RISK ASSESSMENT

RISK & HAZARD IN CONSTRUCTION INDUSTRY:

The International Labour Organization (ILO) classifies the construction industry as government and private-sector firms erecting buildings for habitation or for commercial purposes and public works such as roads, bridges, tunnels, dams or airports. In India, construction workers also clean hazardous waste sites.

Health Hazards On Construction Sites

Construction workers are exposed to a wide variety of health hazards on the job. Exposure differs from trade to trade, from job to job, by the day, even by the hour. Exposure to any one hazard is typically intermittent and of short duration, but is likely to reoccur. A worker may not only encounter the *primary hazards* of his or her own job, but may also be exposed as a *bystander* to hazards produced by those who work nearby or upwind. This pattern of exposure is a consequence of having many employers with jobs of relatively short duration and working alongside workers in other trades that generate other hazards. The severity of each hazard depends on the concentration and duration of exposure for that particular job. Bystander exposures can be approximated if one knows the trade of workers nearby. Hazards present for workers in particular trades are listed in table.

Primary Hazards Encountered In Skilled Construction Trades

Each trade is listed below with an indication of the primary hazards to which a worker in that trade might be exposed. Exposure may occur to either supervisors or to wage earners. The classifications of construction trades used here are those used in India. It includes the construction trades as classified in the Standard Occupational Classification system. This system classifies the trades by the principal skills inherent in the trade.

Table: OCCUPATIONAL HAZARD

S.NO.	OCCUPATIONS	HAZARDS
1	Brick masons	Cement dermatitis, awkward postures, heavy loads
2	Stonemasons	Cement dermatitis, awkward postures, heavy loads
3	Hard tile setters	Vapor from bonding agents, dermatitis, awkward postures
4	Carpenters	Wood dust, heavy loads, repetitive motion

5	Drywall installers	Plaster dust, walking on stilts, heavy loads, awkward postures
6	Electricians	Heavy metals in solder fumes, awkward posture, heavy loads
7	Electrical power installers and repairers	Heavy metals in solder fumes, heavy loads
8	Painters	Solvent vapours, toxic metals in pigments, paint additives
9	Plasterers	Dermatitis, awkward postures
10	Plumbers	Lead fumes and particles, welding fumes
11	Pipefitters	Lead fumes and particles, welding fumes
12	Steamfitters	Welding fumes
13	Carpet layers	Knee trauma, awkward postures, glue and glue vapour
14	Soft tile installers	Bonding agents
15	Concrete and terrazzo finishers	Awkward postures
16	Insulation workers	Synthetic fibres, awkward postures
17	Paving, surfacing and tamping equipment operators	Asphalt emissions, gasoline and diesel engine exhaust, heat
18	Roofers	Roofing tar, heat, working at heights
19	Sheet metal duct installers	Awkward postures, heavy loads, noise
20	Structural metal installers	Awkward postures, heavy loads, working at heights
21	Welders	Welding emissions
22	Solderers	Metal fumes, lead, cadmium
23	Drillers, earth, rock	Silica dust, whole-body vibration, noise
24	Air hammer operators	Noise, whole-body vibration, silica dust
25	Pile driving operators	Noise, whole-body vibration
26	Hoist and winch operators	Noise, lubricating oil
27	Crane and tower operators	Stress, isolation
28	Excavating and loading machine operators	Silica dust, histoplasmosis, whole-body vibration, heat stress, noise
29	Grader, dozer and scraper operators	Silica dust, whole-body vibration, heat noise
30	Truck and tractor equipment operators	Whole-body vibration, diesel engine exhaust

Construction Hazards

As in other jobs, hazards for construction workers are typically of three classes:

1. Chemical Hazards
2. Physical Hazards
3. Biological Hazards

Evaluating Exposure

Evaluating either primary or bystander exposure requires knowing the tasks being done and the composition of ingredients and by-products associated with each job or task. This knowledge usually exists somewhere (e.g., material safety data sheets, MSDSs) but may not be available at the job site. With continually evolving computer and communications technology, it is relatively easy to obtain such information and make it available.

