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CONTENTS

Vol No. - LIII No-3 | Oct. - Dec., 2022

Editorial 5

NSCI Safety Rating System
Akshay Hotkar 15

Success Story of NSCI Golden Star Ratings in Construction Industry
Arvind Kumar Roy 17

Challenges to be Encountered in Bio-Medical Waste Management
Prashant Singh 35

Managing Safety & Risk Perceptions – an Overview
B. B. CHAKRAVORTY 45

Behavioural Economics of Safety Culture Management in Companies
Dr. Harbans Lal Kaila 54

Behaviour Based Safety (BBS): Overrated and Over Relied? – Critical Views
Krishna Nirmalya Sen et. al. 61

The CEA (Safety Requirement for Construction, Operation and Maintenance of Electrical Lines) (Amendment) Regulations, 2022
S. N. Dhamone 65

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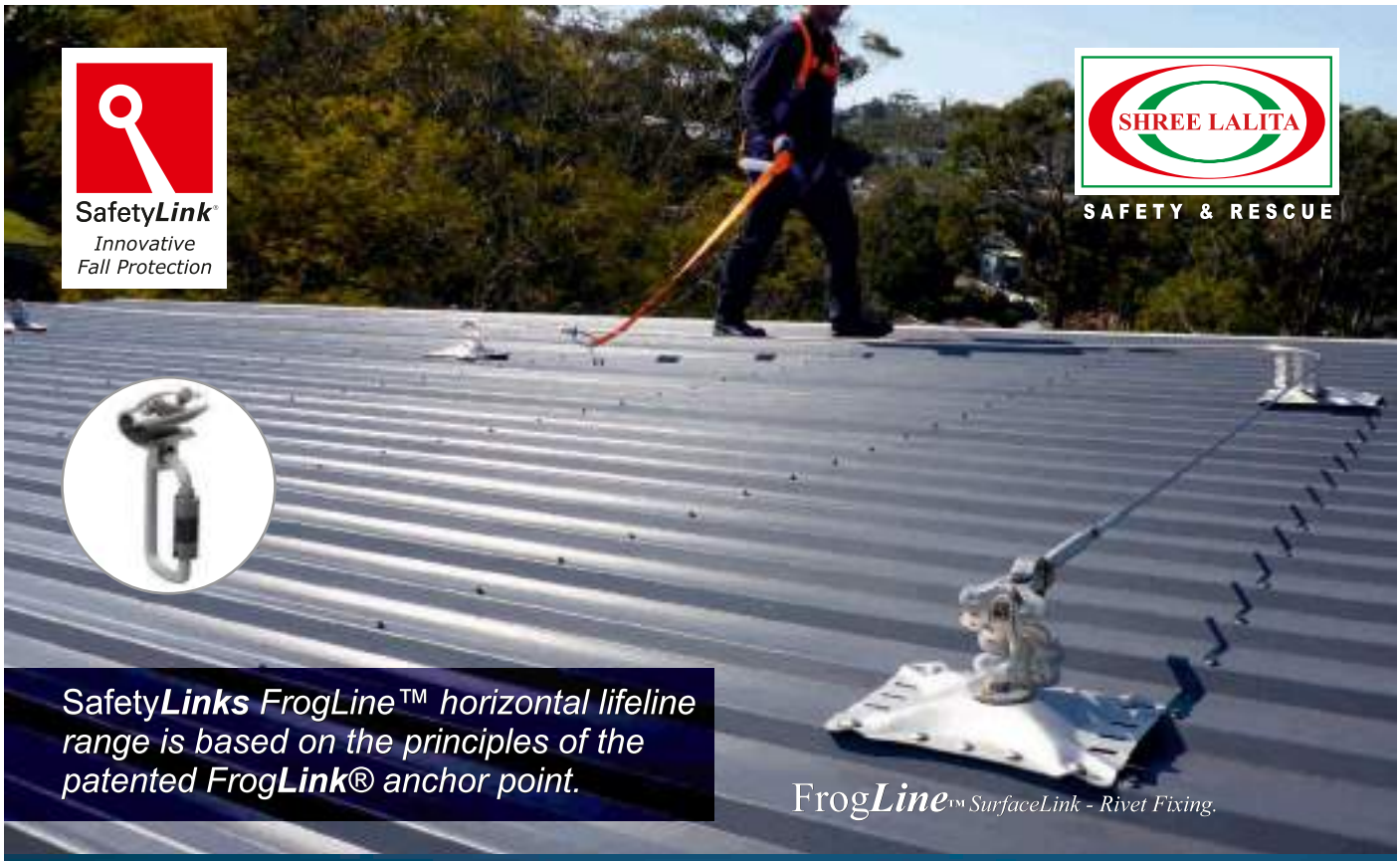
Edited Printed & Published by National Safety Council at Plot No- 98/A, Institutional Area, Sector 15, CBD Belapur, Navi Mumbai- 400614. The National Safety Council does not necessarily subscribe to the view expressed in this journal.

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EDITORIAL



Over the years, various industrial sectors and other establishments in India have made remarkable improvements in their Occupational Safety & Health (OSH) standards, demonstrated better performance and enhanced OSH awareness amongst the employees and other stakeholders. The mere practice of compliance to the statutory requirements as a benchmark of safety standards and adhering to the prescription of safety practitioners are no longer attractive. The performance levels need to be systematically measured on a defined scale and against the relevant elements to set benchmarks.

The National Safety Council of India has developed an indigenous tool called as NSCI Safety Rating System (NSRS). It is a sector specific comprehensive tool to carry out both qualitative and objective assessment of organisation's OSH system as per the industry specific standards and national/international best practices. Performance based NSRS which awards up to Five Golden Stars rating, is suitable for all types of factories, construction sites, buildings, and service sector industry. This tool helps the organisations' to measure their current OHS levels and develop a road map for the continual improvements in OSH and achieve zero harm goals. Our member organisations and other patrons are availing NSRS services for carrying out their OSH performance rating.

This issue provides a brief about NSRS and a success story of an organisation awarded with NSCI 4 Golden Stars Rating, for the benefit of the readers.

In this issue we have also covered articles on Challenges to be encountered in Bio-Medical Waste Management; Managing Safety & Risk Perceptions – Overview; Behavioural Economics of Safety Culture Management in Companies, etc. written by the experts.

We welcome suggestions from our readers for further improvements in the contents and quality of this Chronicle.



Lalit R. Gabhane
Director General & Chief Editor







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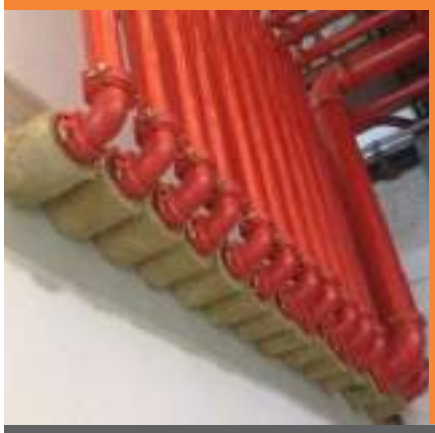
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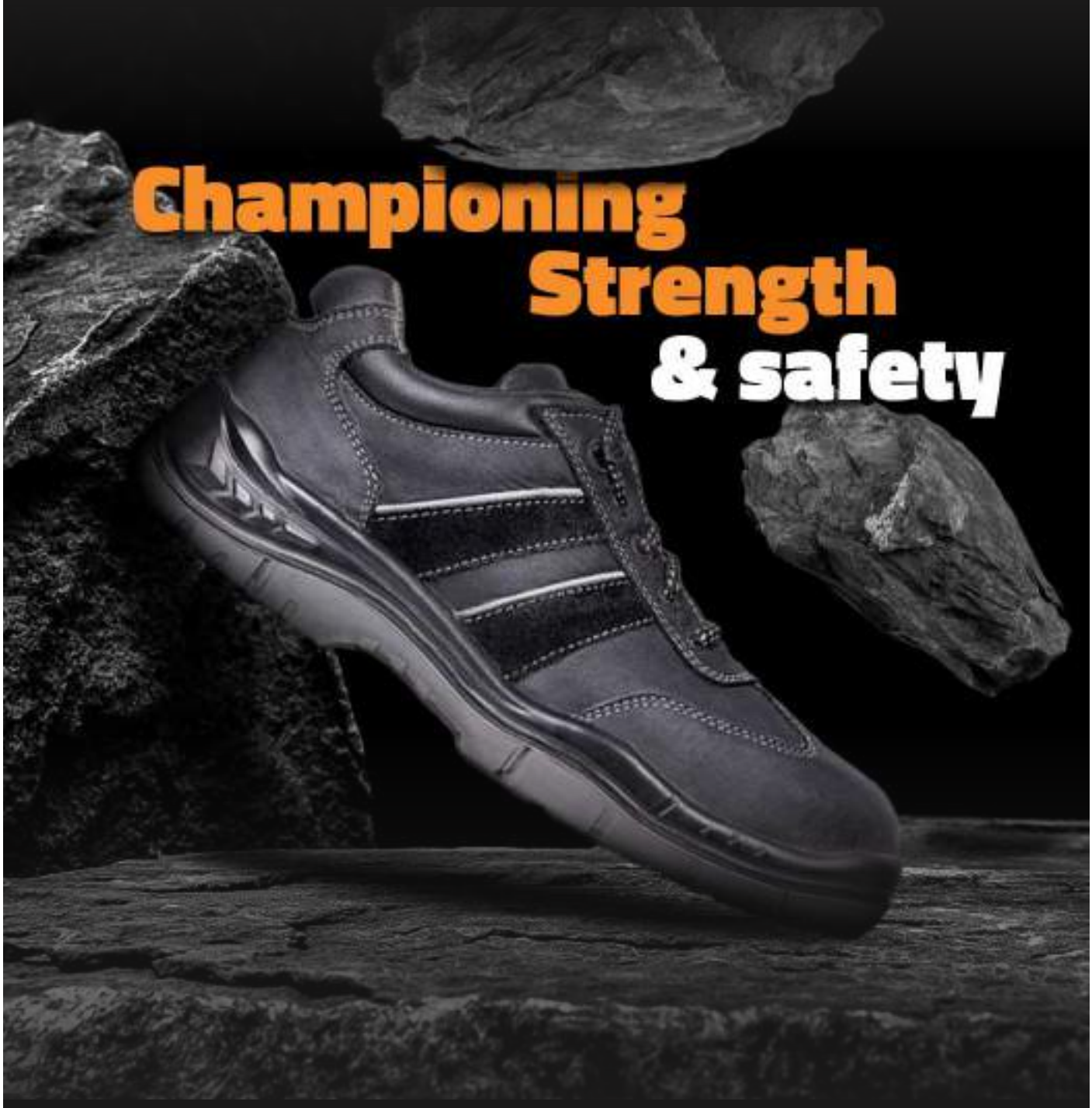
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NSCI SAFETY RATING SYSTEM

Akshay Hotkar, Dy. Director, National Safety Council
Email:avhotkar@nsc.org.in

INTRODUCTION

1. Experience of National Safety Council (NSC) over 56 years, while dealing with various organisations reveal that the safety awareness and safety systems are improving significantly. The era of sticking to the statutory requirements as a bench mark of safety and adhering to the prescription of consultants are no longer attractive to industries. With the substantial economic growth in India the employees / workers also demand a safe workplace and other stakeholders also look for a good OS&H performance. Indian organisations are now very well comparable with any foreign organisations in the aspect of safety. However, there is no platform in Indian context, which can scale the OS&H performance of industries with same yard stick and can lead/ motivate the industries towards continual improvement.

2. As a new initiative, NSC added a new avenue in the form of NSCI Safety Rating System (NSRS) in 2014 to provide esteemed service to it's member organisations and others, which was revised in Jan 2022 taking into account of new OSH standards. This is the tool to evaluate and measure the standards of industries in Occupational Safety, Health and Environment. NSCI Safety Rating System is modelled on IS 14489-2018 Code of Practice on Occupational Health and Safety Audit, National and International best practices and is at par with international standards. In it's pursuit to strengthen the voluntary national movement on SHE and to better serve the nation, NSC has developed this best suited indigenous system of Safety Rating. NSCI Safety Rating is an in-depth assessment on 8 key elements, comprising of around 88 sub-elements aimed at achieving excellence in the OSH Management System. It uses questionnaire with detailed guidance for evaluation. Reference to the relevant national statutes and standards is the unique feature of the process.

3. To motivate industries for improvement in OSH, NSRS act as a competitive tool. Industries can compete with each other by having good safety rating. NSRS is a tool to improvise the stagnant OHS system in industries and provide insight to improve and enhance the OHS standards. As National Safety Council,is the apex body in industrial safety at national level and also having the best expertise in OSH over 56 years, it can do effective and thorough assessment of OSH systems of organisations and rate them as per the compliance and best practices being followed at site.

4. The uniqueness of NSC Safety Rating System is that, while designing the assessment methodology the Indian Statutory requirements and Indian / International Standards, good engineering/ safety practises were referred and kept in focus.

5. The Safety Rating System is suitable for all types of Factories, Construction Sites, Hospitals, Hotels, Malls, Ports, Airports, IT park and Commercial Establishments.

6. There would be two field visits for the assessment. In the first visit, detailed assessment of sites and documents would be verified covering 8 major elements. After this visit, areas for improvement would be suggested in the assessment report and for compliance a time of 1-2 month(s) would be given. After the compliance, second field visit would be undertaken and check the Corrective Action and Preventive Action (CAPA) report along with their horizontal deployment. This gives organisation an opportunity to improve upon and increases the chances of good rating as per NSRS scheme.

7. NSRS is a comprehensive tool developed to carry out qualitative, quantitative and objective assessment of organisation's Occuptational Safety, Health and Environment manangement system as per the industry specific standards and national, international best standards / practices and motivate organisations for continual improvement to achieve zero harm goals.

Features NSRS:

1. NSRS does the assessment beyond the compliance
2. The assessment would use questionnaire, guidelines, document review and discussion with management and workers for evaluation of the safety rating
3. NSRS will be conducted with two field visits
4. NSRS defines the benchmark against the current best practice and techniques and the report for areas of improvement
5. Eligible organisation will get score card and certificate
6. NSRS is tuned to Indian context and at par with International Rating Systems.
7. The NSCI Safety Rating is an in-depth assessment on following 8 major elements

Sr	Major Elements
1	OS&H Management
2	Physical Hazard
3	Chemical Hazards
4	Fire & Explosion Hazard
5	Industrial Hygiene and Occupational Health
6	Accident / Incident Reporting, Investigation and Analysis
7	Emergency Preparedness
8	Safety Inspection

After rating NSCI will issue a score card based on the assessment. Score will be given in the form of Golden Stars with rating as followes:

Rating Scheme				
Score and Number of Golden Stars				
Number of Golden Stars		Grade	Grading Percentage	Result
5	★★★★★	Excellent	>95 - 100%	Score Card & Certificate
4	★★★★	Very good	>85 - 95%	Score Card & Certificate
3	★★★	Good	>75 - 85%	Score Card & Certificate
2	★★	Average	>65 - 75%	Score Card & Certificate
1	★	Basic	>60 - 65%	Score Card & Certificate
None		None	≤60%	Score Card

i) For **5 Golden Stars** rating, organisation should have all the eight key elements of the system in place and each element have to score at least 85% marks and above. The overall marks should be 95% and above. The organisation eligible for Five Golden Star will be awarded with score card and certificate and they will be eligible for applying NSCI **'Safety Shield'** award which is the top most recognition for 'Excellence in Safety' given by NSC.

ii) For **4 Golden Stars** rating, organisation should have all the eight key elements of the system in place and in each element have score at least 75% marks and above. The overall marks should be 85% and above. The organisation eligible for Four golden star will be awarded with score card and certificate.

iii) For **3 Golden Stars** rating, organisation should have at least seven key elements of the system in place and in each element have score at least 65% marks and above. The overall marks should be 75% and above. The organisation eligible for Three Golden Stars will be awarded with score card and certificate

iv) For **2 Golden Stars** rating, organisation should have at least six key elements of the system in place and in each element have score at least 60% marks and above. The overall marks should be 65% and above. The organisation eligible for Two Golden Stars will be awarded with score card and certificate.

v) For **1 Golden Star** rating, organisation should have overall marks 60% and above. The organisation eligible for One Golden Star will be awarded with score card only.

BENEFITS OF APPLYING FOR NSRS

1) Increased visibility of organization's effort in personal Safety, Health and Environment protection

2) Higher NSRS rating enchances stakeholder's confidence and gives a competitive advantage

3) Enhances employee moral and confidence of working at a safe workplace

4) Leap towards better sandards in Occupational Safety, Health and Environment.

5) Benchmarking safety system of the organisation at national level

6) Scaling the industries with the same standards and encourage towards continual development

7) Ensuring better safety culture with higher safety rating

8) Better safety standard leading to better productivity

9) Organisation receiving Five Golden Stars are eligible for applying the most coveted and prestigeuous NSC recognition i.e. NSCI Safety Shield.



A view of sample NSRS certificate

Many organisations have opted for NSRS and appreciated the NSC's initiative as they have benefitted by enhancing their OSH Management System through NSRS assessment.

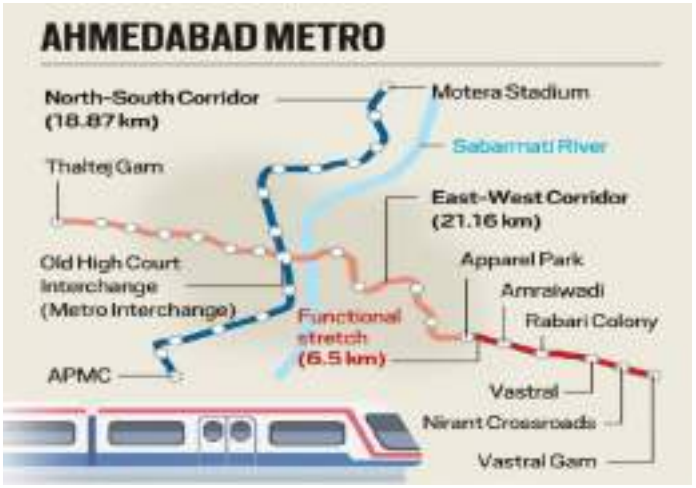
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SUCCESS STORY OF NSCI GOLDEN STARS RATING IN CONSTRUCTION INDUSTRY

Arvind Kumar Roy, Assistant General Manager – HSE, Afcons Infrastructure Ltd., Ahmedabad Underground Metro Rail Project, Phase1, GMRC(L), Email Id: akr_2007@afcons.com; royak1966@gmail.com

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condition), periodical SHE audits, reporting of near-miss reporting, effective communications, pre-activity safety meetings, housekeeping, work permit systems, applicable legal requirements and overall safety commitment for own employees, neighbourhood and set an example of ensuring eco-friendly working environment at a large.

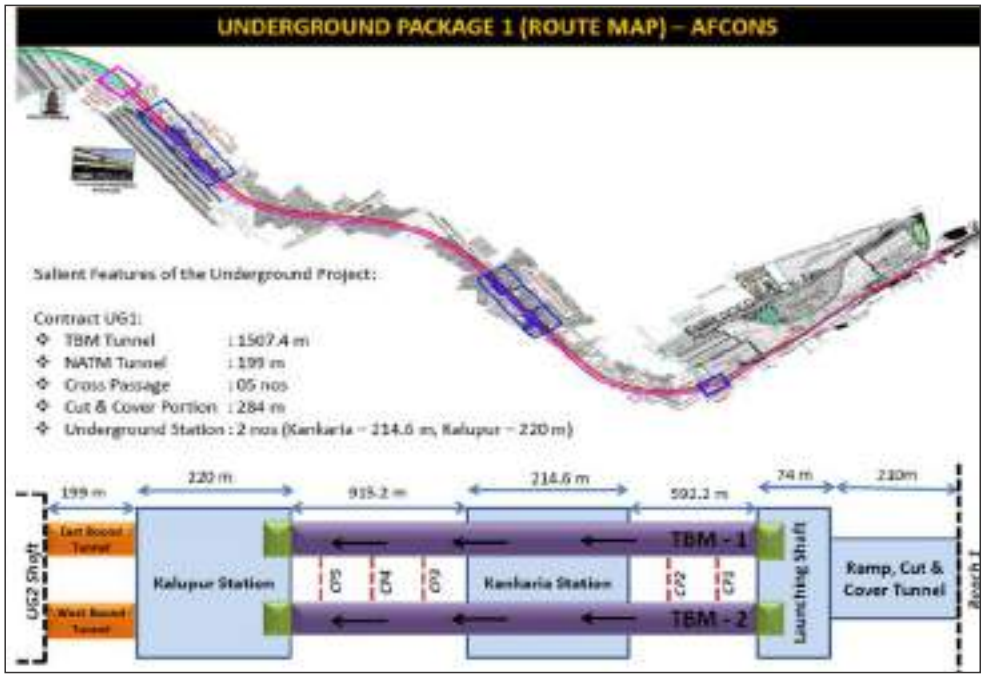
Top management constantly seeking new and innovative ways to reduce work-related injuries and occupational health problems, conservation of natural resources and safety for neighbouring people of project activities. Afcons committed to analyse the incident leading indicators and proactive approached to make safety alert to their workforces. Top management have administered the global guidelines to the project leaders (Project director/ coordinator/ project manager and made them first responsible to provide all supports and empowered to SHE Manager for effective implementation of SHE management systems on topmost priority basis. The effective implementation of safe operating procedures with the methodology of construction activities are needed to review from the design stage and facilitated with required infrastructure for incident prevention. Scheme of safety motivation for best performers and the project achievements on safe man-hours without lost time injury from 1 million to 20-million-man hours worked at project have the safety promotional schemes from top to bottom and on monthly basis among the best SHE performers-staff and workmen including subcontractors.

