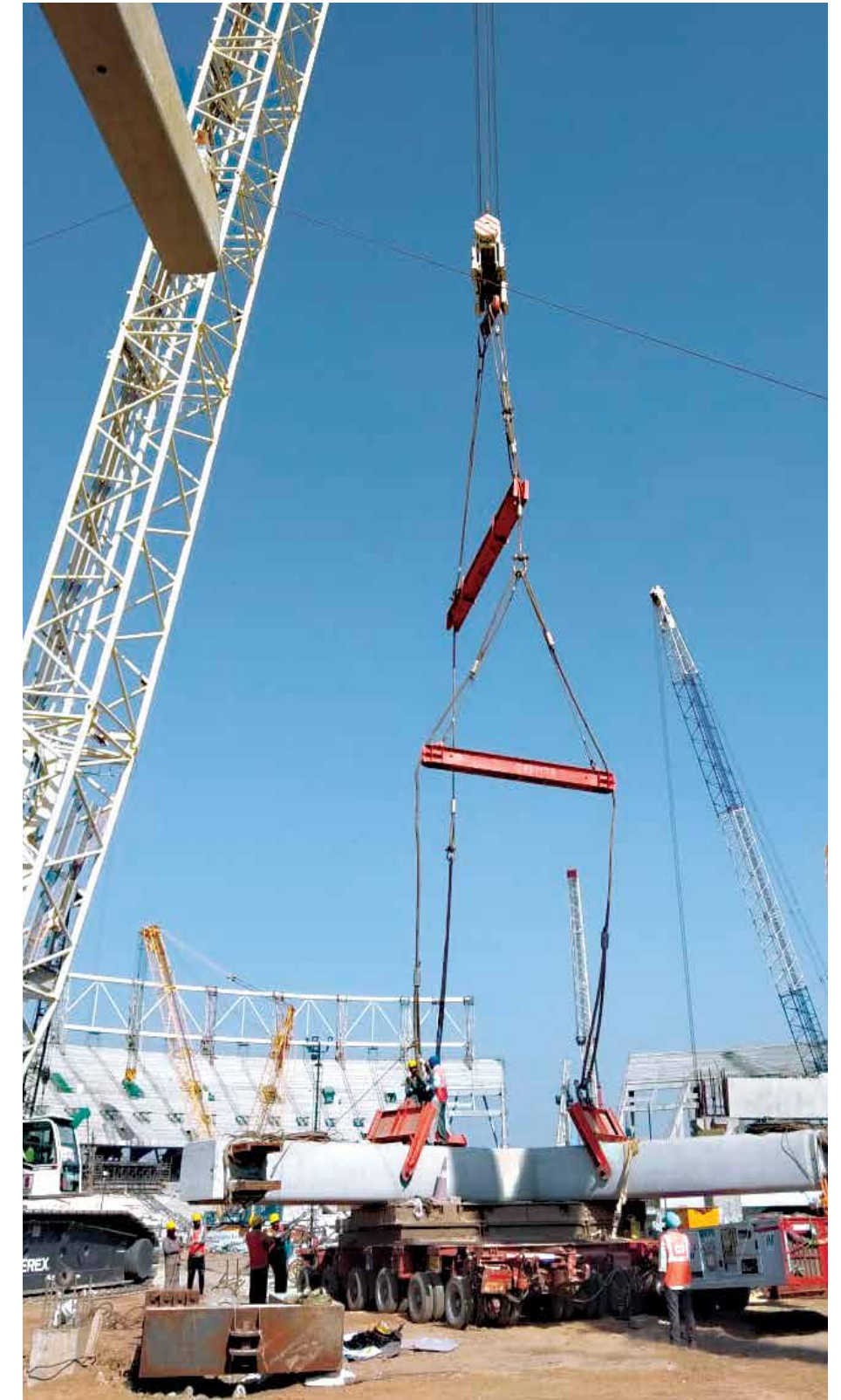
spot, final position of the crane for lifting and the sequential operation of multiple cranes. Lifting a load out of water should not be attempted without considering the buoyancy load.

