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Safety Specifications and Procedures for Building Demolition in Urban Africa

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Abstract:

The African urban environment since the emergence of the 21st century is experiencing significant change in the spatial transformation of its urban setting. The practice of building and demolition- roads, buildings, parks, bridges, transportation terminals and infrastructure etc. In order to meet the demand for buildings of all type- residential, commercial, and Institutional etc., some 'old' buildings for specific purpose have to give way for remodeling or new 'start-up' projects. Therefore, engaging efficient means to guarantee safety of life and property during partially or total demolition of a building as to create space for new project is imperative. Currently, demolition works has become an indicator of the economic activity of countries. The presence of demolition work is considered as a sign of progress, improvement and growth. Demolition and renovation works were carried out and are current in many cities to accommodate trending demand. Research survey the trend in demolition practice uncharacteristic of professional order in some African cities. Study evaluates their spatial environmental order during demolition works. It is observed that demolition activities were being carried out with little considerations for safety. Study thus considers the disorder in such instance, as safety of life and property is important. Research theorizes effect awaiting nonconformity with safety specifications, procedures and complaints for demolition works. For a successful demolition exercise, author recommends that the demolition documents must specify what aspect of a structure to be removed; how to remove;

when and where to dispose remains as to ensure safety and environmental order.

Key words: Building Demolition, Demolition Law, Safety Specification, Urban Africa

1 INTRODUCTION

Safety has always been and will always be amongst the most important consideration in demolition sites because it is a very dangerous job which requires utmost precautions. Africa's remarkable urban development has stimulated the development of new buildings, apartments, shopping malls and infrastructure as to provide for the need of an expanding population (Adiukwu, F.O, 2018). Demolition is the opposite of construction*: the tearing-down of building* and *other associated structures*. In the context, it contrasts with deconstruction, which is the tearing-down of a building while carefully preserving valuable elements for re-use in the environment. Whenever a demolition work is being carried out without proper safety specification documents and demolition procedures the result can be very dangerous. Africa's goal towards the eradication of extreme poverty may depend largely on what methods and means its states manage their cities and resources (Adiukwu, Adedeji & Adiukwu F. F, 2017). Therefore, for urban construction and development order to have any chance of successful implementation, it must be accompanied by efforts to inform and educate stakeholders. Africa's cities need sustained safety in every demolition work. If the public understand the reasons for urban development, they will be far less likely to violate legal standards, safety and procedures. In order to protect the interests of the public and guaranty the prospects for the future, urban authority must respond to development trends, sanction offenders and demand the conformity to safety standards. Though, requirements for demolition varies for different building types, such for residential building of two or three story high, is a rather simple process. The building is pulled down either manually or mechanically using large hydraulic equipment: *elevated work platforms, cranes, excavators or bulldozers*. Larger buildings may require the use of a wrecking ball, a heavy weight on a cable that is swung by crane into

the side of the buildings. Wrecking balls are especially effective against masonry, but are less easily controlled and often less efficient than other methods. Newer methods may use rotational hydraulic shears and silenced rock-breakers attached to excavators to cut or break through wood, steel, and concrete. The use of shears is especially common when flame cutting would be dangerous. Perhaps the most critical function of the demolition documents is to define the scope of work to be achieved in any demolition exercise. For example, for an interior demolition exercise, its extent should be most clearly shown on separate demolition plans and sections, indicating the construction to be removed and construction to be left in place. According to reports on hospital records of the Australian Institute of Health and Welfare (2013), 83 out of 8,300 occupational related accidents in the construction sector in Australia between the years 2006 and 2009 happened on demolition sites. Demolition is a necessary element of renovation and restoration work, which must be documented with the same detail and seriousness that is essential for new construction. Bidding for demolition work in many cities is not easy. It success depends on the volume of details the document can provide to support demolition procedures. The next section discuss the trend in demolition works in Africa's urban setting and demolition disasters from other parts of the world, with emphasis on safety measure.

