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Saftey Aspect in Construction and Maintainence of Buildings in India

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Abstract - *The construction sector is very hazardous across the globe. Construction industry has accomplished extensive growth worldwide particularly in past few decades. Construction is the second largest economic activity in India after agriculture. Poor safety in Construction Industry results in human life and financial losses. Developed Countries have adopted strict safety measures so as to minimize or eliminate accidents at construction sites. Occupational safety in developing countries is lagging behind the developed countries due to various aspects such as improper safety regulations and standards, lack of safety training and safety is considered on the lower priority. Higher priority is given to completion of work compromising the quality and safety of the work. A proper coordination between contractors, clients, and workforce is needed for safe work conditions which are very much lacking in Indian construction companies.*

A detailed literature study was carried out to understand the causes of accidents, Preventive measures, and development of safe work environment. This major project presents the results of a questionnaire survey, which is being distributed among various categories of construction workers in CSIR-Labs across the India The project examines and discusses in detail the total working hours, work shifts, nativity of the workers, number of accidents, and type of injuries taking place in small and large construction sites.

***Key Words*: construction, agriculture, human life, financial losses, safety regulations, working hours, work shifts**.

1. INTRODUCTION

Construction industry is the largest employing industry and still the most dangerous one. In developing countries high priority is given to completion of work at low cost, thus compromising the safety of the site. But in construction industry highest degree of safety cannot be ensured like other industries. Hundred percent safe environments cannot be provided. The rapid growth of construction industry in India today is out of proportion to practical developments in terms of safety and health aspects of the construction workers. Pitfall in legislation combined with lack of proper implementation is also a significant contributor.

In Indian construction sector, the number of people dying in construction could be anywhere from 11,641 to 22,080. In India there are around 7 lakh firms in this industry. As per the survey conducted by National Sample Survey Organization in 1999-2000 there were about 17.62 million workers in India. Safety is a very important aspect as occurrence of accident on site leads to loss of productivity, human suffering, loss of reputation for people associated with the project, statutory problems. Indian construction section alone adds 24.20% of occupational fatality occurring annually in India. The safety performance of construction is poor in comparison to UK, Singapore and Taiwan.

2. REVIEW OF LITERATURE

Different types and reasons of hazards/accidents and their causes are explain this paper. In India the largest employing industry, Construction Industry needs to overcome the causes of hazards. 98% of the accidents can be avoided by adopting proper safety techniques. The simplest method to adopt safety is by leaving the work to the trained competent person only. The current situation of safety in Indian Construction industry is in sa very dire state. There is lot of malpractices going on and no adherence to the stipulated guidelines is observed. On a positive note, the situation is improving as people are being aware of importance of safety and government is becoming stricter with its law implementation. But it is a long way away from reaching the minimum international standards. Technological advancements have also included GPS based tracking system.

Owing to increase in complexity of operations, the construction industry has become more dangerous. Construction industries are faced with the challenge of having close monitor of their labour safety management systems to minimize occupational hazards. This paper is concluded with few points given below:

(i) The working time is comfortable for all categories of workers in most of the sites.
(ii) The average age of the workers was found be 32 years.
(iii) Maximum numbers of workers were native workers but migrant workers are ready to work for low wages.
(iv) The average number of accidents was found to be 16.03 in small construction sites.
(v) The average number of accidents was found to be 13.00 in large construction sites.
(vi) In both small and large construction sites, more number of accidents occurred due to body injuries accounting to 44.1% and 26.4%, respectively.
(vii) In general, safety of workers in all construction is to be improved.
(viii) Contractors and owners must give utmost importance to the safety of the workers. The paper concluded that the major cause for construction accidents is due to injuries. Further studies can be conducted on such injuries and methods that can be adopted to prevent such injuries. Employer can always check legislation and draw up a proper health and safety plan specific to employer's workplace and employees. The provisions available in the laws that can be followed by employers for ensuring safe construction site environment can be studied in detail.

A total of 30 Indian organizations under three industrial categories such as **construction**, **refractory** and **steel** are chosen for comparison purpose. It has been observed that safety performance of construction industries is consistently low as compared to other categories of industries. TE has been calculated using two types of models of DEA such as constant return to scale (CRS) and variable return to scale (VRS). A paired two-sample t-test indicates that TEs obtained using two models are significantly different. Mean efficiency of 30 samples is found as 0.898 using CRS model whereas same is calculated as 0.942 using VRS.

