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Greetings to constructive destruction

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FOR centuries we have grown the habit of accepting building buildings to be synonymous with development and moving forward. Now due to a quirk of events starting from 1980s and still continuing, progress has come to mean demolition.

A number of tall city buildings have the Sword of Damocles hanging over its corporate image on account of flouting the 1996 construction rules, particularly with respect to structure height, limited as it is by road width, as well as the now more prominent Civil Aviation Authority regulation that intends to keep the air traffic funnel clear for the otherwise obsolete Tejgaon/Old Airport.

Pulling down of the Rangs Bhaban at the head of Bijoy Sarani had begun following a court order, but had to be suspended while an appropriate demolishing contractor is appointed.

The severe lacking of knowledge among local 'experts' in such matters was clearly exposed when first the authority mentioned two to three months as the time required for demolishing Rangs Bhaban down to its bottom six floors. Now it appears that abiding by the jurisdictional verdict by using traditional techniques may take years, while using explosives will be complex owing to the surrounding land-use, congested as it is towards the south and east of the building.

Engr. M. Emdadul Islam in today's piece highlights the urgent need to pay attention in this uncharted sector, which has the potentiality of becoming huge and significant in the near future.

Demolishing can go seriously wrong. Therefore, safety has to be of the highest concern and maintained at the uppermost standards, as the sad and unnecessary demise of an 'unprotected' worker has by now given an ominous start to the business of big-time demolishing in Bangladesh.

While demolishing is well justified to curb the lawbreaker, past, present and future, a humane approach will make the task safe for the workers, many of them in it for a square meal, and provide time to the building users whose only fault may have been to accept employment in the vile premises.

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BUET

Demolition works in Bangladesh: An overview

ENGR M EMDADUL ISLAM

DEMOLITION means 'the fragmentation or felling of man-made building or structure'. Like any construction, it is a very skilled and sometimes dangerous operation and requires special procedures, if it is to be carried out safely and successfully. With the advancement of technology, 'Demolition Engineering' has been an area of engineering practice where technology, judgment and experience are utilized in the application of scientific principles and techniques as pertains to design of a certain building or structure.

In Bangladesh, the discipline is relatively a new one although the issue of demolition has come up in the fore recently in the way of governance. But the approach has been indigenous in dealing with the phenomenon of re-building activities or removal of unauthorized structures.

In Dhaka, the Rajdhani Unnayan Kartripakkha (RAJUK) and in Chittagong, the Chittagong Development Authority (CDA) is entrusted with the responsibilities. But, none of these organizations have either any demolition set-up or logistics.

As a result, the demolition, whatever its type may be, is being carried out under great risk and by utilizing the intuition of the 'Authorized officer'- an officer appointed by the government under the provision of the Building Construction Act, 1952. On the other hand, although the Bangladesh National Building Code, 1993 (BNBC) has come into legal effect, so far no 'Building Official' has been appointed, neither has any code enforcing authority been established or any other public institutions made responsible for enforcement of the code. So, despite having a complete code for construction and demolition control, management and safety, the works here are going on in a home-grown manner as earlier.

In such a situation, the demolition of 20-storied RANGS building has begun under RAJUK, which is not only the biggest ever demolition works in the country but perhaps also in the region.

Below is an attempt to shed some light on important features of demolition and to review the situation in Dhaka.

Procedure and precautions

In BNBC-1993, the procedure, precautions and safety provisions in demolition and dismantling of all types of buildings and structures are described in short.

