

## **Safety Management and Hazards Control Measures in Construction**

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**Abstract :** *This paper explores the various safety and control measures (SCM) of accidents in building projects to minimize accidents' occurrence and consequent waste generation. A research methodology, consisting of a literature review and a field study were used to achieve the research objectives. The field survey involves a designed questionnaire that was administered through convenience sampling technique within Lagos State and descriptive analysis tools were used for the analysis. The field survey reveals different control measures in place and their rate of usage on building projects. On the other hand, the literature survey sheds light on the types of accidents on building projects and their respective control measures with methodologies for accidents' preventions. Recommendations based on the findings of the two surveys are outlined in the paper.*

**Keywords -** *We would like to encourage you to list your keywords within the abstract section.*

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### **I. INTRODUCTION**

Accidents as an unplanned and unexpected occurrence, which upsets a planned sequence of work; are resulting to loss of production, injury to personnel, damage to plant and equipment and eventually interrupting production flow. Control measures as an act of limiting or making something to happen in a particular way, stop something from spreading, going out of hand or getting worse. Identify safety in construction as the process or way of protecting the health and life of those who build, operate, maintain and demolish engineering works; and others affected by those works.

Construction industry a deadly working place. Accidents on building sites are inevitable, but could be controlled to prevent minor or serious-consequences on the workers. Thus, control measures of accidents to ensure safety of workers and minimize accident-related waste on sites are essential. Hence, the ultimate aim of this research is to minimize accidents' occurrence on sites. The specific objectives are to identify types of accidents on sites and their control measures, to identify accidents prevention methodologies, to examine the frequency of usage of control measures on sites and to compare the perceptions of construction organizations on the rate of usage of the control measures on sites.

### **II. PROCEDURE FOR SAFETY MEASURES**

#### **A. SAFETY PLANS**

Management of any construction firm has the responsibility of developing a comprehensive and written safety program that is performance oriented. The information should include the basics of personal protective equipment's, the proper use of tools and power equipments, safe work practice, company policy on safety, safety responsibilities, emergency procedure, e.t.c. This document must be made available to every worker on site and adherent to it must not be compromised. The responsibility of the safety personnel shall be to draw up a safety plan, setting out the rules applicable to the construction or building site, and shall make any adjustment to the plan, ensure effective distribution and use of safety equipment.

#### **B. SAFETY TRAINING AND MEETINGS**

Safety training is an essential part of any safety and health program. Safety personnel and site workers should be trained in hazard identification, control and method of encouraging safe practices. The safety training and meetings must emphasis the project's safety requirements, review past activities, plan ahead for new operations; discuss the causes of accidents on site and ways of preventing future occurrence. This training should be provided in the language well understood by the workers.

#### **C. FIRSAID AND MEDICAL ARRANGEMENTS**

First aid facilities must be provided on site regardless of the size of the project and the number of workers on site. In case of any injury such as cuts, strips or trips; prompt treatment with first aid facility can help

prevent further aggravation of such injury. The employer should be responsible for the provision of first aid facility and personnel at all time on site.

#### **D. MANAGEMENT POLICY**

The type of management policy or commitment to safety at workplace is very essential to the prevention of accidents. The various commitment of construction management are in drawing up of an effective safety plans, provision of protective equipments for all site workers and personnel, encourage safe working habits, incentives for safety and regular review of accident prevention or safety program.

All of these accident preventive measures and many more are required on site to effectively prevent or reduce the occurrence of accident on building sites.

Health and Safety Executive (H.S.E.) and Occupational Safety and Health Administration outline preventive measures as:

- ❖ Wearing clothes that are appropriate to the work and weather condition on site.
- ❖ Wearing of hand gloves.
- ❖ Wearing of work traction boots at all times on site.
- ❖ Wearing of hardhats or helmet at anywhere on site.
- ❖ Provision of eyewear or goggle for welding purposes e.t.c.
- ❖ Constant inspection and assessment of equipments, plants, tools and other site materials before use.
- ❖ Organizing effective safety training for all site workers and personnel whether on site or off site.
- ❖ Provision of effective first aid facility and personnel on site.

Provision of barriers, signs or reflector around dangerous areas on site (e.g. barrier around trench and so on).