Management For Safe Construction Work

Effective safety programmes have several features in common. They are manifest throughout organizations, from the highest offices of a general contractor to project managers, supervisors, union officials and workers on the job. Codes of practice are conscientiously implemented and evaluated. Costs of injury and illness are calculated and performance is measured; those that do well are rewarded, those that do not are penalized. Safety is an integral part of contracts and subcontracts. Everybody-managers, supervisors and workers-receives general, site-specific and site-relevant training. Inexperienced workers receive on-the-job training from experienced workers. In projects where such measures are implemented, injury rates are significantly lower than on otherwise comparable sites.

Preventing Accidents And Injuries

Entities in the industry with lower injury rates share several common characteristics: they have a clearly defined *policy statement* that applies throughout the organization, from top management to the project site. This policy statement refers to a specific code of practice that describes, in detail, the hazards and their control for the pertinent occupations and tasks at a site. *Responsibilities are clearly assigned* and standards of performance are stated. Failures to meet these standards are

investigated and penalties imposed as appropriate. Meeting or exceeding standards is rewarded. An *accounting system* is used that shows the costs of each injury or accident and the benefits of injury prevention. *Employees or their representatives are involved* in establishing and administering a programme of injury prevention. Involvement often occurs in the formation of a *joint labour or worker management committee. Physical examinations are performed to determine workers' fitness for duty and job assignment*.

Hazards are identified, analysed and controlled following the classes of hazards. The entire work site is inspected on a regular basis and results are recorded. Equipment is inspected to ensure its safe operation (e.g., brakes on vehicles, alarms, guards and so on). Injury hazards include those associated with the most common types of lost-time injuries: falls from heights or at the same level, lifting or other forms of manual materials handling, risk of electrocution, risk of injury associated with either highway or off-road vehicles, trench cave-ins and others. Health hazards would include airborne particles (such as silica, asbestos, synthetic vitreous fibres, diesel particulates), gases and vapours (such as carbon monoxide, solvent vapour, engine exhaust), physical hazards (such as noise, heat, hyperbaric pressure) and others, such as stress.

Preparations are made for emergency situations and emergency drills are conducted as needed. Preparations would include assignment of responsibilities, provision of first aid and immediate medical attention at the site, communication at the site and with others off the site (such as ambulances, family members, home offices and labour unions), transportation, designation of health care facilities, securing and stabilizing the environment where the emergency occurred, identifying witnesses and documenting events. As needed, emergency preparedness would also cover means of escape from an uncontrolled hazard such as fire or flood.

Accidents and injuries are investigated and recorded. The purpose of reports is to identify causes that could have been controlled so that, in the future, similar occurrences can be prevented. Reports should be organized with a standardized record-keeping system to better facilitate analysis and prevention. To facilitate comparison of injury rates from one situation to another, it is useful to identify the pertinent population of workers within which an injury occurred, and their hours worked, in order to calculate an injury rate (i.e., the number of injuries per hour worked or the number of hours worked between injuries).

Workers and supervisors receive training and education in safety. This education consists of teaching general principles of safety and health, is integrated into task training, is specific for each work site and covers procedures to follow in the event of an accident or injury. Education and training for workers and supervisors is an essential part of any effort to prevent injuries and disease. Training about safe work practices and procedures have been provided by some companies and trade unions. These procedures, include lockout and tagout of electrical power sources during maintenance procedures, use of lanyards while working at heights, shoring trenches, providing safe walking surfaces and so on. It is also important to provide site-specific training, covering unique features about the job site such as means of entry and exit. Training should include instruction about dangerous substances. Performance or hands-on training, demonstrating that one knows safe practices, is much better.

Information about chemical, physical and other health hazards is available at the work site in the languages that workers use. If workers are to work intelligently on the job, they should have the information necessary to decide what to do in specific situations.

And finally, *contracts between contractors and subcontractors should include safety features*. Provisions could include establishing a unified safety organization at multi-employer work sites, performance requirements and rewards and penalties.

FIRE PROTECTION

Preventing fire ignition is the first line of defense in fire safety. The second line of defense, if ignition does occur, is to manage the fire's impact and minimize the risk. The two main methods for managing the impact of a fire are Manage the People Exposed and Manage the Fire itself.