1. Detailed survey and study of the structures to be demolished and its surroundings have to be carried out

2. Planning for demolition and safety of adjoining structures: Neighbours and Public shall be well ahead notified through newspaper or other media

3. Protection of Adjoining Properties: Written Notice shall be served to the potential affected building/structures

4. Precautions Prior to Demolition: Protection of public, sidewalk shed and canopies

5. General precautions during demolition: protection against all damages or loss of life and property, constant supervision, adequate lighting and ventilation at site

6. Sequence of demolition operation: the operation shall proceed in descending order i.e. storey by storey, or roof trusses/steel structures, wall, floor, columns etc

7. Special elements: necessary catch platform and lateral bracing, make-shift stairs with railings, passageways, ladders etc. shall be provided/installed and maintained

8. Miscellaneous: no demolition at night, auditory warning devices, safety devices like helmets, boots, gloves, goggles, safety belts etc. shall be provided

9. No materials shall be dropped or thrown on the ground or outside the exterior walls

10. All the works should be done on approval and under the supervision of 'Building Official' or by an engineer having experience in demolition of similar magnitude

More precautionary, safety and extra measures are required for mechanical and blasting/ controlled demolitions by explosives depending on the site and conditions of work.

These procedure and precautions have not been followed in any demolition works, either in the public or in the private sector anywhere in the country, as a result of which often accidents occurred leading to fatality and injury.

It may be noted here, just a few days back, a labourer was killed during the RANGS building demolitions. He fell down from the 12th floor while striking a peripheral wall with a hammer. There were no protection or safety measures [i.e. sidewalk shed, canopies, scaffolds, etc.] at the site.

In urban areas, addition, alteration, modification and repair of buildings is a common matter. However, no attention to the safety requirements or precautionary measures is considered, leading frequently to accidents.

During such an unplanned alteration and modification works in the Phoenix building at Dhaka's Tejgaon Industrial Area, the whole building collapsed and 17 persons, including several labourers and a pedestrian, were killed while some were injured.

This sort of accidents at various scales has been happening here and there almost everyday. On the other hand, due to absence of insurance policies in demolition works, none of the victims receive any sort of compensation.

In a similar way, demolition, improvement or extension of utility service lines are also dangerous, causing injury and death that make regular newspaper headlines.

Demolition is a hazardous operation and at all times, the methods, materials and equipment used should accord with the need, to safeguard life and property, vis-à-vis

1. Every working-place approach and all openings dangerous to persons employed and others should be properly illuminated and protected.

2. It is essential that precautions are taken before and during actual demolition to safeguard personnel engaged on the site of the works and the immediate vicinity.

3.During demolition work all personnel/operators should wear adequate protective clothing and where appropriate, protective equipment such as safety helmets, goggles as defenders and respirators complying with the requirements of the appropriate standard of health and safety provisions.

Methods of demolition

There are various methods of demolition in use. These are generally classified by two types

- Demolition by Piecemeal or Conventional Techniques
- Demolition by Explosives or Deliberate Controlled Collapse

Demolition by Piecemeal or Conventional Techniques includes:

1. HAND DEMOLITION: It is the progressive demolition of a structure by operatives using hand-held tools like spade, shovel, pick-axe, etc. sometimes by the installation of scaffolds or working platforms where work can be done safely from a part of a building or structure being demolished. The works is carried out generally in the reverse order to that of their construction sequence. The order of demolition for buildings would be progressive, storey by storey, having regard to the type of construction.

2. BY COLLAPSE: It involves the removal of key structural members causing collapse of the whole or part of the building or structure being demolished, by using machineries such as Bulldozers, Pay-loaders, Pull-scrapers, etc.

3. BY PUSHER ARM: It involves the progressive demolition of a wall by using a machine fitted with a pusher arm, capable of exerting horizontal trust. It is normally hydraulically powered and mounted on either wheels or tracks/cranes provided the machine stands on a firm level base.

4. BY DEMOLITION BALL: It involves the progressive demolition of the building by the swinging of a weight ball suspended from a lifting appliance. The ball, usually 0.5 to 2.0 tons in weight and 520 to 840 mm in size, is suspended from a lifting rope and swung by the drag rope and fitted with an anti-spin device.