Afcons top management have established Afcons Safety Council with MD, DMD, P&M Directors, Directors Operations, Directors- HR & Admin, HOD HSE for evaluating overall SHE performances, review of SHE Audits, management review for further improvement and development, AfconSafe App for SHE observations by individual executives, managers on Safe Act / Good Practices, Unsafe Acts and Unsafe Conditions, which has been made compulsory participation and consultation of all employees, SHE Core Committee & made responsible them for daily meet on SHE, Weekly SHE Walks at workplaces, monthly SHE Committee Meeting / Review the performances / developments, SHE innovations, Risk Assessment on each activity, SOP and implementation, near miss reporting, act as mentor for subcontractors and periodical meeting with them for consultation and participation, near miss reporting, detail incident investigation and lesson learnt, periodical audit, special SHE Campaigns and safety promotional activities.

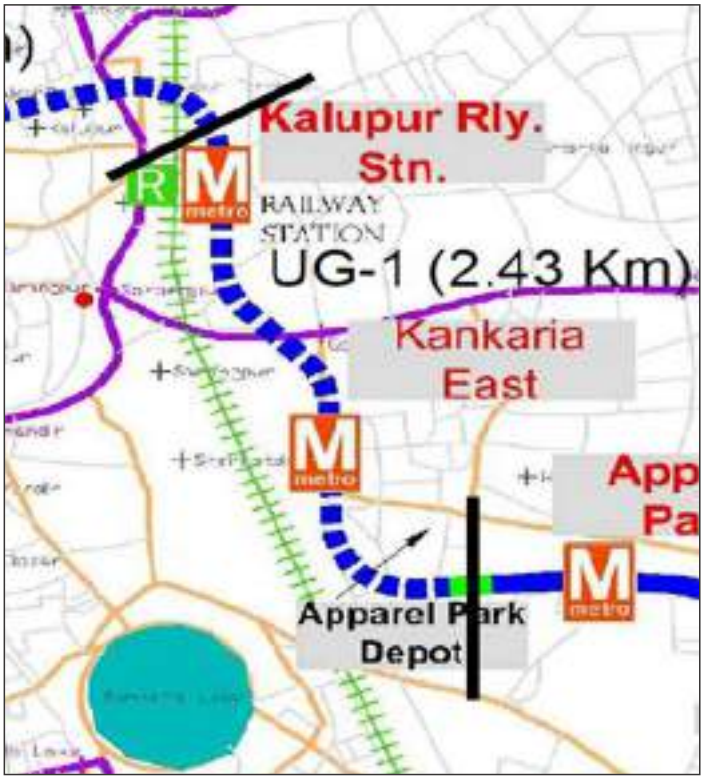
AFCONS project management are committed for 'excellence in safety, quality & execution' as a culture in the organization. For the communication and to obtain the commitment of all its internal stakeholders, the management conceptualized and developed the Total Satisfaction Model to maintain highest safety standards and quality delivery with conformance to Integrated Quality Management systems like ISO 9001:2015, ISO 14001:2015 and ISO 45001:2018 standards.

Top management understands the value of developing high safety culture and maintaining incident free work environment creating very good image in business development, customer satisfaction total satisfaction of employees and neighbours of conducting construction business..

AHMEDABAD UNDERGROUND METRO RAIL PROJECT - PACKAGE UG-1, PHASE1, GMRCL



UNDERGROUND PACKAGE 1 (ROUTE MAP) - AFCONS







Scope of work

Design and construction of underground stations and twin tunnels including finishes and excluding PHE, Electrical and HVAC from east end of east ramp to east end of launching shaft near kalupur metro station from chainage 14328.88m to chainage 11882.88m, which comprises of east ramp, twin bored underground tunnel between east ramp and kalupur metro station all cut and cover portion including two underground stations Kankaria east and kalupur metro station.









3. Employees participation and involvement in SHE matters.

Project management is committed to sustain excellence in business through an established HSE and Quality Management Systems. We aim to achieve the customer satisfactions by providing goods and services as per contractual, statutory, and regulatory requirements, improving in the process of competencies, competitiveness and continue the best efforts without compromising on health, safety, and environmental standards to maintain healthy and incident free work environment until completion of project activities. We shall achieve this through continual improvement of business processes, organisational drive on innovation, productivity, and effective infrastructure resource management. We value continuous awareness / training and sharing of information about the updated global HSE trends at all levels within the organisation.

Project management is responsible to get recognition in overall construction business with the importance of key ingredients of success and established in compliance with the internationally OHSMS:ISO 45001:2018 and ISO 14001:2015 standards that specify the requirements on good SHE performance to the success of business sustainability.

Afcons project management committed to.

- Identifying and complying with OHS&E related laws, rules & regulations, and agreements.
- Clearly defining responsibilities for achieving OHS&E objectives to ensure adequate resources are provided for imparting training and motivation.
- Identifying hazards, perform an OHS&E risk assessment for all site activities to reduce risk to an acceptable limit to achieve zero incidents.
- Report, investigate, document, and take corrective action to prevent re-occurrence of workplace occupational illness and incidents.
- Follow a systematic approach in pollution prevention, waste management and conservation of natural resources by their responsible and efficient use in all our operations.
- Have updated emergency response plan to attend all types of emergencies and disaster, offsite and onsite.
- Innovate design and develop inputs using latest national and international best practices to achieve continual improvement in SHE performance and management.
- Identifying and complying with OHS and seek commitment and cooperation from every level be it individual or external parties such as subcontractors towards environmental preservation and preventing occupational illness and incidents.

Our motto **"OHS is everyone's responsibility"** clearly depicts our commitment towards OHS&E and its continuous improvement to achieve the highest standards. We strongly believe behaviour-based safety is the key driver to achieve OHS&E Excellence.

4. Implementation to the recommendations of studies, audits, committees, etc.

Afcons top management have recommended the implementation of corporate and contractual SHE requirements to continue the best efforts from top to bottom for implementing all SHE matters related to EMS & OHSMS standards, corporate SHE strategies, contract requirements to accomplish the project with zero work-related injuries and ill-health. As per ISO standards (EMS & OHSMS) without compromising on safety-for global excellency implement, improve, and evaluate the performances by internal and external audit. Third party certification and assessment like NSRS for 5 Stars Safety Rating, MARS Audit, Electrical Audit, weekly safety walk through, quarterly external SHE management system audit and BOCW Act & Rules Audit, half yearly internal audit by lead auditor, surveillance audit from

accreditation body, monthly and quarterly management review for continuous improvement in SHE management system etc.

Constitution of site SHE committee has been constituted based on BOCW Act & rules and the directives of top management with the defined roles and responsibilities of project management to conduct meeting on monthly basis. All the core members of SHE committee are made accountable to ensure safe and healthy workplaces at all the time. Committee are not limited but on the following agenda will conduct meeting.

1. Discussions of status on the previous MOM and corrective actions taken.
2. Identify the probable causes of incidents and unsafe work practices (acts & conditions) and suggest on the remedial measures to implement the same.
3. Discuss in detail about near miss reporting, occurrence of incidents (if any) and lesson learnt, suggest on the best safe practices at workplaces.
4. Discuss about the innovative ideas suggested by members on SHE matters.
5. Stimulate the interest from top to bottom in safety drive and motivational programs.
6. Status of the compliance raised in SHE walks through and participation of workforces.
7. Review HIRA, EAI and the statutory compliances of ongoing activities.
8. Suggest required measures for improving health and wellness at workplaces and camp.
9. Status of MIS/TSG Data/ AfconSafe App/ contractual requirements including legal and others.





Corporate safety strategic goal, renewed SHE processes, rewards and encouragements for continuous improvement and development in SHE matters. Each employee of company has been instructed by top management to become a part to ensure the work environment -safe and healthy -everyday-everyone.

5. Special efforts and approaches to SHE and significant achievements (tangible and non-tangible)

Afcons would like to mention about special efforts and proactive approaches for significant achievement in SHE matters.

- Health and hygiene assessment at all the workplaces through awareness among the workforce, training, risk assessment, establish SOPs and implementation, external training, walk through, audit etc.
- Started 96 hours SHE induction training before deployment and safety handbook for routine activity, consultation, and participation of workmen in risk assessment, SOPs, walkthrough, sharing near miss reporting, incident investigation, lesson learnt, effective communication,
- Developed DMS for internal audit on EMS & OHSMS-raised audit report including non-conformity etc
- Developed AfconSafe App for raising HSE observations through web and mobile app for easy access and information to all -immediate corrective actions to preventing work -related injuries / ill-wealth.
- Monthly safety award scheme-best worker, best technician, best supervisor of the month with certificate of appreciation.








- Special safety award during special safety campaign-drive among the best contesters for safety quiz, safety poster, safety song, best housekeeping team, safety team etc
- Safety incentive for milestone achievement - recognition in SHE performance with certificate of appreciation, safety incentive 1 to 4 days gross salary, T-shirt etc.

6. SHE management, its linkages with Key Result Areas and outcomes.

Afcons have established SHE strategic with 100% supports by top management to set an example of safest culture development and vision till 2027 to stand Afcons SHE standards in top 10 international company. Annual SHE plans which are drawn from time to time clearly mentioning the targets, time frame is set every year in the month of March. Stakeholder's participation and consultation being ensured during the process.

SHE department have stablished their own functional OHS&E plan which outlines their health and safety performance of annual objectives and targets. HSE Annual operating plan for the coming financial year. Performance appraisal system is established in which health and safety objectives delegated to individual employees are discussed with individual by his manager. During the midterm performance appraisal process, objectives and targets can be amended if required. Head of the departments will ensure the implementation of plan in their respective department and reviews the progress on monthly basis. Processes are in place to ensure Healthy and safety performance is regularly measured, monitored, recorded, and analysed with results reported. Department's measure and reports HSE performance data monthly. The reported data is collated and analysed, as appropriate, and reported to Personnel who have the responsibility to act on the basis of this information. Information from Departmental safety review meetings and operation review meetings are used for management reviews. Management Review aims at arriving at decisions, identifying actions, assigning responsibilities and target dates. Decisions made during the Management Review Meetings will be implemented and communicated to all relevant parties, including any external parties. EHS department periodically aggregate and analyse health and safety performance data for all department, provide feedback and advice to the departments on initiatives to drive improvement in EHS performance. Systems are established to ensure the appropriate reporting of health and safety performance to relevant authorities. Relevant HSE systems and performance information is routinely communicated by management to relevant stakeholders.

7. Use of advanced digital technology (AI, AR/VR, Robotics, Drone etc.) to enhance safety

To enhance SHE management standards and prevention of work-related injuries and ill-health, SHE Dept. have implemented AfconSafe App for all frontline managers, engineers, officers and supervisors to raise onsite HSE Observations followed by immediate corrective actions to comply. Which assessment being carried out by safety Incharge, virtual meeting, video conferencing, digital

warning sign and stoppage of operational machinery on person come in contact, auto tripping of excessive load lifting machinery, excessive electrical circuit tripping devices, sensor system of over loading on excavated muck over skip bucket, digital view / CCTV to monitor the personnel engaged at workplace, limit switched fitted with batching plant for skip, conveyer belt, concreting mixing unit maintenance etc 40+ modules in HSE management software through web share, mobile app, drone photography, CCTV view for tunnelling, telephones etc for assessment of Accident/ Incident/ Near-miss reporting & analysis, Corrective Actions, HSE Training, BBS observation, employee occupational health management, observations, daily coordination meeting, weekly walks, committee meetings, mock drills, workplaces inspection, audits (internal and external), LOTO & work permit system, equipment inspection, display information and posters, national and international campaigns, special safety drive, ROR, SOPs, HIRAC, follow up environmental compliances-all parameters for ambient air, noise, stack emission, water, soil monitoring, segregation and disposal of hazardous waste materials through approved recyclers, follow up third party testing and certification, environment review (aspect & impact) and special SOP for significant environmental aspect and risk, MSDS, drama, quiz competition, motivation and reward system, employee feedback (survey), subcontractor evaluation, 5s management etc.

Afcons safety council by top management (MD), HODs are Chief SHE is reviewing overall all SHE performances and the best project being awarded with trophy, safety incentive and suggested top management SHE strategy for further improvement.

8. Experience of NSRS and NSRS contributions towards improvements in SHE at Afcons, Ahmedabad Underground Metro Rail Project, Phase1, GMRCL

Ahmedabad underground metro has scored 87.07% and awarded 4 Golden Stars rating by National Safety Council of India in NSRS Assessment with details evaluation of all the eight key elements systems in vogue.

Successful achievement of NSCI 5 Golden Star ratings in the construction industries are the significant achievements in OHS Performances. Ahmedabad Metro Rail Underground Project, Phase1 of GMRCL has successfully achieved 4 Golden Star Ratings, whilst have set an example in developing world class OHS Culture and implementation of OHSMS standards with applicable statutory requirements and contribution towards effectively implementing and improving to maintain safe, healthy and cares of environmental protection through recycling of natural resources, energy conservations, saving of carbon emission and disposal of construction waste materials through GPCB/CPCB approved recyclers. The project alignment of Ahmedabad Underground Metro Rail belongs to the oldest, densely populated city area and the most challenges for continuous implementation and development of OHSMS standards to maintain the records of zero accident / incident since the commencement period of the project.

NSCI experts are very thorough with micro-observations and internationally trends to conduct NSRS assessment with all the following major 8 elements to eliminate the potential situations of foreseen occurrences of work-related injuries and ill-health with applicable laws, rules & regulations in the construction industries:







1. **OS&H Management** - Expert teams of NSCI have thoroughly checked the documentations and on-site inspections during execution phases. Based on their thorough inspections and documentations auditing for three days in first visit and 2 days in the second visit, Ahmedabad underground project unit have obtained 582 out of applicable marks in OS&H management system 675, which is in percentage score 86.22% is a significant achievement among the construction industries have opened the eyes of project management for further improvement scope

and developing a culture of OS&H standards to avert the likelihood occurrence of work-related injuries and ill-health.

2. **Physical hazard** - workforces are the supports of construction activities, which have very high potential risks to meet with work -related injuries and ill-health at workplaces. They're generally frequent changes and unskilled in the construction sector. The continuous safety awareness and close monitoring of workers during construction activities becomes a great challenge for the project management to maintain safe and healthy work environment. NSCI expert teams have thoroughly inspected, onsite interviewed with workforces, and maintained awareness records from first day of deployment to the routine job of safe work practices. Ahmedabad underground project unit have obtained 498 out of applicable marks in physical hazard management system 592, which is in percentage score 84.12% is a significant achievement among the construction industries have opened the eyes of project management for further improvement scope and developing a culture of OS&H standards to avert the likelihood occurrence of work-related injuries and ill-health.

3. **Chemical hazards** - different types of chemicals (cement, silica, oil and lubricant, paint, solvent, concrete curing compound, polymer bonding agents, epoxy grouts, sealants, adhesives, water repellents etc) are being used for construction activities-which are hazardous, and workforces can suffer from occupational diseases/ ill-health on exposure / inhalation/ indigestion/ skin diseases etc. Project management have significant challenges to implement safe procedures, create awareness and maintain healthy working environment with the guidelines of MSDS of chemicals and prevention procedures in handling, usage, and disposal through recyclers at workplaces. Ahmedabad underground project unit have obtained 81 out of applicable marks in Chemical hazards management system 102, which is in percentage score 79.41% is a significant achievement among the construction industries have opened the eyes of project management for further improvement scope and developing a culture of OS&H standards to avert the likelihood occurrence of work-related injuries and ill-health.

4. **Fire & explosion hazard** - construction management are responsible to implement fire and explosion prevention at workplaces throughout all phases of the construction and demolition works. All pressure vessels, gas cylinders (Oxygen, Acetylene, Compressors, Fire Extinguishers etc) have been thoroughly hydro tested by competent authority, display of SOP, identification coding, safely guarded of moving parts and mounted functional pressure gauges etc. Ahmedabad underground project unit have obtained 261 out of applicable marks in Fire & Explosion hazards management system 314, which is in percentage score 83.12% is a significant achievement among the construction industries have opened the eyes of project management for further improvement scope and developing a culture of OS&H standards to avert the likelihood occurrence of work-related injuries and ill-health.

5. **Industrial hygiene and occupational health** - NSCI relies on industrial hygiene and occupational health to evaluate routine jobs and provided workers accommodation for potential health hazards. Developing and setting mandatory occupational safety and health standards involves determining the extent of employee's exposure to hazards and deciding what is needed to control these hazards, thereby protecting the workers. Industrial hygiene and occupational health are trained to anticipate, recognize, evaluate, and recommend controls for environmental and physical hazards that can affect the health and wellbeing of workers. Project management also play a major role in implementing and developing to protect workers from health hazards associated with toxic chemicals, biological hazards, ergonomical hazards and harmful physical agents. Ahmedabad underground project unit have obtained 213 out of applicable marks in Industrial hygiene and occupational health management system 241, which is in percentage score 88.38% is a significant achievement among the construction industries have opened the eyes of project management for further improvement scope and developing a culture of OS&H standards to avert the likelihood occurrence of work-related injuries and ill-health.

6. **Accident / incident reporting, investigation, and analysis** - Incident/accident investigation analysis and understanding the causes of such events is a critical element of safety management. Afcons have developed the system of overriding purpose in carrying out incident investigation is to understand why an incident happened in order to improve the management of health, environment and safety and prevent similar incidents happening in the future. It confirms the general experience that human behaviours and/or the person carrying out the task are frequently blamed as the cause for an incident. However, a more careful investigation often reveals that the underlying root cause of such incidents is generally a “lack of management control” due to inadequacies in the safety management system, standards, compliance, monitoring of work, etc. Ahmedabad underground project unit have obtained 288 out of applicable marks in Accident / incident reporting, investigation, and analysis management system 300, which is in percentage

score 96.00% is a significant achievement among the construction industries have opened the eyes of project management for further improvement scope and developing a culture of OS&H standards to avert the likelihood occurrence of work-related injuries and ill-health.

7. **Emergency preparedness** - OS&H management system requires to establish emergency response procedures at project. Continuous awareness and the evidence provide a plan to assist the project management in developing these procedures. Emergency preparedness helps to minimize the human suffering and economic losses that can result from emergencies. It alerts to the workforce for understanding the consequences and complexity at project, as well as their access and location, have a bearing on the degree of planning necessary for emergencies. Afcons have developed the system and maintained emergency response procedures. Ahmedabad underground project unit have obtained 245 out of applicable marks in emergency response procedures 270, which is in percentage score 90.74% is a significant achievement among the construction industries have opened the eyes of project management for further improvement scope and developing a culture of OS&H standards to avert the likelihood occurrence of work-related injuries and ill-health.

8. **Safety inspection** - Afcons @ Ahmedabad Underground Metro has implemented AfconSafe App for SHE Observations on Safe Act/Good Practice, Unsafe Act, Unsafe Condition and made responsible to all the front-line supervisor to raise on low, medium, high, and critical potential situation of leading consequences of work-related injuries and ill-health at workplaces. Immediate corrective measures to implement and maintain incident free workplaces. Safety inspections being done on daily, weekly by the key responsible personnel and outcomes of SHE observations considers seriously for corrective actions. Ahmedabad underground project unit have obtained 74 out of applicable marks in safety inspection 81, which is in percentage score 91.36% is a significant achievement among the construction industries have opened the eyes of project management for further improvement scope and developing a culture of OS&H standards to avert the likelihood occurrence of work-related injuries and ill-health.

Project management have experienced on NSRS assessment processed by NSCI expert assessors in two phases with Pre-Visit Questionnaires, detailed assessment in OHSMS standards on-site visit /through discussions / review of documents, Re-verification of their suggested site visit & Rating for benefits to implement and develop SHE matters in prevention of work-related injuries and ill-health.

NSRS experts had started 1st phase 7-9 April 2022 and 2nd phase 5-6 May 2022 for re-verification & NSRS rating. NSCI assessors have thoroughly inspected at workplaces and verified OS&H documents during their site visit and many SHE lapses were raised, which can lead serious work-related injuries and ill-health. The Assessors had highlighted their observations on all the elements of international best practices and applicable laws, rules and regulations for improvements in feedback meeting with the project management.

Afcons team accepted the guidelines and lapses in SHE matters for immediate corrective actions with the responsibility and target date for compliances. It's proven that positive response and timely compliances were re-verified for sustainable development and develop a culture of safe work environment. NSCI Assessors were appreciated and awarded 4 Stars Safety Rating, which is the significant achievement in construction sector. Afcons is alone company doing Ahmedabad Underground project has been awarded with 4 Stars Safety Rating Award 2022 by NSCI.

Afcons management have experienced NSRS is most fabulous for sharing and enhancing SHE knowledge among workforce, updated trends and safety elements have very big platform of learning, processing, implementing, maintaining zero target of work-related injuries and ill-health at workplaces, which giving strengthen to SHE management system and continuous assessment through experts of NSCI as third party plays an important role to create good image and safe work practices with follow up the applicable laws, rules and regulations.

