

Demolition of the Building - Review

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Abstract: Every Civil Engineering structure has a life span and if at all the structure survives longer period than it is designed for then it may pose serious threat to its surroundings. In such situation the safety of the surrounding buildings can be attained only by the process of Demolition. Demolition is the reverse process of construction, as the process of construction is carried out basically from constructing the substructure first and then the superstructure but in case of demolition the superstructure is demolished first and then the substructure. Demolition of a building can be defined destruction, breaking down or removal. Demolition of building is the process of dismantling or destroying of a structure after its life of serviceability by pre-planned and controlled methods. The process of demolition can be carried out for various reasons like old structures are to be replaced by new structures, the small structure are demolished to build big structures. There are two most commonly used types of demolition methods and they are Non Explosive method and Explosive method (Implosive Method). During the process of demolition all the reusable material should be collected so that they can be segregated and recycled. This study helps us to know the various methods involved in the process of demolition, various equipments used for the process of demolition and the safety measures that should be engaged during the process of demolition.

Keywords: Demolition, Explosive method (Implosive Method), Non Explosive method

1. Introduction

Generally the structure is designed for a life span of 80-100 years, and beyond this design life the structure weakens and may prove to be dangerous to the people residing in it. The process of breaking down the structure after its design life period by gathering all the necessary and reusable material. The process of demolition should be carried out with great care and perseverance. Many safety measures should be adopted before carrying out the process of Demolition. The process of wrecking down any load supporting structure i.e., the structure can be commercial building, a house, bridge and can even be highway projects. The demolition experts look at several factors when deciding how to demolish a building, usually they consider the area where the building is located, kind of materials used in the building, the purpose of demolition. For small buildings such as residential buildings usually which is two or three floors, demolition process is very simple, the building is brought down either manually or mechanically. But for the tall buildings they use wrecking balls or any other

The appropriate technique should be adopted for the purpose of demolition, the best possible method should be chosen so that the method suits the area in which demolition takes place so that accidents caused during the process is reduced. Before carrying out the process the thorough survey has to be carried out. Most importantly all the necessary permissions from the local authority should be taken prior to demolition.

In the process of demolition the hazardous material like asbestos, minerals, radioactive minerals are separated out and later on are cleared from the site under the guidance of specialised personals. The waste management should be given great importance especially the debris should be collected and disposed off properly. The process may sometimes produce loud noise and may cause disturbance to the nearby residential areas, hospitals and educational institutions.

2. Building Demolition Process

The process of demolition involves various steps and they are:

- 1) Surveying
- 2) Removal of hazardous material
- 3) Preparation of plan

Surveying of the building before demolition: The various components, parameters of the building, to be demolished should be studied by means of thorough surveying, there are mainly two types of surveying conducted and they are:

- a) Building Surveying: The following process is carried out in building surveying:
 - Adjacent traffic condition
 - The area surrounding the demolition may be sensitive with respect to noise, dust, vibration.
 - The presence of shared facilities like partition walls, common staircase with the adjoining buildings.
 - Should take care of near by water resources or drainage, so that flooding, pollution or erosion does not take place.
- b) Structural Surveying: The following process is carried out in Structural surveying:
 - The condition of the building during the process of demolition.
 - The method of construction (the structural system and condition).

Removal of Hazardous material: Experts investigate the site thoroughly and determine the presence of hazardous materials like chemicals, explosive or petroleum contamination, radioactive materials in the building area is collected separately from the site and disposed off properly in a safe area.

Preparation of plan for demolition of the structure: The detailed plan is prepared which will guide through the entire process of demolition work, the plan indicates the step by step procedure that should be conducted, the plan also involves the structural system of the building, the location of

the building to be demolished, the distance between the building to be demolished and the adjacent building or any other adjacent structure etc.,

3. Methods of Demolition

Two methods are generally adopted in the process of demolition of any kind of structure:

a) Explosive Method: Implosion method is the kind of process usually used in the explosive method of demolition. In this method the supports of the building are mainly concentrated on and they are removed, when they are weakened or removed the building automatically collapses. The main components of the building such as columns, slabs, beams are attached with the explosives and later on these explosives are detonated making the structure collapse. Again based on what will be the type of structure collapsing the implosions are divided into two types and they are :

- Falling like a tree: This type just depicts the process of tree falling when it is cut , the building is also made to fall sideward. This method is not generally adopted in the crowded areas but can only be implemented when there is a lot space present adjacent to the structure being demolished. The detonators make the main components like beams and column to collapse which ultimately makes the structure collapse, the falling direction is directed by the steel cables which are tied to structure.
 - Falling into its own footprint: When there is no enough space or if it is a crowded area then this method is adopted. Large explosives are used. This method is not largely used. In this method the explosions are detonated , the upper part of the building is destroyed and falls on the lower portion of the building, hich falls on its own footprint.
- b) Non –Explosive Method: No usage of explosive is done in this method. Only equipments are used for the purpose of demolition. Various equipments are used such as :
- Sledge Hammer: it is a small handheld hammer used mainly for the demolition of the small wall or column.
 - Bulldozers or Excavators: They are bigger machines used for the demolition of structure of small sizes, they are also used for excavation of soil or even transferring of debris into truck.
 - Wrecking Ball: This equipment is used for the demolition of the larger buildings which may be as high as 6-7 storeys , the tall buildings generally cannot be demolished with the help of excavators or bulldozers or sledge hammer but in that case demolition can be done with the help of wrecking balls. These are the large steel balls which are attached to the crane with the help of steel rope.the steel ball is hung with the help of steel rope to the crane. The ball is made to hit the structure to be demolished with the great force and is pulled back again. The process is repeated for quite a few times until the demolition of the structure is not accomplished.
 - High Reach Excavators: For the building which can be classified as very tall can be demolished with the help of the different kind of excavators known as High

