

Reconnaissance Construction Safety Hazards for Zero Accidents: A Review Study of Literature

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Abstract— “Safety doesn’t happen by accident”. Safety in the workplace is not one person’s responsibility. Everyone has a responsibility to make safety a habit and not something one would do whenever a safety audit or major event occurs. The objective of the review is to identify the nature of the construction industry, the employment situation of workers, and the physical and chemical health hazards to which workers are most vulnerable while working on the site. Injuries due to manual handling or lifting and silicosis were found to be the most common physical and chemical damage caused by prolonged exposure to poor field working conditions. The work presented in this paper is a review of researches from the available published articles to get a broad spectrum of occupational health hazards of construction workers, mainly from Indian perspective. Mainly, Google Scholar and Delhi University online standard database were used to collect articles on occupation, health, and working environment. It was further found that the nature of work on the site is highly inconsistent and the participation of workers is entirely on an ad hoc basis. In addition, this paper discusses the objectives of OSHA and introduces the role of its Vision Zero 7 Golden Rules in minimizing accidents and maintaining overall safety in the workplace.

Keywords: Health hazards, seasonal employment, Occupational Safety Health Administration (OSHA), 7 Golden Rules, construction workers.

1. INTRODUCTION

Construction industry is the second largest employer after agriculture in India. It has made great contribution to the national economy and provided employment opportunities for large number of people. There are three main parts of the construction industry viz., real estate construction which includes residential and commercial construction; infrastructure building which includes roads, railways, power, etc., and industrial construction that consists of oil and gas refineries, pipelines, textiles, etc. The number of fatal accidents at the construction sites is alarming and increasing at an unprecedented rate, every year. According to Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries

(CFOI) data, released in 2015, construction industry is the most fatal industry with highest number of deaths (Jones 2016). According to Building & Other Construction Workers Act 1996, Ministry of Labour and Employment, Government of India, construction work is mainly the construction, alteration, repairs, maintenance or demolition of 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, 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 (Chief Labour Commissioner 2019). Also, a building worker is a person who is employed to do any skilled, semiskilled or unskilled manual, supervisory, technical or clerical work for hire or reward in connection with any building or other construction work and not who is employed in a managerial or administrative or supervisory work. According to OSHA, a health hazard is a physical characteristic of a chemical that can be objectively defined in terms of testing requirements (e.g. flammability). These changes are generally indicated by the occurrence of signs and symptoms in the exposed employees - such symptoms are mainly non-measurable and subjective in nature. Hazard is a potential source of harm that adversely affects the health of a person and causes various occupational disorders and psychosocial stresses (Occupational Safety and Health Administration 2017). According to Business Dictionary, workplace safety describes policies and procedures in place to ensure the safety and health of employees within a workplace. It involves hazard identification and control as per government standards and ongoing safety training and education for employees (Business Dictionary 2019).

In recent years, with the rapid development of industrialization and the acceleration of urbanization, the construction industry

has played an important role in carrying out the activities of construction of residential building, roads, bridges, institutions, shopping complexes, commercial buildings, etc. Workers in this industry are usually victims of various dangers - physical, chemical and socio-economic hazards (Schneider 2011). Chemical hazard can be both acute and chronic. Chronic effects take time to show symptoms and are less fatal than acute hazards, e.g. noise causes hearing loss, snuffing asbestos, silicosis, etc. If left untreated, chronic effects can become severe over time and have fatal effects on human health (Vitharana et al. 2015). Unlike other industries, construction industry is known to have high accident rate because of its risk orientation and complexity. It involves a wide range of construction materials, equipment, building services, manufacturers, contractors, sub-contractors, design, operation and refurbishment activities. The Building and other Construction Act (BOCW Act) 1996 is a law designed to regulate the employment and conditions of service of construction and other construction workers and to guarantee their safety, health and welfare measures and other related matters. This act was enacted by the Indian Parliament and enforced by state governments in all states. In India, various departments - under the Ministry of Labor and Employment - deal with issues in construction sector under the leadership of Chief Labor Commissioner. One such department is Directorate General Factory Advise Service Labor Institute (DGFASLI). It provides technical support to draft model rules, conduct investigations and conduct training programmes in the construction sector (Ministry of Labour and Employment 2002).

2. OBJECTIVES

1. To analyze the different health problems among construction workers.
2. To learn about the work culture and nature of employment of workers in construction industry.
3. To research the magnitude of the problems faced by the workers, as evidenced in the research articles.
4. To understand seven golden rules of OSHA for complete protection of workers working in building construction industry from all kinds of occupational hazards.

