"Hostel Block for PGIMER" at Dr RML Hospital, New Delhi.

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 four 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.

LIGHTING PROTECTION:

- The structures shall be protected against lightning in accordance with the requirement of IS 2309: 1989 with latest amendments. The risk factor requires provision of lightning

protection and in addition considered necessary for the safety of tall buildings and human life.

- The lightning protection system shall comprise of a grid of horizontal air terminations and vertical finials provided at the terrace of each high rise tower at the highest point and that of the low rise buildings which are not within the protective angles of the high rise terminations.
- The horizontal & vertical air terminations shall be connected through a series of down earth conductors running along the sides of the building with earth tapes to the Pipe type earth electrodes / earth stations.
- Earth test points shall be provided.
- The lightning protection system shall be based on use of hot dip galvanized iron i.e. GI strip conductors and GI earth stations.

  OR

  Alternatively, controlled steamer emission system along with chemical earth pits may be employed, if client prefers so, but this system of lightning protection shall not be as per IS codes.
- All towers shall be protected from lightning by providing Controlled streamer emission (CSE) lightning arrestors installed at the highest point at the terrace level duly connected to GI tape/cable as per system design criteria.

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