Reach Excavators , which can demolish the building up to the height of 300ft.

4. Recycling of Demolition Waste

Debris management is very important aspect in the process of demolition. Demolition waste is a waste collected from the demolition site. The debris is made up of concrete , wood, brick , clay tile, steel, and drywall . The entire demolished waste cannot be recycled completely. Before conducting the process of demolition hazardous material should be segregated from the non hazardous waste. The debris can be disposed of either in the construction and demolition debris landfill or can be handed over to municipal solid waste landfills. Alternatively the elements obtained during the process of demolition can be segregated and later on recycled, sorting of the debris can be done in the site itself or off site. The following materials are obtained as debris and are recycled in the following way:

- 1) Concrete and Brick: They can be recycled by crushing them into rubble. Once sorted ,screened (when the contaminants are removed) the reclaimed concrete or bricks can be used to fill the road base. The crushing can be done with the help of the mobile concrete crushers.
- 2) Wood: It can be reused or burned as bio energy. Repurposed or recycled wood can be used in pathways, coverings , mulches, compost, animal bedding, or particle board.
- 3) Asphalt: It is recycled and used in pavement.
- 4) Metal: Scrap metal is an established industry focused on the collection, buying , selling and recycling of salvaged materials

5. Major Demolition Projects

- 1) Chimney Demolition: This demolition is one of the most complex projects that required careful and detailed planning. The project took place at Briggate, Leeds where a 53 metre high brick chimney had to be pulled down with explosives. The nature of this project required a keen supervision and coordination of the workers.
- 2) Challenges faced for chimney demolition: Usage of the explosives, Inherent dangers of using explosives, maintaining the safety of the surrounding areas, perfect communication and coordination under high pressure.
- 3) University of Manchester –Asbestos removal: there are several buildings in the Manchester which require proper asbestos removal. Asbestos was sometimes found deposited in the false ceiling inside technical ducts and other small spaces.
 - Stopford Building Demolition: the project involved asbestos removal from three risers and a 9metre section of the corridor. Decontamination and environmental cleaning were also taken care of towards the completion of the project.
 - Renold Building Demolition: The asbestos was found in the spray coated insulation in the pot and beam ceiling. Asbestos was removed with the help of a multi needle injection system and quill blasting method. After the completion of the project works like ceiling reinstatement were also carried out.

6. Precautionary measures to be adopted before and during Demolition

The accidents may occur in the site while demolishing but by taking proper precautions the accidents may be avoided to a larger extent. The accidents may hurt the public passing by or the workers working in the site. The various precautionary methods should be adopted during the process of demolition:

- The machineries or the demolition equipments must be operated under the guidance of the experts. The machineries should be used and maintained as recommended by manufacturer's.
- The demolition shall not be commenced until precautionary measures have been inspected and approved. It is advisable to inform adjoining neighbours prior to the process of demolition.
- During the process of demolition the work shall be under the continuous supervision of the demolisher or an experienced foreman.
- Demolition shall be executed storey by storey commencing at the roof and working downward.
- Chutes shall be completely enclosed and a danger signs shall be placed at the discharge end of every chute.
- Scaffolds above 4 meters height should be erected, Working platforms should not be piled up with the debris, scaffolding should be prevented from damage caused due to the falling debris.
- The demolition site should be barricaded with appropriate warning signs. Only authorized personnel should be allowed in the area.
- Workers involved in the process of demolition must be provided with proper training and instruction. Personal protective equipment such as helmets, boots, gloves goggles, should be distributed to all the workers involved in the process of demolition. The first aid box should be made available in the site.
- All the flammable goods shall be removed from the site unless they are necessary for the works involved.

7. Conclusion

Demolition is the process which has to be carried out with great care. The process of demolition should be carried out under the supervision of the experts. All the precautionary methods should be adopted to ensure the safety of the workers and public. The factors like age of the building, height of the building, and its location with presence of its surrounding with its structural stability. Based on the condition of the structure to be demolished the method of demolition should be decided. In implosion process the explosive should be used very carefully. The process of implosions has many advantages over the conventional process of demolition: it costs lesser than conventional method, it is quickest method, it is more suitable for multi storeyed structures. Prior to the process of demolition the permission should be taken from the local authority. The process should take place in such a way that the adjacent structure should be kept safe during the process of demolition. This method is widely accepted by many. The disadvantage of this process is that it requires more attention

and supervision, because carelessness may lead to greater damage.

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