Execution schedule and 2D drawings are generally used for hazards identification in the construction safety planning process. Planner visualises 2D drawings into a 3D model and mentally links its components with the respective activities defined in the schedule to understand the execution sequence in safety planning. Sequence interpretation and accordingly the hazards identification vary with the level of experience, knowledge and individual perspective of the safety planner. Therefore, researchers suggest the use of four dimensional (4D) modelling or building information modelling (BIM) to create the simulation of construction process by linking execution schedule with the 3D model. Both however lack in the features like: generation and updating of schedule, 3D components editing, topography modelling and geospatial analysis within a single platform which is now a major requirement of the construction industry. This work facilitates 4D modelling, geospatial analysis and topography modelling in the development of safe execution sequence by using geographic information systems (GIS), both 3D model along with its surrounding topography and schedule were developed and linked together within the same environment. During safety review process if planned sequence results a hazard situation, it may be corrected within the GIS itself before actual implementation. Paper also discusses the use of GIS in the development of safety database from which safety information are retrieved and linked with the activities of the schedule or components of a building model. 4D modelling along with topographical conditions and safety database in a single environment assist safety planner in examining what safety measures are required when, where and why. Developed methodology was tested on a real life project in India, lessons learned from the implementation have been discussed in thepotential benefits and limitations section. At last, paper highlights major research areas for further improvements.

In the United States, the Occupational Safety and Health Administration (OSHA) was created to enhance safety in the workplace. Employers are subject to OSHA site inspections and must conform to a set of comprehensive rules and regulations. In contrast, in a developing country such as India, comprehensive and universal safety regulations have not been developed. Workers are generally unskilled or semiskilled, poorly paid, temporarily employed, exhibit low production (productivity) rates, and often migrate in a group from one place to another in search of work. Typically, laborers are not trained in safe work practices, and there tends to be a lack of management commitment to safety programs and various safety procedures. In contrast, in a newly developed country such as Taiwan, the owner and the contractor are assigned joint responsibility for claims resulting from occupational accidents. A basic safety-control system, emphasizing the establishment of a safety committee and self inspection, has been developed to control project

safety. This system may be universally applicable to both developed and developing regions.

Owing to increase in complexity of operations, the construction industry has become more dangerous than ever before. Construction organizations are faced with the challenge of having to closely monitor their safety management systems to minimize occupational hazards, while simultaneously trying to sustain profits in a competitive marketplace. In the United States, government agencies such as OSHA have done their part to promote a zero injury environment. However, in India effective safety construction management is not available. Moreover, the key to proper safety execution is not necessarily through strict guidelines and standards, but through an effective total safety management initiative, first supported by an organizations senior management, then integrated via specific safety management implementation tools/ systems, and finally by continuous follow up and monitoring to ensure quality and continuous improvement. Construction organizations interested in maximizing safety and competitiveness must look to TQM initiatives for inspiration. Quality focus, total commitment, and continual improvement must be the mantra of choice. Only those companies that take on an aggressive safety management approach will sustain profit margins and achieve world-class competitiveness. The proposed TCSM acts as a catalyst for maintaining a safe project, contractor top management should formulate strategies and develop policies that nurture a safe culture. Theauthors would like to conclude that the single most important determinant of the success of an organization in implementing TCSM is its ability to translate, integrate, and ultimately institutionalize TCSM behaviors into everyday practice on the job.

As digital technologies become widely used in designing buildings and infrastructure, questions arise about their impacts on construction safety. This review explores relationships between construction safety and digital design practices with the aim of fostering and directing further research. It surveys state-of-the-art research on databases, virtual reality, geographic information systems, 4D CAD, building information modelingand sensing technologies, finding various digital tools for addressing safety issues in the construction phase, but few tools to support design for construction safety. It also considers a literature on safety critical, digital and design practices that raises a general concern about 'mindlessness' in the use of technologies, and has implications for the emerging research agenda around construction safety and digital design. Bringing these strands of literature together suggests new kinds of interventions, such as the development of tools and processes for using digital models to promote mindfulness through multi-party collaboration on safety.

