

# Assessing the Potential Hazards of Demolishing Operation

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## Abstract

Demolition is regarded as a dangerous and complex activity. It requires sound knowledge of various construction techniques, each of which has its own demolition method. This study aim at investigating the dangers and problems associated with the execution of demolition works. It contains an extensive analysis of the data gathered from a field survey and questionnaires issued. Thirty-five (35) questionnaires were distributed to various sites where demolition works were ongoing. Analysis drawn from structural questionnaires and observation revealed that, most demolition operators are often not provided with safety clothing or protective equipment on some demolition site. The study further revealed that, the general public is mostly exposed to excessive noise, dust or flying particles. These result in operatives experiencing injury in the process especially with the manual method. Also, most of these associated hazards or problems occur as a result of inadequate measures taken in ensuring safety on some demolition sites and its surroundings, workers not abiding by the necessary roles in ensuring a safe operation. This study concludes that, hazards in demolition works can never be prevented yet basic safety measures and the need for constant vigilance on site can reduce most of these hazards. Recommendations to this study prompt that, all workers on demolition sites must be made aware of the kind of dangers or hazards that they could be exposed to with the method employed in the demolition. Trained personnel with the full knowledge of various techniques of demolition should be allowed to carry out the work.

**Keywords:** Health, Safety, Potential, Hazards, Demolition,

## 1. Introduction

The safety in demolition works has in recent time become a very important issue in construction industry since it poses a lot of dangers on the operatives as well as the environment. The term demolition is the “dismantling, razing, destroying or wrecking any building or structure or any part thereof by pre-planned and controlled techniques” (Building Department Hong Kong, 1998). Demolition is regarded as a dangerous and complex activity. It requires sound knowledge of various construction techniques, each of which has their own demolition method. It also requires an understanding of legal and procedural issues involved. (Douglas 2000). The hazards of demolition are by no means confined to the workers themselves. They extend to many others in the locality as well as adjacent property. According to ILO (1992) demolition is potentially hazardous to the workers involved, to the public, to adjacent property, and to the environment. Therefore, extraordinary measures should be taken to protect all of them from such dangers. In given recognition to the hazardous nature of the activities carried out in demolition, it is important to ensure safety measures and systems put in place to facilitate the process. The research is meant to reveal various hazards and impacts arising from demolition works. It will also propose measures that will enhance safety on site. The research would again contribute many benefits to the construction industry especially in demolition works in terms of the process.

The evolution of demolition industry in civil engineering has followed closely the developments in structural as a whole. An understanding of structural and material science is desirable to solve any problems regarding demolition. Today, demolition projects undertaking are complex in nature, demanding greater skill, experience and precision than ever before. According to Douglas (2000), demolition, even when partial is a dangerous and complex activity. New innovative advancement has been made to ensure safe operation and more efficient work. There are worldwide federations such as the National Association of Demolition Contractors (NADC) and the Nation Federation of Demolition contractors (NFDC) that has been establish to contribute all the knowledge and skill required. Due to the hazardous awareness of the surrounding at demolition site, many guides has been prepared to assist people who are responsible for safety and health with detailed procedures to follow in order to identify, assess their risk and implement suitable measures to prevent or reduce the likelihood of their occurrence. (Fales, 1991)

## 2. Problem Statement

The building industry has always been facing a lot of dangerous incidents in respect to demolition works, since in some cases, proper precaution measures and practices are not been embraced or adhere to. Demolition works are associated with a lot of dangerous activities, which in one way or the other has a great hazardous influence on operatives and surroundings in respect to the adjoining properties. The risk involved in this activity is extremely high, which are concerned with various accidents in its process. For these reasons, building professionals sometimes have to deal with and manage, buildings to have knowledge of demolition procedures

and controls, as well as an understanding of basic techniques involve in such works.

### 3. Aim

The aim of this study is to investigate into the dangers and problems associated with the execution of demolition works.

