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HAZARDS IN CONSTRUCTION SECTOR AND THEIR PREVENTIVE MEASURES

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ABSTRACT

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The BOCW Act stipulates health, safety and welfare measures applicable to building workers. Building worker is defined in Section 2(e) of the BOCW Act as "a person who is employed to do any skilled, semi-skilled or unskilled, manual, supervisory, technical or clerical work for hire or reward, whether the terms of employment be expressed or implied, in connection with any building or other construction work." As per Section 2(d) of the BOCW Act, "building or other construction work" includes "the construction, alteration, repairs, maintenance or demolition- of or, in relation to, buildings, streets, roads, railways, tramways, airfields, irrigation, drainage, embankment and navigation works, flood control works (including storm water drainage works), generation, transmission and distribution of power, water works (including channels for distribution of water), oil and gas installations, electric lines, wireless, radio; television, telephone, telegraph and overseas communication dams, canals, reservoirs, watercourses, tunnels, bridges, viaducts, aqueducts, pipelines, towers, cooling towers, transmission towers and such other work as may be specified in this behalf by the appropriate Government, by notification but does not include any building or other construction work to which the provisions of the Factories Act, 1948 (63 of 1948), or the Mines Act, 1952 (35 of 1952), apply." The construction industry has an obligation to provide safety for workers, the public, suppliers, and other participants in the construction process. In the past, traditional safety efforts focused on technical and engineering aspects, but this guide suggests that a strong and positive safety culture and correct behaviors are essential to the improvement of safety in the industry. Creating a strong safety culture requires the involvement and commitment of all project stakeholders. Whether a business is a construction client, designer or constructor, consistent and effective operation of safety management systems throughout the business is assisted by a strong safety culture among senior management and board members overseeing its operations.

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INTRODUCTION

The framework for this guide suggests six best practice principles for creating a strong safety culture. They are intended to operate at an industry level as broad values for

adoption at both the corporate and project level. The best practice principles are:

Principle 1: Demonstrate safety leadership

Principle 2: Promote safety in design

Principle 3: Communicate safety information

Principle 4: Manage safety risks

Principle 5: Continuously improve safety performance
Principle 6: Entrench safety practices.

List of Hazards on a Construction Site

Construction is the main industry for fatal injuries to workers. Construction hazards are heavily dependent on the type of construction work that is being carried out. For example, working on scaffolding presents entirely different hazards to working with asbestos.

The top ten risks and hazards from working on construction sites are:

- Working at height.
- Moving objects.
- Slips, trips, and falls.
- Noise.
- Hand arm vibration syndrome.
- Material and manual handling.
- Collapsing trenches.
- Asbestos.
- Electricity.

Airborne fibers and materials.

Hazard Prevention and Control

Effective controls protect workers from workplace hazards; help avoid injuries, illnesses, and incidents; minimize or eliminate safety and health risks; and help employers provide workers with safe and healthful working conditions [2]. The processes described in this section will help employers prevent and control hazards identified in the previous section.

To effectively control and prevent hazards, employers should:

- Involve workers, who often have the best understanding of the conditions that create hazards and insights into how they can be controlled.
- Identify and evaluate options for controlling hazards, using a "hierarchy of controls."
- Use a hazard control plan to guide the selection and implementation of controls, and implement controls according to the plan.
- Develop plans with measures to protect workers during emergencies and no routine activities.

- Evaluate the effectiveness of existing controls to determine whether they continue to provide protection, or whether different controls may be more effective. Review new technologies for their potential to be more protective, more reliable, or less costly.

- **Action item 1: Identify control options**

- **Action item 2: Select controls**

- **Action item 3: Develop and update a hazard control plan**

- **Action item 4: Select controls to protect workers during no routine operations and emergencies**

- **Action item 5: Implement selected controls in the workplace**

- **Action item 6: Follow up to confirm that controls are effective**

OBJECTIVE

- To determine broad parameters of EHS management at site.
- Establish & define line of command for resolution of all hazard prevention issues.
- Define individual responsibilities hazards prevention & safety promotion responsibility at each level of the construction team.
- Identify highly hazardous operations within the scope of work & specially integrated preventive measures to mitigate the same.
- To ensure compliance with relevant applicable legislation.
- Continual EHS performance improvement by directing focus on the key areas for improvement in consistent manner.

1. METHODOLOGY

- Facility walk down including visit to various sections in plant
- Discuss with the members relating to the work activities
- Review of documents
- Observation of activities / operations / processes
- Analysis of Data
- The project work was carried out in partial fulfillment of the course

- “M Tech in HS&E The information provided herein is only for
- Academic purpose and cannot be interpreted as legal opinion and cannot be used for
- Legal purpose.

Over the last 3 decades, KPIL has been instrumental in making our country infrastructure more efficient through building & integrating terrains and cityscapes [4]. KPIL has constructed landmark edifices across the country. KPIL touches our lives through landmark edifices including highways, expressways, bridges, flyovers, townships, tall buildings, hospitals, industrial units, power plants etc. Of late, the company has started expanding vistas by taking orders from international counterparts. We strive to achieve excellence through speedy execution, cost efficiency, management of sustainability concerns, safety and all regulatory compliances etc.