Prepare for a lift

Like a pilot's series of pre-checks before take-off, the ES has his own. The area of lifting should be cordoned off with only specially trained personnel involved with the activity present. Care must be taken to ensure that the lifting device is not loaded in excess of its rated load or made to handle a load for which it is not designed. It is the operator's responsibility to ensure that the field is clear of all obstructions, the ropes or chains are not kinked, the multiple part lines are not twisted, the load is evenly distributed and not swinging before giving the green signal for the lift to proceed.

Choice of cranes

Armed with a sound lifting plan, the next step is to choose the right kind of cranes. Manager EHS, Gabriel Fernandez shares, "Cranes with the same configuration are best suited for tandem lifts but in case they are unavailable, then those





Razi Ahmed Farooqi
EHS In-charge,
Lucknow Metro project

To avoid mishaps, precast elements should be lifted about 100-500 mm from the pedestal or casting bed to check for any issues before proceeding with the lift. Rectifications are possible at this stage.



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Crane operations

Gantry cranes engaged in tandem lifts should be synchronized, operated with a single remote and inter-locked

for safe material handling. Until the inter-locking they are controlled administratively through inspection checks. Gantry cranes should ideally be moved at minimum speed, maintaining a gap with the load and ensuring centre of gravity. The slings should be of suitable capacity and it is important to ascertain the verticality and tightness of the lifting bars and ensure that the lifting inserts are in their correct positions. “To avoid mishaps, precast elements should be lifted about 100-500 mm from the pedestal or casting bed to check for any issues before proceeding with the lift,” says Razi Ahmed Farooqi, the EHS In-charge at the Lucknow Metro project and a veteran of many lifts. “Rectifications are possible at this stage.” The lifting should be smooth affairs without jerks that could have dangerous shock loads acting on the crane and ASLIs installed

on the cranes should automatically cut off movement if overloaded. It is also nice to be prepared with anti-collision precautions.

Human intervention

“The human factor is the most critical part of any lifting operation,” stresses Stephen Phillip Storey, Head – EHS, Heavy Civil. “The crane operator is the key to the entire operation. He must be on the ball, alert to the slightest sign of trouble to stop the lift or take corrective action. He can make or break a lift so if he shows the smallest sign of being unwell or unfit, he should be replaced immediately, or the lift postponed.” It is imperative for the operative to be well-positioned with a clear view of the operation and is in constant contact with the riggers and signallers, who are pre-designated and thoroughly briefed. “We cannot afford



“
The crane operator is the key to the entire operation. He must be on the ball, alert to the slightest sign of trouble to stop the lift or take corrective action. He can make or break a lift so if he shows the smallest sign of being unwell or unfit, he should be replaced immediately or the lift postponed.

Stephen Phillip Storey
Head – EHS, HCL IC

any miscommunication,” reiterates a serious Razi. A non-routine procedure should be followed in the event of a blind lift where the operation is out of the operator’s view.

The ES must play the role of a conductor of an orchestra. The operator must consult with him when in doubt and respond only to his instructions and instantaneously “The only deviation

is to stop an operation irrespective of whoever gives that command,” adds Stephen. The operator should clear the lift to proceed after checking all aspects and his familiarity with standard hand signals is critical. It remains his responsibility to complete the lifting operation till the load is placed, should never allow anyone else to ride with him in his cabin during the operation and keep all personnel out of harm’s way.

Safety is very much in our hands and as with any other risky activity at a construction site, lifting heavy loads is dangerous but with adequate planning, attention to detail, strong focus, coordinated effort and clear leadership, it can be achieved without incident as the Motera and many other project teams have repeatedly proved. ■

Safety

Roll of Honour

Helmet congratulates the following sites for achieving million and more LTI free safe man-hours

BUILDINGS & FACTORIES

- 31** ITC Sonar Hotel Project, Kolkata
Million Safe Man Hours
August 2009 to June 2019
- 26** Crescent Bay Project, Mumbai
Million Safe Man Hours
October 2012 to June 2019
- 25** Emami City Project, Kolkata
Million Safe Man Hours
January 2013 to June 2019
- 24** IIT Project, Hyderabad
Million Safe Man Hours
August 2014 to June 2019
- 24** Wipro IT SEZ Project, Bengaluru
Million Safe Man Hours
December 2016 to June 2019
- 22** DLF Cyber Park Project, Gurgaon
Million Safe Man Hours
December 2015 to June 2019
- 19** DAICEC Project, Mumbai
Million Safe Man Hours
May 2017 to June 2019