5. BY WIRE ROPE PULLING: It involves the steel wire rope with adequate strength in no case less than 38 mm diameter is used for pulling, fitted with a well-anchored winch or a tracked or heavy vehicles. The direction of tracks or tires is placed parallel to the line of pull, and the horizontal distance of rope length from the demolition work to the winch or pulling vehicle is maintained minimum twice the height of the highest part to be pulled, and in case of masonry structures the pulling is restricted up to a maximum height of 21 meter in height.

3.2 Demolition by Explosives or Deliberate Controlled Collapse:

It involves the deliberate controlled collapse of building by use of explosive charges. An explosives specialist or specialist firm or company is usually employed in each controlled demolition. It is a very much planned exercise and as a preliminary to deliberate collapse sometimes redundant members are removed or weakened by conventional means of demolition. There are special codes of practice for the safe use of explosives in the industry, as well as legislation in developed countries. Indeed, this is the quickest method of demolition, as often seen on television, but very expensive. Thus, because of its high technicalities, know-how and expense, the application of the method is limited and classified.

Explosives demolition is usually carried out by the Telescoping, Toppling, Shattering, Progressive Collapse, Implosion, etc.

Other methods

There are a number of other forms of mechanical, thermal or percussive demolition available. These are generally more limited in application and in a number of cases are useful for smaller demolition works, such as

1. Demolition by Machine-mounted Impact Hammer

2. Demolition by Power Grapples and Shears

3. Demolition by Purpose-built Grabs

4. Demolition by Drilling and Sawing

5. Demolition by Bursting by Gas Expansion Busters/ Hydraulic Busters/ Hydraulic Cannon

6. Demolition by Thermal Reaction and Thermic Lance

7. Demolition by Fire

Besides, for pre-stressed concrete, bridges, arches, chimneys, pylons and masts and other specialist structures that are described as unconventional structures, it require specialist demolition techniques like Oxy-fuel gas, Oxy-arc, Explosive Cutting, Mechanical Cutting, Fashion Cutting, Electron Beams, High Pressure Water Jets, Lasers, Micro-waves, etc.

Demolition in Dhaka

There is no deliberate arrangement for demolition in Dhaka. The works often start without any survey and examination. Usually after the lapse of time given in the notice by the Authorised Officer, a precautionary announcement through the microphone is made by giving a brief amount of time to the owner/occupiers to remove their goods as well as constructions if possible and thereby vacate the premises.

Demolitions are conducted in the presence of a magistrate and police, who are responsible for the law and order situation at the site.

The method of demolition is decided on the spot by looking at the nature of construction. Hand and mechanical demolitions by collapse are usually practised; often the combination of these is common. The works are carried out by hired labourers using departmental equipment. The staffs attend the site or operation without any protective precautions. As a result, very often the staff and labourers experience casualty/injury due to uncontrolled collapse of building members or by flying debris. There also occur various electro-mechanical hazards during the dangerous operations.

Additionally, non-cooperation of owner/occupier of a building is a major obstacle in the demolition operation. Too often the owner and their allies raise objections in carrying out the demolition by the authority despite knowing that their building is unauthorized or constructed with deviations, even after receiving the notices.

Influence of elite/ruling class appears to be another major problem in demolition in Dhaka, so much so that in one instance, an Authorised Officer was replaced at the desire of a powerful lobby on the following day of a demolition programme.

There are many other spatial, socio-economic and religious factors, which equally influence the demolition works in Dhaka.

These drawbacks are allowing unauthorized and risky constructions to emerge in the city. Made without approval and proper design, many of those constructions, high-rise buildings, are vulnerable to earthquakes. Some unscrupulous owner/builder/s, who constructed their buildings at a lower height, later added floors above without considering the legal aspects, design or code. A number of such buildings has already been identified, some of which are even leaning, posing threat to the building users as well as the locality.

Conclusion and recommendations

Demolition, as discussed is a scientific, albeit risky operation. It needs skilled manpower and effective organization, requires special procedures and adequate legislation, and exhaustive publications. It is therefore imperative to frame a code of practice for demolition covering procedure, preparation, technique, and legislation on safety and relevant issues.