Batching Plant

To produce concrete, aggregates, such as gravel and sand, are mixed with cement and water in motor –driven horizontal or vertical mixers of various capacities are installed at the construction site, but sometimes it is more economical to have ready –mixed concrete delivered to the site. Alternatively, concrete mixing plants/station are installed near the site [6].

HAZARDS

- Hitting of scraper during unauthorized person comes in to swing area.
- Failure of wire ropes/lifting tools.
- Failure of pipe lines
- Respiratory diseases during handling of cement, micro silica & fly ash.
- Fire hazards due to bad housekeeping, stacking of empty cement bags, smoking etc.

- Road accident during transportation of concrete.
- Fall of man & material during pipe line erection work at height.
- Cleaning of transit mixer.
- In cement work the main types of accidental injuries are bruises, cuts and abrasions which occur during manual handling work.

Safety measures:

- A basic requirement in the prevention of dust hazards in the cement, aggregate handling causes respiratory diseases. Suitable protective clothing to be provided to protect person from dust hazards.
- Spray water at working area to avoid dusting.
- Batching machine shall be started only when batching drum cover is in the proper position.
- Batching plant & scrapper operator should be trained person.
- Metal scrapper wire rope shall be inspected regularly for any defects, wear & tear.
- When repairing silo, hoppers, batching plant accessories by welding and gas cutting, all safety precautions shall be taken to avoid any fire hazards.
- It must be ensured that workers cleaning the pit beneath feed hopper skips are not injured by accidental lowering of the hopper.
- At time of cleaning transit mixer from inside to remove the concrete lumps use LOTO method to avoid any accident. Also the key of panel board which is locked should be with the person working inside.
- The entire transit mixer shall be provided with reverse horn, side light, front light and proper inspection to be done and checked prior to start of shift.



Fig 1 Safety precaution of plant

ELECTRICAL SAFETY

General

Minimum one dedicated license holder experienced electrical staff shall be provided by KPIL.

Temporary electrical power distribution system

➤ No live work is permitted on any temporary power distribution system. The system must be Isolated, locked out, tagged and verified that it is properly isolated.

➤ The Contractor shall test ELCB's and RCCB's for the temporary power distribution system on weekly basis. Are cord of this sting must be maintain edit the projects item and available for review by KPIL

➤ ELCB's or RCCB' must be used with all temporary power systems including all cord connected equipment and power tools.

➤ All portable electrical tools, and extension lead so cords, and devices must be inspected, approved and tagged prior to use and audited and tested following a clearlydefinedinspection plan and colorcoding system.

➤ Portable hand tools must be removed from service when they become defective or if

they do not meet minimum safety requirements required by KPIL.

➤ Cables must be run above ground if possible. If this is not possible, they must be protected by steel pipes, as when buried underground at road crossings.

➤ Locks & lockout devices must be provided for all circuit breakers.

➤ Extension cords shall be inspected daily prior to each use. If found to be defective, they must be suspended.

➤ All temporary power distribution systems, electric machines, tools, devices and equipment, hand- tools etc. must be inspected and tested on a regular basis and a documented record of inspection and testing must be maintained.

Dewatering Pumps

Diesel dewatering pumps must be utilized in all situations where practical. If electric sump pumps are utilized, the temporary power distribution system must be designed for the environment; with each distribution circuit equipped with an Earth Leakage Circuit Breaker (ELCB) and is reviewed, inspected, tested and pre- approved by KPIL site team.

Generators

- All generators must be earthed as per statutory requirements.
- Dedicated licensed holder electrician can operate only.
- Manufactures guidelines shall be followed.
- Double earthing shall be provided by GI flat both earthing pit shall be in two different locations.
- It must be kept on elevated concrete platform.
- Smoking is not allowed near to Generator area.
- Panel doors shall be locked to prevent unauthorized access.
- Generator yard shall be covered to prevent from sunlight & rain.
- Safety posters shall be displayed at conspicuous location.
- Extension cords must be properly sized to carry the electric load. Overloaded cords can overheat and cause fires or damage to equipment.
- Good housekeeping must be maintained.
- Diesel shall not be stored near to generator.
- Turn off generator & let them cool for refueling, never refuel generator while it is in running.



Fig 2. Electrical Safety

2. RESULT AND DISCUSSION

- The components used to assemble scaffolds shall be inspected before each use and shall conform to requirements of this section regarding materials, strength, dimensions, etc.
- Scaffold components shall be free from detrimental corrosion
- Any scaffold component that is obviously damaged, excessively corroded, defective, or does not meet the applicable codes and standards shall be marked and be

immediately destroyed and shall not be re-used on the project site. However, if possible, defective sections of planks or tubing may be cut off. In this case, the plank or tubing may be reused.