- 17** Orchid Crown Project, Mumbai
Million Safe Man Hours
April 2010 to June 2019
- 16** One ICC and Two ICC Bombay Realty
Million Safe Man Hours
November 2017 to June 2019
- 15** Police Bhawan Project, Lucknow
Million Safe Man Hours
December 2015 to June 2019
- 15** TATA Housing Project, Kolkata
Million Safe Man Hours
September 2014 to June 2019
- 15** Cricket Stadium Project, Motera
Million Safe Man Hours
January 2017 to March 2019
- 15** GHP Experion Project, Gurgaon
Million Safe Man Hours
July 2016 to June 2019
- 14** ESIC Hospital Project, Joka
Million Safe Man Hours
November 2009 to June 2019

- 13** Prestige Song of the South Project, Bengaluru
Million Safe Man Hours
April 2016 to June 2019
- 13** IGH Dwaraka Project, Delhi
Million Safe Man Hours
September 2014 to March 2019
- 12** Oberoi Sky City Project, Borivali
Million Safe Man Hours
June 2016 to June 2019
- 12** DLF Crest Project, Gurgaon
Million Safe Man Hours
November 2017 to March 2019
- 12** IICC Dwarka Project
Million Safe Man Hours
February 2018 to June 2019
- 11** Statue of Unity Project
Million Safe Man Hours
March 2018 to June 2019
- 11** C17 Hindon Project Ghaziabad
Million Safe Man Hours
September 2016 to June 2019
- 11** Raintree Boulevard Project Bengaluru
Million Safe Man Hours
September 2016 to June 2019

Safety

Roll of Honour

TRANSPORTATION INFRASTRUCTURE

- 19** Delhi Agra Road Project
Million Safe Man Hours
July 2016 to June 2019
- 16** Hospet Chitradurga Road Project
Million Safe Man Hours
May 2017 to June 2019
- 16** Western Dedicated Freight Corridor Corporation CTP - 1
Million Safe Man Hours
August 2017 to June 2019
- 15** Western Dedicated Freight Corridor Corporation CTP - 2
Million Safe Man Hours
May 2018 to June 2019
- 11** Yadgiri Warangal Road Project
Million Safe Man Hours
June 2016 to June 2019
- 11** P015 Al Wakrah Bypass Road Project
Million Safe Man Hours
May 2014 to June 2019
- 10** Dholera SIR - Road and other Infra Works
Million Safe Man Hours
July 2016 to June 2019

Safety

Roll of Honour

9 **OPGC MGR Project**
Million Safe Man Hours
July 2015 to June 2019

9 **Road and Infrastructure in Doha Industrial Area. QS001-P06 (LNT- ASTC JV)**
Million Safe Man Hours
August 2015 to June 2019

9 **R1048/1- Improvements of EXPO 2020**
Million Safe Man Hours
July 2017 to June 2019

8 **Riyadh Metro Project**
Million Safe Man Hours
December 2015 to June 2019

8 **WDFC EMP-4**
Million Safe Man Hours
May 2015 to June 2019

7 **Manwath to Beed Road Project (EPC)**
Million Safe Man Hours
December 2014 to June 2019

7 **WDFC CTP-14**
Million Safe Man Hours
February 2017 to June 2019

6 **Bijapur Gulbarga Homnabad Road Project**
Million Safe Man Hours
March 2015 to June 2019

6 **Mukkola - KL/TN Border Road Project**
Million Safe Man Hours
June 2016 to June 2019

6 **Mumbai Monorail**
Million Safe Man Hours
June 2013 to June 2019

6 **Barpali-Bolangir RC Project**
Million Safe Man Hours
April 2014 to June 2019

6 **Construction of Batinah Expressway - Package 4 Project**
Million Safe Man Hours
October 2017 to June 2019

6 **WDFC CTP 3R**
Million Safe Man Hours
November 2018 to June 2019

5 **Villukuri Kanyakumari Road Project**
Million Safe Man Hours
September 2016 to June 2019