NSRS have contributed a lot for improving SHE management systems especially third-party testing and certifications for lifting tools & tackles, hydro-testing for pressure vessels / containers, machine guarding, firefighting system, electrical safety, emergency preparedness, assessment of potential hazards and risks, mitigation measures, near miss reporting, lesson learnt etc. proactive approach to follow all SHE elements and implementation upto grass root level-definitely construction sector can get excellency for 5 Stars Golden Stars rating 95-100% and can set an example of developing highest SHE culture with zero work-related injuries and ill-health to stand the topmost safest organisation India and abroad.




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after an extensive evaluation of Occupational Health and Safety Management System by NSC assessors, has been awarded a rating of
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19th Safety Convention
Inaugural Session and Awards Presentation




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Certificate of Appreciation
This Certificate of Appreciation is Awarded to
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Ahmedabad Metro Rail Project, Phase1
UG1 Package, GEC GMRCL
LETTER OF APPRECIATION


Environment Excellence Awards 2020
Special Jury Recognition
for Construction & Infrastructure Sector
in Large Enterprise Category
awarded to
AFCONS Infrastructure Limited
Ahmedabad Underground Metro Rail Project




GUJARAT METRO RAIL CORPORATION (GMRC) LIMITED
Ahmedabad Metro Rail Project, Phase-I, UG-1 Package,
LETTER OF APPRECIATION







The importance and impact of Safety has been in focus more than ever before in recent years, and to that extent, developing a comprehensive Safety Culture has become imperative.

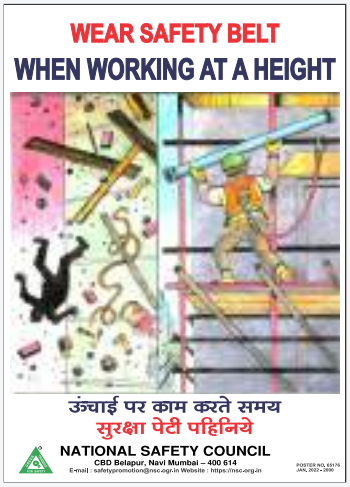
Conclusion: NSRS for Golden Stars OS&H Award Assessment by the experts of NSCI opening the minds of company management to create safe and healthy work environment, which plays good moral and spirit of working personnel to keep confidence about the company management for their safety and health perspective and employees consultation and participation for developing safety culture and sustainability in growth of company with quality and safety for total satisfaction of stack holders, where laws, rules and regulations are being complied and importance given by top management on employees safety and wellbeing. NSCI experts are very comprehensive, contemporary, and quantified assessment, which supports in company safety and health performance with the updated regulations, recognition, and best practice techniques to demonstrate the commitment of top management for achieving excellence in safety and health standards among employees, stakeholders, and international reputation for suitable business requirements, promote continual improvement and are effectively implemented. Consistently high safety standards are achieved through a robust OS&H assurance process including standardisation, training, and performance monitoring. We're confident if the approach of top management is proactive in, SHE matters, 100% culture of safety and zero record of work-related injuries and ill-health can be achieved and organisation can set an example of continual growth without harm. Afcons Management have stated strategic goals for 2027 is to be in the Top 10 Safe Organisations Globally.

* * *

NSC's SAFETY POSTERS







For more details, please visit https://nsc.org.in or write to safetypromotion@nsc.org.in

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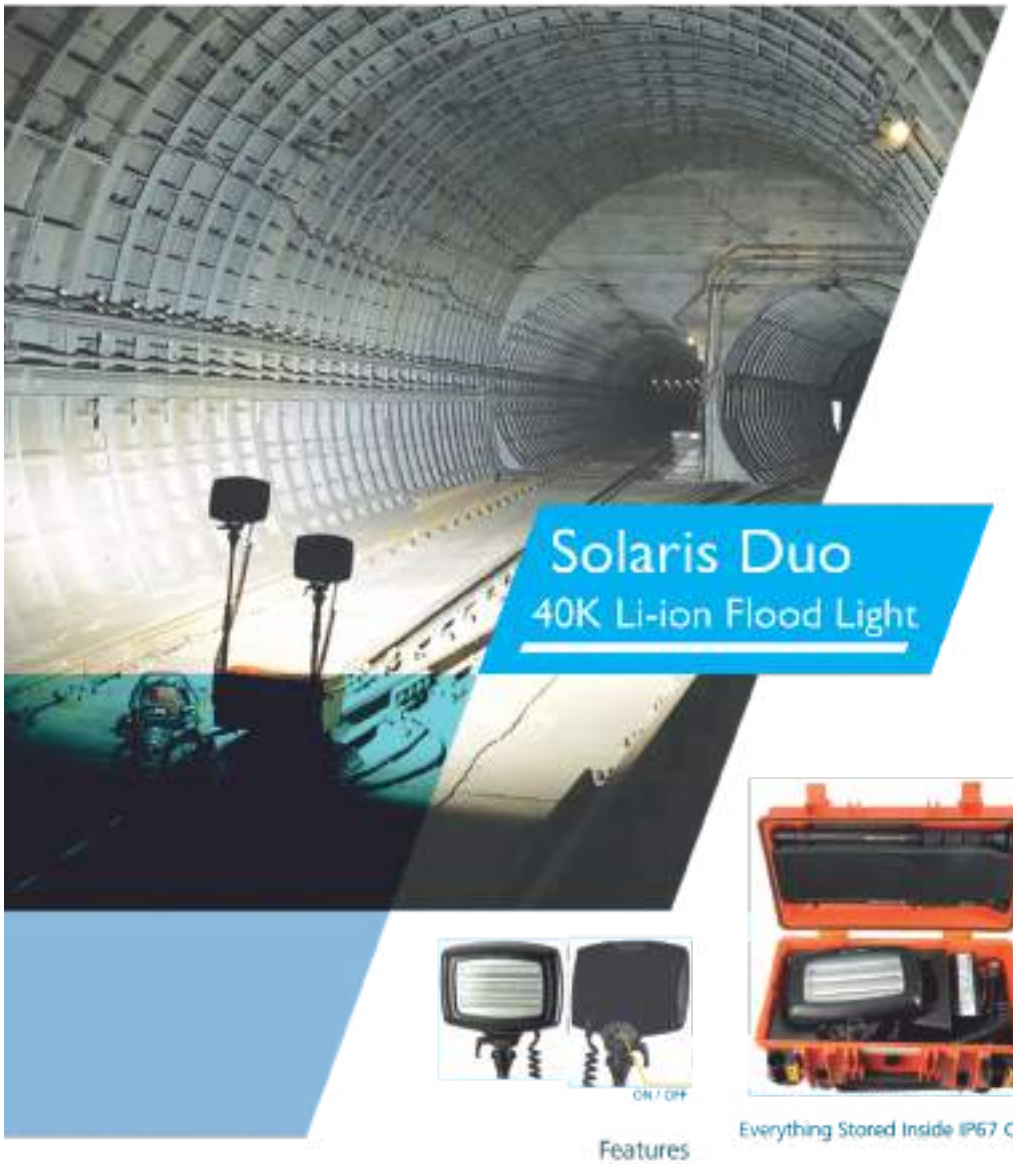
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Easy to Install with Adhesive on all surfaces.



HSB-52
CORNER L-SHAPE



HSB-53
HALF MOON SHAPE



HSB-54
SEMI-CYLINDRICAL SHAPE



HSB-55
TUBE-SHAPE INNER



HSB-73
BEAM GUARD PU



HSB-57
FLAT TYPE

NEW



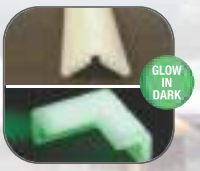
KNEE GUARD
(FOAM)



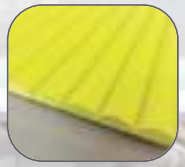
HSB-58
HEAVY CORNER L-SHAPE



HSB-61
EDGE CORNER



HSB-62 / HSB-63
Corner L-Shape / Edge Corner
photo luminescence Self Adhesive



HSB-67
ACCORDIO SLIM SHEET
(600X900MM)



HSB-68
SOFT WARNING TAPE
(EASY TEAR)
SELF ADHESIVE - 150MM

Hadid® Industrial Safety Equipment and Clothing



HRJ-01
REFLECTIVE JACKET



HCC-02
COTTON COVERALL



HDC-03
DISPOSABLE COVERALL



HG-101
CHEMICAL SPLASH GOGGLE



HG-102
CHEMICAL SPLASH GOGGLE



HG-121
CHEMICAL SPLASH GOGGLE WIDE VISION



HG-104
GOGGLE



HG-ZOOM
GOGGLE



HG-110
WELDING GOGGLE
IR5 / IR11



HG-158
METAL MESH GOGGLE



HG-162
OVERSPEC GOGGLE



HBC-05
BUMP CAP



HTG-07
TOE GUARD



HE-201
EAR MUFF



HEH-219
EAR MUFF
HELMET ATTACHABLE



HFR-51 + HV523
FACE SHIELD
RATCHET /
STEEL MESH VISOR



HFS-528
FACE SHIELD
HELMET ATTACHABLE



HFP-552
FACE SHIELD
PREMIUM



HFE-572
FACE SHIELD



HFR-51 + 521AL
FACE SHIELD



HMR-605
RE-USABLE
DUST MASK



HMD-608
MASK



HRBT-314
BARRICATION TAPE



HRC-116
S LINK CHAIN
(RED&WHITE / YELLOW
& BLACK)



HNF-15
NITRILE FLOCKLINE
330MM & 450MM

HGDA-29
HEAT RESISTANT
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CHALLENGES TO BE ENCOUNTERED IN BIO-MEDICAL WASTE MANAGEMENT

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ABSTRACT

Surgical masks are the most preferred Personal Protective equipment (PPE) that people use in case of a pandemic situation. As most of these surgical apparels are disposable in nature and hence, they should be disposed of after every single use because the containment of virus in surgical apparel make the apparel itself infected and disposal of these will come under biomedical hazardous waste management. During a pandemic situation, the demand of these surgical apparel rises to its extremities and the collection, segregation, and disposal units seems to become insufficient to handle these extreme amounts of hazardous waste. Also, exposure to these hazardous waste possess serious threat to human life and environment and it needs special treatment before its final disposal (Mathur, Patan et al. 2012). Generation of potentially hazardous waste has already been increased in healthcare services (Ghasemi and Yusuff 2016) throughout the world in past few months is a burden to the existing biomedical waste management infrastructure. This paper aims to estimate the challenges that India will face in disposal of biomedical waste with present disposal infrastructure available and its shortcomings including the effect of Covid-19 pandemic in waste generation. Also, this paper gives information to about the various disposal methods for disposing the biomedical waste generated from the healthcare entities.

Keywords: Personal Protective equipment (PPE), Hazardous waste, Biomedical Waste Management (BMWM).

1. Introduction:

With respect of BMWM we have 3 international agreements and conventions which are Basel convention on hazardous waste, Stockholm convention on persistent organic pollutants, and Minamata convention on Mercury. In 2012, WHO conducted a survey of 24 West pacific countries to understand the standard of BMWM system in these countries. The assessment was based on 5 key parameters namely management, Training, Policy and regulatory framework, technologies implemented and financial resources. The result reveals that only japan and republic of Korea out of 24 countries are able to use the best technologies available in field of biomedical waste management although in management, training and policy regarding these wastes products, the performance of most of the countries were satisfactory. (Datta, Mohi et al. 2018).

Although WHO categorises Medical waste in 8 categories as-

- General Waste
- Pathological
- Radioactive
- Chemical
- Infectious to potentially infectious waste
- Sharps
- Pharmaceuticals
- Pressurized containers

But on broader terms all the waste getting generated from hospitals are categorised as either infectious or non- infectious waste (K and R 2009). Infectious waste are those that have potential to transmit pathogenic diseases and these waste are considered as hazardous in nature. On the other hand non-infectious waste are mostly from activities of visitors, food preparation, packing, etc. These waste are non-hazardous in nature and generally large in volume as compared to infectious waste. There is no common facility available for all types of BMW treatment and disposal. Every institution have to recognise there specific requirements as per the type and amount of production of BMW.(Gravers 1998). Some of the methods for BMWM are Incineration, Autoclave treatments, Hydroclave treatment, Microwave treatment, Chemical disinfection and Sanitary and secured landfilling.(Pasupathi, Sindhu et al. 2011)

Out of these various crucial steps in BMWM as Handling of waste, segregation, mutilation, disinfection of waste, proper storage, convenient transportation and final disposal (Acharya 2000) the step facing major problem now-a-day with BMWM is segregation. Most of the hospitals do not properly segregate the BMW which ultimately leads to mixing of these hazardous wastes with general waste and results in inappropriate disposal. This improperly disposed mixture or waste act as source of nosocomial infections, environmental degradation, have toxic gases released, habitat for insects and rodents causes spread of various diseases like cholera, typhoid, hepatitis and AIDS through contaminated sharps. (Aggarwal and Kumar 2015). In most of the developing countries re-use of the used-disposed syringes and needles are quite common but it possess great hazard to public health and can cause various infectious diseases. (World Health Organization 2005). Although sharps share only 1% of total waste but can act as major source of disease transmission if not managed properly. (CPCB 2014). In the year 2002, WHO reported that India reuses 50% of the generated biomedical waste like needles, syringes etc. which was intended for single use (Mattoo,

Singh et al. 2014). Also these harmful waste enters in food chain via water and soil and shows harmful effects on plants, animals and human beings.

The collected waste is stored temporarily till the off-site transportation is completed. The transportation is done in colour coded trolleys once or twice a day. Intramural collection and transportation of generated waste is normally done by hospital staff or staff on contractual basis and extramural transportation is done by CBMTFs. The waste is collected in bar-coded bags and transported in GPS enabled vehicles to the treatment site. These bio-medical waste must be stored in isolated areas for not more than 48 hours and in separation with municipal waste which is not properly followed in developing countries like India. (Patan and Mathur 2015). The persons involved in handling of these bio-medical waste at various stages like collection, segregation, transportation etc. do not get suitable PPEs as a result suffers from various diseases. In India, there around 4 million informal workers and state employees collecting garbage door to door without any protective gear. (Relph 2020, 1st May).

Need for an effective BMWM Plan:

Recent advancements in health care sector has been a boon to the mankind and on the other hand with the amount of waste generated from the health care sector if not treated properly, it can pose a serious threat to the existence of the mankind. The wastes generated by healthcare sector commonly known as Bio-medical waste has been increasing off late and with a projected raise in Bio-medical waste generation by 7.5%, it highly recommended to have an effective Bio-medical waste disposal management plan.

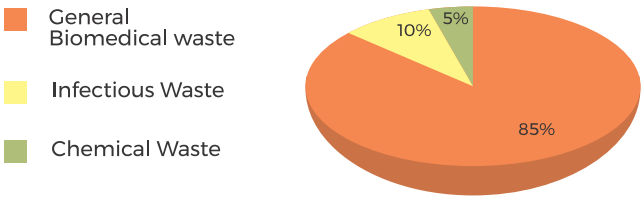
An effective Bio-medical waste disposal management plan starts off with identifying the various sources of BMW generation followed by identifying the components of BMW.

Primary sources of BMW generation	Other sources of BMW generation
Hospitals, nursing homes, veterinary hospitals, clinics, dispensaries, blood	Households, Industries, education institutes and research centres.

Table-1: Depicts various sources of BMW Generation (Babu, Parande et al. 2009)

Components of BMW: In common, most of the constituents of BMW are non-infectious in nature having similar characteristics that of MSW (World Bank et.al. 2012) known as 'General Bio-medical Waste'. Even though accounts for smaller amount, the infectious wastes commonly known as 'hazardous and extra-hazardous wastes' needs attention throughout its life cycle (Radha, Kalaivani et al. 2009) (World Bank 2012 et.al.).

Graph-1: Depicts the constituents of BMW (Radha, Kalaivani et al. 2009, CPCB 2007)



The amount of BMW produced from hospitals depends on various factors such as capacity of hospital in terms of beds, types of services offered, Socio-economic status of patients and area conditions. (Patan and Mathur 2015). The improper disposal of these waste can lead to various infectious diseases and hence it's important to dispose these wastes in safe manner (Mathur, Patan et al. 2012). As per the biomedical waste (management and Handling) rule 1998, it is also the legal requirement of the occupier to ensure that the BMW waste is disposed ina safe manner. Although it is not necessary that all the institutions must have their own disposal facility but it is the responsibility of occupier to ensure that the generated BMW are treated within 48 hours. (Pasupathi, Sindhu et al. 2011). A small percentage of BMW are hazardous in nature and need to be treated and disposed with sufficient care. The process involves various steps like handling, segregation, mutilation, disinfection, storage, transportation and disposal. (Acharya and Meeta 2000). Out of total BMW generated by hospitals in India only 10% is hazardous, 85% is general and 5% is extremely hazardous. (Radha, Kalaivani et al. 2009) but unfortunately most of the BMW (hazardous and non-hazardous) are disposed with municipal waste without no proper treatment.

Multiple cities in India are not able to treat the daily produced solid waste due to insufficient resources and lack of infrastructure (Sharma and Jain 2019) and when the biomedical waste get mixed with these municipal solid waste it increases the quantity of waste as well as the treatment level need to be improved and ultimately results in large amount of untreated hazardous solid waste. The workers involved in waste collection and transportation collect these BMW and try to resell in local markets. Not only these BMW can cause deadly diseases to person involved in picking up these items but also to persons who will buy it from local market. Also, these infectious waste when mixed with municipal waste has potential to produce whole new lot of diseases (Nugget 1996). Most of the surgical apparel from hospitals or from general public are dumped in bins located either inside or outside the premises and eventually get mixed with municipal solid waste. At both inside and outside the healthcare unit, the risk can be minimized by proper treatment of medical waste. (Johannessen, Dijkman et al. 2000) Various places where incineration facilities are not available, these biomedical wastes are being burned in

open pit which is again extremely harmful to health for both living beings and environment. Main contributing factors for these are lack of infrastructure, awareness, and competent personnel who can handle BMW. (Radha, Kalaivani et al. 2009).

2. Literature Review:

Bio-medical Handling Rules 2016 has been used for reference for handling biomedical waste.

Category	Substance	Colour coded bag	Disposal method
1	Human anatomical waste (human tissues, organs, body parts)	Yellow	Incineration / deep burial
2	Animal waste (animal tissues, organs, body parts, carcasses, bleeding parts, fluid, blood and experimental animals used in research, waste generated by veterinary hospitals, colleges and animal houses)	Yellow	Incineration / deep burial
3	Microbiology & Biotechnology waste (wastes from laboratory cultures, stocks or specimens of micro-organisms, live or attenuated vaccines, human and animal cell culture used in research and infectious agents from research and industrial laboratories, wastes from production of biologicals, toxins, dishes and devices used for transfer of cultures)	Red	Incineration/ autoclaving/ microwaving
4	Waste sharps (needles, syringes, scalpels, blades, Glass, etc. that may cause disinfection. Both used and unused sharps)	Blue	Disinfection by chemical treatment/autoclaving, microwaving and mutilation/ shredding
5	Discarded medicines & cytotoxic drugs. (wastes comprising of outdated, contaminated and discarded medicines)	Green/ Blue	Shredding and deep burial
6	Items contaminated with blood, and body fluids including cotton dressings, soiled plaster casts, lines, beddings, other material (Solid waste)	Blue	Disinfection by chemical treatment/ autoclaving, microwaving and mutilation/ shredding
7	Solid Waste generated from disposable items other than the waste sharps such as catheters, intravenous sets, etc.	Blue	Disinfection by chemical treatment/ autoclaving, microwaving and mutilation/ shredding
8	Liquid waste (waste generated from laboratory and washing, cleaning, housekeeping and disinfecting activities)	White	Disinfection by chemical treatment and discharge into drain
9	Incineration ash (ash from incineration of any biomedical waste)	Black	Disposes in Municipal landfill
10	Chemical waste (chemicals used in production of biologicals, chemicals used in disinfection, Insecticides, etc.)	Black	Chemical treatment/ discharges into drains for liquids and secured landfills for solids

Table-1: Depicts BMW disposal methods

Out of these methods mentioned in above Table - 1, **Incineration for medical waste is the most preferred mode of disposal**. (Patan and Mathur 2015).

Advantages of Incineration: The basic advantage of this method is it reduces the total volume and also removes the pathogenic bacteria from the waste.

Dis-advantages of Incineration: Although it is a reliable method but it requires large capital requirement and has high operational cost. Also there is requirement of highly skilled labour to operate these incinerators, ad unavailability of local material requirement for incinerator construction also adds up to the burden. The fuel requirements and the environmental damage that is associated with it also must be considered. Adding to it another major drawback of using incineration for treating BMW is the toxins that evolve due to incomplete combustion, causes rise in Products of incomplete combustion (PIC) and Dioxins. Dispersion of metals which do not destroy during incineration is also serious cause of environmental degradation and it causes severe health impacts like cancer and tumour. Medical devices made up of polyvinyl chloride (PVC) when burned inincinerators produces large amount of dioxins and have maximum impacts on environment.(Vilavert, Nadal et al. 2015). Study done by (Subramanian, Ohtake et al. 2007) found in the sample collected from Delhi, Mumbai and Kolkata, the presence of high concentration of dioxins in breast milk of humans.