At present, high rise commercial building is quite complex in implementing a building maintenance policy. The quality, safety and service are the criteria of the building maintenance policy which should be provided and implemented in the high rise commercial buildings in order to sustain their value and economics. It also can benefit to the investment aspect as well as the maintenance activities. The purpose of this paper is to look at the implementation of the building maintenance policy in building maintenance management of high rise commercial buildings in Malaysia. Seven high rise office buildings were investigated through randomly selection in Klang Valley, Malaysia. This study attempts to provide a perspective of in-house building maintenance personnel and outsourced consultant as well as contractors on the maintenance policy practiced in building maintenance management of high rise office buildings through unstructured interviews. This paper presents the preliminary finding of a study on the building maintenance policy issues in the particular buildings. The current maintenance policy procedures in Malaysia are however based on house rule and contract agreement. The weaknesses in the current procedures are the primary problems because they do not explicitly link maintenance needs with performance management, strategic management and facilities management. The results had shown that the scope of building maintenance implemented varies from one building to another. This implies the quality of maintenance is not consistent especially in building performance aspect. The most important finding is that the building maintenance policy standard is not available in all buildings. This research establishes the need to develop a standard of building maintenance policy in high rise commercial building to be enforced legally in order to ensure the consistency of quality, safety and service to end users as well as publics all the time. As a conclusion, building maintenance policy can be a tool in order to measure and value the quality of the maintenance and operation processes improvement link with performance management, strategic management and facilities management.

Inspection of building / installation for safety all building structure to be inspected twice a year to

ensure that the building/ structure is not unsafe for use a record a certificate also to be prepare. All the electrical installation also to be inspected. In case of deficiency found in the building / structure, necessary report should be made to and immediate steps taken to get the same repair.

India's National Building Code 2005 is one document that gives comprehensive information about various Indian Standards that need to be followed while constructing buildings and relates various requirements for safety measures that need to be implemented.

Crisis situations do not take place every day, but we have to be ready for them if things go awry. Keeping that in mind, the National Building Code 2005 has set certain rules related to fire and life safety that developers have to follow. While "absolute safety from fire is not attainable in practice", the Code specifies measures that will provide that degree of safety which can be "reasonably achieved".
Here are seven important things that the National Building Code 2005 talks about:

- Categories of buildings: According to the code, buildings are classified into nine categories based on the character of the occupancy and they need to put in place the fire-safety standards based on their category. While residential buildings are kept under Group **A**, industrial buildings are demarcated under Group **G**. Business building units are kept under Group **E** and storage buildings under Group **H**. Residential buildings are further categorised into six sub-categories.

- Residential buildings: The code defines residential buildings as constructions "in which sleeping accommodation is provided for normal residential purposes with or without cooking or dining or both facilities, except any building classified under Group **C**". Group **C** buildings cover institutional buildings.

- Dangers to avoid: According to the code, "Every building shall be constructed, equipped, maintained and operated as to avoid undue danger to the life and safety of the occupants from fire, smoke, fumes or panic during the time period necessary for escape."

- Rules for exits: Under the code, while doorways, corridors, passageways are defined as exits, elevators are not kept in that category. The code says that no alterations should be made in a building to reduce the number, width or protection of exits as are required.

- Mandatory fire safety drills: As fire may cause a serious issue in the case of highrises, unless a plan for orderly and systematic evacuation is prepared, fire drills should be conducted at least once in three months in high-rise buildings during the first two years of its construction, says the National Building Code 2005. After that, such drills have to be conducted once in six months.

- Fire detection and alarm systems: In buildings of large sizes where a fire may not itself provide adequate warning to the occupants, automatic fire detection, and alarm facilities are a must.

- Installation of fire extinguishers: Based on their occupancy, use and height, all buildings have to be protected by fire extinguishers, wet risers, automatic sprinkler installations, water sprays, etc.

3. METHODOLOGY

The methodology is designed in order to reflect the different aspects of construction sites and to reflect overall project objectives. It has following steps.

1. Visit of various construction site at Delhi/ NCR obtain relevant data.
2. A detailed questionnaire is designed in order to quantify the criteria influencing the safety at site with weight age depending upon its importance. The criteria considered for survey are as follows:-

   a. Type of work, nature of work, location, value of
   b. Labour information: position, number of workers, work shift, and timing
   c. Accident evaluation: number of accidents, type of injury, and reason for accidents.

The questionnaire is distributed and filled questionnaire is collected back from respondents. A total of 22 whatsapp interviews were conducted across 22 sites with a range of managers, site engineers, personnel responsible for safety, and labourers.

3. Study of various manuals government policies tender document etc.
In the last step, findings based on the questionnaire and interviews were used to analyze the safety performance of the construction industry.

In details it can be seen in following step:-

A) Identification subject Contant: First I recognize the actual requirement for the project worked. Justify himself that there are some additional work need to be done with the existing provisions. Identify what is the requirement & what is actual work to be done for the sub Project. **Review of Existing Literature:** I go through several existing literature /research paper has already been done in this area. This is help me a lot of with adding great knowledge and also avoiding the repetitions of any already existing work. Literature review also strengthen to interacted with subject and improve the methodology being adapted the various project from the last two or three decades.

