HEALTH AND SAFETY IN REFURBISHMENT PROJECTS INVOLVING
DEMOLITION WORK

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To my beloved sister and our late Iliya
ACKNOWLEDGEMENT

No one walks alone on the journey of life. Just where you start to thank those that joined you, walked beside you, and helped you along the way continuously urged me to write a project. So at last, here it is. So, perhaps this project and its pages will be seen as "thanks" to you who have helped make my life what is today. Much of what I have learned over the years came as the results of continuous pure support of my father and mother. I also have to express my gratitude to my supervisor Associate Professor Dr. Arham Abdullah, whom I have had the pleasure of being trained by on this project. I also need to thank my wonderful sister, Ms. Mahboubeh Rakhshanifar, who inspired and assist me in developing the research. I also need to thank JSC Demolition Company, an amazing organization for their fulfilling assistance. I also thank Mr. Mohammad Mahdi Hosseini for his specific guidance and assistance on management issues. Finally, I wish to thank Noorashikin Abdul Rahman for her sincere assistance through data collection.

And to God, who made all things possible.
ABSTRAK

Refurbishment is any upgrade, alteration, modification in the current status of the building to improve performance and efficiency of the structure. Refurbishment projects involve structural alteration, retention and partial demolition which merely coincide with different risks. The importance of considering safety issues and developing management strategies applicable for refurbishment practice arise as a result of increase in the total number of the refurbishment projects and growth of the fatality rate caused by refurbishment work. Increase in the number of accidents may affect project team in many aspects. Financial losses and delay in the completion of work are the typical consequences caused by refurbishment activities. On the critical cases, the public image of the contractors, clients, and management team as general, will be damaged. Therefore, providing a safety and health check list may assist to reduce incompliance with health and safety regulations and to improve communication flow in refurbishment projects. Further, this check list may be used as a basis for the health and safety trainings for the workers. To achieve this target, demolition techniques, methods and accident reports on the refurbishment project has been identified and reviewed. Next, a semi-structured interviewed was conducted to provide a list of common hazards occurring in the site and appropriate precautions that can be applied in the project to prevent accidents in working place. The obtained result was organized in a check list of activities, preventive actions and recommendations.
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<td>CDM</td>
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<td>CIOB</td>
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<td>CIRIA</td>
<td>Building Electrical and Plumbing Control</td>
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<tr>
<td>DBKL</td>
<td>British Standard</td>
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<tr>
<td>DOE</td>
<td>Construction Design and Management</td>
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<td>DOSH</td>
<td>Chartered Institute of Building</td>
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<td>EIA</td>
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Hazard Identification, Risk Assessment, Risk control
Health and Safety Executive International Labor Organization

ONS OSH OSHA
PDRM PME PPE
R&M TIA

Office for National Statistics
Occupational Safety and Health
Occupational Safety and Health Administration
Jawatan Kosong Polis DiRaja Malaysia
Powered Mechanical Equipment
Personal Protective Equipment
Repair and Maintenance
Traffic Impact Assessment
CHAPTER 1

INTRODUCTION

1.1 Background

As conservation and reuse enter the mainstream of practice, young engineers recover that little or nothing in their education has prepared them for this revolution. The past has caught up with us without our recognising it. (Bowles & Thorne, 2008) As a result of sustainable development, the importance of refurbishment practices becomes more tangible because, in nature, refurbishment adhere the resource preservation and prevent carbon emission. Refurbishment is defined as adaptation, extension, improvement and structural alteration of an existing building (Charles O. Egbu, Young, & Torrance, 1996) to permit its re-use and meet functional criteria equivalent to those required for new building. Refurbishment work is less well-planned and more difficult to control than new-build (Charles O. Egbu, 1996).

During last 2 decades, refurbishment and upgrading projects comprise almost half (45 %) of the construction work in UK(ONS, 2009) and during the last decade a significant increase in the amount of refurbishment project was reported in Malaysia as well. In comparison with demolition and reconstruction, refurbishment projects are most cost effective and operative. On the other hand, refurbishment accounts for a substantial proportion of injuries and fatal accidents. 40.6% of construction fatalities as provided by the (HSE, 1988).
As reported by HSE on 12 August 2005, SJB Demolition & Ground works began demolition of a two-storey garage building in Brent, North London, while three workers were inside the ground floor area. As rubble began to fall down the inside stairwell, one of the workers fled through the open front of the building and was hit by the collapsing front wall. He was partly buried in debris and sustained injuries to his neck, shoulder and ribs. An HSE investigation revealed SJB had not checked the area or issued any warning before beginning the work (HSE, 2005).

Similar case happened in Malaysia on 28th May 2009. Jaya supermarket collapsed during demolition work. Seven workers died; while three more were injured during the accident and 69 residents of 12 houses in the vicinity of the supermarket were evacuated in order to provide buffer zone for further demolition work (DOSH, 2009). Therefore, refurbishment works are risk intensive and can be considered as one of the most dangerous activities among construction works and need strategic safety management.

1.2 Problem Statement

Construction industry, annually, suffer a huge amount of damages due to construction accidents caused by non-efficient risk management. Many workers injured reversibly or irreversibly and many contractors and clients lose in terms of compensation costs and reputation consequently.