Other Technologies:

Various other technologies that may successfully replace the incineration in near future. Some of them are: (a) Low heat technologies (93˚ C to 177˚ C), (b) medium heat technologies (177˚C to 540˚C), (c) high heat technologies (540˚C to 8300˚C), (d) plasma pyrolysis, € chemical based technologies like chlorine and non- chlorine based technologies, (f) water reduction technology (Li and Jenq 1993), (g) Lynntech's (Ozone based decontaminations technologies), and (h) Biological method of disposal. (Datta, Mohi et al. 2018).

Although it would be better if hospital have their own BMWM and disposal facilities but as in current scenario most of the hospitals do not have these facilities, cities offering common disposal facility for waste treatment but still most of the hospitals of cities are yet to join these offerings.

Process Flow/Methodology-For handling the CBMW:

Due to rapid urbanization there is sheer rise in the biomedical waste generation which was already overburdenon waste management facilities in urban areas. (K.V.Radha 2009, April,). But in this covid-19 pandemic there

is a sharp additional rise in the biomedical waste generation specifically PPEs including face and head masks, gloves, fluid resistant aprons etc. aggravates the problems. Covid-19 pandemic throws a unique challenge in the world to deal with un-estimated amount of BMW getting generated from covid hospitals, quarantine centres and home quarantine facilities. India lacking in proper monitoring mechanism on waste generation and treatment canlead to more problematic scenario. (Mohan 2020). Due to covid-19 pandemic, the world will be drowning in the medical waste and it will have huge impact on BMWM practices for years to come. The impact of this pandemic will be deep and broad. (Cutler 2020). The (Zuo 2020) claims that china is overloaded with medical waste after this pandemic and Wuhan, centre of covid-19 pandemic, producing six times more medical waste than usual. During the peak of outbreak, Wuhan were generating 240 tonnes of BMW per day compared to 40 tonnes per day before pandemic. Learning from these hazardous situation prevailing all over the world CPCB has released guidelines to control the situation in India. As per recent CPCB guidelines released in April 2020,in addition to BMWM rules 2016, all the BMW getting generated in isolation ward from confirmed or suspected patients, shall be collected in double layered coloured bags to ensure no leaks and all the dedicated collection bins must have covid-19 printed on it. Also the bags collecting waste from covid-19 wards must be labelled with"covid-19 waste". These waste should be disposed on priority basis as have great potential to spread infection. Also it bounds the owner of the healthcare unit not to store these waste for more than 24 hours and should be handed over to CBMTFs on daily basis. A CBMTF cater all healthcare units exist in the radial distance of 75 km within a State/UT. There should be separate vehicle which transport the biomedical waste from isolation ward to treatment facilities and must be sanitized with sodium hypochlorite solution after each trip. The inner and outer surface of all the bins, containers and trolleys for used in storage of covid-19 waste must be disinfected with 1% sodium hypochlorite solution on daily basis. Collect used PPEs such as goggles, face-shield, splash proof apron, Plastic Coverall, Hazmet suit, nitrile gloves into Red bag and Collect used masks (including triple layer mask, N95 mask, etc.), head cover/cap, shoe-cover, disposable linen Gown, non-plastic or semi-plastic coverall in Yellow bags. Also there has been a provision given for the remote areas having non availability of CBMTFs, in case of large volume of yellow colour coded covid-19 bags generated, deep burial can be performed for disposal of these waste.(CPCB 2020). Owing to the recent surge in biomedical waste, the environmental agency of U.K. has relaxed some of the rules and allows the waste infected with covid-19 to be burned in energy from waste incinerators, which was not allowed before. China has registered six times more waste generation in covid pandemic in comparison to its normal waste generation rate and to tackle this several new waste treatment plants and 46 mobile treatment facilities were constructed. (Fletcher 2020, 14th May). In India also, in addition to CPCB guidelines, few states like Uttarakhand made certain rules strictly in adherence to Covid-19 pandemic as gave responsibility to healthcare facilities to have pre-treatment and segregation of certain categories of waste. In any case CBMTFs will be having ultimate responsibility to dispose the waste in proper procedure.

Category of waste	Colour code	Pre-treatment required or not	Final disposal option at CBMTFs
Soiled waste like items contaminated with blood (excluding blood bags) and body fluids, cotton swabs etc.	Yellow	Not required	Incineration
Chemicals used in the labs, liquids waste generated in labs, used or disinfectant to be discarded, infected secretions, aspirated body fluids, floor washing and other housekeeping and disinfection activities	Yellow	Separate collection system leading to effluent treatment plant for pre-treatment and neutralization	The pre-treatment liquid waste shall conform to the discharge norms and then lead to the general drain.
PPEs like face masks, gown, caps, etc. (made of fibre material or others except those material of disposable plastics).	Yellow	Not required	Incineration
Discarded linen, beddings contaminated with blood or body fluids	Yellow	Not required	Non-chlorinated chemical disinfection followed by incineration
Microbiology and laboratory waste like cultures and stocks, specimens, vaccines, dishes and all devices use for culture, and blood bags etc.	Yellow	Pre-treatment with nonchlorinated chemicals or autoclave in safe plastic bags or containers.	Pre-treatment followed by incineration
IV Tubing's, bottles, sets catheters, urine bags, vacutainers etc.	Red	Not required	Autoclave, shredding followed by recycling

Category of waste	Colour code	Pre-treatment required or not	Final disposal option at CBMTFs
Broken or intact glassware, medicine vials, ampoules except those contaminated with cytotoxic waste.	Blue Puncture proof, leak proof box or container with blue marking	Not required	Disinfection then recycling
Metallic sharp waste like needles, scalpels, blades, syringes with fixed needles	White Puncture proof, leak proof, tamper proof containers	Not required	Autoclaving, shredding followed by encapsulation or disposed in iron foundries.

Table-2: Depicts CPCB suggestions on disposal of waste generated from CBMWFs

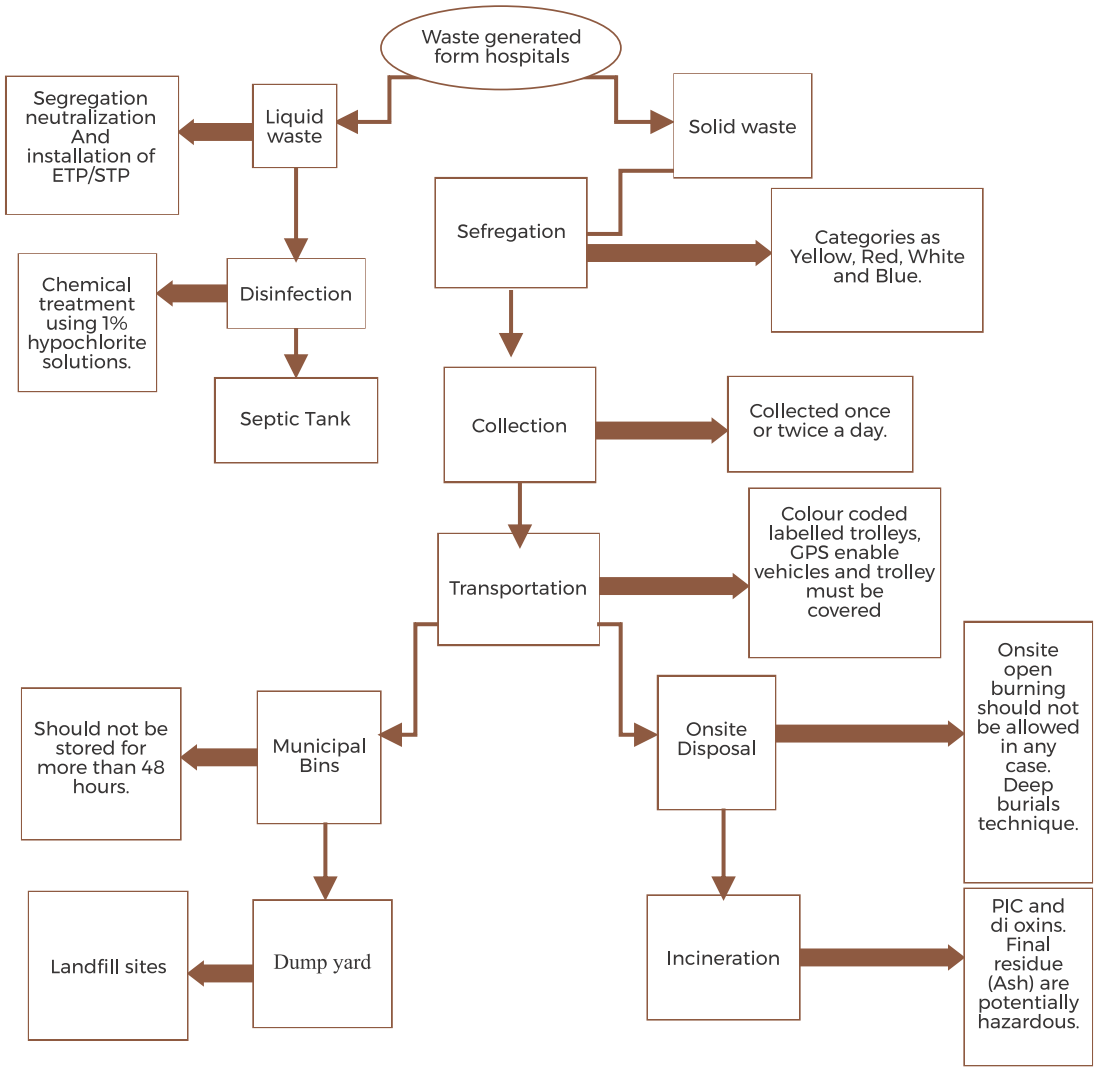
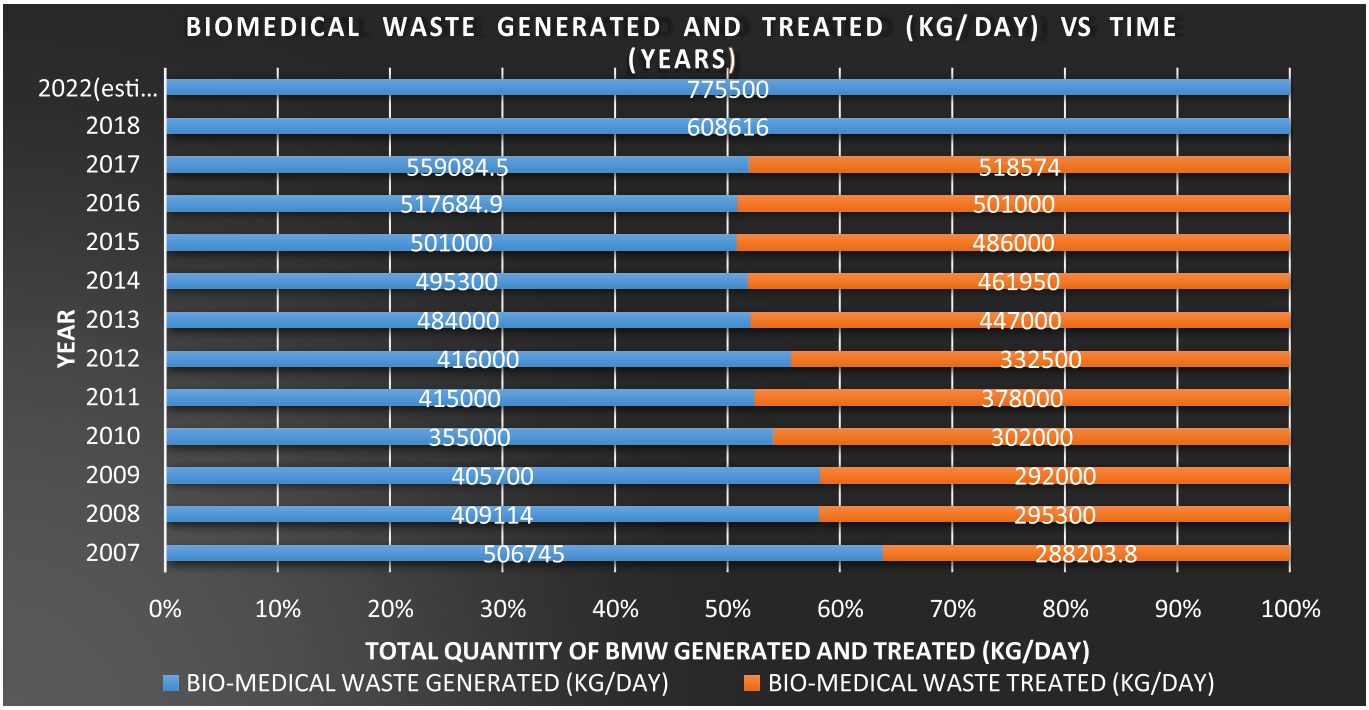
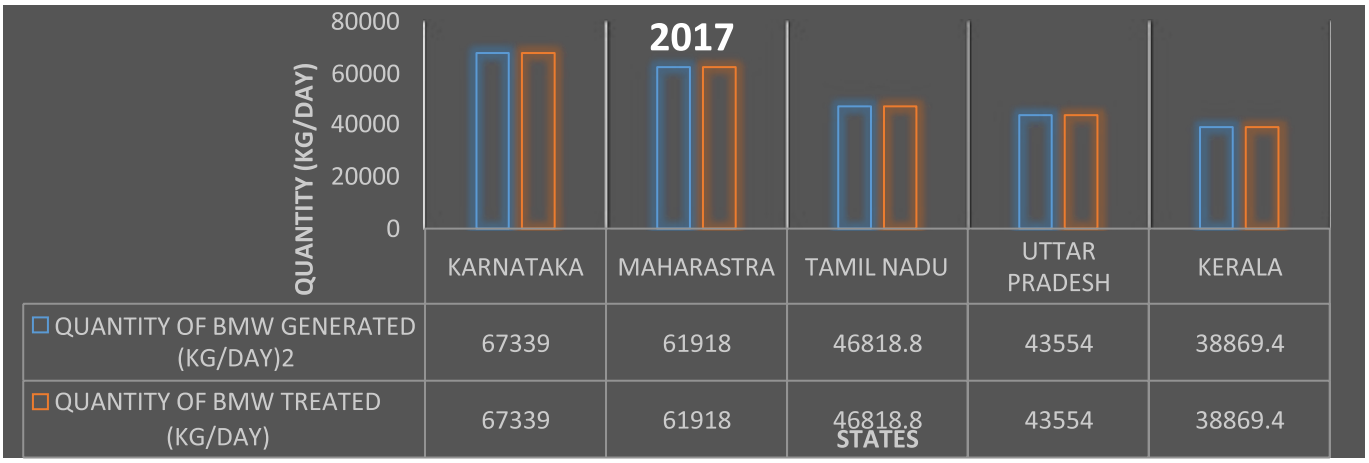


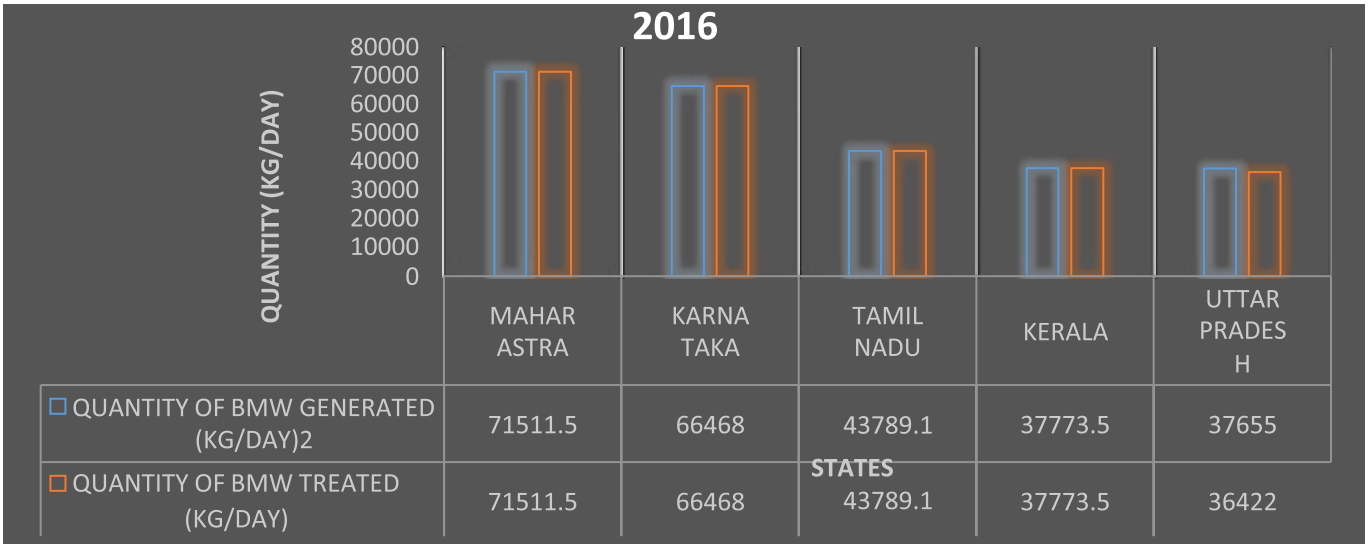
Figure-1: Depicts the BMW handling process flow

Results and Discussions:

BMW Generation and Treatment Data Analysis (year wise):







Graph-2: Depicts the total amount of Biomedical waste generated and Treated In India state wise

(Ministry of Environment , Singh, Unnikrishnan et al. , CPCB 2014, India 2018, Welfare 2020)

(ENVIS Centre on Hygiene , India , Ministry of Environment, and Climate Change et al. 2019, 2nd May, Welfare 2020)

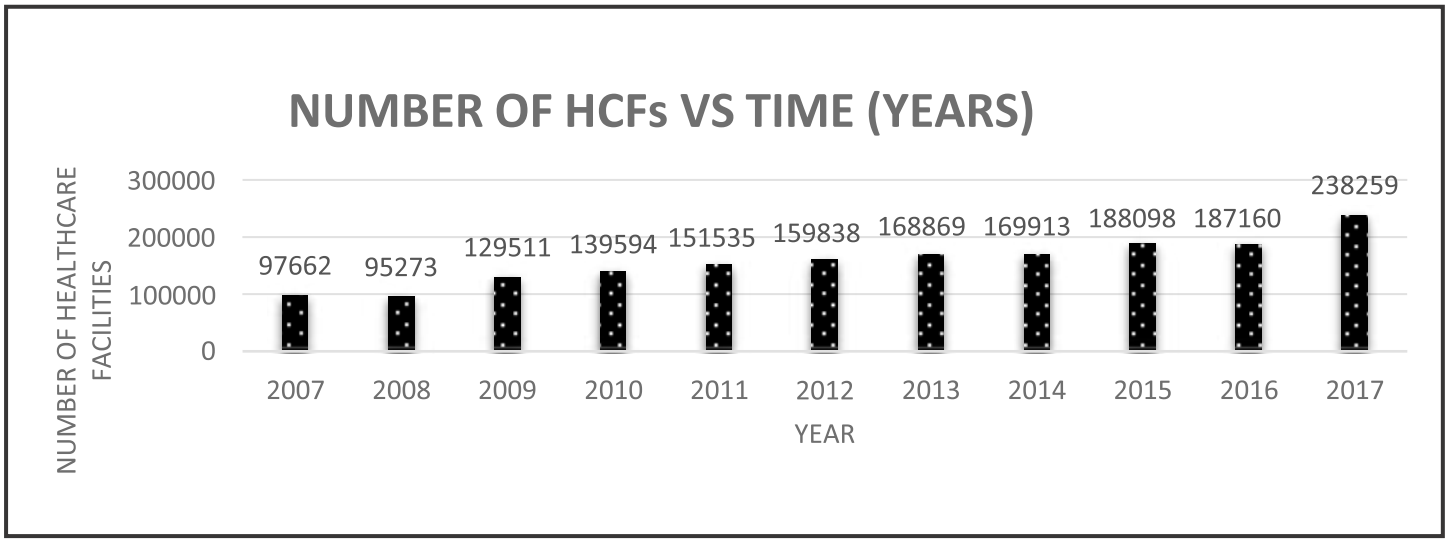
Inference: From the above data it can be inferred that the total amount of BMW generated is not being treated.