2 URBAN AFRICA'S TRENDING DEMOLITION PRACTICE

Africa's cities have a right, indeed a need, to plan and execute demolition projects whenever necessary but strict caution must be undertaken in this regards. There must be strict compliance with demolition specifications, legal and operational procedures for any demolition work in any neighborhood where work is to be carried out in order to guarantee public safety and to protect the integrity of the environment. While poverty and 'culture' undeniably play a key role in the observed unethical practice in operation, and illegal demolitions works in some cities, safety must be envisaged at all time. According to Daily Champion (2008) an 18 year old student was crushed to death by debris falling from a demolished building at Enugu, Nigeria. Rubbles from the same building also fell on Power installation destroying high tension cables and other facilities supplying

electricity. Investigations reveals that the primary causative factor was inappropriate demolition procedures so as to safe cost and maximize profit; ignorance, and defiant of law. Similarly, a vacant building being demolished collapsed onto a thrift store in Philadelphia, killing six people and trapping more than a dozen under rubble. Police described the collapse as an "industrial accident" (CNN, 2013). Therefore education and enlightenment campaign by urban authority to local demolition practitioners is necessary to keep up with modern urban demolition trends and safety specifications, so as to ensure human safety and environmental order. According to Occupational Safety and Health Administration (OSHA) - *United States Department of Labor*- in August, (2015): A 12-story steel framed building with concrete floor slabs was under construction and the exterior of the building was to be clad with glass curtain walls. The construction was almost complete when suddenly during the disassembly, one of the mast climbing work platforms collapsed. The mast supporting the platform partially collapsed. At the time of the incident, there were four employees on the platform perched near the 9th floor. All four workers fell to the ground with the falling mast and platform. Three were killed and the fourth fell on the roof of a portable toilet, and suffered severe injuries. In another incident, on March 25, (2014) two communication towers owned by Union Pacific Railroad, collapsed in Blaine, killing two workers. The project consisted of dismantling an older communication tower with all its accessories (e.g., antennas, dishes, coaxial cables, etc.). The older tower was located next to a newly constructed tower. At the time of the incident, a gin pole was being raised on the older tower to lower a 10 ft. diameter dish when the rigging of the gin pole 'suddenly failed' causing the 60 ft. tall gin pole to plummet down, resulting in the collapse of both the towers. One employee was located approximately 20 ft. below the top on the older 250 ft. high tower and was engaged in disconnecting the 10 ft. diameter dish and another employee was on the same tower approximately 80 ft. from the top. One worker died at the scene and the other was pronounced dead at the hospital. Similar incidents of disaster abounds in many cities when there is an error or shear negligence by demolition practitioners. Though, unforeseen accidents do occur but practitioners must ensure all safety precautions are deployed at all times to avert disaster. According to The New York Times (2015) eight people died in a construction

related accidents in 2014; the year before, three died. It is imperative that demolition works in carried out with the highest safety considerations because failure to comply often leaves sad tales and irreversible damage. According to ABC News (2015) the number of accidents on construction sites has been on the rise, with 231 in 2014, up 24 percent from the year before. Most experts in the industry agree that there is a simple equation at work: *The more construction*, *the more tendencies for danger*. Though, some other accidents can be unexpected and volatile, as in March (2018), when a construction fence, meant to protect pedestrians from falling objects, became loose in the wind at the former St. Vincent's Hospital in Greenwich Village, Denmark; it was being redeveloped as condominiums. It struck a woman and killed her instantly. Another incident was a large section of a flooring, collapsing during interior demolition of an apartment building in Brooklyn in 2017. Construction unions and contractors that use union labor contend that the rise of cheaper, nonunion labor, an increasingly common practice in one of the most expensive real estate markets in the USA, is to blame for the rise in accidents. This is the second-most-dangerous job in America after mining, so workers needs to know what they are doing opined Louis J. Coletti, president of the Building Trades Employers' Association (USA). Some of the recent serious accidents seem surprisingly mundane, underscoring the dangers inherent in demolition works. According to Japan Today (2014) a 66-year-old man walking along a sidewalk at a building demolition site in Tokyo's Chuo Ward was killed after a wall panel fell onto him. The next section discusses building demolition, emphasizes on the technology for demolition practice.