B) Review of existing Building Manual/Norms etc.: I also study various manuals as CPWD manual, national building code 2005 and manual from national safety council. All from their I received valuable data for project.

C) Selection of Project Site: Case study of new building/ old building I selected some project to nearby me at delhi region i.e.,

i) Construction of MP Flats at V. D. Road New Delhi
ii) Maintenance of Multi-storage building at NPL Colony.

iii) Maintenance of residential society at raj nagar extension Gaziabad.
iv) Construction of residential society at raj nagar extension Gaziabad.

Beside to this I visited several constructions site at NCR region.

D) Various activities related to safety assessment & rescue calculation (Accident) : From various literature, manuals, site visited and questioner I find followings.

1. The approximate of no. of accidents at the site:– 2-3 per site per year
2. The proportion of measure/ minor accident:– 1/5
3. Approximate no. of per site:– 0.5 per year
4. Septic control related with work value:–
   It has found that these contracts has less no. of accidents comparative to lower value of same nature
5. The accident in government sector/ private sector: – It has found for same nature the private sector has recounted more accident then government sector.
6. What is safety risk for construction/maintenance-
   both having same type of risk however construction site has risk of big accident maintenance site having comparatively small accident.

E) Study of manuals & tender documents:

a. There are various provisions guidelines for safety in construction but these are not completely followed in actual execution/ maintenance.
b. Several professional are totally un aware from policies
c. Workers are mainly unaware from safety norm and methods and taking it vary casually.
d. Thumb rule are being in practice without scientific approach.
e. The focuses are timely/ speedy work execution work with economy is main criteria.

F) Identification of conflicts: – I also find different conflicts at site within the stockholders. Contractors want maximum profit while department want maximum quality with economy. Due to these safeties measure always compromises. To tackle a middle approach should be introduce.

3.1 CAUSES OF ACCIDENTS

Accidents are caused due to unsafe act by victims, unsafe act by co-workers, unsafe conditions created by the worker, unsafe condition created by use or combination of the above. Unsafe act is an act of commission (doing something unsafe) or act of omission (failing to do something). Unsafe acts are due to overconfidence, disregard of instructions, failure to use PPE (personal protective equipment's). Unsafe conditions is one in which the physical layout of the workplace or work location, and the status of tools, equipment and/or material are in violation of contemporary safety standards. These conditions are due to lack of proper planning, deficient enforcement of safety, absence of safety equipment, and unsafe methods of safety, absence of safety equipment, unsafe methods or sequencing, unsafe site conditions.

3.2 Poor house Keeping

Falls and slips occur on the construction site due to poor housekeeping. A site has poor housekeeping if the work area isn't tidy and has sharp objects, tools, construction waste lying around.

3.3 Excavation

A person may fall into the excavated pit or earth may fall on the workers working in the construction pit. Earth may fall if the shoring isn't in place. And shift in the shoring should be investigated and corrected. The excavated earth should be kept at least 1m away from the pit so as to avoid it from falling in.

3.4 Working at Height

Highest accidents occur due to working at height. Accidents occur while working on height due to improper use of ladders, incorrect scaffolding and negligence on the safety rules. Installation of defective ladders or improper installation of ladders should not be permitted. While working at height accidents occur due to collapse of scaffolds, fall from scaffolds or fall of materials from scaffolds. Improper safety harness, lack of confidence while working at height can cause accidents. Not only are the workers working at height, but even passerbys at risk due to any negligence.

3.5 Electrical Accidents

Burns, shocks, fire and electrocution are included in this hazard. Such accidents occur if electrical equipments are used in wet or damp areas, if electrical connections are overloaded or left free on the ground. Short circuit may occur if proper maintenance of electrical equipments is not done or defective parts are used in the equipments. Hampering the electrical circuits during Excavation or civil works should be taken care of.

3.6 Lifting or Rigging

Heavy loads are lifted and shifted using the cranes and sometimes in the process the cranes overturn. Overturning of crane leads to great financial loss, human life and structural loss. Minor crane accidents often happen due to bad communication between the operator and signal man.

3.7 Hazards in Confined Space

While working in confined spaces (spaces having limited access when subjected to deficiency of oxygen, toxic and flammable gases or substances, etc) there might be heat, electrical, radiation hazards if importance of confined space is not defined. Lack of facilities provided in the confined spaces reduces the hazard facing ability.

