

A Review on Control Blasting Demolition

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Abstract- Demolition of any structure is the process of destroying down or collapsing down of large buildings after its useful life period with the help of some equipment. For small buildings it is a simple process with light equipments but in case of Larger buildings it may require the use of a wrecking ball, cranes etc. Explosive demolition is the preferred method for safely and efficiently demolishing larger structures and skyscrapers. When explosive are used for the demolition, it is known as Implosion. The various steps involved before the demolition process such as surveying, removal of hazardous materials, preparation of demolition plan, stability report and the precautionary safety measures that to be taken are presented in this paper. Demolition of structures using Implosion technique is illustrated. The main explosives used for Implosion method such as dynamites and RDX are highlighted.

Keywords- Demolition, Explosive demolition method, Implosion

I. INTRODUCTION

Every structure is designed for a life period. After that service life period its existence becomes very dangerous to its occupants and surrounding buildings. The building act usually contains provisions to control demolition works for the protection of public safety and to ensure adjoining premises and the site are made good on completion of the demolition. When demolition of a building takes place, the owner must inform the council and permission for the same shall be obtained. Greenhouses, conservatories, prefabricated garages and sheds do not require permission to be demolished. Permission for demolition is not required if building to be demolished has a volume of less than 1750 cubic feet (49.56 cubic meters). Demolition of any structure is a ground to earth technique which means destroying down or falling down of a building with the help of equipments, machineries, and explosives or with manual techniques without affecting the surrounding. When explosives are used for this then the demolition process are called as an implosion.

Implosion is the term that was coined in the late 1950s to describe the process of using the minimum amount of explosives with minimal structural preparation expense to get

a structure to collapse in a controlled fashion. The term is technically incorrect, since implosion implies a collapse from external pressure. A true implosion usually involves a difference between internal (lower) and external (higher) pressure, or inward and outward forces, that are so large that the structure collapses inward into itself. Building implosion techniques do not rely on the difference between internal and external pressure to collapse a structure. Instead, the technique weakens or removes critical supports so that the building can no longer withstand the force of gravity and falls under its own weight. Implosion method is adopted for high raised buildings in urban areas, where the other demolition methods are not acceptable.

Blasters will explode the major support columns on the lower floors first and then a few upper stories. For example, in a 20-story building, the blasters might blow the columns on the first and second floor, as well as the 12th and 15th floors. In most cases blowing the support structures on the lower floors is sufficient for collapsing the building, but loading columns on upper floors helps break the building material into smaller pieces as it falls. This makes for a perfect demolition and easier cleanup following the blast.

Explosives Used For Implosion: Once the blasters have figured out how to set up an implosion, it's time to prepare the building and selection of the explosives used for the demolition. The most common explosives used in demolition are dynamites, water gels, emulsions, PETN (penta-erythritol tetra-nitrate) and RDX (Cyclo- trimethylene-trinitramine).

Dynamite: Dynamite is a combination of nitroglycerin with inert filler, making the end product stable for handling which was invented by Alfred Nobel in 1866. Dynamite is just absorbent stuffing soaked in a highly combustible chemical or mixture of chemicals. When the chemical is ignited, it burns quickly, producing a large volume of hot gas in a short amount of time. This gas expands rapidly, applying immense outward pressure (up to 600 tons per square inch) on whatever is around it. Blasters cram this explosive material into narrow bore holes drilled in the concrete columns. When the explosives are ignited, the sudden outward pressure sends a powerful shock wave busting through the column at

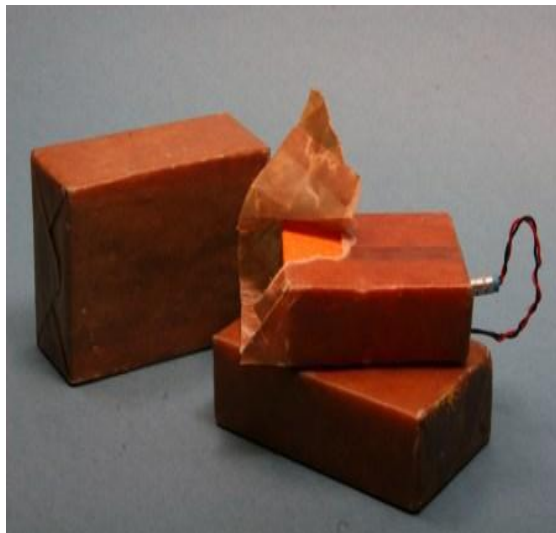
supersonic speed, shattering the concrete into tiny chunks. For concrete columns, blasters use traditional dynamite. Dynamite comes in a wide range of small and medium-diameter cartridges of different lengths



concrete and brick structures is 31mm diameter by 200mm long cartridge configuration or in bulks.



Cyclotrimethylenetrinitramine (RDX): RDX-based explosive compounds expand at a very high rate of speed, up to 27,000 feet per second (8,230 meters per second). It is a high-velocity explosive. Instead of disintegrating the entire column, the concentrated, high-velocity pressure slices right through the steel, splitting it in half. Additionally, blasters may ignite dynamite on one side of the column to push it over in a particular direction. Demolishing steel columns is a bit more difficult, as the dense material is much stronger. To bring down the buildings with a steel support structure, blasters typically use this specialized explosive material cyclotrimethylenetrinitramine (RDX).