### **III. ACCIDENT**

**TYPES OF ACCIDENTS AND CONTROL MEASURES ON BUILDING PROJECTS.** Various types of accidents and their respective control measures from literatures are:

#### **SCAFFOLD ACCIDENTS**

Fall of person from scaffold and collapse of scaffolds has constantly been the number one killer in Hong-Kong construction industry (U.S Department of Labour, 2005). Between 2000 and 2004, the department shows that fatal accident arising from bamboo scaffold and working on platform have accounted for nearly half of the total number of fall-from-height fatal accidents in the period. Similarly, O.S.H.A (2005) reports that hazards occur due to improper erection of scaffold. They add that 4,500 injuries and 50 fatalities from 2.3 million construction workers annually can be prevented with proper erection and use of scaffolds.

#### **CONTROL MEASURES**

- Scaffold must be checked to be sound, rigid and sufficient enough to carry its own weight plus four times the maximum intended load without settling or swaying.
- Scaffold must not be erected, moved, dismantled or altered except under the supervision of a competent person.
- Unstable objects such, as boxes, loose bricks or concrete blocks must not be used to support scaffold or planks on scaffold.
- Scaffold should be used with safety net and belt especially when use for works at height.
- Scaffold accessories such as braces, brackets, trusses or screw legs that are damaged or weakened from any cause must be immediately repaired or replaced.
- A competent person must inspect the scaffold and re-inspect at designated intervals.
- Scaffold must be at least 10 feet away from any electric power lines at all time to avoid any forms of electrocution or contact with live cable.

#### **ACCIDENT DUE TO SLIP, TRIP AND FALLS**

Increase in international and national attention is being placed on occupational strips, trips and falls (STF) as the extent of the problem is recognized. This growing interest reflects an understanding that strips, trips and falls are preventable in lieu of daily occurrence on building sites. More than a million people suffer from these accidents annually. Slips, trips and falls account for 15% to 20% of all workers' compensation cases; with older ones having higher percentage of falls compare to younger ones. This is as a result of the fact that, regardless of the

kind of work to be done or the position of such work, slip or trip falls can occur at any place or point on the construction site, thus, the reason for its control to prevent casualty.

#### CONTROL MEASURES.

- Immediate cleaning of spillage on site.
- The floor must be kept clean and dry always.
- Immediate disposal of waste materials from site.
- Avoid causing trailing cables or littering binding wires.
- Constant wearing of suitable and traction footwear on site.
- Immediate removal of any obstructions on the walk way on site.
- Keep the site clear of any obstacle such as debris, broken blocks or concrete.

#### *CRANE ACCIDENT*

Factors associated with mobile cranes failure include support failure, failure to use outriggers, crane failure or collapses and rigging failure. Though, the collapse of tower cranes is rare, accidents and near misses do occur. Failure of any part of the crane or load carry systems are likely to cause serious accidents, with both crane operators, site personnel and general public involved posits that significant and serious injuries of fatality may occur if cranes are not inspected before use and if they are not used properly. Often, these injuries occur when a worker is struck by an overhead load or caught within the crane's swing radius. It therefore implies that, crane accidents are associated with erection or assembling, usage, dismantling and supervision or inspection and are major treat to life of workers on any building site.

#### CONTROL MEASURES.

- Checking of all crane control to ensure proper operation before use.
- Inspection of wire rope, chains and hook for any damage.
- Ensuring that the load does not exceed the crane rated or carrying capacity.
- Full check of all rigging prior to use.
- Fully extend of outriggers before full operation.
- Never move a load over a worker.
- The load must be raised few inches to verify balance and effectiveness of the brake system.

Watch for overhead electrical distribution and transmission lines and maintain a safe working clearance of at least 10 feet from energized and electrical lines

#### *LADDER ACCIDENT*

Ladder falls or accidents increased significantly in 2001-2005, which gives a significant rise in serious injury from ladder falls. A fall from height, more than one metre, was the most common mechanism of injury accounting for 59% of the total. It was also established that about 20% of ladder-related falls greater than one metre and major trauma cases occurred while people are working on site. despite the knowledge of the dangers of falls from ladders, there has being a significant increase in the number of casualties from ladder falls which resulted into broken limb, fracture and bruises on building sites.

#### CONTROL MEASURES

- The use of correct ladder for the task or job.
- Ladders are ensured to be long enough to safely reach the work area without unnecessary reaching to the sides.
- Avoidance of the use of ladder, especially metallic, near electrical work and overhead lines.
- Never load ladders beyond the maximum intended load or beyond the manufacturer's rated capacity.
- Mark or tag (do not use) damaged or defective ladders for repair or replacement to prevent their usage.