5 **Baharagora Singhara Road Project**
Million Safe Man Hours
November 2017 to June 2019

5 **Raipur Bilaspur Road Project- Pkg-II**
Million Safe Man Hours
September 2016 to June 2019

5 **Bidkin Industrial Area (Package - I)**
Million Safe Man Hours
July 2017 to June 2019

5 **BIAL Runway**
Million Safe Man Hours
December 2018 to June 2019

5 **Hospet-Harlapur RC Project**
Million Safe Man Hours
January 2013 to June 2019

5 **Lucknow-Sitapur RC Project**
Million Safe Man Hours
November 2012 to June 2019

5 **Sambalpur-Barapali RC Project**
Million Safe Man Hours
April 2014 to June 2019

5 **MTC Airside Construction - Abu Dhabi**
Million Safe Man Hours
December 2016 to June 2019

Safety

Roll of Honour

4 **Al-Sharqiyah Expressway Section-II Part-1, Ibra to Al kamil**
Million Safe Man Hours
June 2018 to June 2019

4 **Rewari-Manheru RC Project**
Million Safe Man Hours
September 2012 to June 2019

4 **Chandigarh Kharar Elevated Corridor**
Million Safe Man Hours
August 2016 to June 2019

4 **Bar Bilara Jodhpur Road Project**
Million Safe Man Hours
April 2017 to June 2019

4 **Dept Code - Central Office TI -RKJLRP (JABALPUR MP)**
Million Safe Man Hours
Jan 2019 to June 2019

3 **Veer (Wadpale) to Bhogaon Khurd Section**
Million Safe Man Hours
July 2017 to June 2019

3 **Pragati Maidan**
Million Safe Man Hours
December 2017 to June 2019

Safety

Roll of Honour

- 3 **Hyderabad Metro Rail**
Million Safe Man Hours
June 2012 to June 2019
- 3 **Bolangir-Titlagarh RC Project**
Million Safe Man Hours
April 2014 to June 2019
- 3 **EDFC - CP-303**
Million Safe Man Hours
March 2018 to June 2019
- 2 **DMRC CE-07**
Million Safe Man Hours
July 2013 to June 2019
- 2 **Roha Verna Railway
Electrification Project**
Million Safe Man Hours
May 2017 to June 2019
- 2 **Ghoshpukur Salsalabari Road
Project**
Million Safe Man Hours
January 2019 to June 2019

POWER TRANSMISSION & DISTRIBUTION

- 8 **HMRL PSS & Scada Packages**
Million Safe Man Hours
May 2012 to June 2019

- 6 **Phase 11 Addendum Substation**
Million Safe Man Hours
November 2013 to June 2019
- 4 **BH-UPD-ODSSP Erection- Phase
II Package-4-OPTCL-5**
Million Safe Man Hours
June 2015 to June 2019
- 4 **ODSSP Phase-III Package-4**
Million Safe Man Hours
August 2016 to June 2019
- 4 **250 MW ACEPL, Rewa, M.P**
Million Safe Man Hours
January 2018 to June 2019
- 4 **33/11kV Substations -
A12829 (AADC)**
Million Safe Man Hours
May 2017 to June 2019
- 4 **TFL-ERSS-TL01 for 765 kV D/C
Ranchi - Medinipur**
Million Safe Man Hours
October 2018 to June 2019
- 4 **K-UPD-UGCabling Works
Advance Scrips Project OPTCL**
Million Safe Man Hours
June 2016 to June 2019
- 3 **Trans Scheme- Consultancy
Serv-JSEB-PCGIL**
Million Safe Man Hours
April 2013 to June 2019