3 SAFETY SPECIFICATION AND DEMOLITION PROCEDURE

The safety specification for a demolition procedure is a requirement for any building demolition work. Prints of revised original drawings are ideal for this purpose, if they are available. It is imperative to locate equipment to be removed, such as tanks, water heaters, and fans, and perhaps describe them further in the specifications. New openings, partial removals, and unusual structural conditions should be detailed. The need for further clarification should be determined at a pre-bid conference and tour of the work areas by potential bidders and contractors. In advanced countries like USA, France, Canada,

Australia etc., most demolition operations are strictly governed by local ordinances aimed at protecting the public space and limiting nuisance factors. They may restrict work to daytime, weekday hours. Chutes may have to be sound-deadened with dust-reducing canvas trunks. Blasting may be prohibited. Reputable demolition contractors will be familiar with such requirements. Some safety and protection requirements must be amplified in the specifications, however. Safe access to occupied portions of the building and exit stairs must be maintained. Bracing and shoring may be necessary. If the work is in an old building and is relatively extensive, a separate pest-control program with the owner's regular treatments must be organized. Daily removal of accumulated debris is mandatory. The demolition consultant must make available to the bidders all reliably known information about existing utilities. Describe and locale major items of mechanical and electrical equipment in demolition areas within a job site. Show points of electrical service and utility entrance into the building, Also indicate location of disconnect switches, panel boards, and cutoff valves. Specify removal of inactive piping and conduit or capping and abandoning them. Describe support and other means of protection for utilities to remain. Even when what is involved is total demolition, valuable items must not be destroyed. The demolition of large buildings has become increasingly common in many cities around the world as the pressure of urbanization and changing needs for housing is a constant. At 439 feet and 2.2 million square feet, the J.L. Hudson Department Store in the USA, perhaps may be the tallest steel framed building and largest single structure ever demolished. Las Vegas is a city famous for its frequent demolition of casinos. Here, demolitions were carried out without much damage to the environment and harm to the people. Usually, useful materials were recovered before demolition. It is necessary to note that preparing a building for demolition is by no means an easy task, thus it can take several weeks or months to prepare a building for demolition. All items of value in the building, such as copper wiring, are stripped from the building. Some materials must be removed, such as glass that can form deadly projectiles, and insulation that can scatter over a wide area. Non-load bearing partitions and drywall are also removed. Considering the fact that in some instance a portion of the existing building may be occupied during demolition operations, require close coordination with the owner in scheduling the work and protecting

the occupants. Barricades, signs, temporary lighting, and fire extinguishers may be necessary. Strict dust control measure should be clearly specified. Temporary wood stud partitions covered with minimum 6-mm vinyl sheeting are a good start. Openings in the partitions must be closed with weather-stripped doors. Doors to existing stairwells should be taped, and penetrations from one floor to the next caulked or stuffed. Protect flooring in occupied areas from dust on wheeled equipment and workmen's shoes. Describe limitations on the contractor's use of elevators and loading dock, when part of a building is to be demolished, any error in operation can be disastrous. Some demolition operations have failed, severely damaging neighboring structures, as a result of error. The greatest danger often experience is from flying debris which, when improperly prepared for, can kill onlookers. Demolition of buildings and structures are required for several reasons. Its methods and processes for buildings and other structures are described subsequently. As we know that every design of a building or a structure has a lifespan known as *design life span*. The Architect designs the building considering a span of life expectation, e.g. 70 -100 years. When the design life of a building is over, the structure is not safe for human habitation; hence concerns for neighboring buildings. Though, there can be other reasons for demolition of a building; *old structures are to be replaced by new ones*. It can be that the structure has lost its stability or is having structural damage, therefore unsafe for living etc. Researchers, scholars and engineers are devising new methods to demolish old buildings, as to ensure safety. A few of these demolition sights can be as remarkable as a tall building neatly collapsing onto its own footprint after being demolished with explosives by demolition experts. The use of explosives for demolition operation may be quick, but also expose high risk factors if not carefully and correctly carried out. With more developments in many of Africa's crowded cities, great cautions and more discreet ways of demolishing old buildings is imperative to ensure safety. Bringing down a building with explosives, must be a carefully orchestrated event. The contractors who specialize in such work must be competent with operation procedures. This helps to protect other buildings and infrastructure in the neighborhood. Though blasting technology and techniques have improved over the decades, the use of explosives remains limited in many cities in Africa. There are a number of reasons for this. In