3. METHODOLOGY

At the onset, all relevant journal papers were retrieved and analyzed from all prominent accessible databases. In today's era, every possible topic has many online databases available. Therefore, several online databases in the form of monthly journals and conference proceeding were reviewed through the well-known search engines Google Scholar and the online Delhi university. The articles, which had 'construction safety, health hazards, Building and other Construction Act, 1996 and OSHA guidelines' as keywords in research papers were identified. These papers were published in journals,

conference proceedings and technical reports in the respective official websites. Out of 40 articles, 10 articles were selected to determine the health hazards and risks associated with construction sites and possible methods to improve safety on construction sites.

4. SCENARIO OF WORK CULTURE IN CONSTRUCTION INDUSTRY

Construction site is usually a place where a considerable number of workers are involved in various activities. Employment at construction sites can be divided into three parts: skilled labor which includes managerial and technical personnel with professional degrees and appropriate knowledge and training; semi-skilled like contractors, sub-contractors, plumbers, mason, painter, etc, and unskilled labor like site laborers with less or no construction knowledge. Among the three categories of workers at construction site, unskilled workers (site labourers) are most vulnerable to occupational hazards - physical and chemical. Also, the nature of work of construction workers is very inconsistent and their involvement is entirely on an ad-hoc basis. Most of the site workers are migrant persons who have migrated to cities in seek of better income generating opportunities. It is observed that many on-site workers are employed under seasonal occupation. Seasonal occupation is a type of occupation in which persons are employed for short period of time, only four or six months. When farming does not yield any profit due to off season or during times of drought, floods, etc., these people usually migrate to cities for certain time period (4 or 6 months or more) till the situation becomes normal or till the season of their cultivation arrives. Most of these people are seasonal workers and make up a large proportion of construction workers. They might work an average of only 1,500 hours a year, while manufacturing workers are more likely to work 40 hours a week, or 2,000 hours a year. To make up for slack time, many construction workers have jobs other than construction and risk of other health or safety hazards. For a given project, the number of workers and the composition of the labour force in any location often change. At any one time, a project may include a large proportion of inexperienced, temporary and transient workers who may not be familiar with the common language. These workers work every day and one major issue that the contractors face at the construction sites is how to retain the same workers for the whole project (Vitharana et al. 2015).

5. HEALTH HAZARDS OF CONSTRUCTION WORKERS

Construction workers face various health hazards at work. Different trade, different jobs, different days, even an hour exposure is different. Exposure to any risk is usually intermittent and lasts for a short period of time but is likely to occur again (Health & Safety hazards in the construction industry 2000).

1. **Chemical hazard:** Chemical hazards are often airborne and may appear as dusts, fumes, mists, steam or gas, thus, exposure usually occurs by inhalation, although some airborne hazards may settle down and be absorbed through the intact skin (e.g. pesticides and some organic solvents) (Jannadi and Bu-Khamsin 2002). Following a thorough review, several diseases related to the construction industry resulting from exposure to a variety of toxic chemicals were identified. It was found that silicosis, lung cancer and respiratory tract cancer are most common among construction workers (Figure 1).