- 3 **Lusail CP-24 Substation Project**
Million Safe Man Hours
June 2015 to June 2019
- 3 **ME-QA-SS-Manateq Packages
P1 to P5**
Million Safe Man Hours
September 2017 to June 2019
- 3 **400/220/66kV GIS SS -
Wangtoo**
Million Safe Man Hours
November 2018 to June 2019
- 3 **TW01 for 800kV HVDC
Raigarh Pugalur-PGCIL**
Million Safe Man Hours
August 2017 to June 2019
- 3 **SAOO Power System
Reliability Improvement
Project 115kV OHTL, Shedgum
& Uthmaniyah**
Million Safe Man Hours
March 2015 to June 2019
- 3 **L-UPD-IPDS Kanpur-KESCO**
Million Safe Man Hours
November 2016 to June 2019
- 3 **BH-UPD-Rural Eltrl Work
DDUGJY WESCO Pk 4 - OPTCL**
Million Safe Man Hours
January 2017 to June 2019

Safety

Roll of Honour

- 2 **V-UPD-Saubhagya RE works at
ALY Kaushambi-PUVVVNL**
Million Safe Man Hours
May 2018 to June 2019
- 2 **BH-UPD-ODSSP Erection-
Phase II Package-3-OPTCL-5**
Million Safe Man Hours
March 2017 to June 2019
- 2 **Replace Electrical Equipment
at Southern Area GOSP's
(GOSP Project)**
Million Safe Man Hours
April 2016 to June 2019
- 2 **Phase 12 Substation**
Million Safe Man Hours
July 2015 to June 2019
- 2 **220 kV & 132 kV TL - WBSETCL
Pkg- I**
Million Safe Man Hours
March 2013 to June 2019
- 2 **H-IE-Power Supply & Scada-
Stage 4-HMRL-5**
Million Safe Man Hours
February 2018 to June 2019
- 2 **132kV D/C JUSNL NIT-42**
Million Safe Man Hours
April 2017 to June 2019

Safety

Roll of Honour

- 2** **J-SS-PUVVNL/RGGVY-II RURAL ELEC IN JAUNPUR-PVVNL**
Million Safe Man Hours
January 2016 to June 2019
- 2** **V-UPD-Saubhagya-RE Works Ghazipur Chandauli-PUVVNL**
Million Safe Man Hours
October 2018 to June 2019
- 2** **100MW/145MWp SBE SPV Plant Bhadla –Raj**
Million Safe Man Hours
March 2018 to June 2019
- 2** **220/132kV- WBSETCL Package AB-WBSETCL**
Million Safe Man Hours
December 2015 to June 2019

HEAVY CIVIL INFRASTRUCTURE

- 63** **Riyadh Metro JV project**
Million Safe Man Hours
- 49** **Doha Metro JV Project**
Million Safe Man Hours
- 16** **KAPP-Main Plant Project**
Million Safe Man Hours
- 14** **Medigadda Barrage Project**
Million Safe Man Hours

- 9** **Kalpakkam - WMP & Allied Project**
Million Safe Man Hours
- 8** **Mumbai metro UGC01 Project**
Million Safe Man Hours
- 8** **Vizag vessel Project**
Million Safe Man Hours
- 6** **Chennai Metro UG 02 Project**
Million Safe Man Hours
- 6** **KAPP-IDCT Project**
Million Safe Man Hours
- 5** **MTHL Pkg1 Project**
Million Safe Man Hours
- 4** **WDFC 15 A Project**
Million Safe Man Hours
- 4** **Barapullah Bridge, Delhi**
Million Safe Man Hours
- 4** **Hyderabad AFA Project**
Million Safe Man Hours
- 4** **Punatsangchhu HEP, Bhutan**
Million Safe Man Hours

- 4** **KAPP-NDCT Project**
Million Safe Man Hours
- 3** **Ahmedabad Metro Project**
Million Safe Man Hours
- 3** **Mumbai metro UGC07**
Million Safe Man Hours
- 3** **RAPP Project**
Million Safe Man Hours
- 3** **Durgam Cable Stayed Bridge**
Million Safe Man Hours
- 3** **VIH Project**
Million Safe Man Hours
- 3** **Mandovi Bridge, Goa Project**
Million Safe Man Hours
- 2** **ZF Shillong Project**
Million Safe Man Hours
- 2** **Kalpakkam -FRP Project**
Million Safe Man Hours
- 2** **Seabird Phase II Project**
Million Safe Man Hours
- 2** **KAPP- CSP Project**
Million Safe Man Hours