It is an urgent need to establish demolition set-ups equipped with adequate trained manpower drawn from the areas of concerned disciplines, particularly for Dhaka and Chittagong where at the moment large scale demolition works are going on. The team will initiate, promote, investigate, plan, implement, co-ordinate and monitor the whole business of demolition following standard procedure and safety provisions. The BNBC being in force, a central 'Code Enforcing Authority' may be established immediately with adept building officials to look into the whole gamut of the business.

Demolition indeed needs more precautionary measures than construction by virtue of its nature. Thus, demolition works, whatever its type, needs to be carried out by qualified contractors, enlisted with the authority. Training can also be arranged for engineers and other technical staff both at home and abroad, to improve the standards and efficiency in the interests of the public at large.

Research institutions and units for recycling and proper usage of demolition wastes needs to be established. In Bangladesh, almost all the debris and demolition wastes (brick, steel, etc.) have for long been used in construction works and infrastructure development, such as secondary/tertiary road constructions, land fill etc. But, at present there is no authority to look into the matter, nor any obligations for checking the strength and quality of those materials before their reuse.

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How building implosions work?

TOM HARRIS

YOU can demolish a stone wall with a sledgehammer, and it's fairly easy to level a five-story building using excavators and wrecking balls. But when you need to bring down a massive structure, say a 20-story skyscraper, you have to haul out the big guns. Explosive demolition is the preferred method for safely and efficiently demolishing larger structures. When a building is surrounded by other buildings, it may be necessary to 'implode' the building, that is, make it collapse down into its footprint.

A real implosion?

Strictly speaking, an implosion is an event where something collapses inward, because the external atmospheric pressure is greater than the internal pressure. For example, if you pumped the air out of a glass tube, it might implode.

A building implosion isn't truly an implosion -- atmospheric pressure doesn't pull or push the structure inward, gravity makes it collapse. But the term implosion is in common use for this sort of demolition. In this article, we use the word this way.

The bigger they come, the harder they fall

The basic idea of explosive demolition is quite simple: If you remove the support structure of a building at a certain point, the section of the building above that point will fall down on the part of the building below that point. If this upper section is heavy enough, it will collide with the lower part with sufficient force to cause significant damage. The explosives are just the trigger for the demolition. It's gravity that brings the building down.

Demolition blasters load explosives on several different levels of the building so that the building structure falls down on itself at multiple points. When everything is planned and executed correctly, the total damage of the explosives and falling building material is sufficient to collapse the structure entirely, so cleanup crews are left with only a pile of rubble.

In order to demolish a building safely, blasters must map out each element of the implosion ahead of time. The first step is to examine architectural blueprints of the building, if they can be located, to determine how the building is put together. Next, the blaster crew tours the building (several times), jotting down notes about the support structure on each floor. Once they have gathered all the raw data they need, the blasters hammer out a plan of attack. Drawing from past experiences with similar buildings, they decide what explosives to use, where to position them in the building and how to time their detonations. In some cases, the blasters may develop 3-D computer models of the structure so they can test out their plan ahead of time in a virtual world.

The main challenge in bringing a building down is controlling which way it falls. Ideally, a blasting crew will be able to tumble the building over on one side, into a parking lot or other open area. This sort of blast is the easiest to execute, and it is generally the safest way to go. Tipping a building over is something like felling a tree. To topple the building to the north, the blasters detonate explosives on the north side of the building first, in the same way you would chop into a tree from the north side if you wanted it to fall in that direction. Blasters may also secure steel cables to support columns in the building, so that they are pulled a certain way as they crumble.

Sometimes, though, a building is surrounded by structures that must be preserved. In this case, the blasters proceed with a true implosion, demolishing the building so that it collapses straight down into its own footprint (the total area at the base of the building). This feat requires such skill that only a handful of demolition companies in the world will attempt it.

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