The automatic fire alarm shall be provided depending on the height of the tower. It shall be as follows:

Hazard classification as per the NBC-2016, Part IV-Fire & Life Safety:

a. Hospitals (C-1):
b. Medical College (B)
c. Residential Buildings (A-4)

Minimum fire fighting requirement (as per NBC 2016 Part IV Table 23) will be provided in the project. The same is tabulated as under:

S. No	Description	Minimum Fire Fighting Requirement		
		Hospital Block	**College Block**	**Residential Buildings**
1.	Fire extinguisher	Required	Required	Building height is less than 15 m.
2.	First hose reel	Required	Required	
3.	Wet riser	Required	Not Required	
4.	Down comer	Not Required	Required	
5.	Yard hydrant	Required	Not Required	
6.	Automatic sprinkler system	Required	Required	
7.	Manually operated fire alarm system	Required	Required	
8.	Automatic detection & alarm system	Required	Not Required	
9.	Underground water tank	150,000	Required	
10.	Terrace water tank	20,000 L	25,000 L	

FIRE DETECTION

Despite the many precautions taken, fires may breakout. Hence the project will establish measures to detect a fire and to extinguish it. Automatic fire detection has many advantages such as speed and reliability and is recommended.

MANAGEMENT PLAN

Since the project may face fire hazards or other emergency situations; an emergency plan is provided to caution the persons during any accidents. The fundamental approach, governing fire safety attempts to ensure that fires do not at all start in the first place and should they occur, to restrain their spread by quick detection and extinguishments.

The task of accident and emergency control can be simplified and made effective if pre-planned systems and procedures are available. Without these, important matters may be overlooked at the time of an emergency.

Every management must survey the total operation to identify potential for fire losses and develop an action plan to put the business back to normal with minimum loss of time. A fire protection Manual should be prepared, preferably in 3-parts.

1. The first part should outline the fire risks in terms of plant locations, equipment and facilities and indicate the ways in which risks have been minimized.
2. The second part would set out operating procedures, standards of fire protection established, and maintenances of these standards action to be taken in the event of fire by every level of management responsibility for inspection and repair. It should also include instructions for staff responsible for building services.
3. The third part should outline the training required for existing and new staff, the inspection schedules and check lists, sources of additional information and help.

The Management Cell of the project shall keep ready a plan to alert and take care of residents in case there is any fire. There shall be designated an Emergency Team that shall consist of staff of maintenance department, security supervisor representative of residents from campus.

ELECTRICAL HAZARDS SAFETY MEASURE PLAN

A dangerous condition such that contact or equipment failure can result in Electric shock, arc-flash burn, thermal burn, or blast. Electrical hazard includes ‘dangerous’ meaning ‘able or likely to inflict injury’; there are high voltage, low current sources that are not intrinsically dangerous, and there are low-voltage, high-current sources that are not ‘safe’. A ‘harmless’ static electricity shock could cause sufficient startle reaction to make a worker fall off a ladder. A hazard analysis is necessary to identify electrical hazards and determine the degree of risk. We are considering different types of measures for preventing electrical hazards which are as follows:

Safe Electrical Installation

- Installation of new electrical systems to a suitable IS standard. Requirements for electrical installations, and then maintain them in a safe condition;
- Provision of enough socket-outlets - overloading socket-outlets by using adaptors which can cause fire.

Provision of safe and suitable equipment:

- Proper selection of equipments;
- There will be provision of an accessible and clearly identified switch near each fixed machine to cut off power in an emergency;
- For portable equipment, there will be use of socket-outlets which are close by so that equipment will be easily disconnected in an emergency;
- The ends of flexible cables will always have the outer sheath of the cable firmly clamped to stop the wires (particularly the earth) pulling out of the terminals;
- Damaged sections of cable will be replaced completely;
- There will be use of proper connectors or cable couplers to join lengths of cable
- There will be proper protection of light bulbs and other equipment which could easily be damaged in use. And also creates risk of electric shock if they are broken;
- Electrical equipment used in flammable/explosive atmospheres will be designed to stop it from causing ignition.

