

SGG08A - GUIDANCE ON DEMOLITION

INTRODUCTION AND DEFINITION

Demolition is a specialist work activity that requires detailed due diligence of the structure, and the appointment of competent organisations and people to ensure that it is carried out safely.

The term demolition has a broad definition that encompasses the majority of work involved with the removal of an existing structure. The British Standard Code of Practice for Full and Partial Demolition defines demolition activities as any process that involves dismantling, disassembly, demounting, partial demolition, removal, decommissioning, deconstruction and soft stripping. Demolition activities may also form a small part of structural refurbishment, including renovation, rebuilding, remodelling, reconstruction, redevelopment, restoration and renewal.

Under the terms of the Construction (Design and Management) Regulations (CDM), demolition is also defined as construction work, and as such, the relevant regulations within CDM apply to demolition activities.

LEGISLATION

The CDM Regulations apply to all demolition activities and require the parties involved to plan, manage and monitor both the pre-construction and construction stages of the demolition project. To understand the general requirements of the CDM Regulations, reference should be made to the procedures and guidance contained in Section 10 of the Health & Safety TQM.

The CDM Regulations also contain two specific legal duties applicable to demolition, which are regulation 19 Stability of Structures, and regulation 20 Demolition or Dismantling.

Regulation 19 requires all practicable steps to be taken to ensure that any new or existing structure does not collapse due to the carrying out of construction work. Furthermore, regulation 19 requires any temporary support or structure to be design, installed and maintained to withstand any foreseeable loads.

Regulation 20 requires the demolition or dismantling of a structure to be planned and carried out in such a manner as to prevent or reduce danger to a level as low as reasonably practicable. Regulation 20 also requires the arrangements for carrying out demolition and dismantling to be recorded in writing before the work begins.

Additional legal duties can also apply to demolition work where asbestos and lead containing materials are present. The Control of Asbestos Regulations require a Refurbishment and Demolition survey to be carried out prior to demolition work commencing, in order to identify any asbestos containing materials, and ensure that appropriate control measures are implemented during removal work.

Similarly, the Control of Lead at Work Regulations require lead containing materials to be identified prior to demolition work commencing, and specifically where paintwork or coatings may be disturbed, so that appropriate control measures can be implemented.

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PLANNING FOR DEMOLITION

Site Information

The successful completion of a demolition project will be dependent on acquiring a thorough understanding of the nature of the structure, the interrelationships with other structures and the surrounding environment. A detailed due diligence process will provide the necessary information for a competent person to then determine the most appropriate method(s) of demolition for the structure.

Information can be obtained through both a desk top study and site survey, which verifies the accuracy of any existing information and historical records that are acquired. Existing information and historical records will contribute to the understanding of health and safety risks, and provide reassurance to the demolition contractor when selecting the most suitable method(s) of demolition.

It is recommended that the following site information is obtained for demolition works:

1. Details of any explosive atmospheres;
2. Details of any chemical or biological residues or contaminants;
3. Details of any asbestos or lead containing materials;
4. Details of below ground structures, such as basements, cellars, tanks and vaults;
5. Details of above ground structures;
6. Structural assessments of buildings;
7. Details of fragile surfaces or materials;
8. Topographical features that require protection;
9. Ground conditions, including geotechnical information, soil contamination and unexploded ordnance;
10. The types and locations of services, both above and below ground; and
11. The presence of neighbours whose premises or equipment might be sensitive to the work, or that might impact on the work.

Structural Information

A critical element of demolition work is obtaining information to understand the structural form and features of a building. Acquiring this information will assist a demolition contractor to determine the most appropriate method of demolition and avoid unplanned collapse.

The structural form and features of a building should be obtained by carrying out an assessment of the condition of the structure, which focusses particularly on the presence and frequency of defects, the inherent stability of a structure due to its design, and the affect deterioration has had on the structural stability.

An examination of the structural materials should also be carried out to determine whether the condition of certain materials has affected, or may affect, the structural stability of the building. This examination should include any material, including concrete, steel, timber and masonry that provides load bearing support to the structure.

Unplanned Structural Collapse

The CDM Regulations carry a specific legal duty to avoid the collapse of structures, and as such, significant effort should be placed on managing this risk during the pre-construction stage of demolition activities. The aforementioned surveys and information will contribute to this process, and allow the demolition contractor to determine the effects on the structure of the proposed methods and sequences of demolition.

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The most appropriate method(s) chosen should be those that provide the greatest residual stability to the structure during the whole demolition process. An assessment of the residual stability should be carried out throughout each stage of demolition, to ensure that the structure is acting as intended and that the residual strength is as proposed.

DECOMMISSIONING

Decommissioning Activities

Prior to the demolition works commencing, the structure should be decommissioned to verify that all operational systems have been terminated and are “dead”.

