Controlled Execution of Demolition work for Residential Building

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Abstract
Demolition means destroying or bringing down any building or part of building, who’s working or service life is finished. Demolition works are done with manually and by using the machines, equipment’s. It is necessary that demolition is done with a proper planning or in a controlled manner as well as by considering safety aspects to reduce the demolition waste. This paper gives the planning for the demolition. In this paper we also define the major factors for the controlled execution of demolition. Planning incudes the general surveys, structural surveys, demolition plan. Pre-planning for the demolition will help to reduce the construction waste on site.

Keywords: Demolition; Preplanning; Major factors.

1. Introduction
Every structure is designed for specific service life period. When the structures have passes their life, they need to be demolished. In India there are many such structure who passes their life already, such a structures are very dangerous for surrounding buildings, hence they need to be demolished for the safety and reconstruction purpose. Actually in construction industry demolition is very common activity because of any time change in design of the structure during a construction period. Demolition is nothing but the falling down or destroying down the building with the proper planning by considering the safety measures. There are so many old structures which are very dangerous, they need to be replaced by the new one, and to carry out this purpose demolition is necessary. During demolition safety aspect is very important, hence structure taking down very carefully preserving its valuable elements for the reuse. Traditional method of demolition is handy tool. In demolition the mechanical equipment’s are also used as well as explosives are used for the destroying of structure. For the demolition by any of method need of proper understanding of not only the structure but, also the methods for minimizing the risk at site. Risk in demolition should be understood that may damage the persons or any surrounding structure. This project gives the attention on the planning and execution of demolition work with safety at a work place.

1.1 Objectives:
- To study the pre-planning for the control execution of demolition work.
- To find the major factors for controlled demolition and study of different methods.

2. Demolition and Pre-planning:
Demolition means destroying, dismantling and bringing down any building or structure or any part of structure with a pre-planned and controlled methods. Before starting any demolition, it contains many steps and activities. Activity such as survey of surrounding structures. Demolition methods are varying depending on type of structures, area available, availability of time, material of building. For the demolition pre planning is very necessary.

Preplanning incudes following points:
2.1 Survey of site
2.2 Demolition plan
2.3 Pre-cautionary measures
2.1. Survey of site
For the demolition of any building, there should be priority to surveying of site is very necessary. Two types of surveys should carry out. These are 
1. Building survey    
2. Structure survey

2.1.1 Building survey
- Building survey includes the records of the drawings, layout plan showing the adjoining properties, road and pedestrian walkways etc.
- The building material used for construction.
- Presence of the wastewater, flammable or explosive and radioactive materials, presence of the material that contaminates the soil.
- Site conditions such as slopes to the ground, retaining wall, bridges, underground railways and its above structures, overhead cables or wires, utility service connections.
- Drainage conditions, water receiving bodies, presence of wells.
- Vehicular traffic conditions and pedestrian.
- Clear spaces from the building for the transportation of the building debris during demolition.
- Site area which is available for alone on-site sorting of building debris.
- Impact of the vibrations and traffic.

2.1.2 Structural survey
In the structural survey structural details shall be checked. The structural engineer should check the unusual detailing that may cause the abnormal structural behavior during the demolition.
- The structural material used in construction.
- Structural design and condition of the basements, underground water tanks.
- Presence of the cantilever structures, balconies.
- Presence of the signboard, sun shading devices on building.

2.2. Demolition plan
Demolition plan should contain:
- Detailed plan showing the location of the building which is to be demolished.
- A detailed layout plan for all floors of the building to be demolished.
- Plan showing the steps for the demolition.
- A plan gives the information about all precautionary and emergency measures.
- A plan showing the movement of the powered mechanical plants and equipment’s.
- A plan for handling and transporting the debris.

2.3. Precautionary measures
- A danger sign board on every site of demolition should be posted all around the structure as well as site and at all doors. There should at least two independent exists for the escape of the workmen in case of emergency. Unauthorized person should not allowed on site during working hours.
- It should be instructed to the worker the use of all safety appliances while working on demolition site.
- Google’s are used at the tie of demolition of walls, floors, tearing of plasters especially in the use of the gas cutter, jack hammer, it protects the eyes from flying pieces, dirt, dust.
Rubber gloves should be used by the worker while removing the steel, there may be chances of injury to hands.

Safety belts shall be used by the workers who are working at the higher level, it helps to prevent from falling. First aid equipment's shall be made available also qualified doctor made available at call.

Protective screen cover shall be placed, to prevent from the flying pieces. Bamboo scaffolding or metal scaffoldings are used for providing protective screens to enclose the building structure for retaining the small debris. Heavy duty nets shall be used.