### 4. Objectives

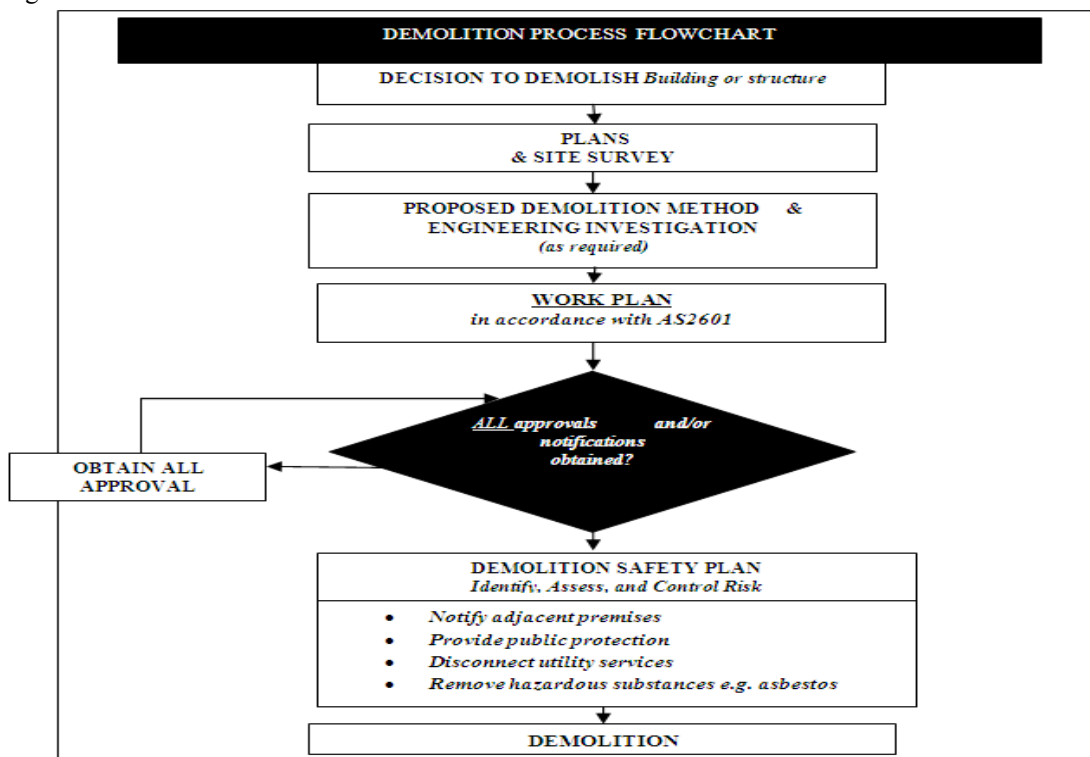
- To assess the degree of hazards associated with the demolition operations.
- To identify the demolition hazards which are mostly encountered on the site.
- To identify the demolition method that is associated with much hazardous activities.

### 5. Structural Demolition

Structural demolition can be defined as:

“Dismantling, razing, destroying or wrecking any building or structure or any part thereof by pre-planned and controlled techniques” (Building Department Hong Kong, 1998) “The controlled removal of selected part of the structural or key structural members to cause complete collapse of the whole or part of the building structures” (BS 6187: 2000). Although the definition varies depending on the source but it still reflect on the same objective and meaning. Before any demolition activities, there are many steps that need to take place, these includes but not limited to performing asbestos abatement, removing hazardous or regulated materials, obtaining necessary permits, submitting necessary notifications, disconnecting utilities, rodent baiting, and development of site-specific safety and work plans. (Rizman 2010). Improper handling of demolition of buildings or structures gives rise to many hazards. These hazards include falling from elevated work surfaces, exposure to hazardous substances, poor lighting, electrical hazards, falling objects, confined space, etc. In addition, risks incurred during demolition such as overloading, improper removal of bracing members can cause instability to structural members. To ensure that such hazards are properly managed and the potential risks minimized, adequate and practicable measures must be taken before and during demolition work. This is to ensure that the safety of workers, the public and neighboring properties are safeguarded. (Rizman 2010).