Contributing Factors:

(a) Lack of infrastructure

(b) Lack of awareness

(c) Non-availability of competent personnel



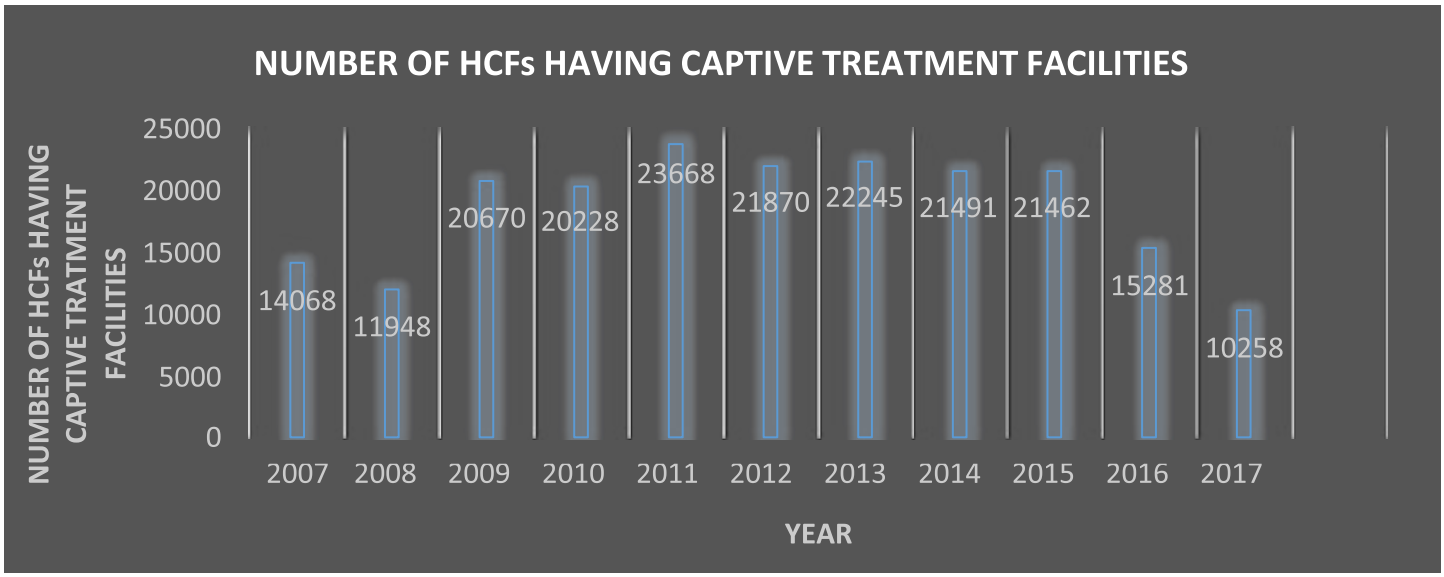
Graph:3 Depicts Number of Healthcare facilities In India-year wise

Inference: From the above data it can be inferred that there is a drastic increase in number of health care facilities.

Contributing Factors:

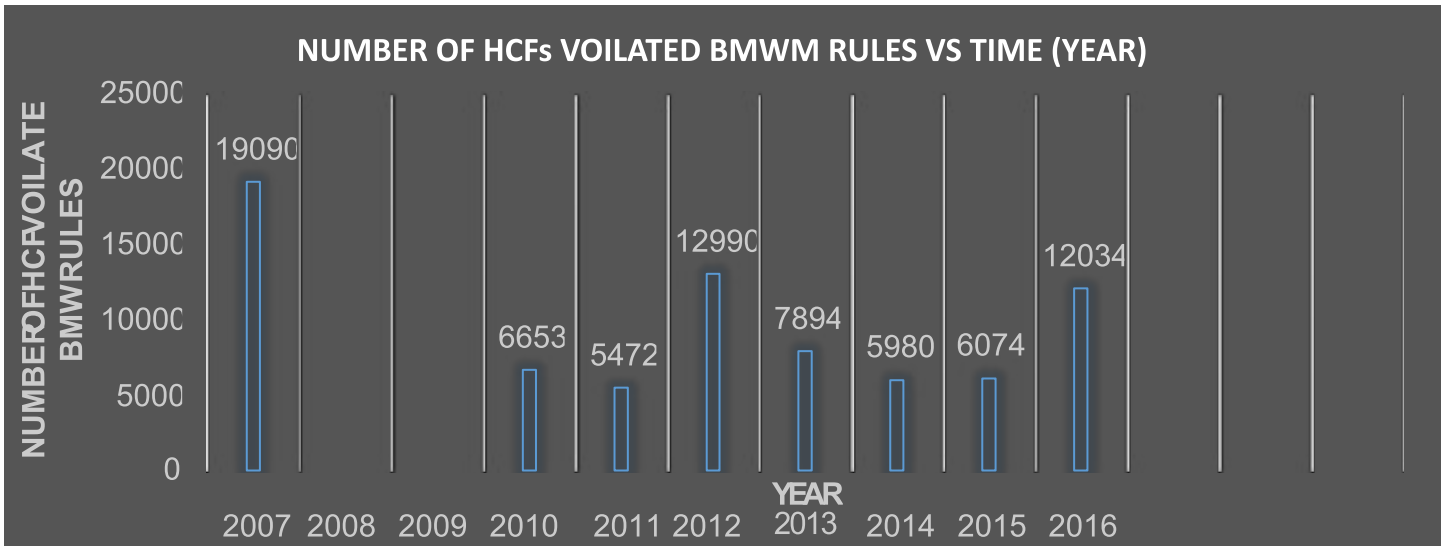
(a) Government schemes

(b) Population Advancement



Graph-4: Depicts Number OF HCFs having Captive Treatment Facilities In India-year wise

(Ministry of Environment , Singh, Unnikrishnan et al. , CPCB 2014, India 2018, Welfare 2020)



Graph-5: Depicts Number OF HCFs that violated BMWM rules In India-year wise

Inference: there is a sharp increase in the number of HCF violating BMW rules in 2016.

Contributing Factors:

1. Unavailability of budget to small hospitals for complying with the BMW rules and to implement new procedures.(Singh, Unnikrishnan et al.)
2. Lack of suitable infrastructure and staff are also major constraints in the implementation of BMWM rules.

Challenges and Areas of Improvement Required:

On the basis of ENVIZ Newsletter on Biomedical waste management 2014, WHO concluded in the report (Organization 2017) that healthcare facilities are still not segregating the biomedical waste as required by BMWM rules. India lacking in number of CBMTFs need to treat the generated waste and the waste collection frequency need to be improved. There is no proper framework for providing training which leads to lack of awareness among staff. Lastly, under-reporting and open burning of biomedical state is still in practice in some parts of country.

Few challenges outlined by ASSOCHAM and Velocity titled 'Unearthing the Growth Curve and Necessities of biomedical waste management are–(India 2018)

The speed with which the data are available regarding biomedical waste are not up to the mark. The operation of CBMTFs without legal authorization under BMW Rules, underreporting of generated waste, lack of CBMTFs etc. are some of the key areas where India BMWM system need to improve. Also suggested to have more stringent monitoring and evaluation network to make sure there is an effective management of BMW. Awareness, motivation, cost factor and lack of concern are some common key problems responsible for improper management of BMW.

As per (Singh, Unnikrishnan et al.) 2019, the biggest challenge in the road of proper BMWM is the unavailability of funds for implementation of BMW rules. In comparison to amount of waste generated, thereare not sufficient CBMTFs installed in India which further need to be increased. Also considering that the SPM emission from Incinerators has been reduced but still they emit toxic pollutants and potentially hazardous ash.(Datta, Mohi et al. 2018).

Recommendations:

- The timely data publication is one the important aspect to keep an eye on proper management of BMW. There is high amount of application from healthcare facilities pending for authorization from concerned authority. CPCB and SPCBs must have a database for all the authorization provided or need to be provided to healthcare facilities and strict protocol for all SPCBs to follow for selection of type of units that need authorization and theses data must be published without delay.
- The onsite incinerators are against BMWM rules so shall be shut down immediately.
- From graph – 5, it is clear that there is large amount of HCFs that violate BMWM rules and hence CPCB and SPCBs must have strict monitoring provision and regular visits on healthcare units and CBMWFs to improve the compliance with the rules.
- There should be formation of District level monitoring committees to watch the compliance of HCF with rules as CPCB do not monitor the HCFs very often.
- Keeping the Economic factor in mind, there must be more in numbers of CBMTFs as existing numbers are not enough to treat the waste efficiently.
- CPCB and SPCBs should take responsibility to monitor the CBMTFs collection aspects as many hospitals claims that various CBMWFs do not collect the waste on time and also collection is not in proper manner due to untrained employee. Strict actions must be taken against such treatment facilities.
- BMWM rules require to provide proper training to all healthcare workers and CBMTFs staff but implementation of this rule can hardly be seen. CPCB and SPCBs must come up with proper training module to

train the mentioned workers and staff at least biannually.

- CPCB should publish SOPs for the hospitals to manage and treat liquid waste through STPs/ETPs.
- Training and awareness programs must be conducted to tackle the under-reporting of accidents causeddue to sharps, needles etc. and BMW generation.
- Healthcare units, ETP/STP, CBMTFs and any other unit performing well in waste management mustbe appreciated and their work must be reorganised and rewarded.
- CPCB and SPCB must maintain the data in relation to covid-19 hospitals and quarantine centres and generation of waste from these sources.

Refrences:

(2014). "Bio-medical waste management: situational analysis & predictors of performances in 25 districts across 20 Indian States." Indian J Med Res 139(1): 141-153.

Acharya, D. and S. Meeta (2000). "The book of Hospital Waste." Management. Minerva Press, New Delhi: 15- 47.

Acharya, D. B., Singh Meeta (2000). The book of hospital waste management. New Delhi, India, Minerva Press.

Aggarwal, H. and P. Kumar (2015). "Need for biomedical waste management." Journal of Medical Society 29(1): 58-58.

Babu, B. R., et al. (2009). "Management of Biomedical Waste in India and Other Countries: A Review." J. Int. Environmental Application & Science 4(1): 65-78.

Chellamani, K., et al. (2013). "Surgical face masks: manufacturing methods and classification."

Council, N. R. (1989). Biosafety in the laboratory: prudent practices for the handling and disposal of infectious materials, National Academies Press (US).

CPCB (2014). "Bio Medical Waste Management - An Overview." from http://www.cpcbenvis.nic.in/envis_newsletter/BMW%20Newsletter.pdf.

CPCB, M. (2020, 2020, 18th April). "Guidelines for Handling, Treatment and Disposal of Waste Generated during Treatment/Diagnosis/Quarantine of COVID-19 Patients ". from https://www.tnpcb.gov.in/pdf_2020/BMWGUIDELINES-COVID_Revisied_April2020.pdf.

Cutler, S. (2020, 2020, 16th April). "Mounting Medical Waste from COVID-19 Emphasizes the Need for a Sustainable Waste Management Strategy." from https://ww2.frost.com/frost-perspectives/managing-thegrowing-threat-of-covid-19-generated-medical-waste/.

Datta, P., et al. (2018). "Biomedical waste management in India: Critical appraisal." Journal of laboratory physicians 10(1): 6.

ENVIS Centre on Hygiene, S., Sewage Treatment Systems and Technology (2019, 20th April). "State-wise details of quantum of bio-medical waste generated in the country ". from http://www.sulabhenvis.nic.in/Database/TabularData_9639.aspx.

Fletcher, C. (2020, 14th May). "The world must avoid the impending waste crisis being brought on by singleuse PPE." CORONAVIRUS CRISIS. from https://scroll.in/article/961855/ the-world-must-avoid-the-impendingwaste-crisis-being-brought-on-by-single-use-ppe?utm_source=rss&utm _medium=jio.

Ghasemi, M. K. and R. B. Yusuff (2016). "Advantages and Disadvantages of Healthcare Waste Treatment and Disposal Alternatives: Malaysian Scenario." Polish Journal of Environmental Studies 25(1).

Gravers, P. (1998). Management of Hospital Wastes-An overview. Proceedings of National workshop on Management of Hospital Waste.

India, A. (2018). "Unearthing the growth curve and necessities of bio medical waste management in India.".

India, G. o. (2019, 27th June). "Ministry of Environment, Forest and Climate Change." from http://moef.gov.in/about-the-ministry/introduction-8/.

Johannessen, L., et al. (2000). Healthcare waste management guidance note, World Bank, Health Population and Nutrition Team.

K, K. and L. R (2009). "A Case Study of Biomedical Waste Management in Hospitals." Global journal of health science.

K.V.Radha, K. K., R.Lavanya, (2009, April,). "A Case Study of Biomedical Waste Management in Hospitals." Global journal of health science 1.

LaGrega, M. D., et al. (2010). Hazardous waste management, Waveland Press.

Li, C. S. and F. T. Jenq (1993). "Physical and chemical composition of hospital waste." Infect Control Hosp Epidemiol 14(3): 145-150.

Mathur, P., et al. (2012). "Need of biomedical waste management system in hospitals-An emerging issue-a review." Current World Environment 7(1): 117.

Mattoo, K., et al. (2014). "Are Dental Training Programs Heading towards Ecological Disaster–Results from a Survey." J Atmos Pol 2: 17-21.

Ministry of Environment, F., et al. (2019, 2nd May, 2020, 8th June). from http://www.cpcb.nic.in/.

Ministry of Environment, F. a. C. c., GOI (2020, 8th June). "Annual Reports." from https://cpcb.nic.in/annualreport.php.

Mohan, V. (2020). Dealing with biomedical waste in the time of Covid-19 presents huge challenge. The Times of India.

Nayak, A., et al. (2015). "Biomedical waste management: A Review." Journal of Advanced Medical and Dental Sciences Research 3(1): 130.

Nugget, I. (1996). "Hospital Waste Management and Bio-degradable Waste." Govt. of India, Press Information Bureau. Available at: http://www. pib. nic. in/infonug/infonug 99: i3008991.

Organization, W. H. (2017). Report on health-care waste management (HCWM) status in Countries of the South-East Asia Region, World Health Organization. Regional Office for South-East Asia.

Pasupathi, P., et al. (2011). "Biomedical waste management for health care industry." Int J Biol Med Res 2(1): 472-486.

Patan, S. and P. Mathur (2015). "Assessment of biomedical waste management in government hospital of Ajmer city-a study." International Journal of Research in Pharmacy & Science 5(1).

Radha, K., et al. (2009). "A case study of biomedical waste management in hospitals." Global journal of health science 1(1): 82-88.

Relph, N. K. (2020, 1st May). "A coronavirus time bomb waiting to explode: India's 4 million waste pickers." from https://www.scmp.com/week-asia/health-environment/article /3082355/coronavirus-time-bomb-waitingexplode-indias-4-million.

Salkin, I. F. and M. Kennedy "Review of health impacts from microbiological hazards in health-care wastes."

Sharma, K. D. and S. Jain (2019). "Overview of municipal solid waste generation, composition, and management in India." Journal of Environmental Engineering 145(3): 04018143.

Singh, A., et al. "Biomedical Waste Management in India: Awareness and Novel Approaches."

Subramanian, A., et al. (2007). "High levels of organochlorines in mothers' milk from Chennai (Madras) city, India." Chemosphere 68(5): 928-939.

Uttarakhand, G. o. (2020, 17th march). Biomedical waste management of BMW generated from screening and treatment of novel corona infection. UK/COVID-19/BMW/17-03-2020. N. H. Mission.

Vilavert, L., et al. (2015). "Two decades of environmental surveillance in the vicinity of a waste incinerator: human health risks associated with metals and PCDD/Fs." Archives of environmental contamination and toxicology 69(2): 241-253.

Welfare, M. o. H. a. F. (2020, 2020, 7th February). "Bio-Medical Waste." from https://pib.gov.in/PressReleaseIframePage. aspx?PRID=1602353.

World Health Organization (2005). "Safe management of bio-medical sharps waste in India." from https://apps.who.int/iris/handle/10665/206337.

Zuo, M. (2020, 2020, 12th March). "Coronavirus leaves China with mountains of medical waste." from https://www.scmp.com/news/china/society/article/3074722/coronavirus-leaves-china-mountains-medical-waste.

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MANAGING SAFETY & RISK PERCEPTIONS – AN OVERVIEW

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Introduction:

Safety perception and risk perception are found in safety management discourses or literatures in the context of at-risk behaviours of employees. It becomes necessary to understand: How and why individuals develop safety or risk perceptions? How do perceptions influence behaviours? This paper attempts to deal with these questions in order to manage employee perceptions. Organisations by and large, show scant interest in understanding employee perception of management commitment in the areas of proclaimed safety beliefs, values, systems and behavioural regulations. So, when an incident takes place organization usually talks of poor safety motivation and commitment which are actually driven by employee safety and risk perceptions.

Perception defined:

Of many definitions available, the one given below seems broad. **Perception is the ability of mind to transform sensory stimuli into conscious thoughts or sensations through five sense organs. Perception is not reality but how we look at reality. Prior awareness of the sensed object or any other thing can augment ability to perceive the reality**. Perception describes the way people sense consciously the external things around and relate to their past experiences. So, it is part of cognition or mental activities involving – sensation, memory, thinking and imagining. In other words, perception is also a cognitive phenomenon that deals with ability of people to gather, process, store, recall from memory and relate to past knowledge or experiences. These abilities are essential to carryout regular works safely. Inexperienced and ignorant people can't have right perceptions. A person having insufficient sensory stimulation, sensations would not be able to correctly recognize the stimulants. Safety is attended stimulus requiring focused attention. Lack of recognition and attention to stimuli from work situations leads to wrong perceived reality resulting unsafe behaviour. An example will clarify. A snake under certain situations can easily be perceived as a rope due to attention deficit. A person having low perception of risk of snake bite, would show high risk behavior.

Stages of Perception process:

Perception occurs in five stages of mental activities: Stimulation, Organisation, Interpretation, evaluation, memory and recall. At the end of the process if it triggers a response, then response could be some physical or psychological actions.

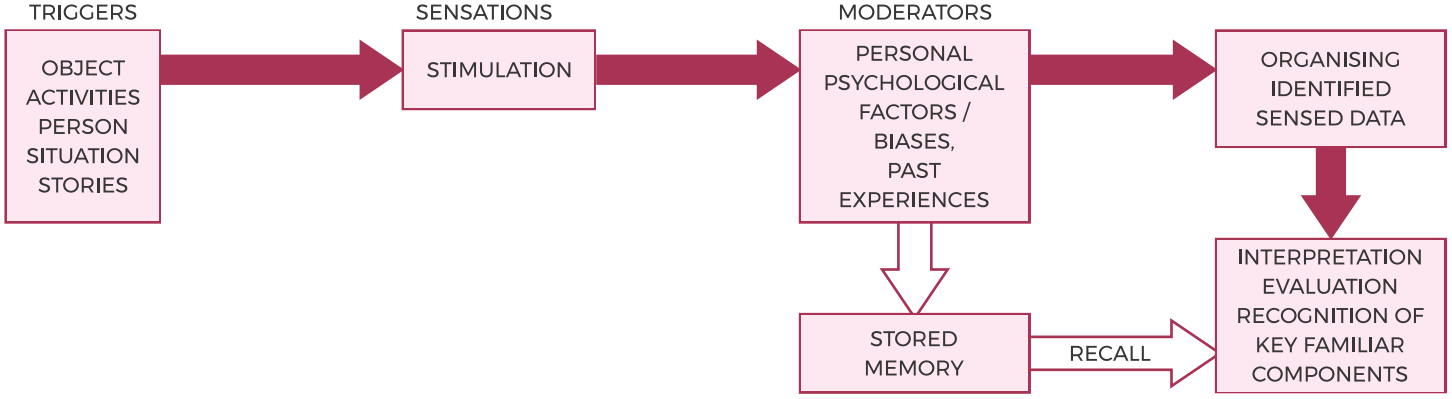
Process starts with receiving stimuli from work environment and ends with interpretation of those stimuli, please see the process model given above. Process requires person to understand the work situations correctly and interact with it appropriately and meaningfully. This is taken care by developing safety awareness and practicing safety at work.

Stimulation: When a person attends his work activities, his brain gets stimulated by his sensed information from work situations via his sensory organs (external) and by thinking and feeling (internal), creating sensations. These sensations and mental activities create perceptions and emotions required to carry out work activities.

Organisation: Person now identifies, connects the key and familiar components of stimuli in meaningful manner, based on his knowledge and past experiences. At this stage, people have to be consciously aware and alert of observed work content and situations. Higher safety awareness leads to higher level of safety consciousness of the sensed information observed.

Interpretation: Once the key components are recognized, person starts evaluating validity of sensed information by recalling from memory- his past experiences, knowledge and understanding about them. This enables him to compare, interpret the meaning of sensations thrown-up by work situations, to react or accept the situations. With that, process of perception gets completed.

General sensation-perception process model



Perception is often influenced negatively or positively by corresponding personal biases created by work experiences, work attitudes, personality, motives and past incidents. In this context organizational factors can also equally influence building perceptions of employees. Organization has great responsibility to guide the employees in shedding negative biases and building positive ones.

Memory:

To remember and reuse past experiences, information and perceived situations for future activities, these must be stored as working or short time memory – in subconscious mind and later transferred and stored in unconscious mind as long term memory since birth. Persons use stored data for interpretation and evaluation of current sensed data. In the context of safe behavior, subconscious mind controls and directs change of short term memories, enables quick recall and access to information of safety practices, procedures and work experiences required in day to day activities. Regular practices strengthen working memory and help developing sound behavior patterns, habits and discipline. So, we can choose the memories and remember them as necessary. When regular attention over a long period is paid to certain safe practices and experiences during work activities, these get progressively stored as the long term memory in unconscious mind. By choice we can't remember things stored in unconscious mind. But with little focus we can easily access these memories. That's why people must make habit of concentrating on both written and verbal safety instructions and on laid down procedures to be complied with during work activities. Making a habit of following this practice, employees develop lasting memories of safe activities. Loss of memory takes place due to intentional or otherwise removal of stored information from mind. This happens if persons do not recall and use their stored information often or develop attitudinal problems.

Recall:

Ability to remember or recall of stored past perceived situations or information later-on at will, is very useful in interpretation and evaluation process. Persistent recall improves accuracy of this step. Quick recall of stored data helps remembering details about work safety as and when required. It means when safety behavior forms a disciplined habit, safety perception level remains high. Converse is also true.

Perception and Awareness relation:

From the perception process described above, we find that it is conscious mind of a person that starts the process. But conscious mind has no memory and sensed information is passed on to subconscious mind for further processing. So, sensation perception process takes place in subconscious mind. Perception resides in one's memory as consciousness. When we connect the awareness with alertness about the work situations around us, then actually we perceive the reality through our consciousness. They don't have separate identity. Perception without awareness is illusion or imaginary that has no place in safety.

