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Assessment and Control of Risk in Building Construction Projects

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Abstract:
Building technology trades usually have potential hazards and risks likely to cause accidents on building sites. This study focused on building technology trades, risk assessment and control in building construction project for skill development. Exploratory study was adopted. The population for the study was 25 which comprised of 15 building personnel, five construction safety professionals and five academics in seven building trades. Data was collected using cataloged questionnaire and brainstorming sessions with expert panel. Finding revealed that principal contractors, contractors and sub-contractors, very rarely or never considered providing information on common construction hazards and control measures, providing workers with PPE at site. It was recommended that building designers and draftsmen should consider safe design which is the most effective risk control measure.

Keywords: Risk, Risk Identification, Risk Assessment, Building Technology Trade and Risk Control.

I. INTRODUCTION

The alarming injury rate remain a global issue in the building construction industry. Lingard (2013) reported that there are more than 60,000 estimated global yearly fatal injuries in building development projects. Planningand design are essential elements in every building technology trade. Reducing risk at source is a major component in improving site safety as stated by workplace safety and health act. There is need to examine who and what generate risk and report it from source.Building construction sites are predominant hazardous places where injury, illness or even death can occur to workers while carrying out their entrepreneur activities. These hazardous situations can result from falls from height, tools, equipment or machine injuries, inhaling hazardous chemicals, dust from wood, nail and other sharp object wounds and the likes. Hazardcan be described as a state of being exposed to danger. It is a source of harm to humans. Hazards can also be in form of exposing property to damage, making the environment unsafe or alliance of these factors.Recognizing hazard is usually seen as a major step in controlling safety processes as it enables personnel adopt current safe procedures and reduce potential injuries. According to Albert (2014), inability to recognize hazards leads to substantive increase in injuries.Hazard leads to risk in health. Risk is a potential for danger. According to Workplace Safety and Health Council and the Ministry of Manpower (2011) risk is the possibility that a hazard will cause a definite damage to someone. More precisely, risk is the probability that accidents or ill-health will likely occur and magnitudes of such cannot be predicated or known. Therefore, risks include environmental related conditions, ongoing operations interference in building trades, accidents in construction sites, faults in designing as well as construction. All these risks may negatively affect the building construction process hence, the need for risk identification and management. Risk assessment tools are used in assessing and managing hazards in building construction projects by designers, architects, and engineers.Risk assessment entails estimating the probability of an accident happening, and when it does, probability that people will be harmed; extent of damage to the environment or equipment as well as the severity of the accident. The level of one's exposure to hazards in building construction determines the risks and likely consequences in building technology trades. Building technology trade is a skill processes that involves construction activities such as masonry, woodwork and carpentry, block/ brickwork, plumbing, painting, as well as maintenance workas offered in Industrial Technology Education. Building technology trade also involves the ability to properly use tools and equipment in building construction, estimate materials and time needed for completing a project, interpret building project blue print, drawings and diagrams as well as keeping required records and understand work safety rules that would lead to risk control in construction. Risk control is a developmental process of applying safety procedures and controlling hazards. Risk control is the removal of hazards in a work environment in such a way that the hazard does not act as risk for workers (Devdatt, et al, 2018). The process of risk control and management is a difficult task for project managers as they are saddled with the responsibility of identifying causes of risks as well as tracing same to the consequences. Project Management Institute (2007) noted that managing risk in the construction project is a systematic way of identifying, analyzing and responding to risks in order to realize objectives of the project. Potential hazards in building project can be controlled at the project beginning (source of problem creation), howbeit, controlling hazard at the source is always better to prevent consequences (often referred