crowded cities there are tougher controls over demolition. These include protecting adjacent buildings and reducing dust, which is hard to prevent even when knocking down walls with old-fashioned wrecking balls. An additional problem is that when everything tumbles into a giant heap it is difficult to extract material for recycling. Apart from dust, explosive charges can throw out fragments called "fly rock". Other ways of physically pushing parts of the building apart are being developed. Excavators with hydraulic arms of unprecedented length and power are another alternative. Their use is growing in countries like China. Many cities in China are plagued by air pollution and the pace of demolition and construction is frantic. The process can be used to take giant skyscrapers apart in the most crowded places in the cities. An example is the 30-storey Sunning Plaza in Hong Kong, built in 1982, demolished using this procedure. Dismantling with excavators from the top down also yields more recyclables than explosions would, and much of the material recovered can be sold for reuse rather than scrap. Thus in specifications, the expert must appropriate the most suitable operation procedure for a demolition exercise in a neighborhood considering the local context in the infrastructure and surrounding buildings. Recycling of materials, many scholars and practitioners agree, defrays demolition costs by as much as a 10% in some instance.

3.1 BUILDING DEMOLITION PROCESS

Different steps are engaged in the process of demolition of building structures:

i. Surveying
ii. Removal of hazardous materials
iii. Preparation of plan
iv. Safety measures

3.1.1 Surveying of Buildings for Demolition

Surveying means the case study of different parameters of the structure to be demolished with its surroundings as to ensure safety and also plan for best approach for demolition. Two types of surveying are mainly conducted. They are Building surveying and Structural surveying.

3.1.2 Building Surveying

In the survey of buildings for demolition, the following process must be undertaken:

i. Types of construction material building posses
ii. Building initial use, and expected state during demolition.
iii. Look out for the presence of wastewater, hazardous materials, matters arising from toxic chemicals, flammable or explosive and radioactive materials, etc.
iv. The Drainage conditions and possible problems on water pollution, flooding and erosion.
v. Shared facilities with adjoining building, including common staircases, partition walls.
vi. Adjoining pedestrian and vehicular traffic conditions
vii. The sensitivity of neighborhood with regards to noise, dust, vibration and traffic impact.

3.1.3 Structural Surveying

In structural survey, the following processes are considered:

i. The method of construction
ii. The structural system and structural conditions of basements, underground tanks or vaults.
iii. The original structural system used in the building design.
iv. The condition of the building.

3.1.4 Removal of Hazardous Materials

If hazardous materials like asbestos minerals, petroleum contamination, and radioactive metals are found in the investigation of site for demolition. Specialized personals are to be engaged for the removal of the hazardous materials from the site prior to the demolition of structure.

3.1.5 Preparation of Demolition Plan for Structures

A detailed demolition plan is made before any demolition work is carried and it should illustrate the different process involved and they are:

i. The location of the building to be demolished.
ii. The distances from the building to be demolished to its adjacent buildings, streets, structures and significant street furniture.

iii. The structural support systems of the building.
iv. A plan showing the procedure for the demolition of the building; detailed sequence of demolishing structural members; and the method of demolition to be adopted.
v. A plan showing all precautionary measures for the protection of the public including hoardings, covered walkways, catch platforms, catch fans, scaffolding, protective screens and safety nets.
vi. Method of handling demolished building debris.
vii. Time required for the complete demolition process etc.