Safety perception:

Safety perception of employees is built on internalization and integration of self and organizational safety beliefs, values and behavioural regulations. When asked about some wrong practices, employee might reply – **"This is how we do here." "We are good at safety; it won't happen to me".** These statements are indicators of low appreciation and attention to safety resulting in lower safety perception. Employees indulge in risk taking. Development of safety perception is influenced by organizational perception inventory or safety climate profile at any given time.

Risk perception:

Risk perception refers to risk taking by individuals or individual capacity to accept certain amount of risks. In short, ability to discern risk is tied up to risk tolerance. Known hazards and risk factors are generally taken care by using standard safe design, engineering, installation and selecting safe operational processes and practices. However, these risk factors do not discourage individuals taking risks. Reasons are diverse human factors, mostly psychological. Organization has to deal with additional psychological risks factors such as risk tolerance and workplace emotions.

Risk tolerance and risk perception:

Factors that affect risk perception and risk tolerance, can be categorized into macro, meso and micro levels. Macro level factors are organizational safety climate, level of safety leadership, safety communication and compliance culture. Meso level factor is peer or group pressure. Micro level factors are individual perceived level of safety knowledge, experience and self-efficacy to manage risks. Risk assessment at individual level is influenced by additional psychological risk factors. Some of these are explained here.

1. Inability to accurately perceive risk may lead to higher risk tolerance levels which could encourage higher risk behaviours.
2. Habitual engagement in high risk behaviours lead to higher risk tolerance and lower risk perception ability. Risk tolerance levels and risk behavior levels are reciprocally related to levels of risk perception.
3. When safety deviations necessary at times, have low risk then these become workplace norms with consent of superiors. Such low risk behaviours create low risk tolerance and high risk perception. However, lack of safety enforcement at workplaces, in the long run, could ultimately lead to high risk behaviours create high risk tolerance and low risk perception.
4. Some people may fairly understand risks but they are willing to take risk for "Thrill".
5. Taking more risk means violation of safety rules and

regulations due to lower organizational safety commitment or poorly rated safety climate by employees, as well as poor perception of rules and regulations.

6. Peer group pressure may force high risk behaviours and go against their better judgment.
7. New recruits are susceptible to take risks due to lack of risk education and awareness or prefer not to "swim against majority taking risk".
8. Ignorance of risks and less experienced can lead to lower risk tolerance but not necessarily lower risk behavior.
9. More knowledgeable and competent employees often may have higher risk tolerance and risk behavior but perceived knowledge may not be all that proper.
10. Misplaced self-confidence of control over situations causes employees relaxed and carefree towards unsafe /risky behaviours.
11. Optimism bias influence risk perception. A few examples are given below:
    - Underestimating severity of risk, overestimating efficacy of risk mitigation measures and self-capacity to handle risks
    - In case of low risk perception, recognition from superiors and peers can lead to chivalry in taking risk and benefitting organization.
    - Habitual risk behaviours without negative outcomes often decrease risk perception.
    - If everyone is doing it then risk level is low/not unsafe.

Perception – behavior cycle:

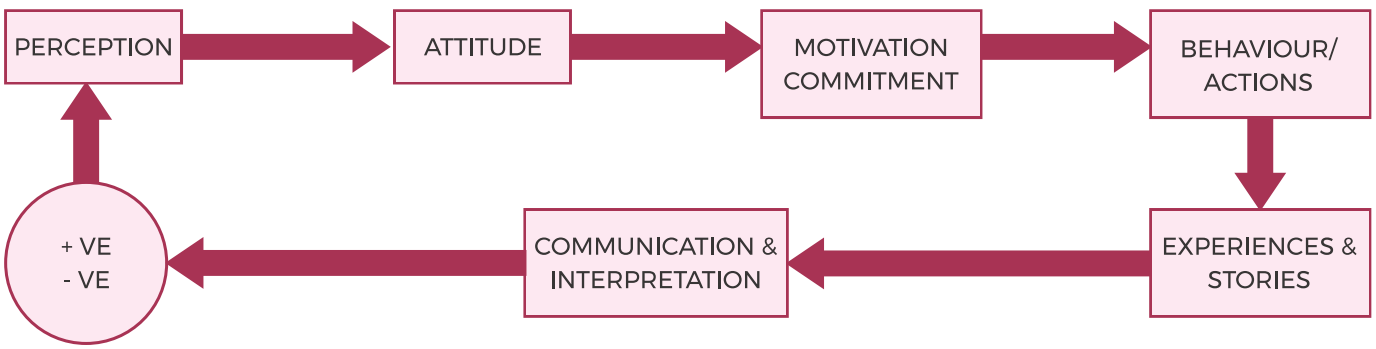
Perception creates attitude and influence safety behavior and culture. Visible safety commitment and safe behaviours of senior executives create higher employee perceptions and better attitudes towards safety.

Workplace behaviours result in experiences of incidents that produce stories, have power to stimulate both positive and negative thoughts and sensations, leading to positive or negative perceptions. An incident of injury would spread as negative stories in the organization. Such stories can create conflicts in the minds of employees and have potential to change existing perceptions and attitudes about management safety commitment. Such changes have profound influence on safety decisions and behaviours at all levels in the organization. Perception-behavior cycle explains this aspect.

It is very essential for the superiors to keep watch on the persons who create negative stories, spread rumours and display (situational or by level) such behaviours that may lead to negative stories. In order to stop speculations and gossips, best way is to introduce organizational culture of open conversations and information sharing with employees on all safety matters including incidents on regular basis. This exercise shall be well structured and outcome shall be shared with higher-ups for review and feedback. Objectives should be to remove biases and misunderstandings that can negatively influence the employee perceptions.

Perception inventory survey is the primary performance tool and complementary to safety audits. Audits assess what are in place, perception surveys assess how effective they are as perceived by the employees. Survey reveals organizational safety climate and that is reality. Also reveals perception gaps in terms of management efforts in risk reduction and mitigation. A few organizations in India do carry out "Attitude survey", but that do not focus on employee perceptions specifically. Also, these exercises do not find much acceptance from employees, hence the same remains as an academic exercise without benefit. Perception survey findings can identify specific important opportunities of correcting risk taking behaviours by locations, work activities and employee groups.

HIRA of work activities performed by the management does not control risk taking behaviours. This is so because the employees exposed to work risks, are not part of the exercise. They are also not fully educated and communicated about the exercises. That creates often mismatch between the assessed risks and actual risks considered in work procedures. Risk-taking behaviours can be expected.



PERCEPTION – BEHAVIOUR CYCLE

Conclusion:

Measuring and managing of employee safety and risk perceptions, organizations need the leading indicators of perception change that can be developed by answering the following questions.

a. Does organization know about the current level of employee safety / risk perceptions?

b. Do the seniors care to know psychological profile of their reports?

c. Do the perceptions lead to positive safety attitude?

d. Do the decisions taken by superiors shape perceptions, attitudes and behaviours of their reports?

e. Are the employees competent to take decisions on safety matters related to their activities?

f. Do the incidents and work experiences influence employee safety perceptions, decisions, behaviours and stories?

g. What are the current stories? Are these negative, positive or mixed?

If management is afraid of what perceptions may reveal, company is right candidate for employee perception survey. Don't let fear dictate level of safety.

* * *

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BEHAVIOURAL ECONOMICS OF SAFETY CULTURE MANAGEMENT IN COMPANIES

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Abstract

Most companies care for money and profits more than the safety of their human resources. Why companies' managements and employers do not decide to spend on safety cultural aspects, as because they are not concerned or less sensitive towards unsafe way of working leading to disaster, incidents, family suffering, impact on new generations. gas leakages, or they are not aware that the benefits of safety implementation in any company, small or big, would definitely outweigh the monetary gains of not implementing it. This article discusses these factors based on observations of 309 HSE and HR professionals, and makes recommendations for HSE policy and planning for safe businesses caring for human cost or losses. While considering the economics of safety management approach, it is important to understand as to why companies stop and refresh their actions for programs leading to longterm safety culture. Though, the slogan seems to have changed, i.e. behaviour first, as we used to say, safety first. However, a large number of Indian companies (90%) are still not able or willing to decide over safety culture management for a variety of reasons as discussed in this paper.

Key Words: Behaviour, Safety,, culture, management, companies, Economics

Introduction, Literature and Context

The ILO has adopted more than 40 standards specifically dealing with occupational safety and health, that provide essential tools for governments, employers and workers to establish such practices to ensure maximum safety at work. Yet for millions of workers the reality is very different (ILO. 2021).

It is argued that a major part of the deliberate violations of rules and regulations in socio-technical systems can be explained as a consequence of the disregard of three propositions of behavioural economics by system designers and managers: (1) unclear or conflicting rules or constraints, (2) delayed, ambiguous or missing feedback, and (3) absence of clear priority rules in cases of conflicts between high-level and low-level safety commitments (Battmann and Klumb, 1993).

Behavioural economics is the study of how psychological, social, and emotional factors often conflict with and override economic incentives when companies or employers make decisions. Behavioural economics can help us uncover ways to limit the organizational impact of biases and cognitive limitations—or ethically exploit them to help drive enterprise value (Deloitte, 2021).

Benefits accruing from a safe work environment include reduction in lost employee hour, decrease in hospital costs, reduced sick leave, down-trend in pollution costs, low property damages, and significant reduction in insurance premiums which ultimately result in higher productivity (Ekenedo, 2013).

Does safety culture create a base to an economic value for an organisation? It is 'money' of the behavioural economics that provide the answer, along with actionable insights for employers and policymakers as they negotiate between the safety management and profits (Jaggi, 2021). Insights from psychology helps understand how companies make financial decisions for health, safety and environment (HSE). Hence, behavioural economics is central to a firm's actions for implementation of long term safety culture (Dash, 2020).

According to a Chief General Manager of ONGC, the benefits of behavioural safety implementation in any company, small or big, would definitely outweigh the monetary gains of not implementing BBS. There is an increase in productivity and monetary gains of managing safe behaviour, and opposite is also true in case of occurrence of disasters due to unsafe way of working such as fire incidents, rail or road accident, family suffering, gas leak etc.

Behavioural economics relates to the economic decision-making processes of individuals and institutions (Academy 4SC, 2021). Safety culture is about an organisation's values, beliefs, norms, practices, competencies and behaviours related to safety. You can influence organisations via the people within them, including through organisational policies and procedures (Drummond and Pietikainen 2021).

International research on the return on investments in prevention proves that every unit invested in safety and health generates a potential benefit of more than two units in positive economic effects. Improving safety and health in the enterprise does not necessarily mean to increase spending (DGUV, 2021).

The Covid19 situation highlights the significance of balancing the economy with safety and health, considering the interdependencies between safety and micro-economics, for supporting this kind of decision-making in terms of cost-benefit analysis and cost-effectiveness analysis in safety culture management, and a little attention has been paid to these fundamental issues and the methodologies in behavioural safety economics (Chao, et al., 2021).

Objective

Does safety culture create a base to an economic value for an organisation or why do companies fail to decide to spend basic expenditures for establishing safety culture? The present article is focused to explore various aspects of behavioural economics of safety culture management of companies, and make recommendations.

Methodology

Since the behavioural economics of safety culture management is a relevant, critical and major concern for companies, it is good idea to explore various learnings of field professionals especially during Covid19 scenario when economic spending on safety is a real issue. A total of 309 HSE/HR professionals were requested to reflect their views on this subject. Both primary and secondary data were collected during June-July 2021. Themes were identified to describe the research findings.

Results and Findings

This article provided researched information on why to decide and how to implement a long term workplace safety culture that begins with employer health and safety education and the provision of safe, healthy work practices in the community, government and private industry workplaces.

1. Almost 90% of the study respondents felt that the basic reasons that the Indian companies are not ready to spend on safety, are: the ignorance, cost, wrong regulation, misuse of regulation, workers reluctant behaviour etc. The behaviour and safety both are positively correlated, if one is reduced, other will fall vis-a-vis. If everyone will demonstrate safe behaviour, at all times, probably safety will automatically be taken care including technical safety aspects. If one does the Root Cause Analysis (RCA), the underlying cause of safety implementation, is the behaviour of people. Also the companies not willing to spend on safety is due to, the feeling and the perspective of being safe every time is not in their mind and heart. Entrepreneurs haven't been given any feel of being safe.

2. The study respondents (about 78%) also emphasised that in quantitative terms, increase in participation at bottom line can be linked to a good safety culture. The benefits of BBS implementation in any company, small or big, would definitely outweigh the monetary gains of not implementing BBS. Concept to understand is that risk is part of our daily life, but accidents need not be.

3. The prime challenge in implementation of behavioural safety culture program is the involvement of all employees including contract employees which can only be possible once fear from their minds be removed for carrying out spot-correction of at-risk behaviours on the shop floor. In other words, a buy-in by each employee is paramount for successful implementation. This can be demonstrated by head of the departments and other senior leadership team through their visible actions reinforcing safe behaviours and reducing at-risk behaviours. It is pertinent to regularly review the BBS checklist for inclusion of new risks such as road safety, covid19 appropriate behaviours and emotional health care etc. Employees should be encouraged for openly reporting of at-risk behaviours without any fear with 'No Blame, No Fault, No Name' way with prime objective of on-the-spot behaviour correction to reduce the risk of accident or incident as reported by 86% of the study respondents.

4. Safety culture is sum of beliefs, attitudes and practices being followed in various activities of business. The principle of any positive safety culture management ensures that the businesses are making sustainable profits. The 88% of study respondents perceived that a strong safety culture ensures everyone is empowered and feels responsible for safety and pursues it on daily basis by carrying out spot correction of at-risk behaviours without any fear with prime objective of Zero Harm to anyone. When an employee feels valued, listened to and truly cared for, his or her outlook towards the organization is different with high morale and full of positivity in all other aspects too. This puts onus on the senior management to create an environment in which employees feels comfortable speaking up when they see safety hazards or at-risk behaviours. Thus, making safety a way of life.

5. The challenges of behavioural based safety (BBS) culture have been addressed actively for gaining results as the experts feel that BBS really stood the test of time, almost 50 years, dealing with critical at-risk behaviours, implementing it correctly. If implementing incorrectly, BBS can backfire negative experiences, like stopping or refreshing this program. BBS culture is a business imperative.

6. Economics of behavioural safety culture implementation in companies is expressed by 82% of the study participants in terms of a list of themes that emerged from the qualitative data:

   a. Unsafe way of working will lead to disaster. Any disaster is beyond economic valuation.

   b. Road accidents.

   c. Rail accidents.

   d. Family suffering.

   e. Impact on new generations.

   f. Most of fire incidents, gas leakage of Bhopal tragedy.

7. Managing behavioural safety can directly increase productivity and can foster better employees engagement which are the indirect benefits as reported by 77% of the study respondents. Numerous case studies exist revealing the positive relationship between safety and productivity, which can be applied to any aspect of safety for justifying investments to reduce the probability and severity of accidents, and logically address questions such as: how does the maintenance or operations manager convince the plant manager to spend money from the annual budget for safety improvements?, and how does the plant manager influence corporate decision-makers to prioritize safety improvements? (Swinderman, 2018).

8. The study participants (89%) also expressed that it has been proven that organisations who embrace behaviour safety approach, can ensure that no-one is injured or made ill through their work. By taking their health and safety to a different level they are able to drive real value into their organisation and dispel the myths that exist. Behavioural Safety is not a new concept, but many who start the journey do not complete it, due to a lack of program structure, inadequate training or losing effectiveness over time as a result of policies and processes becoming too routine. Implementation of a safe culture comes not only with a change in behaviour but with a change in the mindset or attitude of a person. In order to bring forth a change, one must tackle the problems with a persons attitude, this can be done by hearing out ones concerns and implementing a reward system. Once a positive attitude/ mindset has been achieved, a safety culture can be implemented. Krishna Rao, a veteran safety professional stated that advertising safety has become like role modelling. For every award won for excellence in safety is only a step towards excellence in safety, but winning it just a year will not reflect good safety systems rather maintaining it throughout and improving continually shall be the Goal of Zero Harm.

Conclusions and Implications

1. In the past 15 months, we all have witnessed direct and indirect pandemic effect jeopardizing many lives with its devastating and painful impacts. It is important to note that Covid appropriate behaviour was a key in controlling the spread of pandemic. However due to lack of awareness among majority of the urban and sub-urban communities, the spread was uncontrollable beyond anyone's imagination. Unsafe behaviours could be one of the reasons for wide spread of infection even to rural areas during the second wave. This could have been avoided or the extent of damage would have been reduced if people would have behaved responsibly following various Covid appropriate behaviours to mitigate its impacts (Nature Human Behaviour, 2020). Applying behavioural approach for safe business operations, industries have to decide, safety first or behaviour first, choose or lose.

2. A strong safety culture begins with visible management's commitment and highly engaged and empowered employees at all levels. This results in happy stakeholders due to reduced costs, increased plant reliability and availability, reduced maintenance and better product quality besides other intangible benefits of motivated employees and happy customers making it more sustainable profitable business. The 81% of study participants also stated that behavioural safety culture is a tool which can be successfully used to mitigate risks arising out of occupational health and safety as well as process safety. This behavioural science approach is currently being applied successfully in numerous companies worldwide (Geller, 2001).

3. Furthermore, there is need to extend behavioural safety culture program to employees families and other key stakeholders of our society especially children and youngsters. This could only be achieved through intervention of educational institutions and public forums raising awareness on behavioural safety culture to make it a way of life. One could imagine huge benefits of reducing road accidents; controlling pandemic and reducing industrial accidents etc. which ultimately would help in creating a happy society.

4. Occupational health and safety (OSH) management can and should be viewed in monetary terms as part of a business system (Eastern Kentucky University, 2021). Some challenges or questions on safety culture economics are:

   - Visible or lack of management support;
   - Leaders don't walk their talks at the site;
   - Convincing the unit level management why BBS is important for company's business;
   - Too much emphasis on at-risk behaviours, not talking safe behaviours. Positive reinforcement or appreciating safe behaviours is many times more effective than merely taking unsafe behaviours towards building longterm safety cultures;
   - Receptive or resistant employees
   - Observations data being shown to all employees to make impact to continue observations
   - Barriers to safety, resources, engineering solutions to be addressed, otherwise people understand that BBS is only about talking and not taking actions on the ground
   - Focus on 3 or 4 percent of negative people also who don't cooperate as well as positive majority of

employees;

- Disciplinary action is important if somebody does deliberate violations. Enforcement and reinforcement go together. BBS does not replace other safety systems, rather integrate it all.
- Focus on first positive reinforcements for majority of workforce, and enforcement on small number of employees. Reinforcement of positive behaviour pays back better than focusing on at-risk ones.
- it helps impacting cultural change quickly in 6 months, sustaining BBS culture would take 3-4 years.
- BBS tool is good, depends upon the user companies for its success, as 50% have implemented incorrectly.
- It takes time to change negative or resisting people for their involvement. Good to see the reasons why they resisted.
- Functioning of steering teams without involving CEO of the organisations;
- Making BBS an HODs function.
- Emphasising quality of BBS observations
- Linking with KRA of every employee
- Including BBS in vendor terms and conditions
- When monthly BBS review is not regular and feebly conducted by HODs without much involvement, the BBS culture weakens by itself ignoring at-risk behaviours, followed by sudden incidents impacting business and lives. "You May Need To Care"
- Behaviour change is a buzzword every where now. Even driving ESG in businesses requires behaviour change among business leaders setting ESG goals as business goals for a profitable business.

5. Annual Safety Culture Reviews are crucial for continuous development; these are often not addressed actively by managers. Importantly, change in hierarchy of safety controls at sites is very important; this also is not emphasized so much by HODs. Most important, 5-minutes of safety-time each day each employee, to be fixed as a SOP, plays a significant role in developing good safety culture. Performance reviews must be used as part of safety culture for maintaining a safe work environment (Hestbak, 2019).
6. Focus on continually spreading the message of behavioural safety culture to keep the industry moving. There is nothing more precious than human life. In the industry, if we truly believe in the adage of Safety First, it has to become a daily ritual with empathy, consideration, alertness and anticipation. To ensure observations and spot-corrections for Zero unsafe behaviour, these are the crystallized learnings that has been imparting with a BBS missionary zeal, impacting all the practitioners in the industry continually raising the bar of safety. As per a President of the chemical plants, whether a fire accident or a national disaster, behavioural safety culture has enriched lives by proactive prevention.
7. It's truly a noble initiative towards the safety of industry and people working there. Organisational antecedents are a kind of prop which works as a support route in weakening the existing safety culture. There should be only a Go or No-Go treatment in behaviour at the workplace. The No-Go gate should bear a penal action depending upon the potential of violations. Leaning on antecedents in explaining an at-risk behaviour allows build up of probabilities for a serious consequences.
8. Developing a good safety culture in the organization, should be on top of agenda for all forward looking organizations, to ensure long term business sustainability. An organisations' culture is best indicated by the way their workforce behaves when they're away from the workplace. A shared vision of the people of a Zero Harm future would be the bedrock of a safety culture, reflected by the safety beliefs, values, attitudes and reflecting in everyday behaviour. It is important to motivate and engage employees to pursue the behaviours that contribute to a strong culture of safety and well-being both and off the job (Scace, 2018).
9. The industry craves for the social wellbeing. Safety is the core value in the industries of the developed nations. There has been dramatic changes in the benchmarking of the safety statistics from all the developed nations. Similarly, environmental standards are implemented as a disciplinary benchmarks. Now due to spread of pandemic Covid19, health standards and benchmarking have been dramatically improved. but Safety is way beyond the environmental and health benchmarking. It is still starving for the benchmarking. The root cause of every injury caused by incident is behaviour. The fraternity must find metrics to measure the behavioural changes and improvements. This will have cascading effect on environmental health also.