to engineering controls); or controlling hazard as work progresses (referred to as engineering controls); or controlling hazard through the use ofpersonal protective equipment (PPE) (often the least desired control method). It would suffice to say that risks are unavoidable in any building project. There is need for appropriate risk assessment and control in order to reduce hazards in building trades during construction. There is need for occupational health and safety procedures by building technology tradesmen to prevent occupational hazards, prioritize accidents and manage occupational risks.There are innovations in occupational safety procedures in building technology trades. Despite these occupational safety procedures, high rates of injury are annually reported globally. Globally,there are annual reported fatalities of over 60,000accidentsfrom construction projects (Lingard, 2013). Over last 50 years, construction industry has undergone profound changes in terms of safety enforcement, emphasis on safety training, and improvement in overall safety culture. However, Albert et al. (2014) as well as Carter and Smith (2006) noted that effective safety level of performance is far from being achieved; and construction workers remain highly vulnerable to workplace injuries. The major reason for poor performance safety at work is the inability of workers to detect risks and potential hazards. Despite the importance of hazard recognition in prevention of risks at work, studies show that most hazards are still not recognized or inadequately assessed. The unrecognized hazards render building technology tradepersonal tounanticipated risk that can potentially lead to terrible injuries and even death. Therefore, there is need for risk assessment and control in building construction projects.

II.OBJECTIVES

1. To determine design application for safety processes and the specific risk reduction procedures in building technology trades.
2. Ascertain roles and responsibilities of relevant parties responsible for building project

III. METHODOLOGY

The study adopted exploratory research. The first stage involved building personnel. In this phase, the study identified design safety processes and specific risk reduction procedures in building technology trade from the viewpoint of building personnel. To gather this data, the researcher first engaged 15 building personnel representing diverse specialty in building trades including three electricians, two plumbers, two carpenter, four bricklayer, two maintenance workers, one painter, and one iron worker. The personnel were employed in four building projects site within Nsukka Local Government area, Enugu States Nigeria. The workers were also engaged in an activity on on-site hazard identification. On site hazard identification activities required that the workers representing diverse specialty trades in building construction were asked to identity risks and potential hazards from selected sample of four building sites from the early agreedseven trades. As the personnelidentified risks orally from each building construction site, the researchers cataloged the information as a questionnaire. In the second stage of the exploratory design, professional and experts in building construction were involved. In thecontext of this study, expert construction professionals are experts and professional having above 10 years of experience in building construction and experiences in risk assessment and risk control in building technology trades.

The expert and professionals were identified from the Association of General Contractors (AGC) in local building construction projects within Nsukka local Government. Overall five safety professionals accepted participation, and their accumulated experience in building construction exceeded 52 years. Apart from expert construction professionals, researchers with expertise in building technology trades alsocontributed in the study. Overall five academics whose research focus was in building technology trades participated in the study. The questionnaire catalogue was developed by the researcher with the help of building construction personnel in the site. The participant where asked to state to what extant those identified risks are true in the building technology trades after words, the questionnaire catalogue was shared to all the expert partakers which was followed by brainstorming sessions conducted that consists five construction safety professionals and five academics in building technology trades.

IV. RESULTS AND DISCUSSION

Table.1. Results on design application for safety processes and the specific risk reduction procedures in building technology trades.

S/N	Task	Risk Assessment Rating	Remark
	Designers Structure Considerations in Site Hazards		
1	Underground services	3	H
2	Traffic and vehicular movements as it concerns the site	2	M
3	General workers movements within the site	1	L
4	Condition and closeness of adjacent buildings	2	M
5	Designing safe access to the roof	2	M
	Design Considerations Guides against Health hazards		
1	Use of safe solvent or adhesives and water-based paintsmaterials	1	L
2	Use of materials that are easy to handle such as light weight building blocks.	1	L
3	Avoiding cutting chases in brickwork and concrete	1	L

	and flame cutting or sanding areas coated with lead paint or cadmium		
	Pre-fabrication Considerations to reduceHazards on Site		
1	Steel structures can be designed so that they can be prefabricated and assembled on ground and then lifted to position for installation	3	H
2	Cutting of steel can be done under controlled environment off-site to reduced dust generation on-site.	2	M
3	Welding on sites can be reduced to eliminate burn risks or fire incidences. Bolts and nuts can be used as connections.	3	H
4	Falls can be reduced or eliminated through certain features that can cause falls, such as controlling heights.	3	H
5	Installing permanent access early such as stairs, so that ladder or scaffolds will not be used.	3	H