Fatality rate shows an irregular pattern which is mainly caused by unstable development of construction industry and economic status of countries. Additionally, lack of safety awareness among workers, lack of commitment by employers to implement measures to improve occupational safety and health contributed towards the increasing number of accidents. A study on fatal accident shows that 75% of fatal accidents are caused by lack of effective management practice (HSE, 1988).
Refurbishment projects with a high rate of risk, lack safety consideration and recommendation during planning, design and execution phase. There is evidence that the construction industry lacks effective management systems to cope with refurbishment safety risks and hazards (Charles O. Egbu, et al., 1996) although it is widely acknowledged that refurbishment projects are complex, risky and uncertain (Charles O Egbu, 1994; Quah, 1992).

Unfortunately, no official statistics exist on the current proportion of refurbishment work in Malaysia. The R & M sector (the UK repair and maintenance sector), since 1990, has accounted for more than 40% of the total UK construction output and accounts for about 43% of the total number of fatal accidents in building and civil engineering industry in UK (HSE, 2002).

Common hazards which could result in fatal accidents in demolition and refurbishment work include falling debris, premature collapse of element/structures, dust and fumes, asbestos, noise and vibration, and electric shock (Hughes & Ferrett, 2008).
In comparison with the total demolition, partial demolition which is the key element on refurbishment projects requires a larger number of workers due to the manual activities. Unfortunately, partial demolition shows a higher potential of fatal accidents occurrence compared to demolition work. Social impacts of construction accidents, on the other hand, are not well specified however, in some cases, it may involve people from different walks. This will highlight the importance of the supervision and monitoring of the safety factors in refurbishment sites.

Therefore, this study managed to identify accident prevention procedures during refurbishment works in order to avoid fatal and serious injuries, and economic loss. Hence, the need for hazard identification and control measures in refurbishment projects is highlighted. Therefore, the organizations and individuals involved in refurbishment projects, from worker and non-worker victims to the government would ensure the safer completion of refurbishment projects which is the focus of the current project.

**Figure 1: Construction Worker Fatalities by Site Activities**

Source: (HSE, 2004)
1.3 Research Questions

Before commencement of work in developing a safety management framework for refurbishment project we should consider following questions:

1. What are existing hazards in refurbishment sites and projects;
2. How serious or how frequent each hazard is and how it could affect the work process;
3. What are the current practices and criteria for selecting appropriate methods;
4. What are the most important consideration and recommendation in these projects in order to avoid incidents in the sites.

1.4 Aim of the Study

This study is managed to specify the efficient management strategies by providing a safety and health framework for refurbishment projects in order to minimize the number of accidents and improve health and safety status of the refurbishment site.

1.5 The Objective of the Study

As a result of accurate inspection and supervision of work, protective measures can be applied by the management team and safety committee which is assigned by the head management officer. Therefore, providing a check list of safety measures can be an effective tool to monitor the sequence of project. The specific objectives of this research are:
1. To identify hazards caused by the nature of refurbishment project;
2. To identify common accidents happen during refurbishment work;
3. To develop a safety check list for refurbishment projects to manage safety and health in these projects.

1.6 Scope of the Study

The scope of work mainly focuses on identifying hazards and existing risk in refurbishment project in Malaysia in order to provide a framework for the constructors to comply with to avoid accidents and incidents in working sites. The proposed refurbishment project to be investigated is City Square Shopping Complex in Johor Bahru, Malaysia. It is projected to demolish Reinforced Concrete beams, slabs, and parapet walls in Level 5, 6 and 7 of this building.

The typologies of the selected case study covered different types of refurbishment sites as office buildings and commercial areas. Therefore the selected case study present a comprehensive range of refurbishment safety issues that allowed the development of all the findings and considerations of the project.

1.7 Methodology

To achieve forgoing targets a combination of methods is proposed and utilized. Firstly, existing literature on health and safety in refurbishment projects shall be reviewed. Next, review of the current statistics on the accident and, where possible, incident occurred during demolition work is suggested. Finally, to establish end user requirement, semi structured interviews were conducted within industry
practitioners including structural engineer, project manager, site supervisor, demolition contractor, contractors, workers and clients.

1.8 Research Outline

This study conducted the research at University Technology Malaysia on ‘Health and Safety in Refurbishment Projects Involving Demolition Work’. The first chapter of research illustrates the main contents of the project including the research background, objectives and methodology and the case study that has been investigated.

The next chapter discusses the key safety factors identified for refurbishment sites involving demolition activities. Recommendations related to key issues to be considered for the implementation of safety management strategies in refurbishment projects is also documented. The research work has highlighted the importance of proactive involvement of all the key functionaries for a better safety management of the whole refurbishment process. The report documents the key responsibilities for all the figures identified in the refurbishment process.

Chapter 3 of the research justify the applied method to achieve the objectives of the current research and to fulfil research questions. A good example of the practice was documented to direct the application of the method in the real life issue with regards to the prerequisite criteria for selection of the case study.

In chapter 4, the results of the site investigation and interviews is developed followed by the discussion on the archived results and provided recommendation presented by the respondents. The check list has been depicted at the end of this chapter.
Conclusion and further studies have been covered in the last chapter. The report concludes with recommendations for further research and a reliable safety check list for the implementation of demolition incurred by refurbishment projects based on the results achieved from this project.
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