The decommissioning process should involve gathering information about the structure to determine which systems are operational and those that are dead. Where systems are still operational, a competent person should be engaged to terminate the system and provide verification that it is no longer live.

Decommissioning a structure should include the following activities:

1. Termination of high voltage cables at points external to the demolition area;
2. Termination of low voltage cables connected to different systems to the one above;
3. Disconnection of cables crossing the demolition area from structures that are not to be demolished;
4. Disconnection and separation of emergency / standby direct current (dc) battery systems;
5. Removal of bulk process or other chemicals, including battery acids and oils;
6. Draining and purging of all process chemicals from pipework and vessels, such that the plant is chemically inert;
7. Draining, purging and venting to atmosphere of vessels and systems that have contained flammable or noxious gases, ensuring that fluids cannot accumulate;
8. Draining of all substantial heads of water;
9. Isolation of water and gas supplies at points external to the demolition area, or removal of sections of pipework and fitting of blanks or plugs; and
10. Removal of asbestos, or if it is to be removed later, the preparation of an asbestos register.

DEMOLITION METHODS

Soft Strip

Soft strip involves the removal of all internal fixtures, fittings and equipment that do not provide any structural support. This can include the removal of windows, doors, suspended ceilings, raised access floors, partition walls and even mechanical items such as lifts. Soft strip is often carried out using hand-held tools and small machines.

Partial Demolition

Partial demolition is often carried out where structural refurbishment is required, and only involves the removal of a limited number of structural elements.

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Partial demolition can involve the following types of work:

1. Removal of floors and walls;
2. Formation of new openings;
3. Excavation / removal of foundations to form a basement under the existing structure;
4. Cutting back floors to create additional height and space;
5. Significant rebuild, where major structural elements are removed but the foundations and/or façade are retained.

Progressive Demolition

Progressive, or top-down, demolition is the most common method of demolition, and generally involves the removal of a structure in the reverse sequence to the construction process. This method involves the controlled removal of sections of the structure, whilst retaining the stability of the remainder and avoiding whole or partial collapse.

Progressive demolition is suited to confined or restricted sites, as greater control can be exerted over the demolition sequence and the process of removing the structure.

Deliberate Collapse

Deliberate collapse involves the removal of key structural elements that results in the collapse of the whole or part of the structure. Deliberate collapse is suited to sites with large working space, as there is less control exerted over the structure as it is removed. Deliberate collapse is quicker than progressive demolition, however, it requires a similar amount of planning and preparation to ensure that the structure collapses as intended.

DEMOLITION TECHNIQUES

It is preferable for demolition to be carried out by mechanical techniques that permit the operative to be remote from the demolition area, or alternatively, protected from the demolition hazards. The method, or methods, of demolition selected should be based on the risk assessment that identifies the specific risks of the demolition process and details the required risk control measures.

Hand Demolition

Demolition work can be carried out using hand-held tools, where a risk assessment identifies this as the safest method. Hand demolition generally occurs during the soft-strip stage of demolition, and, it is rarely used to carry out structural demolition. Mechanical equipment is generally used to assist the hand demolition process, such as breakers, shears and lifting equipment.

Machine Demolition

Remote controlled machines and/or robotic devices are the recommended option for demolition activities, as the operator can be located a safe distance from the demolition area. This is possible by using an umbilical cable control or radio controlled device, and can result in a significant risk reduction to the operative.

Demolition from a protected cab increases the risks to the operative, due to the proximity to the demolition area, however, specific control measures can be introduced to control the risks. It is important that any working platform is adequate for the loadings of the machine, and to ensure stability of the machine during the whole operation. Platforms should be designed under the temporary works process to ensure they are adequate for the proposed machines.

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Furthermore, machines must be fitted with falling object protection systems (FOPS) to prevent falling objects damaging or penetrating the operator's cab. The protection systems are generally formed from a mesh or grill that is installed over the roof and windscreen of the machines.

It is important that all machines are appropriate to the demolition activities being carried out and the location involved. A competent person must always operate the machine and ensure that the machine is maintained in good order.

Compact Machines

Compact machines are commonly used in top-down demolition projects to undertake structural demolition to a level where a high reach machine can complete the removal of the building.

Where compact machines are used on the upper floors of a structure, it is essential that an assessment is made of the floor loading. This should verify that the floor is capable of withstanding the loads from the machine(s) and any debris that collects, and specifically identifies where weaker points of the structure may be located.

Where compact machines work on floors that are being demolished, it is important that control measures are implemented to reduce the risk of a machine falling down a hole or from edges of the structure. This can be achieved through the installation of edge protection and/or restraint systems.

High Reach Machines

High reach machines are those capable of working above a height of 15 metres, and reduce the risk of working at height for demolition workers. The use of high reach machines should be carefully controlled, as the platform level, orientation to the structure, angle of the boom and attachments can all have a significant impact on the operating parameters of the machine. The machine should be set up in accordance with the manufacturer's instructions and only operated by operatives who are competent with that type of machine.