Reduction of Voltage:-

One of the best ways of reducing the risk of injury when using electrical equipment is to limit the supply voltage to the lowest needed to get the job done, such as:

Temporary lighting can be run at lower voltages, e.g. 12, 25, 50 or 110 volts;

- Where electrically powered tools are used, battery operated will be safest;
- Portable tools are readily available which are designed to be run from a 110 volts centre-tapped-to-earth supply.

Provision of safety device

If equipment will be operated at 230 volts or on higher, then the provision of an RCD (residual current device) will be provided as an additional safety. An RCD is a device which detects some, but not all, faults in the electrical system and rapidly switches off the supply. RCD will be built into the main switchboard or the socket-outlet, as this means that the supply cables will be permanently protected. Additionally a plug incorporating an RCD, or a plug-in RCD adaptor, will also be provided for an additional safety. RCDs for protecting people have a rated tripping current (sensitivity) of not more than 30 milliamps (MA).

- An RCD is a valuable safety device, never bypass it;
- If the RCD trips, it is a sign there is a fault.
- The RCD will have a test button to check that its mechanism is free and functioning.

Work safely

We will make sure that people who are working with electricity are competent to do the job. Even simple tasks such as wiring a plug can lead to danger – we will ensure that people know what they are doing before they start.

We must not allow work on or near exposed live parts of equipment unless it is absolutely unavoidable and suitable precautions will be taken to prevent injury, both to the workers and to anyone else who may be in the area.

Underground power cables

Always assume cables will be present when digging in the street, pavement or near buildings. The usage will be up-to-date service plans, cable avoidance tools and safe digging practice to avoid danger.

Overhead power lines

When working near overhead lines, it may be possible to have them switched off. So, we will keep the safe working distance from the cables.

BASIC PRECAUTIONS:

There are various ways of protecting people from the hazards caused by electricity, including insulation, guarding, grounding and electrical protective devices. We will significant reduce electrical hazards by following some basic precautions.

Insulation

All electrical cords will have sufficient insulation to prevent direct contact with wires. All cords will be checked before each use, since corrosive chemicals or solvent vapors may erode the insulation. Damaged cords will be repaired or taken out of service immediately, especially in wet environments such as cold rooms.

Guarding

Live parts of electric equipment operating at 50 volts or more will be guarded against accidental contact. Plexiglas shields may be used to protect against exposed live parts.

Grounding

Only equipment with three-prong plugs will be used. The third prong provides a path to ground that helps prevent the buildup of voltages that may result in an electrical shock or spark.

Circuit Protection Devices

Circuit protection devices will be designed to automatically limit or shut off the flow of electricity in the event of a ground-fault, overload, or short circuit in the wiring system. Fuses, circuit breakers, and ground-fault circuit interrupters are three well-known examples of such devices.

Fuses and circuit breakers prevent over-heating of wires and components that might otherwise create hazards for operators. They disconnect the circuit when it becomes overloaded. The ground-fault circuit interrupter or GFCI, will be used to shutoff electric power if a ground fault is detected. The GFCI will be particularly used near sinks and wet locations. Since GFCIs will cause equipment to shutdown unexpectedly, they may not be appropriate for certain apparatus. Portable GFCI adapters (available in most safety supply catalogs) may be used with a non-GFCI outlet.

Safe Work Practices

The following practices will be used to reduce the risk of injury or fire when working with electrical equipment:

- Avoid contact with energized electrical circuits.
- Disconnect the power source before servicing or repairing electrical equipment.
- When it is necessary to handle equipment that is plugged in, be sure hands are dry and, when possible, wear nonconductive gloves and shoes with insulated soles.

- If water or a chemical is spilled onto equipment, shut off power at the main switch or circuit breaker and unplug the equipment.
- If an individual comes in contact with a live electrical conductor, do not touch the equipment, cord or person. Disconnect the power source from the circuit breaker or pull out the plug using a leather belt.

High Voltage or Current

Repairs of high voltage or high current equipment will be performed by trained electricians. Individuals who are experienced in such tasks and would like to perform such work on their own equipment must first receive specialized electrical safety related work practices training by EHS staff.

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