Risk Assessment and Occupational Hazards of a Construction Site

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***Abstract*: Minor injury to fatality and permanent disablement cases due to accident at the construction sites are one of the highest as compared to the other sector. Hence, there is an urgent need to mitigate this problem. The first step that should be taken is identifying the hazard to ensure a safe and conducive working condition. The study determines six major groups of hazards in relation to works at construction sites such as physical, chemical, mechanical, biological, psychological and physiological hazards. The most common hazards for the project around the study area are noise, electric shock and vibrations as the major physical hazards; cement dust and sand dust as major chemical hazard; hit by equipment as major mechanical hazard and job dissatisfaction as major psychosocial hazard in building construction projects. Thus, contractors should be responsible and accountable for documenting different types of hazards as they are implementing agent of safety during the construction and development ofany project. For this, awareness level should be increased by conducting regular awareness program, along with engineering and enforcement activities.**

Index Terms: Accident at construction site, Identifying the hazards, Types of hazards, Awareness.

I. INTRODUCTION

In Construction industry work rapidly varies at different point of time and it is not continuousprocess industry and it involves various types of activities and sophisticated machinery. Handling of these machinery and performance of activities may result in certain hazards. Where hazard is defined as a source or a situation with a potential for harm in terms of humaninjury or ill health, damage to property, damage to the environment or a combination of these.So, these hazards are to be controlled to prevent accidents which may cause delay in work andalso increase in investment and also demotivate the fellow workers.

Thayyil Jayakrishnan, Bina Thomas, Bhaskar Rao and Biju George (2013), studied that construction workers are at a greater risk of developing certain health disorders and sicknessthan workers in many other industries. In India the construction workers are mostly migrantsfrom remote villages, often are less educated and not cautious about different preventive measures. Most of them are inter-state migrants and has poor language skills that prevent them from understanding the safety precautions given and to voice their problems. Apart from this, in most of the construction projects the workers employed are unorganized in nature and often not guided by the legislations made for the health and welfare of the workers and hence are not eligible for free or subsidized care.

Guddi Tiwary and PK Gangopadhyay (2011), stated that in India, as the construction workersare mostly illiterate, it is desirable to impart health education to them, to apprise them of the ill effects of work and the remedial measures. Awareness programs and local group discussions are essential for improving the health status of these working communities.

Emily Q Ahonen, Fernando G Benavides and Joan Benach in the Scandinavian Journal of Work, Environment & Health summarizes the information on immigrant occupational health.
Increased migration is a reality in industrialized countries all over the world, and it has social,political, and economic consequences for migrating groups, as well as for their sending and host societies. More reliable data, targeted appropriate interventions, and enforcement of existing regulations are necessary to improve the health of immigrant workers.

V.Arndt, D. Rothenbacher, U. Daniel, B. Zschenderlein, S. Schuberth and H. Brenner studiedthat musculoskeletal diseases and external causes are major factors limiting the work capability of construction workers and lead to an increased proportion of occupational disability in their cohort occupational health exams conducted among the construction workers in Wurttemberg (Germany), aged 25-64 years.