Water Gel and Emulsions: This consists of water-containing chemical mixtures that are either water gels or emulsions. Water gels contain oxidizing salts and fuels that are dissolved in water. Emulsions are fine droplets of oxidizing salts and water surrounded by a fuel mixture of wax and oil. These explosives are even more stable. These products are available in several forms and sizes. The standard size used to demolish

II. METHODOLOGY

Dynamic Response of Concrete Frame Structure under a Blasting Demolition Environment Xuansheng Cheng, Wei Jing, Jiexuan Ma (2006) :- Demolition of any structure is the process of destroying down or collapsing down of large buildings after its useful life period with the help of some equipment. For small buildings it is a simple process with light equipments but in case of Larger buildings it may require the use of a wrecking ball, cranes etc. Explosive demolition is the preferred method for safely and efficiently demolishing larger structures and skyscrapers. When explosive are used for the demolition, it is known as Implosion. The various steps involved before the demolition process such as surveying, removal of hazardous materials, preparation of demolition plan, stability report and the precautionary safety measures that to be taken are presented in this paper. Demolition of structures using Implosion technique is illustrated. The main explosives used for Implosion method such as dynamites and RDX are highlighted. The methodology, merits and demerits of the demolition using implosion is explained

International Conference on Innovations & Advances in Science, Engineering and Technology [IC - IASET 2014]:- Different simulation blasting vibration waves are obtained using MATLAB software to examine the dynamic response of concrete frame structure under a blasting demolition environment, avoid impact on surrounding buildings, and prevent the vibration damage of blasting demolition to buildings. Structural displacement and acceleration response of a concrete frame structure with different explosive energy and blasting centre distance are discussed using SAP2000. Results show that

(1) Vibration response on top of the concrete frame structure reaches maximum under the blasting vibration wave;

(2) The larger the explosive distance, the smaller the explosive vibration response,

(3) Explosive vibration response increases with the increase of explosive energy. Therefore, moderate explosive energy should be used in demolition engineering to decrease the influence on surrounding buildings. Weak parts on top of concrete frame structures should also be strengthened further in structure design.

Analytical Investigation of High Rise Building under Blast Loading P. Vinothini* and S. Elavenil (2004):- Demolition of any structure is the process of destroying down or collapsing down of large buildings after its useful life period with the help of some equipment. For small buildings it is a simple process with light equipments but in case of Larger buildings it may require the use of a wrecking ball, cranes etc. Explosive demolition is the preferred method for safely and efficiently demolishing larger structures and skyscrapers. When explosive are used for the demolition, it is known as Implosion. The various steps involved before the demolition process such as surveying, removal of hazardous materials, preparation of demolition plan, stability report and the precautionary safety measures that to be taken are presented in this paper. Demolition of structures using Implosion technique is illustrated. The main explosives used for Implosion method such as dynamites and RDX are highlighted. The methodology, merits and demerits of the demolition using implosion is explained.

Analysis of building collapse under blast loads B.M. Luccioni, R.D. Ambrosini R.F. Danesi (2006):- Since the dawn of civilization, people have demolished structures to make room for new structures, to rehabilitate existing ones, and to create new edifices with materials taken from existing structures. Cave dwellers began digging out adjacent earth and stone to expand their abodes. Later, demolition evolved into the removal of building parts to be used to build new structures. When the German archaeologist Heinrich Schliemann discovered the remains of Homer's Troy, he found it was the seventh city built on the same site. In the time of the Egyptian pharaohs, it was a common practice for the new ruler to tear down edifices built by his or her predecessor and to reuse the material to build a new palace or tomb. Portions of Hadrian's Wall in northern England were recycled to build housing and commercial structures in Newcastle and other towns in the region. Today, demolition is a barometer of economic activity. When demolition occurs, it is usually a sign of coming growth, expansion, or renewal. Major cities in the United States and elsewhere are constantly renewed. Old factories are gutted and converted into new office spaces or

residences. Industrial facilities are cleared to accommodate new machinery and equipment. Dilapidated housing is demolished to make way for new and more efficient residential uses.

Contributions to the design of controlled building demolition USING using explosive Dipl. eng. Pușcău Horea Gheorghe (2000):-The main target in this paper is concrete demolition techniques. Economy and impact on environment are considered. Common techniques for total demolition like the use of rock-bucket, steel ball, demolition hammer, crushing jaw and blasting are presented. There are even more techniques used for partial demolition e g diamond drilling and sawing, bursting, water jet and mini blasting. Demolition cause many environmental problems, which must be considered when choosing demolition techniques. The future demolition needs more planning, selectivity, pre crushing and quality assessment.