Safety

Roll of Honour

- 2** **WDFC CTP 14 Project**
Million Safe Man Hours
- 2** **WDFC 15 C Project**
Million Safe Man Hours
- 1** **WDFC 15 B Project**
Million Safe Man Hours
- 1** **Kochi Dry Dock Project**
Million Safe Man Hours
- 1** **Iswar Gupta Bridge Project**
Million Safe Man Hours
- ### WATER & EFFLUENT TREATMENT
- 9** **Laying of Sewers at Cuttack**
Million Man Hours
- 9** **Bhatpara Sewer Network and Waste Water Treatment**
Million Man Hours
- 8** **River Front Development Project, Patna, Bihar**
Million Man Hours
- 6** **Sewerage Scheme in Varanasi City**
Million Man Hours

Safety

Roll of Honour

6 **Bansujara Irrigation Scheme**
Million Man Hours

6 **Ratangarh Sujangarh WSP**
Million Man Hours

6 **Kharkai Barrage with Gates and
its Allied Works**
Million Man Hours

5 **Dholera SIR**
Million Man Hours

5 **15 nos LIS in Cluster XV @
Bolngir Subrnapur Boudh**
Million Man Hours

5 **Banswara District & Pratapgarh
District WSS**
Million Man Hours

5 **Integrated Sewerage Work - Pali
(Design and Build)**
Million Man Hours

4 **Nellore UGDS**
Million Man Hours

4 **Integrated WS and WW Works
Jhunjhunu Project(DB)**
Million Man Hours

4 **DWSP**
Million Man Hours

3 **13 nos LIS in Cluster XIV @
Kalahandi and Bolangir**
Million Man Hours

3 **O and M for Sri Sathya Sai Water
Supply Anantapur**
Million Man Hours

3 **WS Scheme - Balasore/Bhadrak/
Keonjhar/Puri/Bolangir**
Million Man Hours

METALLURGICAL & MATERIAL HANDLING

32 **Hot Strip Mill, RSP, Rourkela**
Million Man Hours

18 **Coal Handling Plant, RRVUNL,
Chhabra**
Million Man Hours

7 **Coal Handling Plant, Khandwa**
Million Man Hours

7 **Slab Caster, Bokaro**
Million Man Hours

6 **Coal Handling Plant. Khargone**
Million Man Hours

6 **LTEW, Kanchipuram**
Million Man Hours

5 **Pet Coke Evacuation Project,
IOCL, Paradip**
Million Man Hours

5 **Coal Handling Plant, Lingaraj**
Million Man Hours

5 **Coke Dry Quenching, TSL,
Jamshedpur**
Million Man Hours

4 **Coal Handling Plant, NCL,
Nigahi**
Million Man Hours

4 **LSAW, Abu Dhabi**
Million Man Hours

3 **Coal Handling Plant,NCL, Khadia**
Million Man Hours

3 **Material Handling System, RIL,
Jamnagar**
Million Man Hours

3 **Benefication Plant at SK Mines,
Phase-III, Dariba**
Million Man Hours

2 **JSW, Dolvi**
Million Man Hours

2 **BF#3 Upgradadtion, JSW,
Bellary**
Million Man Hours

Safety

Roll of Honour

L&T GEOSTRUCTURE

3 **JSW - Paradip**
Million Safe Man Hours
January 2017 June 2019

2 **IWAI - Sahibganj**
Million Safe Man Hours
December 2016 June 2019

1 **NTPGC**
Million Safe Man Hours
May 2015 June 2019

1 **Kalinga**
Million Safe Man Hours
April 2018 June 2019

NIOSH Excellence Award for ITC Colombo 1



ITC Colombo 1, a project being constructed by B&F was conferred the prestigious National Institute of Occupational Safety and Health Excellence Award by NIOSH in the Large Sector Projects category. The award was presented at a ceremony on 22nd August 2019, in Colombo, graced by the Honorable Prime

Minister of Sri Lanka, Mr. Ranil Wickramasinghe.

Mr. Niranjan Simha, SBG Head, CBA SBG - B&F IC received the award from the Honorable Labour Minister of Sri Lanka, Mr. Ravindra Samaraweera in the presence of the ITC Colombo 1 project team.

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