Recommendations

1. Supportive Safety Culture is one of the essential pillars for building a progressive and sustainable organisation. Every individual's own behaviours as safety ambassadors, collaboration and engagement with all levels; encouragement, rewards and recognition for right safety behaviours make a big

contribution towards developing and implementing a long term safety culture. To embed a sustainable safety culture, companies must overcome the mind-sets that underlie unsafe behaviours (Hortense et al., 2019).

2. A second of risk is sufficient for an incident, or a second of human care is sufficient for spot-correction of that risk. You may choose, or lose, be quick in deciding. A one-minute message of the MD/CEO must go to employees each month on the relevance of 5-minute daily 'at-risk behaviours' observation care for spot-correction' by each person. It helps pushing longterm safety culture at site. According to the Lorraine M. Martin, the President and CEO of NSC, "Business leaders must support safety now more than ever, I appreciate your constant dedication to safety" (National Safety Council, 2021).

3. Culture is the key Driver. If a person has a positive attitude and a good culture in the organisation, then it's easy to implement any policy or new thought. We need to work a lot in this regard. There is a strong hope of establishing principles of long term behavioural safety culture by the industry leaders. Their will and sustained actions, in this regard, can surely control incidents and the related loss of lives and the business. Economics and Country Risk insights and analysis provide a clear 360 degree perspective on what matters most to your business allowing you to bring opportunities and risks into focus, as global economic growth depends increasingly on Covid19 vaccination progress reflecting safety mindsets of everyone involved (Johnson, 2021).

4. Measuring BBS System Efficiency as a Core Value of Corporates on 25 Points

   S. P. Garg, GAIL advisor stated that now "Safety" is considered as one of the core values of organisations. "Behaviour" is getting more attention, as it plays important role in developing organisations culture. Safe behaviour and attitude can help come out of the "chalta hai culture". This index score of measuring BBS system efficiency as a core value of corporates, indicate how much organisational time is spent on safety functions to build safety culture, not how much money is spent. Surprisingly, Safety time of an organisation is one of the best leading indicator in developing sustainable safety culture, not the safety budget. Hence if your score on the index below is increasing, it means clearly that safety is a core value and everyone at work cares for safety behaviour of each other around. Planned intervention of behaviour-based safety (BBS) helps organisations improve their safety time arithmetic (Kaila, 2020).

   (25 points x 4 marks each = 100) (Please give your score very frankly to each item below)

   Assign marks between 1 to 4 to each item below as per your own assessment.

   1 What is the percentage of shop-floor people doing BBS observations daily for five minutes?

   2 What is the percentage of contractors/security staff doing BBS observations daily for five minutes?

   3 What is the percentage of managers doing BBS observations daily for five minutes?

   4 Is Cultural change from 1st (reactive) to 4th (interdependent) level taking place?

   5 Is BBS a part of your EHS policy and annual review?

   6 Are observers/departments being recognised /rewarded?

   7 What is the percentage of incidents reduction after implementing BBS?

   8 Is BBS Goal-setting each month by HODs to down the level happening?

   9 Is BBS a part of KPI for departments?

   10 What is the percentage of at-risk behaviours overall at each site?

   11 Has BBS been included in vendors T&C?

   12 Is BBS seen as a business value by top management?

   13 Are all barriers in HSE management being spot-corrected by managers?

   14 Are top process hazards being corrected?

   15 How far business heads involve in BBS?

   16 Has BBS been extended to families/ residential colonies/communities?

   17 Has BBS been extended to surrounding schools/ industrial associations?

   18 Has BBS been extended to road safety?

   19 Has BBS been extended to COVID-19 observations?

   20 Has BBS been extended to psychosocial risks as per ISO45003?

   21 Has the culture of spot-correction become a way of work life?

   22 Has BBS become a big brother safety approach by all?

   23 Has HODs become role model for BBS?

   24 Has reactive safety culture gone away?

25 Do juniors observe and spot-correct seniors for BBS?

Scoring:

a. You total score out of 100:

b. Your weak areas with less score for improvement:

c. Your strong areas to sustain BBS:

Fortunately, it is still the 'total time spent on safety by each member in an organisation by way of daily observations and spot-correction of at-risk behaviours', is the "Best Leading Indicator", and not how much money is spent on safety. Hence what really matters is not merely economics but the social sciences approach of safety culture management. But the critical question is, are companies ready to organise for this safety time? Largely, no, as time is money for most companies. They think of only minimum to minimum safety implementation. Thus, economics tend to override safety as the leaders' sensitivity towards humanity remains low. Employees, employers, managements, and all need to understand that without total safety culture, there would be no enterprise's survival in future times to come. Though the safety training implementation is difficult in low and middle income enterprises, yet it is possible to facilitate it through the team-based internal mentors and coaches (Penkunas et al., 2021).

5. Finally, to deal more effectively with various aspects of the behavioural economics of safety culture management of companies, the summary of findings recommend to address the list of following 20 issues mentioned in Table 1.

In overall, companies are not realising that spending on safety is an investment not expenditure, which deserves a national level debate in public interest. Also, Nature is the mightiest teacher, the world could ever have in support of safety, health and environment, like Covid19. The same seems true for industry, if leaders fail in their HSE duties to inculcate safety culture for their workforces and workplaces, incidents teach in a harder way.

Table 1 : Behavioural Economics Aspects of safety culture management in companies to consider

1.	Unsafe way of working will lead to disaster. Safety culture is a business imperative.
2.	Reasons that companies do not spend on safety are: ignorance, cost, and misuse of regulations.
3.	Increase in participation at bottom line can be linked to a good safety culture.
4.	Organisations that implement behaviour safety approach, can ensure that no one is injured or made ill through their work.
5.	Applying behavioural approach, for safe business operations, industries have to decide, safety first or behaviour first, choose or lose.
6.	Behavioural safety culture is a tool which can be successfully used to mitigate risks.
7.	Extend behavioural safety culture program to employees families and other key stakeholders.
8.	Annual Behavioural Safety Culture Reviews are must. Culture is the key Driver.
9.	Continually spreading the message of behavioural safety culture to keep the industry moving.
10.	Supportive Safety Culture is an essential pillar for building a progressive and sustainable organisation.
11.	Business leaders must support safety now more than ever.
12.	Measure behavioural safety culture System Efficiency as a Core Value of Corporates.
13.	Total time spent on safety by each member in an organisation by way of daily observations and spot-correction of at-risk behaviours is the Best Leading Indicator.
14.	People need to reinforce about what is hazard and consequences.
15.	In India money plays first, then human life. Life has no value.
16.	HSE is shown case ornaments for the corporate.
17.	Top management people are not aware about safety. They are only trained to do the business.
18.	There is no minister at the Centre and State to monitor the implementation.
19.	Safety should be a compulsory subject in the primary school to 12th class.
20.	Companies are not realising that spending on safety is an investment not expenditure.

References

Academy 4SC (2021). Introduction to Behaviours al Economics: Acting Irrationally. Retrieved on 26 July 2021 from https://academy4sc.org/video/introduction-to-behaviours al-economics-acting-irrationally/?

Battmann, Wolfgang & Klumb, Petra. (1993). Behavioural economics and compliance with safety regulations. Safety Science. 16. 35-46. 10.1016/0925-7535(93)90005-X.

Chao Chen, Genserik Reniers, Nima Khakzad, Ming Yang (2021). Operational safety economics: Foundations, current approaches and paths for future research, Safety Science, Volume 141, 105326, ISSN 0925-7535, https://doi.org/10.1016/j.ssci.2021.105326.

Dash, Sanket Sunand (2020, December 20). Behavioural Economics: A New Driver of Strategic HRM. NHRD Network Journal, Volume: 14 issue: 2, 206-215. https://doi.org/10.1177/2631454120977240

Deloitte (2021). Behaviours al economics and management. Retrieved on 29 July 2021 from https://www2.deloitte.com/us/en/insights/focus/behaviours al-economics.html

DGUV (2021). About Vision Zero. Retrieved on 29 July 2021 from https://www.vz-rsi.in/about

Drummond, James, and Pietikainen Anna (2021). How behavioural science can promote safety culture. Retrieved on 27 July 2021 from https://apolitical.co /solution-articles/en/how-behavioural-science-can-promote-safety-culture.

Ekenedo, Golda. (2013). Framework for developing and sustaining safety culture in a developing economy. European Journal of Applied Sciences. 1. 28 -37.

Eastern Kentucky University, (2021). The Economic Aspect of Health and Safety. Retrieved on 30 July 2021 from https://safetymanagement.eku.edu/blog/the-economic-aspect-of-health-and-safety/

GELLER, E. SCOTT (2001). Behavior-based safety in industry: Realizing the large-scale potential

of psychology to promote human welfare. Applied & Preventive Psychology 10:87-105 (2001). DOI: 10.1017.S0962184902010028

Jaggi, Gautam (2021, Mar 23). How behaviours al economics can enable a safe return to work. Retrieved on 28 July 2021 from https://www.ey.com/en_in /megatrends/how-behaviours al-economics-can-enable-a-safe-return-to-work

Johnson, Sara (2021, July, 26). Global economic growth depends increasingly on Covid19 vaccination progress. Retrieved on 29 July 2021 from https://ihsmarkit.com /research-analysis/global-economic-growth-depends-Covid19 -vaccine.html

Hestbak, Brad (2019 September 11). How can performance reviews be used as part of safety culture and maintaining a safe work environment? Retrieved on 30 July 2021 from https://www.safeopedia.com/how-can-performance-reviews-be-used-as-part-of-safety-culture-and-maintaining-a-safe-work-environment/7/8088

Hortense de la Boutetière, Jean-Benoît Grégoire Rousseau, and Eion Turnbull (2019, May 21). Overcoming limiting mind-sets to improve safety. Retrieved on 25 July 2021 from https://www.mckinsey.com/business-functions/organization/our-insights/overcoming-limiting-mind-sets-to-improve-safety#

ILO (2021). International Labour Standards on Occupational Safety and Health. Retrieved on 28 July 2021 from https://www.ilo.org/global/standards /subjects-covered-by-international-labour-standards/occupational-safety-and-health/lang--en/index.htm

Kaila, Harbans Lal (2020). Planned Intervention of Behaviour-Based Safety (BBS) Helps organisations Improve their Safety Time Arithmetic. WSJ, Vol-XXIX No-3, 34–41.

National Safety Council (2021). Perspective: Safety Leadership. Retrieved on 28 July 2021 from https://www.nsc.org/workplace/safety-topics/coronavirus/a-letter-from-our-ceo

Nature Human Behaviour (2020, May, 19). EDITORIAL. Retrieved on 29 July 2021 from https://www.nature.com/collections/gdjdibibfg/

Penkunas Michael J. , Chong Shiau Yun, Rhule Emma L. M. , Berdou Evangelia and AlloteyPascale (2021). Designing the next generation of implementation research training for learners in low- and middle-income countries. Globalization and Health, 17:63. https://doi.org/10.1186/s12992-021-00714-3

Scace, Emily (2018, Sep 17).Safety Culture 2018: Seven Life Lessons from E. Scott Geller. Retrieved on 31 July 2021 from https://ehsdailyadvisor.blr.com/2018/09/safety-culture-2018-seven-life-lessons-from-e-scott-geller/

Swinderman R. Todd (2018, Octtober, 01).The Economics of Workplace Safety. Retrieved on 30 July 2021 from https://ohsonline.com/articles/2018/10/01/the-economics-of-workplace-safety.aspx

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BEHAVIOUR BASED SAFETY (BBS): OVERRATED AND OVER RELIED? – CRITICAL VIEWS

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Of late, interactions with colleagues on Behaviour Based Safety (BBS) have been fetching mixed responses. While the effectiveness of BBS as a panacea for all safety problems is acceptable by most people, some also do express genuine reservations about the sustainability of BBS efforts and its effectiveness in workplaces with complex operational challenges. Both parties seem to have well-aligned arguments for their respective outlooks. Hence it may be wise to look at the views from both sides.

1. BBS at a glance:

Behaviour-based safety (BBS) includes a set of techniques focusing on the behaviour of employees to prevent accidents and injuries [1]. "BBS focuses on what people do, analyse why they do it, and then applies research-supported intervention strategy to improve what people do" [2]. The BBS theory tries to modify the behaviour of employees from working at 'at risk' level to a 'safe' level. The BBS process includes identifying unsafe behaviours of employees and then identifying the activators that encourage/trigger such unsafe behaviours and trying to modify it into safe behaviour [3].

Enthusiasm for BBS – probable reasons:

- Low hanging fruit: Easy to adapt and roll out in the organization
- Display of success: Generate evidence supported by data for the higher-ups in the organisation
- Low investment: Minimal investment
- Good practice – As a leading indicator

2. Concerns with BBS:

BBS focuses primarily on unsafe acts, and human behaviour and not on the inherent risk of the working environment. The impact of risks emanating from interactions among man-machine-materials-management-environment interfaces, including the engineering aspects are not effectively addressed by BBS. Several publications explain the dynamic view of BBS.[3], [4]

Three well-known arguments for BBS were listed in [5]–[7] i.e. 1) it onus on the worker 2) it minimises the importance of the environment 3) it focuses on the immediate cause. All these are interconnected with each other as BBS directly blames the workers for incidents placing all responsibility on workers for accidents without considering the working conditions. So, after an accident, the workers' behaviour gets highlighted as an immediate cause and no further efforts are made to identify the reason for such behaviour. For example, while analysing an accident, the BBS approach shows the workmen used the wrong tool or damaged tool or tool without valid inspection certificates as the cause of the accident. In this analysis, the carelessness of the workmen gets more visibility while the responsibility of the management to supply the right tools while ensuring their proper condition and inspection [1] does not get addressed. But if we inspect for the root causes in this case, one may be that management has not provided sufficient and proper tools to the workmen, so workmen have no other option than to use the damaged tool which leads to an accident. If the management had provided adequate tools with easy allocation to workmen, then workmen would have not used the wrong tool or damaged tool or tool without valid inspection certificates. Another downside of BBS is supported by the Hawthorne effect which states that "the behaviour of people gets changed when they know that they are being observed" is that after being observed during work can be more stressful than working in normal conditions leading to cause more unsafe behaviours.

Some similar arguments were raised by [8], [9]revealing that victim blaming tendency arises from Heinrich statistics in the 1930s. Heinrich collected data from insurance reports and there is a requirement of scientific proof for his conclusions [8] as his data was based on supervisors' reports which tend to blame workers [9].

In addition, BBS relies on techniques to modify the behaviour of employees. For the short term, the change may be visible but if it is observed for a long period, then it may be clear that the behaviours of employees might have changed but the safety level of systems remains the same [8]. Hence BBS tends to give a false impression sometimes that safety concerns were solved but the core concerns related to safety remain unseen. Even it was stated in multiple causation theory that improving the behaviour of workers only contributes minutely to close safety concerns. So, the real safety issues get faded/ignored in the name of BBS. Let us understand this with the help of an example, one worker is walking below a suspended load made of a bunch of small pipes which poses the threat of pipes falling from the bunch. Now, BBS can discourage or refrain the workers from walking under the suspended load, but BBS cannot prevent the fall of pipes from the suspended bunch. For prevention, a sling of sufficient load capacity should be provided, the

covering to prevent the fall of material should be provided, the machine should be in well-maintained condition etc. These preventive measures are required other than BBS to make the workplace safer.

For an accident to cause, contributory factors flow from both management and worker sides. Hence preventive action should address both. But by implementing the BBS, seemingly more emphasis gets exerted on the employee side while the major and most important management side is systematically pushed backstage. Hence, BBS solutions appear like recommending vitamin doses as an alternative to a balanced wholesome diet. It is true that the appropriate application of vitamins is an important nutrient required by the human body, but it cannot fulfil the need of the human body which primarily require carbohydrate, fats and protein through a balanced diet mix. In the same way, BBS efforts in an organization can supplement the core safety efforts for further improvements but it can't eliminate or replace the core or basic elements of safety engineer or safety management.

3. Concerns related to BBS in industry:

As a few industrial sectors increasingly shift their focus toward BBS implementation, some claim that the implementation of BBS by those organizations has been very successful. [10]–[12]This leads to a need to understand the excitement behind the whole thing. According to the hierarchy of control, implementing BBS and focusing on workers is easier than exercising other control measures such as elimination, substitution, and engineering control.

As indicated, BBS primarily focuses on the two lower levels of the hierarchy of control, administrative control, and PPE (Fig. 1) through SOP, use of appropriate PPE etc. Since BBS is found to impact only these two, the other higher levels of control do not get influenced by BBS. So, this does not make a robust platform to achieve the mission of vision zero accidents.

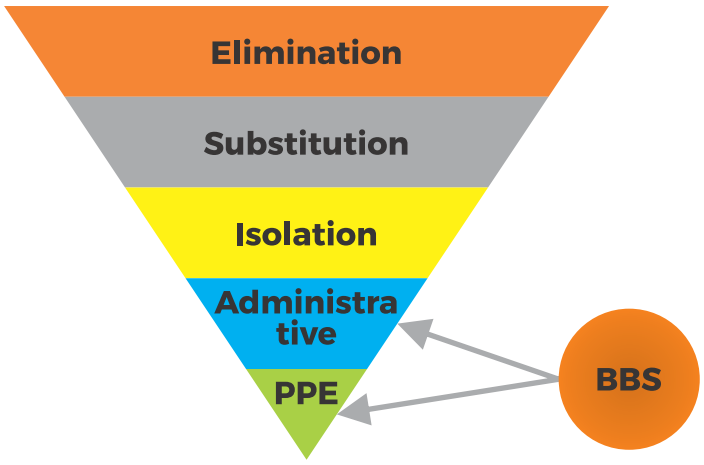


Figure 1 BBS primarily address only two lower leves of hierarchy of control

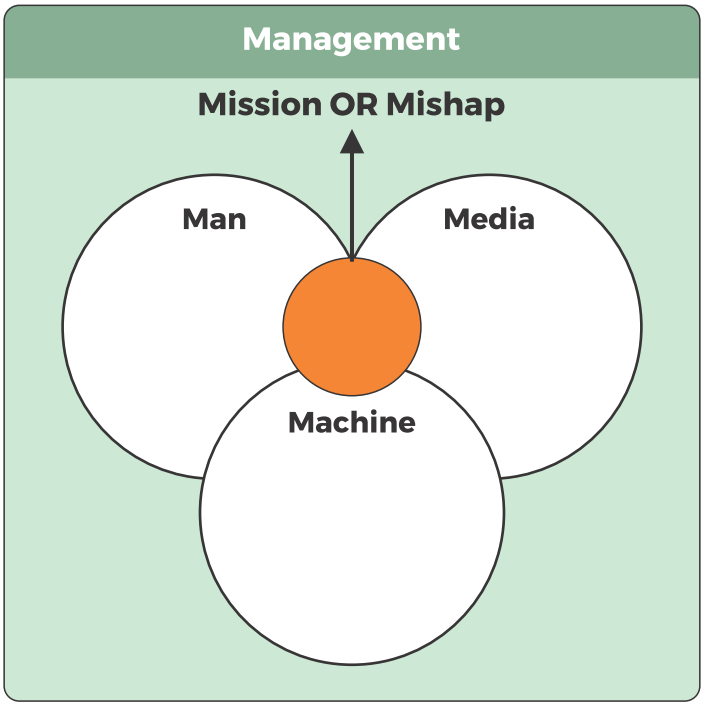


Figure 2 The 5 M Model E A Jerome, 1976)

As we know, behind an incident, there may be several contributory causes. Fig. 2 depicts interactions among various workplace factors that can lead to an accident. Various control measures can be applied to each of these factors to curb the contributory causes. An all-around approach with appropriate weightage on these factors should be efficient for accident prevention.

Let us understand this with the help of two scenarios considering man, machine, method, materials, environmental factors as well as their interactions. In the first instance, suppose there is a well-built road without any pits etc i.e., there is no deficiency in environmental factors. Driving a robustly designed motor car in such a situation is normally safe. But even in this case if the driver opts to talk over the phone or use messaging services or listen to the radio or even fall asleep due to fatigue, it may lead to an incident. Though the road and vehicle are safe it is important to minimise the risk of an accident by eliminating unsafe behaviour by the man in the driving seat. So, in such situations, BBS can be of some help to modify the behaviour of the man and play an important role in the prevention of an incident by promoting safe behaviour.

Now let us take the second scenario, in which the car is old and isn't well maintained, its brake and clutch are not functioning properly. The road is full of potholes and cracks with poor illumination during the night. In other words, the machine (here motor car) and environmental factors (roads and others such as traffic system, surveillance etc.) are not in good shape. What would be the influence of BBS in this case? It would be minimal. So, in such cases reliance on BBS alone or overreliance on BBS may lead to catastrophic consequences.