Protection to traffic: Temporary closure of a traffic lane may be applied for the night work.

3. Major factors for controlled demolition
1. Control on the events of the accidents.
2. Control on the environment pollution
3. Control on the structural collapse.

3.1 Control on event of accidents
On the demolition site accidents are caused due to falling form the height, accidents due to falling materials, uncontrolled collapse, risk from connected services, traffic management, hazardous material, noise and vibrations, fire. Following are the reasons of the accidents.

- Lack of preplanning
- Lack of use of safety equipment’s.
- Lack of maintenance of the equipment’s.
- Lack of inspection on site before the demolition.
- Stability report at all stages of demolition is not prepared.

To control on events of accidents we have to arrange some safety consideration such as follows:

3.1.1 Training and communication:
Workers and the equipment operator shall go through the job safety training and be informed of the potential hazards during the training sessions as well as on the job training.

3.1.2 Equipment maintenance:
All equipment should be tested before use and properly maintained. The inspection report should be recorded.

3.1.3 Fire:
All flammable goods should be removed from the site before the demolition. A storage facility is provided for, furniture timber, doors etc.

3.1.4. Hazardous materials:
Material such as LPG cylinders in domestic flats, toxic and corrosive chemicals for industrial undertaking, asbestos containing materials should be identified and then removed.

3.2 Control on environmental pollution
The general requirements to minimize environmental impacts from demolition site.

3.2.1 Air pollution
Concrete breaking, handling of debris and hauling process are main sources of dust.
Asbestos: Asbestos should be removed by the registered contractor.
Water spray: water sprays are used to minimize the dust during the demolition.
Burning of the waste materials: Burning of the waste material on site should be avoided.
Material should not be dropped from the height, it creates the dust.
Waste material should be removed as soon as, it may create the dust because of wind.

3.2.2 Noise and vibration:
Noise is created due to use of the powered mechanical equipment’s such as pneumatic breakers, generators, loading derbies.

Remedies:
- Vehicles or mechanical plant shall be fitted with effective exhaust silencers.
- Machines should be shut down when not on use.

3.3 Control on the structural collapse
There are the two principles of the structural demolition. These are
1) Progressive demolition:
   In this demolition key structural members on which structure relies, are removed by proper sequence so that there should not be collapse of whole structure. The progressive demolition is useful in the restricted areas.
2) Deliberate collapse mechanism:
   In this mechanism key structural members are removed so that whole structure is collapse. Deliberate collapse mechanism is used for the isolated sites.

4. Methods of demolition
1) Manual method
2) Top to down by machine
3) Non Explosive Demolition Agent

4.1 Manual method:
This method is applied from top to bottom. Jack hammers are used to break down the concrete. Gas cutter or Oxy-acetylene torch are used to cut reinforcement. Demolition sequence:
1) First cantilevered structures, verandahs, balconies are bring down.
2) Floor slab shall begin at mid span and working towards the beams.
3) Floor beams are demolished in order of cantilevered beam, secondary beam, main beam.
4) Non load bearing walls shall be removed then load bearing walls are removed.
5) If the site conditions permit, the first floor slab directly demolished by the machine standing on ground.

4.2 Top to Down by machine:
The sequence of Top to down by machine is same as the manual method only demolition is done by the machines. For this purpose equipment or mechanical plant are lifted on the top floor. The adequate propping’s shall be provided at the floor level below the working floor. A ramp is provided to lower the machine.

4.3 Non explosive Demolition Agent (NEDA):
The NEDA helps to reduce the noise, flying debris and vibration. A drilling pattern is designed first. Then it is mixed with water and placed into holes. NEDA is used for the foundation works. When used in rock, it should be contained in the strong, flexible, impermeable bags to prevent uncontrolled entry into rock joints.

5. Conclusion
From the present study following conclusions can be drown.
- Building demolition is depends on various factors such as age of building, site conditions, height of building, and its location. With the help of preplanning we can achieve controlled execution of
demolition. Controlled execution helps in ensuring the safety of not only workers but also surroundings.

- Preplanning for the demolition helps to reduce accidents on site during demolition, wastages of time, manpower. Hence there is need to define control factors which helps in the preplanning of demolition work.
- This study defines the three controlled factors for demolition are, control on the events of the accidents, control on the environment pollution, control on the structural collapse. By control of these factors we carry demolition by minimizing the demolition waste.
- After study it is understand that Manual method and Top down by machine, these methods are more suitable for residential building than other methods such as wrecking ball, implosion etc. to reduce impact on environment as well as to reduce the demolition waste.

References