3.1.6 Safety Measures during Demolition of Building Structures

It is very imperative to ensure all the workers, site supervisors, architects and engineers including plant and equipment operators are to be briefed with the potential risks and process of demolitions prior to demolition work. All goods that are flammable must be removed from the site unless its use is required in the work involved. All the flammable materials like wood, timber, fuels etc. should be kept in proper storage facilities. Firefighting appliances should be stationed in the demolition site till the process is duly complete. Due to the demolition of structure, many problems are often faced by the workers, such as. exposure to dust, chemical exposure, heat stress and ventilation, noise exposure, medical and first aid facilities, sanitation and occupational diseases. To overcome these problems, safety protective gadgets and measure should be deployed.

3.2 DEMOLITION METHODS FOR BUILDINGS AND OTHER STRUCTURES

The threshold for defining a high reach demolition is when it reaches a height of more than 20 meters. This method is usually formed by a base machine (excavator, tank, engine, counterweights), a demolition arm consisting of three sections or by a telescopic boom and a primary tool attached to the base machine (crushers, shears, hammers). High reach demolition machines can be equipped with different tools to make them suitable for executing demolitions of structures. This method is used on reinforced concrete, masonry, steel and mixed material structures. The equipment used for this type of demolition is not the same one as the one used to separate or crush the rest of the

material. The following factors might affect the proposed demolition process using this type of technology: Structure height, Site conditions, Structure shape, and Structure location.

Implosion is a controlled process for demolishing a structures. There are a couple of good options that can be considered for building demolition. The process is dependent on some factors like the area where the building is located, the building material, the purpose of the demolition and the way that debris is going to be disposed.

There are two types of demolition methods used for buildings and structures

i. Non-explosive demolition
ii. Explosive demolition.

3.2.1 Non-Explosive Demolition Method

One of the oldest and most used methods for building demolition, the ball and crane, uses a wrecking ball weighing up to 13,500 pounds to demolish concrete and masonry structures. During the process, the ball is either dropped onto or swung into the structure that is to be demolished. The ball and crane, however, is unsuitable for all demolition applications. Some limitations:

i. Additional work removing rebar in concrete structures is needed.
ii. Only highly skilled and experienced crane operators should be used on ball and crane demolition
iii. Smoothness in controlling the swing of the ball is critical since missing the target may tip or overload the crane.
iv. The size of the building that can be demolished with this method is limited by crane size and working room, including proximity to power lines.
v. This form of demolition creates a great deal of dust, vibrations and noise.

This method is the demolition of a structure without the use of explosive, using equipment suitable for tearing and breaking down. Different equipment's are used for the demolition activity.

i. **Sledge hammer:** - It is a small handheld hammer used for the demolition of small wall or single column.
ii. **Excavators and Bulldozers**: - These are big machines uses to demolish building of small sizes. They are used for excavation of soil or transferring of debris to trucks etc.

iii. **Wrecking Balls**: -The building with the greater height up to (6-7 story) cannot be demolished with the help of excavators or bulldozers. In such cases crane with wrecking balls are used to perform the demolition activity. The wrecking ball crack is crack attached with a huge steel ball hanging from a steel rope. The steel ball is pulled and released towards the building. The steel ball with force strikes the building and the part of the building is demolished. This method is not recommended as the trajectory of the steel ball cannot be controlled after it strikes the structure.

iv. **High Reach Excavators:** -High Reach Excavator machines are used in the demolition of tall building where demolition by explosion is not possible. The building of height up to 300ft can be demolished by this type of machine. High reach excavators can be used for different use, by doing some attachments such as: Excavators with shear attachments – *excavators with shear attachments*. Hydraulic hammers – *Hydraulic hammers* and *remove steel reinforcement*