3.8. Guidelines for Safety Practices

In paramount of growing concerns regarding safety in Industry there are some guidelines that are set up to be followed at construction sites for increasing safety standards.

3.8.1. Management Leadership

The highest authorities of the company need to provide leadership, vision and resources for effective health and safety programmes. They need to make it worker safety and health core value of their organization. They should visibly communicate their safety and health commitment of continuously improving standard to workers. They are ought to lead by examples through their own actions.

3.8.2. Hazard Identification and Assessment

Hazard identification and assessment is very important in any safety and health program. This is due to the fact that unanticipated hazards can arise due to various factors. The failure to identify these hazards is one of the primary causes for construction injuries and illness. Before any construction work takes place, management should assess job site condition to identify potential areas of serious injuries. Many serious injuries are attributed to workers falls, collapse, being struck by vehicles, trench cave-ins and electrical lines. The responsibility of the workers and employees is to collect and review data related to hazards on the site. They also need to conduct regular inspections of job sites to keep track of occurrence of hazards. They should also look into various dangerous consequences and group them together and identify the trend in their occurrence. For every hazard the severity and the likelihood needs to be found out to determine its risk factor.

3.8.3. Worker Participation

The effectiveness of safety program depends on the proper participation of workers. Successful programmes educate the workers of the potential hazards that are associated to their job. For any effective programme the workers should have access to important details of the programme and feel comfortable to give in their inputs.

3.8.4. Hazard Prevention and Control

Effective controls protect workers from hazards; help avoid injuries, illnesses, and incidents; minimize or eliminate safety and health risks. The employers are responsible for developing a hazard control plan to determine the implementation of controls. There should be a hierarchy of orders developed by employer for identifying and controlling hazards. They also need to develop plans to protect workers during emergencies and non-routine times. They need to continuously monitor the effectiveness of existing controls and determines if new method are required. Continuously review new technologies for cost effectiveness and better productivity.

3.8.5 Education and Safety Training

This is an important part of health and safety programme as it gives employers and workers greater understanding of the programme and help them contribute to its development and implementation. Training should be at the core of every safety program. It is important to identify the areas in which training is required. All employees should be trained on hazard communication; other training may include electrical

lock out, confined space entry, trenching, back-injury prevention, fall protection, fire protection, equipment safety and other safety concerns. They also help them be updated with knowledge about hazards and controls as it helps them become more productive and work safely.

3.8.6. Safety organization

The organization of safety on the construction site will be determined by the size of the work site, the system of employment and the way in which the project is being organized. Safety and health records should be kept which facilitate the identification and resolution of safety and health problems on the site.

3.8.7. Safety officer

One commonly accepted prerequisite for administering a successful safety program is the designation of a safety officer at the project level. It is standard practice on many large projects to require a safety officer. Safety provisions requiring a safety officer should be included in the construction contract.

3.8.8. Program Evaluation and Improvement

The continuous evaluation of health and safety programme is required to verify their implementation and later on its effectiveness. Whenever the results of this evaluation identify areas to improve the programme, the concerned authorities should implement the changes and monitor the effectiveness of the change.

3.8.9. Communication & Coordination for Employers on Multiemployer Worksites

Generally in construction industry, contractor hires various sub-contractors who have different workers working at various projects. Therefore it is important that all the various section of workers coordinate and work and their safety is preserved.

3.9. Why are these Guidelines not Followed in India

The Indian Construction Industry is comprised of huge number of companies which fall into different brackets of expertise. It is observed that the above guidelines are usually only followed by the top-tier companies and its implementation is hardly observed in the low tier firms. Even in the top tier companies the full implementation of these guidelines is not observed at all their sites. This implementation of guidelines in the industry is not seen because of the following reasons:-

3.9.1. Cost of Implementation

This is one of the biggest factors that the implementation is not observed in India. The low-tier companies cannot afford the cost of hiring professionals for safety implementation and monitoring. They don't have enough capital to afford personal protective equipment for their workers. Safety is less of a priority in budget allocation for projects. This is similar case in almost all companies in India.

3.9.2. Worker Negligence

The workers come from different background and are not well-educated regarding safety. They don't understand the risk to their lives due to lack of safety practices. Even after being educated about the risk, they don't tend to follow the practices. They find it a hindrance to their work. Only after experiencing the fatality of such conduct they understand it's value which sometimes can be too late.