- Where a built –in ladder is part of a scaffold system, it shall conform to the requirements for ladders (IS:3696, Pt-II)
- Foundations shall be sound, rigid, and capable of carrying the scaffold self-weight plus the maximum intended load without settling or displacement.
- Unstable objects such as barrels, boxes, loose brick or concrete blocks shall not be used to support scaffolds, planks, or timber sills.
- A sound base is essential. Therefore, the ground or floor on which a scaffold stands shall be carefully examined for its load-bearing capacity.
- Screw jacks shall be used to compensate for variation sing round level.
- Steel base plates must be used under all standards.
- When scaffolds are supported on the ground, suitable sole plates must be used to spread the load.
- Guardrails, including Mid rail, must be provided on the exposed sides and ends of all working platforms more than 3min height. The height to the top of the guardrail must be not less than 0.95mtr.

Safety Precaution's

- Avoid working at height where possible. if something can be assembled on ground level, do it there.
- Top rail (handrail) shall be 1200 mm, Mid rails shall be located midway 600 mm between the top rail and the working surface and Toe boards should be provided to prevent persons falling off the working surface. Toe boards must be a minimum of 150 mm / 6 inches in vertical height
- Every floor opening into which any person can fall shall be guarded by a standard guardrail system or by a metallic grating duly fixed in position
- All platform / walkway above 1.8 M from floor shall be provided with guardrail system.

- Providing vertical and horizontal safety net
- Lifelines, if used, shall be of sufficient strength to withstand the large forces involved in falls.
- Proper working platform to be provided and should be fixed and covered properly
- Ensuring any access equipment in use is stable, suitable, and appropriately maintained
- Protecting people on the ground by using appropriate guards, warnings, and exclusion zones around the working at height area
- Postponing the work where necessary - for example, if weather conditions are such that work will not be safe, postpone rather than try to work around it
- Don't stack or keep material at edge, remove loose objects or objects that may fall from heights
- workers should never work alone when using a harness as fall protection, Duct, shaft etc.
- Fitness of workers if they are not fit to
- work at height for any reason including consideration of medical conditions, such as vertigo, as well as the weight of the person using the harness should not be allowed to carry work at height
- Employees and contractors shall receive appropriate awareness training on the nature of the working at heights hazards on the site, work environment, and activities being undertaken during the induction process, TBT, Job Specific training.
- Safe access to and from the site, hard canopy to be provided at tower entrance.
- Work permit to be issued by authorized person.
- Ensuring that all workers are competent - this usually means that they have completed the appropriate training for working at height.
- No working at height shall be carried out without supervision.
- Pictorial safety poster and signage/cautions board to be displayed in language understood by workers

➤ Fall arrestor to be provided while working in external area, duct, Shaft, scaffold, Rsp, Tower crane etc.

➤ By providing PPE like goggles, helmets, masks, ear protection, gloves, leather aprons, safety shoes, safety harness etc.

3. PREVENTIVE MEASURES AGAINST SPECIFIC HAZARDS

➤ Floor opening, gangways, elevated workplace and other work area where a person and material could fall more than 2meters contractor should provide with following fall protection.: -

➤ The contractor must provide vertical safety net 2 floors below the working slab along the outer periphery of the building and 1.5 meters above the working slab (Monofilament safety net to be used) as per specification and horizontal net 2 floor below the vertical net.

➤ The Contractor must provide Horizontal periphery safety net to be provided at the interval of every 6 floors at an angle of 35 to 45 degrees and should have horizontal catching width of 5 meter along the outer slab end of the building.

➤ The contractor must provide adequate safety net protection or cover immediate below the working level and hard guard railing of adequate strength having Top rail, Mid rail and toe guard at every floor at Lift shafts. Every lift shaft must be covered with metallic gratings and safety nets at the interval of every 5 floor.

➤ Contractor must provide hard barricade (railing with top, mid and bottom rail) if required with toe guard along the outer periphery with adequate strength to prevent fall of men and material from edges of the floor. Height of top railing should be 1200 mm, Mid railing 600mm, toe guard of 150mm.

➤ The Contractor must have covered all floor opening, Utility duct opening at all floor if required railing to be provided.

➤ Safety net shall be installed at Podium level of the building. Drop test of safety nets of every lot should be carried out after initial installation in controlled environment and to be recorded.

➤ Hard canopy to be provided above the designated entry/exit of each towers for protection from falling objects for safe workforce movement.

➤ Every safety net should have identification tag and shall be inspected monthly after the installation or after any major repair.

➤ Debris, construction waste fallen on safety net shall be removed by contractor on weekly basis.

➤ Double life line to be provided around the working slab periphery area with 16MM Polyamide Rope OR 40NB M.S. Pipe and it should be fixed properly so it can sustain min load of 2.3tons.

4. CONCLUSION

It is concluded that construction industry is hazardous. Thus, documented and well systematic hazard identification system at every construction project is essential for the safe working environment at construction site.

Implementing stringent safety measures can significantly reduce risk of accidents and injuries in the construction sector

Hazards in construction sites are:

- Working at height.
- Moving objects.
- Slips, trips, and falls.
- Noise.
- Hand arm vibration syndrome.
- Material and manual handling.
- Collapsing trenches.
- Asbestos.
- Electricity.
- Airborne fibers and materials.

The preventive measure is:

- Proper training
- Safety gear
- Regular inspection
- Fall protection system
- Equipment maintenance system
- Communication protocol
- Continuous safety monitoring

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