Demolition of Structures Using Implosion Technology Associate Professor, Dept Civil Engineering, TIST, Kochi, Kerala, India An ISO 3297: 2007 Certified Organization Volume 3, Special Issue 5, July 2014 :- Demolition of any structure is the process of destroying down or collapsing down of large buildings after its useful life period with the help of some equipment. For small buildings it is a simple process with light equipments but in case of Larger buildings it may require the use of a wrecking ball, cranes etc. Explosive demolition is the preferred method for safely and efficiently demolishing larger structures and skyscrapers. When explosive are used for the demolition, it is known as Implosion. The various steps involved before the demolition process such as surveying, removal of hazardous materials, preparation of demolition plan, stability report and the precautionary safety measures that to be taken are presented in this paper. Demolition of structures using Implosion technique is illustrated. The main explosives used for Implosion method such as dynamites and RDX are highlighted. The methodology, merits and demerits of the demolition using implosion is explained.

Osama Concrete bridge demolition methods and equipment, ASCE, Journal of Bridge Engineering, 1998:117-125:- Brisbane's Airport Link is Australia's largest road infrastructure project, worth a total value of a\$4.8 billion. The project is using surface and underground blasting to excavate hard volcanic rock, Brisbane Tuff. This paper tells the story of the most challenging and difficult blast of the whole project: the removal of a remnant pillar of rock (approximately 2250 m³) next to a major arterial road and within 100 m of existing infrastructure including a number of heritage listed buildings,

residences and privately owned sensitive receivers. The pillar consisted of a hard rock wall (Brisbane Tuff) between 2 m and 6 m thick, 15 m high and 35 m wide; with in situ precast concrete piles embedded within 1 m of the boundary of the pillar. Orica Australia Pty Limited was contracted by Thiess John Holland, to perform the work in this area, including design, modeling, drilling and loading of the explosives, as well as blast clearance and shot firing. Access to the area was limited so all explosives and equipment, including the 20 t drill rig, had to be lifted in and out by crane. Due to the nature of the blast, with infrastructure 5 m directly in front of the 15 m high face, there was only ever going to be one chance to get this blast right. This was an extremely complex blast which required the use of a number of different types of packaged explosives, as well as special timing techniques only made possible by using electronic initiating systems. This type of blast is high risk, and is more typical of a building demolition in the urban environment. The blast was fired on the 25 September 2010, and was highly successful. The environmental results for vibration and overpressure were well under the imposed limits, and the embedded concrete piles remained undamaged.

Controlled concrete demolition using explosive cracking agent john A. gambatese 10.1061/ (ASCE) 0733-9364(2003)129.1(98):-The demolition of concrete is a common part of many renovation and rehabilitation projects in the construction industry. Traditional means for demolishing concrete include the use of jackhammer, explosive and high pressure water blasting. On some projects it may be required to confine to demolition to a small portion of the structure or to a shallow depth on a concrete member. If this is the case the use of traditional demolition methods may not be feasible or may require special precaution and procedure. A pilot study was conducted to evaluate the use of a soundless chemical demolition agent (SCDA) for performing controlled concrete demolition on a small scale. SCDA are dry, powdery material that expands considerably when mixed with water. The agent has traditionally been used for large demolition applications such as for mining and for breaking up the foundations. The study examine the performance of SCDA on a small scale, placing SCDA in holes 6.35 mm (1/4 in) in diameter and less. The results of the study indicate that SCDSs can be used on a small scale to create the controlled cracking of concrete. Using SCDA in this manner can be useful for undertaking controlled demolition without excessive vibrations, loud noise or water. Example of useful application includes removing just the cover from concrete structure and demolishing sections of concrete features that are of architectural or historic significance.

PC- based simulations of blasting demolition of RC structures Koji uenishi, hiroshi takahashi, hiroshi yamachi, shunsuke sakurai :- A fully three dimensional finite difference code is developed for simulating wave and fracture propagation in solid and it is used to study the physical process associated with blasting demolition of reinforced concrete structure on PC basis. The code is validated by comparing the numerical results with those obtained by a blasting experiment using a RC beam specimen in a field.

Demolition technique chister monline D.sc. civil engineer Stockholm Sweden: - The main target in this paper is concrete demolition techniques. Economy and impact on environment are considered. Common techniques for total demolition like the use of rock-bucket, steel ball, demolition hammer, crushing jaw and blasting are presented. There are even more techniques used for partial demolition e g diamond drilling and sawing, bursting, water jet and mini blasting. Demolition cause many environmental problems, which must be considered when choosing demolition techniques. The future demolition needs more planning, selectivity, perishing and quality assessment.

III. CONCLUSION

Demolition method applied in a structure depends upon various factors such as site condition, type of structures, age of building, height of building and economy and most important its location with presence of its surrounding with its structural stability. Building implosion is the strategic placing of explosive materials and timing of its detonation so that a structure collapses on itself in a matter of seconds, minimizing the physical damage to its immediate surroundings. Despite its terminology, building implosion also includes the controlled demolition of other structures, such as bridges, smokestacks, towers, and tunnels. The Advantages of implosion technology method over conventional methods are: It is less expensive; it is a quickest method, Suitable for multi- storied structures high piers, distressed piers etc. The disadvantages of this method over conventional methods are: Large pieces of debris might project towards spectators away; a small carelessness will lead to huge damage, Need of Experienced hands. The advantages of this method make this method more acceptable over the other demolition methods.

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