3.9.3. Lack of Implementation of Legislation

There are different laws set up by the government for the safety standards, but the implementation isn't monitored completely. Corruption at different levels of the implementation has made it easy for defaulters to get away with it. The workers are not aware of their rights and methods to fight for infringement of their rights.

3.9.4. Engineer Negligence

The different engineers working on sites don't take safety seriously and don't take proper efforts for the following of the safety plan of the site. They are not strict with sub-contractor and workers who do not follow proper safety norms.

QUESTIONNAIRE NO-1 FOR SITE VISIT

- SITE– Construction of MP qtrs. at V.D. Dass Roas/ Maintenance of MSB at NPL colony.
- Following questionnaire prepared and asked at above mention site between January to March-2020

Sl. No.	Questionnaire	Answer/ Comments			Suggestion/ Recommendation
		Top management	Middle management / Supervisor	Worker	
1	Do you have a Health and Safety (H&S) policy?	YES	YES	Not aware	Suitable training to be emphasis to workers
2	When was your Health and Safety Policy last updated or reviewed?	YES	YES	Not aware	Mock drills safety policies to be display at various places
3	Do you have Arrangements that detail how your company manages H&S?	YES	YES	Not aware	Slogans
4	How are your Arrangements for H&S communicated to your employees (and sub-contractors, if applicable)?	YES	YES	Not aware	Animations/ pictures to be display specially workers
5	How do you consult with your employees on H&S matters?	YES	YES	Not aware	Regular communication should be 1st activity regarding safety & health hazards
6	Are your H&S Arrangements subject to a system of Monitoring, Review and Audit?	YES	YES	Not aware	Proper arrangement of PPTs to be maintain
7	Who has the main H&S responsibility in your organisation?	J.E./A.E. at Site	J.E./A.E. at Site	Mate	Name to be display at every place
8	What safety and other relevant qualifications do they hold?	YES	Training of safety & first AID	Not aware	Safety training/ qualification should be necessary
9	From whom do you get competent H&S and construction safety advice e.g. in-house safety advisor or consultancy?	From internal safety officer & local government bodies	From internal safety officer & local government bodies	Mate	Clear instruction & responsibility to be fixed
10	What H&S qualifications does your competent H&S advisor hold?	Safety training & qualificatio n	Engineering degree diploma	Not aware	Safety training/ qualification should be necessary
11	Do you have evidence of employee training to ensure their competence to carry out the work at our premises?	YES	YES	Not aware	Every accidents should be documented
12	Do you have evidence of training for key project members e.g. CDM Co-ordinator?	N/A	N/A	N/A	Every accidents should be documented
13	Please name your employee who will be responsible for H&S on our site.	A.E/J.E.	A.E/J.E.	Mate	N/A
14	Please detail what relevant	Engineerin	Engineering	N/A	N/A

	qualifications, training and experience the person responsible for H&S has.	g degree diploma	degree diploma		
15	How many reportable accidents have you had in the last 2 years?	6	6	6	Every accidents should be documented
16	Has your company ever been subject to any enforcement action? If yes, please provide details.	NO	NO	NO	N/A
17	Do you have procedures for reporting and investigating accidents, dangerous occurrences, and diseases? Provide details of any investigations carried out following accidents (if any).	YES	YES	N/A	Proper safety & health procedure should be drafted an approved by Competent Authority
18	If applicable, do you have Procedures for ensuring the competence of sub-contractors?	YES	YES	N/A	Sub contractors also trained & sensitize regarding health & safety issues on site
19	Have risk assessments been prepared for the activities to be carried out on our premises? Examples required.	NOT Regular but mock drills fire etc.	NOT Regular but mock drills fire etc.	N/A	Regular risk assessment must be performed
20	Have method statements been prepared for the activities to be carried out on our premises? Examples required.	N/A	N/A	N/A	N/A
21	Have safe systems of work been prepared for the activities to be carried out on our premises? Examples required.	YES	YES	Not aware	Innovative safety & health program me should be introduce
22	Do you have arrangements for the maintenance of plant and equipment? Please provide details.	YES	YES	Yes	Proper management for the inspection & maintenance of plant & equipment should be done.
23	How do you ensure that adequate welfare facilities are available prior to work commencing? Please provide details.	YES cleaning of site etc./ necessary clearance	YES cleaning of site etc./ necessary clearance	YES Site cleaning	All clearance should be taken prior the start of work

QUESTIONNAIRE NO-2

Question Pattern of Questionnaire No-2 for Whatsapp Group (CSIR-Engineer)