**Demolition process** The basic knowledge of structural demolition is required to ensure the effectiveness of demolition process. According to ACT safe demolition work code of practice, demolition process is explained by the figure below



(ACT Safe Demolition Work Code of Practice Third Revised Edition, November 2000).

## **6. Pre – Demolition Check**

Prior to permitting employees to start demolition operations, an engineering survey shall be made by a competent person of the structure to be determine the location of the framing, floor, and walls and possibility of unplanned collapse of any portion of the structure. Any adjacent structure where employees may be exposed shall also be similarly checked. The employers shall have in written evidence that such a survey has been performed. (OSHA Standards for the construction industry 2000). According to Best Practice for Demolition in New Zealand, the public is primarily concern with materials falling, or dust billowing from the site onto the public roadways or adjacent properties. Two major concerns are the potential instability of partially demolished structures, and noise emanating from demolition site.

## **7. Site inspection**

The demolition contractor must check the site, building or structure, its content and environment for likely hazards. This includes:

- Asbestos – containing materials;
- Hazardous and flammable substances,
- Fire extinguishers and other compressed gas containers,
- Underground tanks, pits, sumps, basement or other voids;
- Unsafe structural members; and unsafe access routes.

## **8. Adjoining Building**

A demolition contractor should check the relationship and the condition of adjoining building. No part of the demolition process is to adversely affect the structural integrity of any other building. Consideration may need to be given to monitoring, the use of shoring and underpinning, and to the changes in soil condition as a result of demolition.

## **9. Historical use of the building**

The building owner or principal must provide the demolition contractor written evidence of historical use of the building/structure. This does not relieve the obligation of the demolition contractor from confirming such condition of the existing building. Those conditions may arise from hazards including Hazardous substances, lead, asbestos, and radioactive substances. All hazardous substances must be removed prior to the commencement of demolition.

## **10. Public services**

All services, either underground or above ground, such as gas, water, electricity, drains, fire service and risers, and telephone cables; must be located and plans provided by the client/principal (where applicable). They must be maintained by the demolition contractor for reference throughout the contract.

## **11. Structural inspection**

The building owner or principal must provide the demolition contractor with all known and applicable structural plans so that the demolition contractor can examine them. It must be understood by the demolition contractor that the original drawings may not be true record of what was actually built. Where the nature of the construction is uncertain, a special investigation by the demolition contractor must be carried out, and may include input from specialists such as registered engineers.

## **12. Health And Safety Requirements**

The following information is provided to assist contractors in recognizing hazard that may occur in demolition activities and to minimize risks that may be imposed on workers, visitors and the site environment.

## **13. Demolition Safety Plan Hazard Identification**

Demolition safety plan is one of the phase involve in demolition process which covers all the steps acquire to identify, asses and control hazard which might occur at the workplace during the demolition work. It should be developed in consultation with employees and health and safety representative. A hazard is anything with the potential to harm life, health or property. Hazard identification is the process of identifying all hazards in the workplace. According to ACT Safe Demolition Works (2000), identification of hazards should include those that exist at the workplace before work begins. In order to understand what hazard identification involves, an understanding about the nature of hazards must be achieved. Hazards are the main cause of occupational health and safety problems at workplace. Therefore, finding ways of eliminating hazards or controlling the associated risks is the best way to minimized workplace injury and illness. Hazard identification involves the systematic approach or investigation of all potential hazard sources and the recording of hazards identified. As stated in the

ACT Safe Demolition Work (2000), method of identifying hazards includes:

- Inspection of the demolition site and structure, plant and equipment, and direct observation of work process.
- Consultation with workers, who are usually aware of what can go wrong and why, based on their experience with a job.
- Consultation with practitioners and representatives of industry association, unions, and government bodies, for advice and information on health and safety matters relevant to demolition work.
- Analysis of workplace injury and incident records on demolition and construction sites, to identify where and how injuries have previously occurred.