3.2.2 Explosive Demolition Method (Implosion Method of Building Demolition)

Implosion is the process of demolition of a building using explosives. This is potentially a very dangerous means of tearing down a building and only explosive experts are expected to be engaged in such service, because if the supports of the building are removed, the structure collapses. Thus, using implosion technique, the main supports of the buildings such as column's, beams and slab are fixed with explosives. When these explosives are detonated, the column collapse and so is the structure. Depending how the structure falls, many scholars agrees there are two kinds of implosion:

i. **Falling like a tree:-**here, the building is made to fall like a tree to the sideward. This is the commonly used type of implosion. When free space is available besides the building, this type of demolition is recommended. If the free space is available on the left side of the building, the explosives are set on the lower level of the building on the left side columns. As the explosives are detonated, the columns ruptures, the building tends to falls towards the left side. In any case, Steel

cables are tied to the building to control the falling direction of the building.

ii. **Falling into its own footprint:-**in situation where a free spaces is not available around the building and the structure around the building are to be protected. This type of demolition is used. Here, explosives are set in the floor below the middle part of the building. The explosives are to be heavy as the explosion must demolish the building at once. If one part blast and followed by another. Then the building falls towards the first blasted part. Though, only few companies in the world are experienced in handling this kind of demolition. As the explosions are detonated, the upper part of building destroys and falls upon the lower building. Due to the heavy load and force the lower part of the building also collapses and falls on its own footprint.

3.2.3 When a Selective Demolition is the Only Option Required

There are instance when a selective demolition order may be required for a building. Also known as *strip-out*, the process is popular and widely used means of demolition. As recycling and salvaging of material are very attractive to builders (cost saving and profits) during demolition, allowing them to re-use material or recycle it. Selective interior/exterior demolition or recycling of wood, brick, metals and concrete are all recycled for future use in new structures blending the old with the new. The demolition process is not limited to removal of interior equipment, walls, floor, ceilings and exterior components. The main purpose of this method is to recover the maximum amount of primarily reusable and secondary recyclable material in a safe and cost-effective procedure. Though, it is labor intensive and can be very difficult to achieve in a timely and economical manner for light framed buildings.

3.2.4 Real Cost of Building Demolition

Often times, the cost of a demolition work is a concern of stakeholders and needs due considerations as to ascertain resources and labor to engage. Cost of demolition differs considerably across Africa. To determine the cost of a building demolition, it is necessary to start first by completing a site assessment. There is need to determine the type of building to be demolished, the logistics, site clearances,

environmental hazards and what to do with the debris generated by the process. Similarly, it is important to consider the cost to haul the material, tipping fees, and the landfill cost. In general, the following numbers can be used as a starting point when estimating the demolition cost (using USA standards):

i. House Demolition $5.00 per square foot (Typical Range: $4.00 - $7.00)
ii. Concrete Sawing, Demolition or Removal: $5.50 per square foot on a typical 4-inch,

Though it can range from $3.50 - $8.00

4 THE LAW AND DEMOLITION PRACTICE

Africa cities have laws on demolition practice which guides procedures for demolition works. More often than not some demolition practitioners disregarded safety specifications. Governmental demolition of buildings is common in countries such as the United States, Canada, and UK. For example, in slum clearance, growth management, zoning, urban renewal, or in cases of housing code enforcement, public agencies may even demolish privately owned buildings without paying compensation to the owners or alternatively order the owner to demolish the structure. The US courts has upheld the constitutionality of statutes permitting building demolition. These statutes are so common that national code-drafting agencies, such as the Building Officials Conference of America and the American Public Health Association-U.S. Public Health Service, have drafted model demolition ordinances. What happens to the materials that are removed? These are called "construction and demolition (C & D) Debris. "Construction and demolition (C & D) debris consists of the materials generated during the construction, renovation, and demolition of buildings, roads, and bridges. C & D debris often contains bulky, heavy materials that include: Concrete, Wood (from buildings), Asphalt (from roads and roofing shingles), Gypsum (the main component of drywall), Metals, Bricks, Glass, Plastics, Salvaged building components (doors, windows, and plumbing fixtures), and Trees, stumps, earth and rock from clearing sites. By law, the contractor is required to remove all materials from the premises and legally dispose of them. Unless otherwise stipulated, he also has salvage rights to reusable materials and equipment-and will include