- Name:
- Designation:
- Location:
- Year of experience:
- No. of accident notice in whole service response during construction/ maintenance:
- No. of death notice whole service during construction:
- Awareness of safety policy {fully/partially/none}

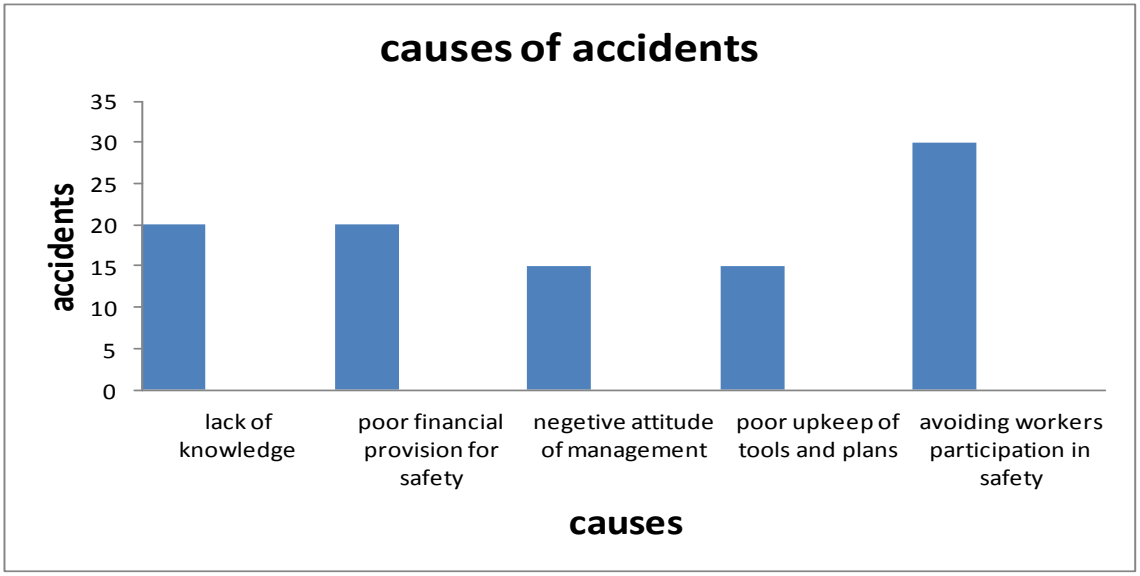
- Advice/ suggestion for safety measure at site in five lines:

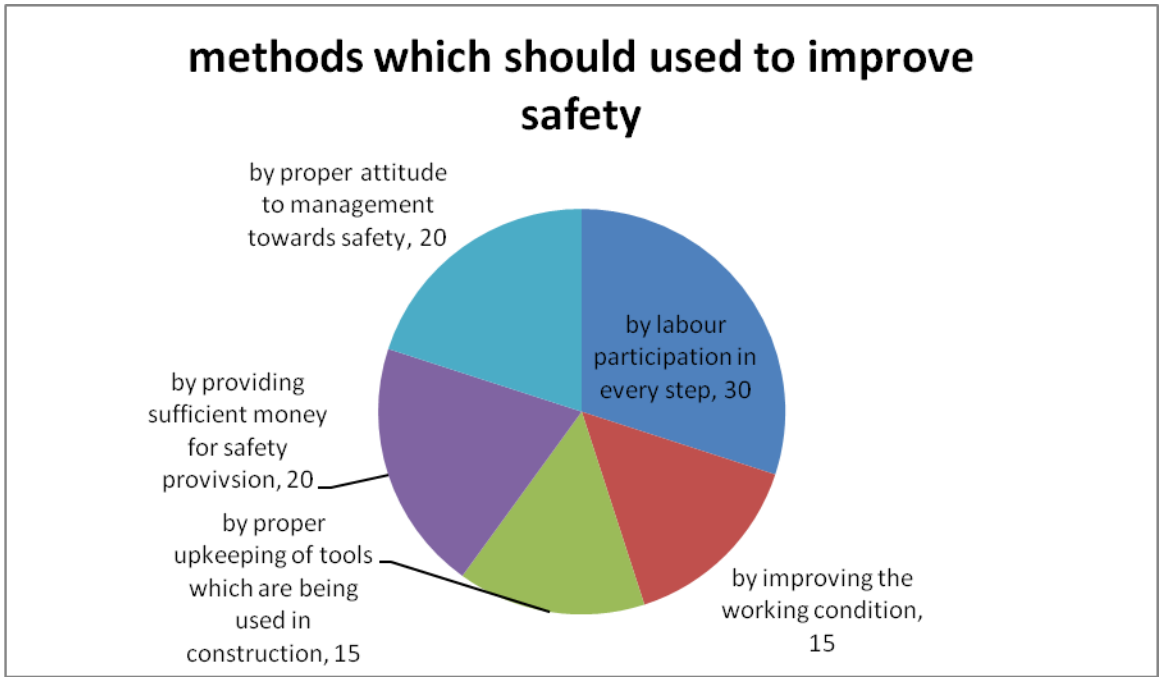
Link to form:
https://forms.gle/KwSBZLmfo9Kfk3KV9