It is important to notice that hazards can arise in many different ways and can take various forms which may result unnecessary costs and human suffering. Hence, hazard identification process must be properly done to achieve zero injuries. Risk is the potential outcome of a hazard that may arise in the workplace. It means risk is the possibility of injury, illness, damage or loss occurring because of hazard. Risk assessment means the process of assessing all of the risks associated with each of the hazards identified during the hazard identification process. When hazards have been identified, the next step is to assess in terms of their potential to cause injury or illness to anyone at or near the workplace. (Rizman, 2010)

#### 14. National Building Regulations, 1996

Regulation 54 of the National Building Regulations, 1996, states that:

- i. All demolition works shall be conveyed to the District Planning Authority or the police prior to the commencement of the demolition works and it shall be ensured the efficient warning is given to the public of the danger posed by the works.
- ii. Dust arising from demolition works shall be controlled so as not to create nuisance or danger to the health of the general public.
- iii. Sufficient precautions shall be taken to safeguard public safety, health and adjoining properties.

#### 15. Research Methodology

##### 15.1 Population and Study Area

Unearthing the information on the study population of forty (40) workers from different sites were considered. This includes Project Managers/Directors, Engineers, Foremen and Laborers. This study was conducted within the Accra Metropolis. Accra is the capital and largest city with an estimated urban population of 2,291,352 as of 2012.

##### 15.2 Sampling Procedure and Sampling Size

A simple random sampling was employed to select the sample of 35 from the population. To retrieve information for this work, the researcher used questionnaires as the tool for this research. Primary and secondary source of information were also used as the basis in coming out with the necessary data and information that were employed in the research. The primary data were gathered through the administration of questionnaires to Project Managers/Directors, Engineers or site foremen and laborers. The secondary sources of information also constitute information gathered from the library and assessing the internet. A pilot study to observe some demolition sites were embarked Based on these observations, questionnaires were distributed to some personnel on site for analysis.

*Table 4.1. Method with the highest impacts of demolition hazards*

Methods	Frequency	Percentage
<b>Manual method (by hand)</b>	15	53.57
<b>Mechanical method</b>	5	17.86
<b>Explosion or implosion</b>	8	28.57
<b>Total</b>	<b>28</b>	<b>100</b>

Source; Field source

The above result reveals that, demolition by hand involves many hazards with 15 respondents which represent 53.57%. This was followed by explosion or implosion with 8 respondents also representing 28.57%. The least among them is demolition by mechanical means with 5 respondents which amounts to 17.86%. This indicates that, workers normally found themselves confronted with dangerous activities in manual method of demolition operation.

*Table 4.2 Do operators undergo any special training before undertaken the demolition exercise?*

Response	Frequency	Percentage
<b>Yes</b>	11	39.29
<b>No</b>	17	60.71
<b>Total</b>	<b>28</b>	<b>100</b>

Source; Field survey

In finding out whether demolition operators undergoes a special training before they are allowed to undertake demolition works, 11 respondents constituting 39.29% said yes. Whiles 17 respondents also constituting 60.71% said no. This means that in most demolition works, operators are allowed to undertake the exercise without undergoing any special training.

## 16. Conclusion

It is observed from the study that demolition operation is dangerous in nature and its associated hazards and impacts are very high and requires a sound knowledge of various construction techniques, each of which has their own demolition method. The research revealed various demolition techniques or methods that can be used to demolish a structure or a building and some common hazards which are associated with the operation and also revealed that, manual method of demolition are associated with a lot of hazards and also involves much impacts on the workers since most of them are mostly expose to dangerous and deadly activities. The analysis of the data obtained revealed that some demolition sites in the Accra metropolis do not take adequate measures to control hazards on site.

## 17. Recommendations

From the research carried out, the following recommendations are needed to be made;

1. All the personnel involved with demolition operations must be provided with the full personal protective equipment or those with protective equipment will be allowed on site.
2. All workers on site must be made aware of the hazards that they could be exposed to with the method employed on site if they do not adhere to safety precautions. This could be done through placing of posters around and notices at points on the site.

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