the value of salvage in his bid. If the owner desires to retain some items in the building for sale or reuse, those items must be clearly identified. They may be shown on the drawings or listed in the specifications. More directly, the owner may physically "tag" each item in a permanent manner. The specifications should then describe disposition of the items-to be left in place, moved to storage in the building, or delivered to some remote place for the owner. When the work involves demolition in a historic structure, special handling and coordination is important. Thus, the consultant must identify architectural elements to be preserved (moldings, column capitals, railings), and specify their protection. Some will be reused in the restoration work; others may be used to make molds. This requires cooperation with preservationists. It may be necessary to-analyze old paint and stencil patterns on exposed surfaces before they are demolished.

CONCLUSION

Having observed the latent dangers awaiting negligence of safety specifications, It is therefore necessary for the building demolition consultant to prepare appropriate demolition documents considerately for any operation; this is often neglected and sometimes not in use for demolition operation in some cities in Africa. Here, no details given for a demolition operation is too much. According to Adiukwu, F.O, Ala, A.A & Olarenwaju (2016) the building industry produce, educational, commercial, church, mosque, residential and industrial buildings etc. for direct economic benefits to the economy of the nation. Therefore before the start of every demolition work, the demolition contractor should take a number of steps to safeguard health and safety of workers on the job site and to achieve the best for his client. These preparatory operations involve the overall planning for demolition job, including the methods to be used to bring the structure or part of it down, the equipment and the measures to be taken to perform the work safely. Planning for demolition job is as important as doing the work. Above all, specifications are indispensable to the contractor as "guides". He must not lose sight of this document.

REFERENCES

[1] ABC News (2018)-Demolition Goes Wrong As Silo Falls Wrong Way to Crush Danish Cultural Centre. 09 April. http://www.abc.net.au/news/2018-04-09/demolition-of-silo-in-denmark-goes-wrong/9632542.

[2] Adiukwu, F.O (2018) -The Social Isms, Effects and Trends of Building Collapse in Urban Africa-European Academic Research, ISSN 2286-4822 Vol. V Issue 12 March. pp. 6239- 6261. www.euacademic.org.

[3] Adiukwu, F. O, Adedeji, A, Adiukwu, F. F (2017). - Architecture and the Green Urbanism of Africa's Urban Built Environment: The Omen towards Smart Cities in Africa. European Academic Research Vol. IV, Issue 10/ January, ISSN 2286-4822, pp. 9024- 9047. www.euacademic.org

[4] Adiukwu, F.O, Ala, A.A & Olarenwaju (2016). Effect of Earth Construction Acts on the Urban Environment- International Journal of Innovative Research and Advanced Studies (IJIRAS) ISSN: 2394-4404 Volume 3 Issue 9, August

[5] Australian Institute of Health and Welfare (2013)-Safe Work Australia-Work-Related Injuries Resulting In Hospitalization July 2006 - June 2009, pp. 22.

[6]CNN (2013) - Six dead in a Philadelphia building Collapse and 13 injured- June 6

[7] Daily Champion (2008). Nigeria: Building Demolition Claims One in Enugu- Daily Champions Newspapers, July 23

[8]Occupational Safety and Health Administration- *United States Department of Labor* (2015) - Investigation Of the March 23, 2015 Mast Climbing Scaffold Collapse during Dismantling at Raleigh, NC August.

[9]Occupational Safety and Health Administration (2014) - Investigation of the March 25, 2014 Failure of Gin Pole Rigging, and Collapse of Cellular Towers at Blaine, KS August. www.OSHA.gov

[10] Occupational Safety and Health Administration- *United States Department of Labor* (2012) - Investigation of the March 22, 2012 Partial Building Collapse during Demolition at 604-606 West 131st Street, New York, NY, July. www.OSHA.gov

[11] Japan Today (2014) -Pedestrian Crushed to Death by Panel at Tokyo Building Demolition Site. August 22, www.Japan Today.com