II.OCCUPATIONAL HAZARDS AT CONSTRUCTION SITE

Physical Hazards in Construction

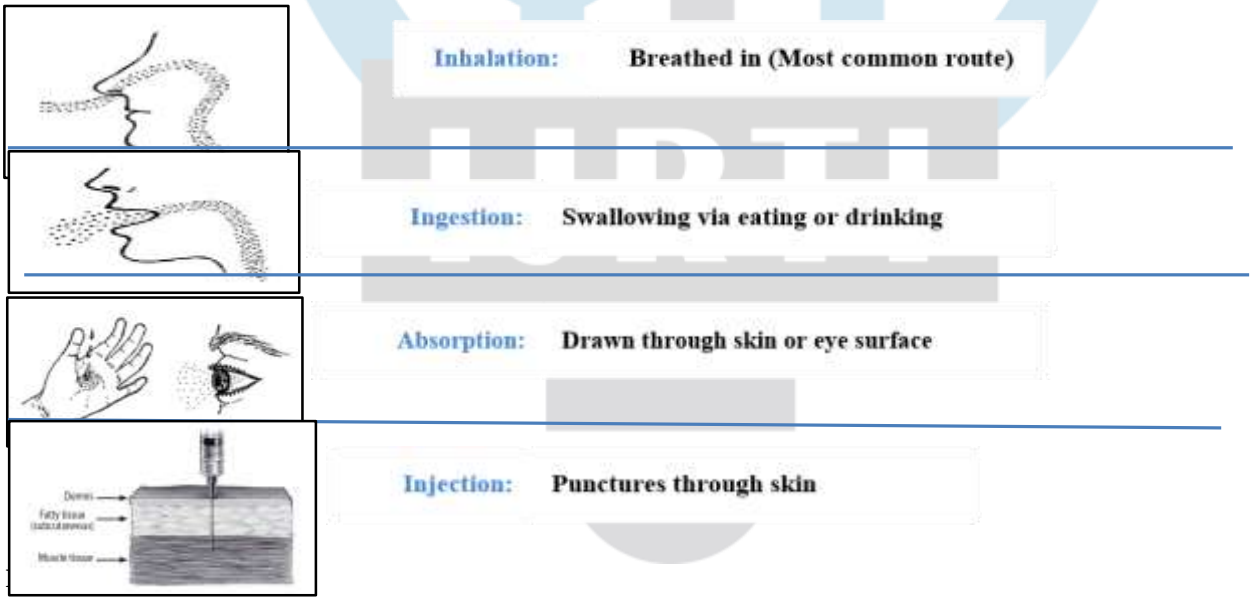
- Noise
- Temperature extremes
- Vibration
- Radiation

Protection Against Physical Hazards

Hazard	Engineering Controls	Administrative Controls	PPE
Temperature	Heaters; AC; windshields; ventilation	Water; Rest; Shade	Hoods; cooling vests; hard hat liners
Vibration	Vibration reduction equipment	Train not to grip too tightly; Job rotation	Anti-vibration gloves
Noise	Silencers; mufflers; enclosures; sound barriers	Increase distance between source and worker	Ear plugs; muffs

Chemical Hazards in Construction

Routes of Entry



Exposure Condition		Exposure	Example
ACUTE	Immediate	Short-term, high concentration	H_2S exposure within a confined space
CHRONIC	Delayed; generally for years	Continuous; for long periods of time	Asbestosis

Chemical Hazard Protection

- **Engineering**
  - Ventilation (local/general)
  - Process and equipment modification
  - Isolation/automation
- **Administrative**
  - Monitor/measure exposure levels
  - Inspections and maintenance
  - Develop SOPs
- **PPE**
  - Respirators
  - Gloves
  - Safety glasses
  - Protective clothing

Chemical

Biological Hazards in Construction

Mold

Insects

Animals

Effects of Exposure to Biological Hazards

- **Mild**
  - Allergic reaction
- **Serious**
  - Tetanus
  - Swine Flu
  - SARS
  - Avian Flu
  - West Nile
  - Lyme Disease
- **Chronic/Terminal**
  - HIV
  - Hepatitis B & C

Protection Against Biological Hazards

- Practice precaution with:
  - Blood
  - Bodily fluids
  - Animals
  - Insects
- Personal hygiene
- Proper first aid
  - Cuts/Scratches
- Proper PPE
- Vaccinations – schedule

Ergonomic Hazards in Construction

Lifting and pushing

- Heavy
- Awkward
- Repetitive
- Awkward grips and postures
- Reaching
- Using wrong tool or using tool improperly
- Using excessive force
- Overexertion

Effects of Exposure to Ergonomic Hazards

Musculoskeletal Disorders (MSDs)

- **Mild**
- **Joint pain**
- **Swelling**
- **Sciatica**
- **Acute lower back pain**
- **Serious**
- **Epicondylitis (Tennis Elbow)**
- **Raynaud's Phenomenon (White finger)**
- **Thoracic Outlet Syndrome**
- **Carpal Tunnel Syndrome**
- **Chronic lower back pain**
- **Tears (Rotator cuff is common)**