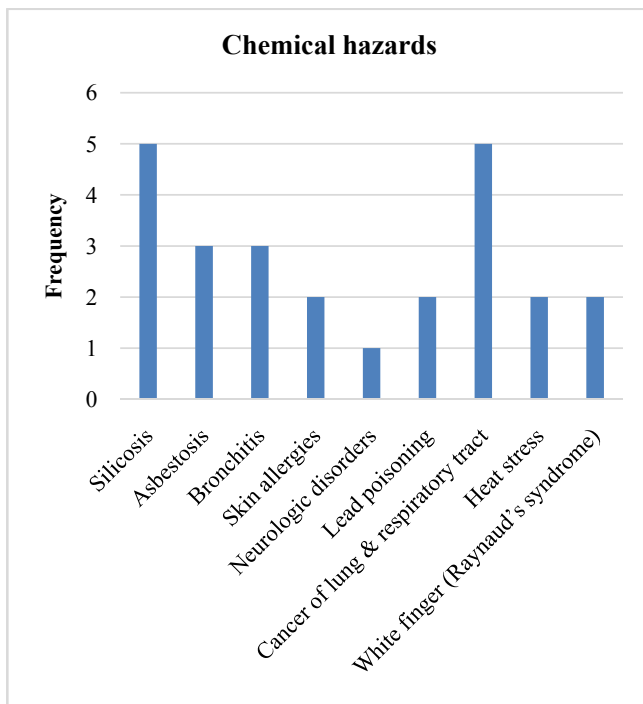


Figure 1: Chemical hazards in construction sites

2. **Excessive Noise & Vibration at work :** The sources of noise are various types of engines, winches, rivet guns, nail guns, paint guns, pneumatic hammers, power saws, sanders, routers, planers, explosives and many more (Andreson et al. 2000). Demolition activity itself causes a lot of noise. It affects not only the people who operate the machine, but also the people around it. Large mobile machines such as pneumatic hammers, many hand tools and bulldozers also cause workers to vibrate.
3. **Physical hazards:** Construction work is usually carried out in very hot or cold, windy, rainy, snowy or foggy weather, resulting in a great deal of physical injury (Schneider 2001). Based on a detailed review, Figure 2 discusses the various construction activities and physical injuries associated with it. Among them, trips, slips and manual lifting and handling and fall from height are the most common and most dangerous. (Nadhim et al. 2016).

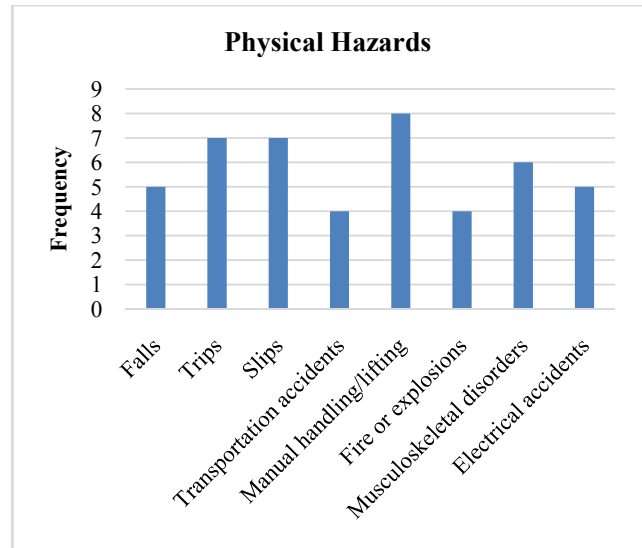


Figure 2: Physical hazards in construction sites

6. OSHA 7 GOLDEN RULES TOWARDS ZERO ACCIDENTS AT SITE

OSHA is an agency of the United States Department of Labour under the Occupational Safety and Health Act, 1970 (Mehagraj 2017). To achieve zero harm at work place, the International Social Security Association (ISSA) under OSHA has set 7 golden rules towards zero tolerance to hazards at work place; these 7 golden rules are as follows.

1. Take **leadership commitments** in making safety a top priority on every agenda by immediately responding to any unsafe conditions and behaviour. It highlighted the role of front line and middle line managers in ensuring total safety at site.
2. Identify **hazards and risks** by a systematic risk assessment, including maintenance and repairs, evaluating work accidents, diseases and near misses. This rule introduces 360-degree defence mechanism to avert any mechanical causes of accidents to occur.
3. Set your own **occupational safety goals**, assess progress and adjust, if necessary.. Each company should have its own SOP (Standard Operating Procedures) to maintain the health and safety of its employees, both indoors and outdoors.
4. Ensure a **safe system** by increasing responsibility of all managers and implementing a safety management system. Regular training courses for middle managers and administrators to update their knowledge.
5. Use **safe and healthy technology** by taking account of OSH (Occupational Safety and Health) when ordering new machines. It emphasises on using all machines and

PPEs in a safe manner and checking safety installations regularly.

6. **Improve qualification** by defining the required qualification for each workplace, and by setting up a plan for training and instruction.
7. **Invest in people** by involving your employees, using your employee's ideas, acknowledging good safety performance, developing confidence and a culture of prevention. Encourage group discussion and follow problem solving approach in very meeting. (Breuer 2017).

7. CONCLUSION

Based on the analysis of data, it can be inferred that this review study is merely a discussion about the vulnerability of a construction worker at site. In this regard, many issues related to the safety of the workers at construction sites were identified. Safety of construction workers is given first priority not only in India but worldwide. In India, Ministry of Labor and Employment have had proposed a slew of measures for ensuring the safety and protection of workers, but still safety at site lackluster due to poor compliance. Therefore, there is a great scope for intervention in this field. An in-depth study in this field is necessary for the realization of the goal of OSHA to ensure maximum security of labor force. Central Labor Institute in India has been tirelessly working towards safeguarding the health of the construction workers under the safety guidelines of OSHA and HSE (Health and Safety Executive).

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