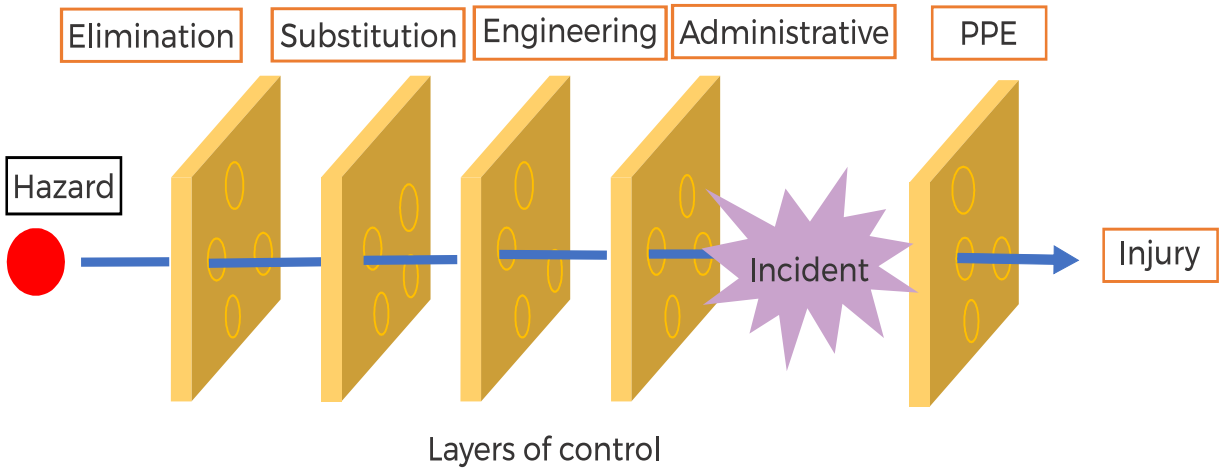
Let us look at BBS in the paradigm of the "Swiss cheese model" and consider various control measures from the hierarchy of control as the layers of cheese in this model as shown in Fig. 3. As BBS only focuses partly on administrative controls and PPE, it would be acting only on a few parts of the outermost layers of the model. So, controlling the incidents by relying only on some parts of these layers of protection would be difficult. But if the action was taken at engineering or precursive layers it will not allow the line of hazard to convert into incident and injury (Fig. 4). So even if there is a behavioural fault, there will be no effect on the line of hazard. Let us understand this with the help of an example. Suppose in an Industry engineering controls are implemented in such a way that a signal will be generated, and further processing will stop if the control valve is open. In this case, even if the employee kept the control valve of the pipeline open, there will be a signal in the DCS (distributed control system) which can be digitally controlled and closed. Here, engineering control can overcome the behavioural fault and prevent an incident. Sometimes, by using engineering control, it is possible to make the system fool proof, and eliminate behavioural faults, which may lead to an incident.



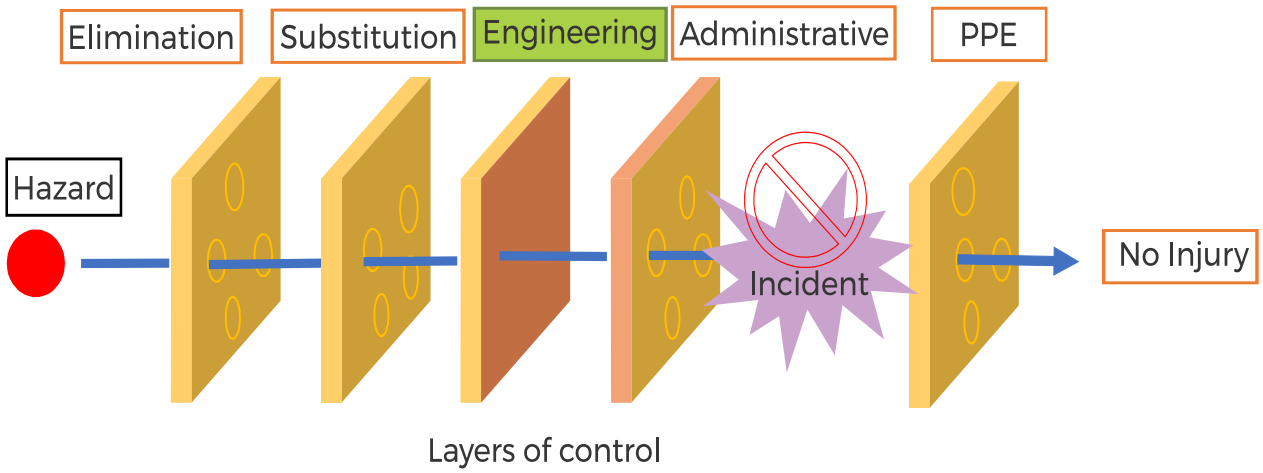
Figure 5 Incident vs SOSC analysis for 2021

A study was undertaken, based on which a trend between monthly incidents and SOSC of a construction industry is generated shown in Fig. 5. SOSC (safety observation and safety contact) is the part of BBS implemented at construction sites. By observing the relationship between SOSC and Incidents for a period, it was observed that both are aligned together for the study period. But if BBS alone is capable of reducing the incidents, then both curves would be in the inverse manner i.e., when SOSC is high, the incidents must be low and when SOSC is low, the incidents must be high. So this study shows that there is no significant change in safety at the workplace based on BBS.

Over-reliance on BBS may lead to negligence of the core issues of the safety system, which may lead to an accident. Let us understand this with the help of an



Layers of control



Layers of control

example. Sometimes a doctor gives symptomatic medicines that will suppress only symptoms, but those medicines will not cure the disease, but the patient feels satisfied, and as a result, after some time, that disease worsens and becomes complicated to treat. Similarly, BBS can cure only symptoms, but there is a need to eliminate hazards to make the system safer.

Conclusion:

As nothing beyond a certain limit is good, BBS is not an exception. Though BBS has positive potential for improving safety compliance at work, too much reliance on it and considering it as a replacement of other essential safety control measures may be problematic. Such misplaced understanding about BBS may not only create complacency in the mind of the management but also generate misconceptions of having done a lot by implementing BBS in the respective organizations.

In fact, to make workplaces saferand healthier, we need to have multi-pronged approach. We should not forget that BBS is just one of the ways which primarily focuses on unsafe act/ practices.

References:

[1] M. Pęciłło, "Results of implementing programmes for modifying unsafe behaviour in polish companies," International Journal of Occupational Safety and Ergonomics, vol. 18, no. 4, pp. 473–485, 2012, doi: 10.1080/10803548.2012.11076954.

[2] E. S. Geller, "Behavior-based safety in industry: Realizing the large-scale potential of psychology to promote human welfare," Applied & Preventive Psychology, vol. 10, pp. 87–105, 2001, doi: 10.1017.S0962184902010028.

[3] B. Skowron-Grabowska and M. D. Sobociński, "Behaviour Based Safety (BBS) - Advantages and Criticism," Production Engineering Archives, vol. 20, no. 20, pp. 12–15, Sep. 2018, doi:10.30657/pea.2018.20.03.

[4] B. H. W. Guo, Y. M. Goh, and K. le Xin Wong, "A system dynamics view of a behavior-based safety program in the construction industry," Safety Science, vol. 104, pp. 202–215, Apr. 2018, doi: 10.1016/j.ssci.2018.01.014.

[5] D. M. DeJoy, "Behavior change versus culture change: Divergent approaches to managing workplace safety," Safety Science, vol. 43, no. 2, pp. 105–129, 2005, doi: 10.1016/j.ssci.2005.02.001.

[6] J. Frederick and N. Lessin,"19d326d8b17607ecd032b44a57eb27b8".

[7] J. Agnew and C. Ashworth, "Behavior-Based Safety: Setting the Record Straight."

[8] T. A. Smith, "What's wrong with behavior-based safety?," 1999.

[9] "Behavior-Based Safety/ 'Blame-the-Worker' Safety Programs Understanding and Confronting Management's Plan for Workplace Health and Safety," 2010.

[10] S. v S Raja Prasad and Y. v S S S V Prasad Rao, "ANALYSIS OF IMPLEMENTATION OF BEHAVIOUR BASED SAFETY PROGRAM IN INDIAN CONSTRUCTION SEGMENTS, USING TOPSIS," 2013.

[11] G. ZIGULIS, "BEHAVIOR-BASED SAFETY." [Online]. Available: www.ohsonline.com

[12] J. P. Depasquale and E. Scott Geller, "Critical Success Factors for Behavior-Based Safety: A Study of Twenty Industry-wide Applications," 1999.

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THE CENTRAL ELECTRICITY AUTHORITY (SAFETY REQUIREMENTS FOR CONSTRUCTION, OPERATION AND MAINTENANCE OF ELECTRICAL PLANTS AND ELECTRIC LINES) (AMENDMENT) REGULATIONS, 2022

Sandeep N. Dhamone, Deputy Director, National Safety Council
Email: sndhamone@nsc.org.in



The Central Electricity Authority (CEA) on November 15, 2022, issued Central Electricity Authority (Safety Requirements for Construction, Operation, and Maintenance of Electrical Plants and Electric Lines) (Amendment) Regulations, 2022 to further amend the Central Electricity Authority (Safety Requirements for Construction, Operation, and Maintenance of Electrical Plants and Electric Lines) Regulations, 2011. The highlights of amendment are as follows: -

- These regulations has been made applicable to generating companies, transmission licensees, distribution licensees, Central Transmission Utilities, State Transmission Utilities, or any person.[under regulation 3]
- Accreditation of electric plants with IS-18001 certification [under regulation 4 in sub-regulation (2)]
- Formulation of written statement of policy in respect of safety and health of employees, duly signed by owner, also to be displayed at conspicuous places at the premises [under regulation 4 in sub-regulation (4)]
- Establishing procedures to identify hazards that could give rise to the potential of injury, health impairment or death and measures to control impact of such hazards; [under regulation 4 in sub-regulation (4) (b) for clause (d)]
- Setting up an Early Warning System to deal with hazardous events such as Glacial Lake and Landslide Outburst Floods, Earthquakes, Cloudburst, Flash Floods, Avalanches, Dam Break event, etc. in case of all large hydro projects under operation as well as under implementation; and [under regulation 4 in sub-regulation (4) (b) for clause (d)]
- Establishing Standard Operating Procedure to deal with these hazardous events;" [under regulation 4 in sub-regulation (4) (b) for clause (d)]
- Establishing system for proper communication, documentation and record management either in certified soft copy or hard copy form in relation to occupational safety and health. [under regulation 4 in sub-regulation (4) (b) for clause (j)]
- Establishing methodology for internal and external audit of safety management system as per relevant Indian Standard;" [under regulation 4 in sub-regulation (4) (b) for clause (i)]
- In case of any accident, the contractor should immediately submit a state of the same to the Owner and the safety officer, containing the details of the accident, any injury or causalities, extent of property damage and remedial action taken to prevent recurrence.[under regulation 7 in sub-regulation (5)]
- The Owner should ensure that a fully equipped ambulance van is provided at the site for transportation of serious cases of accident or sickness to the hospital promptly and said ambulance van is maintained in good condition and equipped with necessary facilities. Provided that where number of employees including contract workers is less than two hundred, the Owner

may make arrangements for procuring such facility at short notice from a nearby hospital or other place, to meet any emergency. [under regulation 10 in sub-regulation (4)]

- Tests for respiratory disorder for employees exposed to dusty environment in power generating stations once every six months. This provision will not be applicable for the hydro power stations after commissioning of the project. [under regulation 10 in sub-regulation (4) for clause (d)]
- Vertigo Test for all personnel involved in height work. [under regulation 10 in sub-regulation (4) for clause (e)]
- Owner should ensure availability of adequate infrastructure for imparting effective audio-visual safety training at the plant or premises. [under regulation 11 in sub-regulation (4)]
- Safety precautions including imparting specialized training shall be ensured in critical activities like scaffolding, electrical works, hot works, working in confined spaces. [under regulation 11 in sub-regulation (5)]
- Safety audit of generating stations shall be periodically carried out every two years by an accredited third party and the audit report shall be sent to the Authority. [under regulation 12 in sub-regulation (1)]
- Authority through a designated officer may verify such reports by physical site inspections as and when required. [under regulation 12 in sub-regulation (2)]
- Safety checks shall be site specific and shall include the minimum safety checks as identified in Schedule IV annexed to these Regulations. [under regulation 12 in sub-regulation (3)]
- Relaxation of regulations. – The Authority may, by order and for reasons to be recorded in writing, relax any of provisions of these Regulations in respect of the matters referred to the Authority on case to case basis [under regulation 13]
- Hazard identification and risk assessment including job safety analytical framework and safe working procedure [In Schedule I under regulation 5]
- Man lifter word added in working at height element [In Schedule I under regulation 5]
- Radioactive Radiation & Drainage facility for excess water words are added in safe working environment element [In Schedule I under regulation 5]
- Working in night and foggy atmosphere, Safety in surface cleaning or preparation work and Permit to work system are added as content of safety manual [In Schedule I under regulation 5]
- Safe storage, handling and Installation of various electro-mechanical equipment as per recommendations of manufacturers [In Schedule II under regulation 5]
- Major fire in switchyard has been added in addition to Major fire in transformer yard in elements of Onsite emergency management plan[[In Schedule III under regulation 9(2)]
- Major fire in battery room or switchgear room or control room new element has been added in Onsite emergency management plan[[In Schedule III under regulation 9(2)]
- Toxic gas dispersion caused by uncontrolled ammonia leakage has been added in addition to uncontrolled chlorine toner leakage in in elements of Onsite emergency management plan[[In Schedule III under regulation 9(2)]
- Elements of safety checks for electrical plants has been inserted as new schedule [Schedule IV under regulation 12]. The Elements of safety checks for electrical plants



1. Emergency Management Plan.
   (a) Fully tested Siren of approximately 110 dB to 120 dB level shall be available.
   (b) Adequate numbers of Wind Socks or Cones shall be available at strategic locations.
   (c) Emergency exit as per standard shall be available.
2. (a) General Aspects of Safety.
   (i) factory inspectorate or directorate officials should visit at least once in a year;
   (ii) safety Policies should be reviewed once in a year;
   (iii) safety Committee shall be constituted under Plant Head or Deputy Plant Head; and
   (iv) at least one number of advanced life support ambulance shall be available;
   (b) Safety training and awareness.
   Safety training and awareness programmes shall be conducted at least one in a year.
   (c) Safety Promotional Activities.
   Safety promotional activities such as Signages and posters awards for safety shall be done once in a year.
   (d) Safety Metrics and Incident Control Measures.
   Special safety measures shall be taken to check or avoid vulnerable accidents viz. fall from height, confined space entry, fall of materials, lack of supervision or knowledge, Bottom ash area.
   (e) Hazard Identification and Control.
   Hazard Identification Study shall be done for identifying hazards in order to prevent and reduce any adverse impact that could cause injury to personnel, damage or loss of property, environment and production, or become a liability.
3. Boilers Act, 1923.
   The provisions of Boilers Act, 1923 (as amended from time to time) shall be complied with including the inspection and certification of the boiler by the Boiler Inspector.
4. Compliance with respect to Environmental Provisions or regulations.
   Adequate Environment Protection measures especially for waste water, chemicals and dust suppression system shall be provided in line with Air and water Act and provisions of appropriate Pollution Control Board.
5. Maintenance Safety Management System.
   Periodic health check-up of workers shall be done as per hazardous industries.
6. Internal Safety Audit.
   Regular Internal Safety Audits shall be carried out by the owner of the plant.
7. External Safety Audit.
   Safety checks or audits of generating stations shall be periodically carried out as per the regulation 12 above.
8. ISO 45001: Safety Audit.
   Plant shall be audited and certified as per ISO 45001 at least once in a year.
9. Fire Detection, Protection and Maintenance System.
   (a) Minimum two numbers Electric with two numbers jockey pumps (one working plus one standby) shall be installed.
   (b) Fire hydrant pumps shall be tested weekly and fire hydrant jockey pumps shall be tested daily in each shift.
   (c) Fire tenders shall be inspected daily in each shift and adequate manpower for each shift shall be employed.
   (d) All external fire detection shall be checked quarterly and all heat and smoke detectors annually tested.
10. Safety Aspects of Boiler.
   (a) General or Statutory Requirements.
   Boiler shall be externally inspected every time after annual maintenance or during hydro test.
   (b) Superheaters and Reheaters.
   (i) Superheaters and Reheaters tubes shall be inspected once a year during annual overhaul.
   (ii) Safety valves shall be tested once a year during annual overhaul.
   (c) Economiser.
   Economiser tubes shall be inspected once a year during annual overhaul.
   (d) Drum or Separator and Steam Headers.
   (i) Drum instrumentations shall be calibrated once in year.
   (ii) Drum internals shall be inspected once in a year.
   (e) Air Preheaters and Steam Coil Air Preheaters.
   (i) Air Preheater water washing shall be done once in a week.
   (ii) Air Preheater instrumentations shall be calibrated once in a year.
   (f) Steam Generator Integral Piping, Valves, Fittings and Mountings.
   Calibration of instruments such as pressure gauges, Thermocouple, Resistance Temperature Detectors, Flow sensors etc. shall be done during annual overhaul.
   (g) Duct Work, Dampers and Insulation.
   Metallic and Non-Metallic expansion joints shall be replaced once in three years and for Circulating Fluidized Bed Combustion boilers once in six months.
   (h) Soot Blowing System.
   Soot blower operation shall be done daily.
   (i) Electrostatic Precipitator.
   (i) Ministry of Environment Forest and Climate Change Norms in respect of Suspended Particulate Matter level shall be maintained.
   (ii) Dust collection efficiency shall be tested daily by opacity monitor.
   (j) Operation and Maintenance Aspects.
   (i) Boiler Overhauling shall be done every year.
   (ii) Safe shutdown of unit shall be done strictly as per Original Equipment Manufacturer's Operation

and Maintenance Manual.

11. Safety Aspects of Turbine Generator.

(a) General Aspects.

Safety awareness programs shall be conducted on safety for Turbine manpower.

(b) Steam Turbine Protection.

(i) Main turbine over speed protection checking shall be done atleast once in a month or as per Original Equipment Manufacturer's Manual.

(ii) Automatic Turbine Tester checking shall be done atleast once in a month or as per Original Equipment Manufacturer's Manual.

(c) Turbine Vibrations.

Main Turbine Vibration readings shall be maintained as mentioned in the unit specific Original Equipment Manufacturer's Operation and Maintenance Manual.

(d) TG Foundation and Civil works.

TG deck Non Destructive Test shall be carried out by competent agency.

(e) Valves and Non Return Valves.

Valves required for smooth operation shall be checked after every major shutdown as mentioned in the unit specific Original Equipment Manufacturer's Operation and Maintenance Manual.

(f) Turbine lubricating oil and jacking oil system.

(i) Hydro test of lube oil system shall be carried out as mentioned in the unit specific Original Equipment Manufacturer's Operation and Maintenance Manual.

(ii) Oil pipe line shall be inspected daily as mentioned in the unit specific Original Equipment Manufacturer's Operation and Maintenance Manual.

(g) Turbine Bearings and Turning Gear.

Lubrication and maintenance of turbine bearings and turning gear shall be done continuously as mentioned in the unit specific Original Equipment Manufacturer's Operation and Maintenance Manual.

12. Safety Aspects of Balance of Plant.

- Coal Handling Plant and Associated Sub-System.

(a) Railway Siding and Track Hopper.

(i) Signalling system of the track shall be kept in healthy condition and in auto mode.

(ii) While working at Wagon Tipplers, the following shall be ensured:

- ultrasonic sensors and signalling system in proper condition;
- the speed of the locomotive less than 5 km per hour in tippler area;
- brakes applied gently;
- all wagon doors remain closed;
- decoupling and coupling done from outside handle; and
- all limit switches in healthy condition.

(iii) Maintenance of wagons shall be carried out weekly.

(iv) Maintenance of locos shall be carried out every hundred hours of running.

(b) Coal Yard and Stacker and Reclaimer.

Water pressure shall be at least 3.5 kg/cm2 in hydrant line at the farthest end.

- Ash Handling Plant and Associated Sub-System.

(i) Bottom Ash System.

Bottom Ash handling system, after burning grate, Slag bath, submerged coneveyor, elevated conveyor, bin or silo shall be properly maintained.

(ii) Ash Bund or Dyke.

Maintenance inspection of Ash Dyke shall be carried out every alternate day.

- Fuel Oil Unloading System.

Electrostatic charges accumulated in the Bowser Lorry during movements or transportation has to be discharged by the drivers before unloading fuel oil, using a discharge rod, to prevent Explosions.

- D M Plant.

External inspection of the acid and alkali storage tanks shall be done once in six months.

- Cooling Tower.

Cooling Tower concrete structure shall be inspected during annual maintenance by a designated Civil Engineer.

- Compressor House.

Receiver tanks shall be hydraulically tested periodically at least once in a year.

- Transformers, Switchyard and Sub stations.

Environment friendly Clean Agent System shall be provided in Control Rooms viz. Main Control Room, Coal Handling Plant Control Room, Switchyard Control Room, Ash Handling Control Room.

- Diesel Generator.

Diesel Generator system shall be checked daily.

- Lift and Hoist.

Testing of Lift and hoist shall be done every year by competent agency.

13. Electrical and control and instrumentation system and associated sub-system.

(a) Electrical panels or Relays or interlocks or Lights shall be maintained and inspected under regular maintenance programme in every shift.

(b) Electrical panel rooms shall be segregated. Also, the Air Handling Unit room shall be segregated from the remaining facilities. For Air Conditioners which involves circulation shall be provided with automatically closing damper to prevent the circulation of smoke in case of any fire."

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