Protection Against Ergonomic Hazards

- **Use ergonomically designed tools**
- **Use correct work practices**
- **Proper lifting techniques**
- **Work station setup**
- **Ask for help when handling:**
- **Heavy loads**
- **Bulky/Awkward materials**
- **Proper PPE**

III. HAZARD IDENTIFICATION TECHNIQUES

The employer shall develop a hazard identification and assessment methodology taking intoaccount the following documents and information -

i. Hazardous occurrence investigation reports;
ii. First aid records and minor injury records;
iii. Work place health protection programs;
iv. Results of work place inspections;
v. Employee complaints and comments;
vi. Any government or employer reports, studies and tests concerning the health and safety ofemployees.
vii. Reports made under the regulation of Occupational Safety and Health Act, 1994
viii. The record of hazardous substances; and
ix. Other relevant information.

IV. RISK ASSESSMENT & RISK MATRIX

Risk can be presented in variety of ways to communicate the results of analysis to makedecisionon risk control. For risk analysis that uses likelihood and severity in qualitativemethod, presenting result in a risk matrix is a very effective way of communicating thedistribution of the risk throughout a plant and area in a workplace.
Risk can be calculated using the following formula:

L x S = Relative RiskL = Likelihood
S = Severity

RISK MATRIX

The key to identification, allocation and mitigation of hazards and evaluating as to how the documentation of the project reflects adequately the requirements relating to hazard identification and management is the preparation of an adequate and comprehensive risk matrix.
A risk matrix is essentially a table

RISK MATRIX						
PROBABILITY	Very Likely - 5	5	10	15	20	25
	Likely - 4	4	8	12	16	20
	Possible - 3	3	6	9	12	15
	Unlikely - 2	2	4	6	8	10
	Very Unlikely - 1	1	2	3	4	5
		1	*2*	*3*	*4*	*5*
		Negligible	***Slight***	***Moderate***	***High***	***Very High***
		SEVERITY				

Risk	Risk Level	Action
1 to 6	**Low Risk**	**May be acceptable but review task to see if risk can bereduced further**
8 to 12	**Medium Risk**	**Task should only be undertaken with appropriatemanagement authorization after consultation with specialist personneland**
15 to 25	**High Risk**	**Task must not proceed. It should be redefined or furthercontrol measures put in place to reduce risk. The controls should be**

V. LIKELIHOOD OF AN OCCURANCE

This value is based on the likelihood of an event occurring. You may ask the question "How many times has this event happened in the past?" Assessing likelihood is based worker experience, analysis or measurement. Likelihood levels range from "most likely "to "inconceivable." For example, a small spill of bleach from a container when filling aspray bottle is most likely to occur during every shift. Alternatively, a leak of diesel fuelfrom a secureholding tank may be less probable.

LIKELIHOOD	EXAMPLE	RATING
Most likely	The most likely result of the hazard/ event being realized	5
Possible	Has a good chance of occurring and is not unusual	4
Conceivable	Might be occur at some timein future	3
Remote	Has not been known to occurafter many years	2
Inconceivable	Is practically impossible andhas never occurred	1

VI. SEVERITY OF HAZARD

Severity can be divided into five categories. Severity is based upon an increasing levelof severity to an individual's health, the environment, or to property. Table B indicatesseverity by using the following table:

SEVERITY(S)	EXAMPLE	RATING
Catastrophic	Numerous fatalities, irrecoverable property damage and productivity	5
Fatal	Approximately one single fatality major propertydamage if hazard is realized	4
Serious	Non-fatal injury, permanent disability	3
Minor	Disabling but not permanent injury	2
Negligible	Minor abrasions, bruises, cuts, first aid type injury	1

VII. CONCLUSION

By finding the hazards with the help of risk assessment and eliminating them we can reduce the accidents in the site, so that we can reduce the loss of life, property and reduce the direct and indirect loss through accidents. Also the expenditure i.e., direct cost and indirect cost on the accident and its compensation i.e., paid after any accident can also be reduced. And we can increase the safe man hours. With the help of risk assessment we can eliminate the near misses and develop preventive measures. Site performance can also be improved and also safe healthy work environment can be developed. For each risk needed data's were collected and analyzed based on those data's risk were separated major and minor once the reference of severity rate.

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