#### *ELECTRICAL ACCIDENTS*

It implies that electrical works involving the use of electricity on site is very risky. He further shows that most people affected by electrical injuries are electrical workers (i.e electricians; electrical power installers and repairers; their apprentices and their supervisors). These workers had one-third of the electrical deaths followed by general labourers on site. also conclude that the majority of electrocution death resulted either from direct or indirect contact with power lines; but having the power de-energized in close proximity to building sites and other settings, where there are potential for power line contact reduces this hazard. Where not possible or

practicable to de-energize lines, adequate clearance must be maintained or lines encased in insulated sleeves to prevent electrocution of whatever kind.

**CONTROL MEASURES**

- All electrical workers must wear a non-conductive hand glove at work.
- De-energizing of electrical lines in proximity to construction sites
- Ensuring that all cables are in proper conditions before switch in on the machine.
- Adequate provision of personal protective equipments on site
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**IV. FIELD SURVEY**

Control Measures of Accidents on Sites.

Table 1 shows the response to the provision of safety control measures of accidents on sites. It can be observe that 26 of the respondents (76.5%) claimed to always provide control measures of accidents to workers on site, 8 respondents (23.5%) provide it sometimes while none claim to never providing it. This shows that, most construction organization know the importance of controlling or preventing occupational accidents among workers on site and also valued the life of their workers.

Table 1: Provision of Control Measures of Accident on sites.

| Provision of control measures on sites | Frequency | Percent |
|--|-----------|---------|
| Always                                 | 26        | 76.5    |
| Sometimes                              | 8         | 23.5    |
| Total                                  | 34        | 100.0   |

Table 2: Different Control Measure of Accidents used on sites.

| Control Measures                            | N  | Rate of Usage |    |   | Mean Value | Rank |
|---|----|---------------|----|---|------------|------|
|   |    | 3             | 2  | 1 |            |      |
| Provision of First Aid Facility             | 34 | 28            | 6  | - | 2.82       | 1.5  |
| Provision of Helmet or Hard Hat             | 34 | 28            | 6  | - | 2.82       | 1.5  |
| Provision of Protective Cloth               | 33 | 26            | 7  | - | 2.79       | 3    |
| Provision of Traction Boots                 | 34 | 26            | 8  | - | 2.76       | 4.5  |
| Provision of Hand Gloves                    | 34 | 26            | 8  | - | 2.76       | 4.5  |
| Use of Signs, Guides, Caution and Reflector | 34 | 24            | 9  | 1 | 2.68       | 6    |
| Provision of Goggle or Eye wear             | 33 | 22            | 11 | - | 2.67       | 7    |
| Use of Protective Equipments                | 31 | 12            | 19 | - | 2.39       | 8    |
| Use of Safety Belt                          | 32 | 15            | 13 | 4 | 2.34       | 9    |
| Use of Safety Net on Scaffolds              | 30 | 11            | 16 | 3 | 2.27       | 10   |

Note: N represents total number of respondents, 3 represent Always, 2 represent sometimes, 1 represent never.

Table 2 shows the different control measures of accidents used on building sites as reported by the respondents. It can be shown from this Table that hardhat and first aid facility are often used as control measures of accidents on site. Hard hat or helmet are provided to prevent been struck on the head by falling objects or materials while first aid services are provided to give a firsthand treatment to any injury sustained on site, so as to limit its fatality before proper hospital attention is given. Protective cloth, traction boots and hand gloves follow these descendingly. Traction boots are provided to prevent any step-on or slip accident while hand gloves are provided to protect the hand from direct contact with energized cable or circuit, sharp objects or materials, etc. Next are usage of signs, guides, caution and reflectors to give signal of danger ahead to any one approaching; eyes wear; and protective equipment. This shows that protective equipment is not often used on site as control measures of accidents. Provision of safety net on scaffold is least used among other measures as control measures of scaffold accident. Though, it is used to prevent falling-off of workers, tools or materials from a scaffold, its usage are not common on site in Lagos state. Despite the varying of usage of these measures, all of the respondents signified all the control measures as a means of controlling accidents on sites.

## V. CONCLUSION

The study reveals:

- The various types of accidents that exist on construction sites and their respective control measures.
  - Several accidents' prevention methodologies.
  - The types and frequency of usage of accidents' control measures on sites.
  - That helmet, first aid services, protective clothes and traction boots are the most used safety measures on sites, though their usage differs from site to site.
  - A safety officer, different from the site engineer or manager, should be employed on site to specifically plan, monitor and ensure adherence to control measures on site to minimize accidents' occurrence and waste.
  - First aid facility and attendant should be made available on site at all time.
  - The use of safety equipments or control measures of accidents should be highly enforced on all workers on site.
- Warning signs, guides or reflector should be displaced where necessary on site

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