3 = High (H):Certain or Nearly Certain to be Considered; 2= Medium (M): Reasonably or likely Considered, and 1= Low (L): Very Rarely or Never Considered. The results of table 1 emphasized design application for safety processes and the specific riskreduction procedures in building technology tradeswhich shows that the hazards and risksshould be considered for safety processes. Design structure considerations such as pre-fabrication are important for the building designer/craftsmen, principal contractors, contractors, and sub-contractors machinery management in ensuring safe work sites. These are in line with the design safety principlesthat consideration of actual potential hazards and risk to each project be in the forefront of a designers work and designers can then quantify the risk and develop a framework within which design, specification, and planning of project and operation activities can either be used to prevent such hazards materializing or be employed to mitigate the effects. This can be seen in the table above where the researchers cataloged the interview with the workers in the site and the brainstorming session with the expert panel. The findings also revealed that pedestrian movements to and within the site during construction, safe solvent or adhesive and water base paints, use of materials that are easy to handle such as lightweight building blocks, are very rarely or never considered in the process of design.

Table.2. Results on Roles and Responsibilities of Relevant Parties Responsible for Building Project

S/N	Task	Hazard/Risk Assessment Rating	Remark
	Principal contractors		
1	Identify specific workers at high risk of exposure to hazards	1	L
2	Ascertain the sources of the specific risk	2	M
3	Determine specific control measures to be implemented	2	M
4	Determine effectiveness of existing hazard control measures	1	L
5	Make arrangements for first aid for injured personsand also arrange for their evacuation	1	L
6	Arrange for isolating hazardous incident scene on site	2	M
7	Arrange for making the workplace safe after hazardous incident	2	M
8	Arrange for safe guarding the incident site	3	H
9	Informing relevant regulator and emergency services as required	2	M
10	Arrange for investigating incident cases	1	L
	Contractor and Subcontractor		
1	Provision of first aid equipment on site	1	L
2	Arrange for training staff in use of first aid	1	L
3	Provide information on common hazardous situations on-site and control measures	1	L
4	Provide safety training, information and documentation	2	M
5	Providing workers with PPE	1	L

3 = High (H): Certain or Nearly Certain to be Considered; 2= Medium (M): Reasonably or likely Considered, and 1= Low (L): Very Rarely or Never Considered. The results of table 2 emphasized on the roles and responsibilities of relevant parties responsible for building project at all stages of a building construction which involves principal contractors, contractor and sub-contractors that are in line with principle of design for safety. The table above shows the outcome of the interview/

interactions the researcher and site contractors, and brainstorming session with the expert panel. The finding revealed that principal contractors, contractors and sub-contractors, very rarely or never considered identifying specific workers at high risk of exposure, provide facilities and first aid equipment, and provide information on common hazardous situations on-site and control measures, and providing workers with PPE at site.

V. CONCLUSION

Workers in building technology trades need to be prepared to work safely in changing, hazard-filled work environments, equipped with the knowledge and entrepreneur skills to protect themselves and their co-workers. Building technology trades risk assessment and risk control in industrial technology education for entrepreneur skill development were evaluated in 7 trade areas namely, carpentry, electricians, plumber, bricklayer, painter, iron worker, and maintenance workers.

RECOMMENDATION

1. There should be provision of information about chemicals used on site, potential physical and other healthhazardsat the work site in the languages that workers can understand;
2. Workers need safety information and control measures for each situation;
3. Contracts between parties involved in building construction should include safety features;
4. Building designers and draftsmen should consider design specifications that are safe which will help eliminate hazards at source.

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