Response of Questionnaire No-2 for Whatsapp Group (CSIR-Engineer)

Timestamp	Username	Name	Designation	Location	Year of Experience	No. of Accident	No. of death	Awareness of Safety Policy
17-06-2020 19:16	cts@cecri.res.in	Subramanian CT	Superintending Engineer	Karaikudi	27	one no in construction of transmission line tower.	one no during stringing the conductors in transmission line towers.	Fully Aware
17-06-2020 19:40	kamal_jain@cdri.res.in	Kamal Jain	Senior Superintending Engineer	Lucknow	33	3	Zero	Fully Aware
17-06-2020 21:04	deepaksbendale@gmail.com	Deepak Bendale	Asstt.Executive Engineer	Pune	15	4	0	Partially
17-06-2020 21:04	deepaksbendale@gmail.com	Deepak Bendale	Asstt.Executive Engineer	Pune	15	4	0	Partially
17-06-2020 22:19	mishra271973@gmail.com	Shkk	Fjji	Bky	Fji	Djj	Sgh	None
26-06-2020 13:13	ravi.pathak@timesgroup.com	Ravi Pathak	Sr Manager	Manesar	26	1	Nil	Fully Aware
26-06-2020 18:01	pankaj25671@gmail.com	Santosh Yadav	Deputy general manager	Mundra port Gujarat	27	9	3	Fully Aware

Conclusion of Questionnaire :-





4. CONCLUSIONS

4.1 Conclusion & Future Scope

In India the construction industries has accomplished extensive growth particularly in past few decades. For any construction project to be successful it is necessary that all the structures should be safe and personnel safety is utmost importance. The safety issues consider to design stage to completion. Therefore the scope of safety aspects in construction will be wider in future. The use of latest technology for safety is necessary to pace with latest technological construction techniques. As spread of trend for construction of high rise buildings the safety during maintenance will be important facture. Presently the buildings of complex nature such as mercantile, atomic stations, sub-station, doc yards & defence are more in construction the safety aspects will play a big role. Hence several alternatives may be search by this to provide this requirement.

Owing to increase in complexity of operations, the construction industry has become more dangerous. Construction industries are faced with the challenge of having close monitor of their labour safety management systems to minimize occupational hazards. This paper is concluded with few points given below:

(i) The working time is comfortable for all categories of workers in most of the sites.

(ii) The average age of the workers was found be 28-35 years.

(iii) Maximum numbers of workers were native workers but migrant workers are ready to work for low wages.

(iv) The average number of accidents was found to be 6.03 in small construction sites.

(v) The average number of accidents was found to be 4.00 in large construction sites.

(vi) In both small and large construction sites, more number of accidents occurred due to body injuries.

(vii) In general, safety of workers in all construction is to be improved.

(viii) Contractors and owners must give utmost importance to the safety of the workers.

The paper concluded that the major cause for construction accidents is due to injuries. Further studies can be conducted on such injuries and methods that can be adopted to prevent such injuries. Employer can always check legislation and draw up a proper health and safety plan specific to employer's workplace and employees. The provisions available in the laws that can be followed by employers for ensuring safe construction site environment can be studied in detail. Main recommendations:-

(i) Workers should be given first priority for training of safety & health aspects

(ii) Regular inspection of plant & equipment should be done

(iii) Proper safety personnel should be deployed at site

(iv) Innovative methods i.e. slogan, robotics, animation etc. & should be used at site for proper training/ awareness

(v) A common advertisement of safety at construction site should be displaced regularly and noticed new channel/ IV programs.

(vi) For maintenance of M.S. Building as for as possible short should be outside building or proper size of shaft for maintenance activity

(vii) Maintenance plate form at several floors may be constructed with proper ladders

(viii) All CI/GI pipe etc should be in the proper approach for maintenance people

(ix) In contract document safety clause should be given prime provision and some financial reserve (2 to 5%) should be done to ensure compliance of safety provision at site.

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