EXCLUSION AND CONTROLLED ZONES

Due to the inherent risks involved with demolition activities, both exclusion and controlled zones should form part of a safe system of work. It is important that exclusion and controlled zones are installed to provide adequate protection for those involved in the work activity, but also those located outside of these zones.

Exclusion Zones

Exclusion zones should be established based on the findings of a risk assessment, and should only be formed where access is not required into the area by those involved in the demolition activities. An example of an exclusion zone is a floor below a working level, where compact machines are carrying out top-down demolition activities.

It is important that exclusion zones are constructed from physically robust materials, such as scaffolding or plywood, the extent of the zone is suitable for the demolition activity taking place, and that appropriate signage is provided to warn those in the vicinity.

Where access is required into an exclusion zone, this should be controlled through a formal process that provides authorisation to enter an area, providing certain control measures have been implemented. The details of an exclusion zone should be included in the risk assessment and method statement, so that the workforce clearly understand the requirements of the exclusion zone.

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Controlled Zones

Controlled zones should be established based on the findings of a risk assessment, and should be formed where access is frequently required into an area by those involved in the demolition activities. An example of a controlled zone is the area surrounding plant or machinery, where personnel may need to enter on a regular basis to damp down or clear certain items of debris. These work activities should only be permitted when it is not possible to undertake them from outside of the controlled zone.

It is important that controlled zones are constructed from physically robust materials, such as crowd barriers, that the extent of the controlled zone is suitable for the demolition activity taking place, and that appropriate signage is provided to warn those in the vicinity. The details of a controlled zone should be included in the risk assessment and method statement, so that the workforce clearly understand the requirements of the controlled zone.

TEMPORARY STRUCTURES PROVIDING STABILITY OR SUPPORT

Temporary structures that are used to provide stability or support to a structure being demolished should be designed, installed, maintained and dismantled in accordance with British Standard 5975:2008+A1:2011.

Examples of temporary structures involved in demolition activities are:

1. Shoring and propping for vertical loads, such as props, spanning beams, needling beams, backpropping and underpinning;
2. Shoring and propping for horizontal loads, such as raking props, flying shores, braced towers and façade retention schemes;
3. Tube and fitting and system scaffolds; and
4. Structural steelwork and timber.

The demolition contractor must appoint a Temporary Works Co-ordinator to ensure that all items of temporary works are subject to the temporary works process. This will ensure that the items have been designed properly and have received an appropriate check to verify that the proposed design will work as intended.

SAFE SYSTEMS OF WORK

Risk Assessment

A risk assessment must be produced for all demolition activities, including soft strip, hand demolition and mechanical demolition. The risk assessment should clearly identify the health and safety risks of the demolition activities, and detail the risk control measures that are to be implemented. Where relevant, the risk assessment should also detail any decommissioning activities that are required, due to the structure not being adequately decommissioned prior to demolition work starting.

Demolition Phase Plan

A Demolition Phase Plan is required for all demolition works, and should include the following items:

1. Scope of works and programme, including the details of any soft strip and asbestos removal works etc;
2. Details of existing information and records, including the Health & Safety File, Operation & Maintenance Manuals, structural and asbestos surveys, services etc;

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3. Roles and responsibilities for personnel, including the Demolition Manager;
4. Supervision levels to be provided and competence of all workers;
5. Details of decommissioning work carried out, such as service terminations, and any remaining activities to be completed;
6. Method of demolition, detailing the main sequences and the expected method statements for each sequence; and
7. Health & Safety File information expected from the demolition work.

The document acts as the management document for the project, with the risk assessment and method statements providing the activity specific information.

COMPETENCE

The competence of demolition workers is governed by the Certificate of Competence of Demolition Operatives (CCDO), which establishes the competencies that must be achieved by all demolition operatives.

The CCDO requires candidates to have:

1. The CITB Health & Safety Test;
2. Obtained an approved asbestos training certificate;
3. Obtained a demolition awareness training certificate; and
4. Undergone a verbal one-to-one assessment with an externally appointed independent industry assessor.

Higher level CCDO cards are also available for skilled workers, supervisors and managers, whereby vocational competence is also assessed.

RESIDUAL RISKS FOLLOWING DEMOLITION

Once a structure has been demolished, the site should be left in a safe condition with no residual risks present that do not have specific control measures applied to them. Information should also be made available to the Client, in the form of a Health & Safety File.

The Health & Safety File should include details of:

1. The works undertaken;
2. Asbestos removed, including clearance certificates;
3. Contamination treated during the demolition work;
4. Service locations, including the termination points;
5. Known underground residual risks, such as buried objects, voids etc; and
6. Historical information that is still relevant to the site.

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