

Code of practice for demolition

ICS 91.200

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- Construction Health and Safety Group
- District Surveyors Association
- Drilling and Sawing Association
- Health and Safety Executive
- Institute of Demolition Engineers
- Institute of Explosives Engineers
- Institution of Civil Engineers
- Institution of Structural Engineers
- National Federation of Demolition Contractors
- National Joint Utilities Group
- Royal Institute of British Architects
- Royal Institution of Chartered Surveyors

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Foreword

This Code of Practice has been prepared by Subcommittee B/513/9 which comprises people with a wide experience of demolition, from a variety of interested organizations. This document supersedes BS 6187:1982 which is withdrawn.

This revision of BS 6187 is a re-write of the 1982 version which takes into account the advances in technology and equipment that are available to the demolition industry. The application of new techniques and the effects of new legislation that has been introduced, particularly health and safety, and environmental legislation, including the Construction (Design and Management) Regulations 1994, the Construction (Health, Safety and Welfare) Regulations 1996, the Management (Health, Safety and Welfare) Regulations 1999 and the Environmental Protection Act 1990 have been taken into account. The document is written for all involved in demolition (which includes partial demolition) projects and gives emphasis to responsibilities from concept stage to completion. This code addresses the health and safety of those engaged in the demolition process and also of those members of the public who may be affected by the demolition activities.

This edition of BS 6187 has been expanded to cover, for example, project development and management, site assessments, risk assessments, decommissioning procedures, environmental requirements and façade retention. Deconstruction techniques are considered, including activities for re-use and recycling. Principles relating to exclusion zones and safe working spaces, their design and application have also been added.

Clauses on recommendations for methods of, and techniques for, demolition, together with considerations of specific types of structure have been retained. The text has been significantly updated, however, to reflect current and developing best practices, allowing for innovative techniques and methods to be developed and introduced, by being less prescriptive.

As a Code of Practice, this British Standard takes the form of guidance and recommendations. It should not be quoted as if it were a specification and particular care should be taken to ensure that claims of compliance are not misleading.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application. This code of practice can, however, be included as part of a contractual relationship.

Annexes A and B are informative and annex C is normative.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 120, an inside back cover and a back cover.

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Introduction

This Code of Practice concerns the process of demolition from initial considerations, through planning, to the execution stages, see Figure 1.

This Code has been written on the understanding that the execution of its provisions is entrusted to appropriately qualified and competent people.

Route maps have been included at the beginning of most clauses to guide the user through the information in the text. This is particularly in respect of the hierarchy and interdependence of use of the clauses and sub-clauses, which may not always be obvious because of the complexity of the demolition process and the wide coverage in this document. Part of the complexity arises because a demolition project from inception to completion is a complex process that involves many activities, many of which are iterative (but at different levels) and which require re-visiting. An example is, as the project moves through the tender process to contract acceptance and onto site operations by referring to planned methods of work which will be developed and augmented further at each of these stages.

The maps are not intended to be process flowcharts, but indicative of the interdependence. One flow chart is included, however, which shows the processes in the document for dealing with structural stability (see Figure 2).

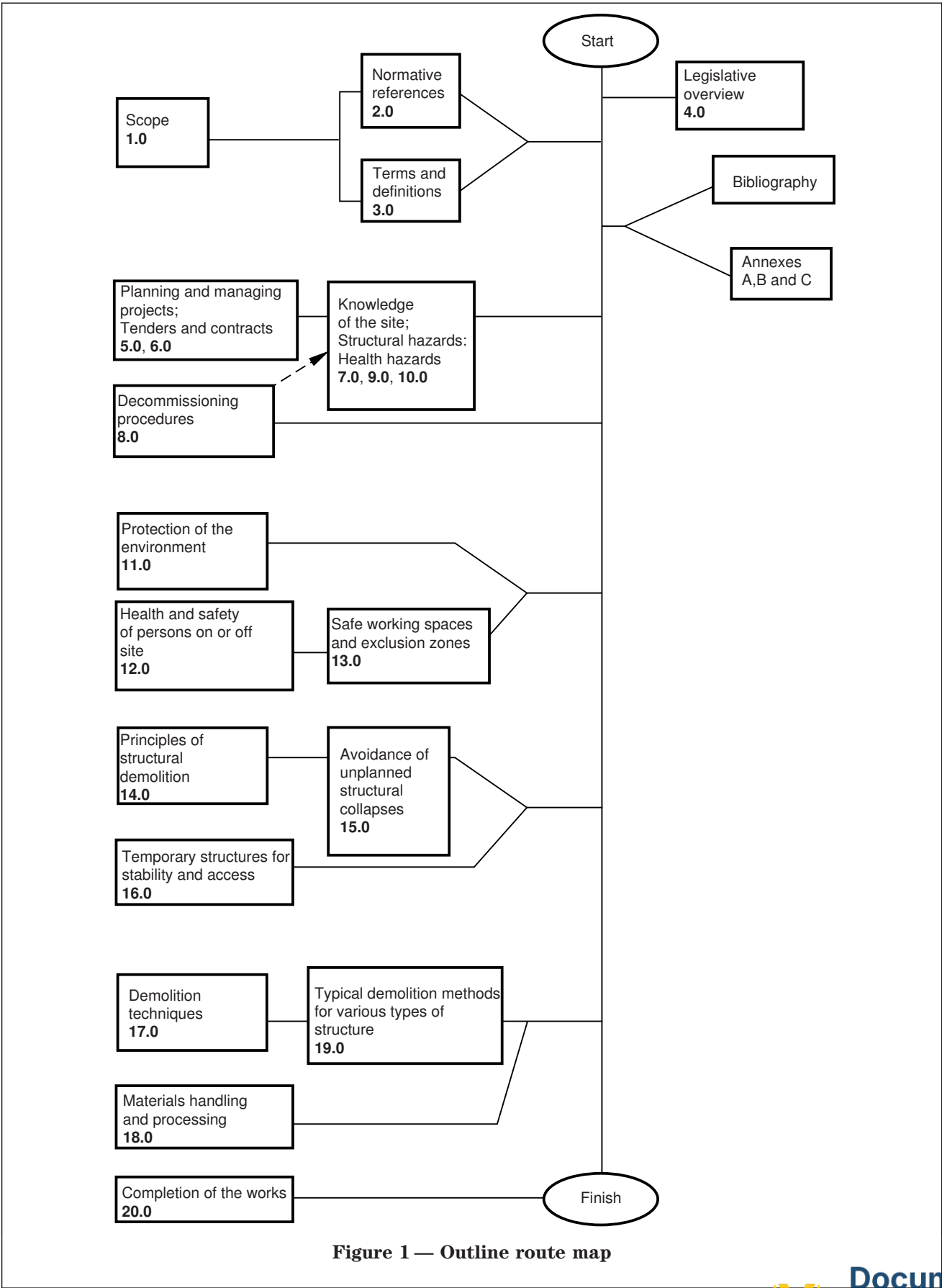
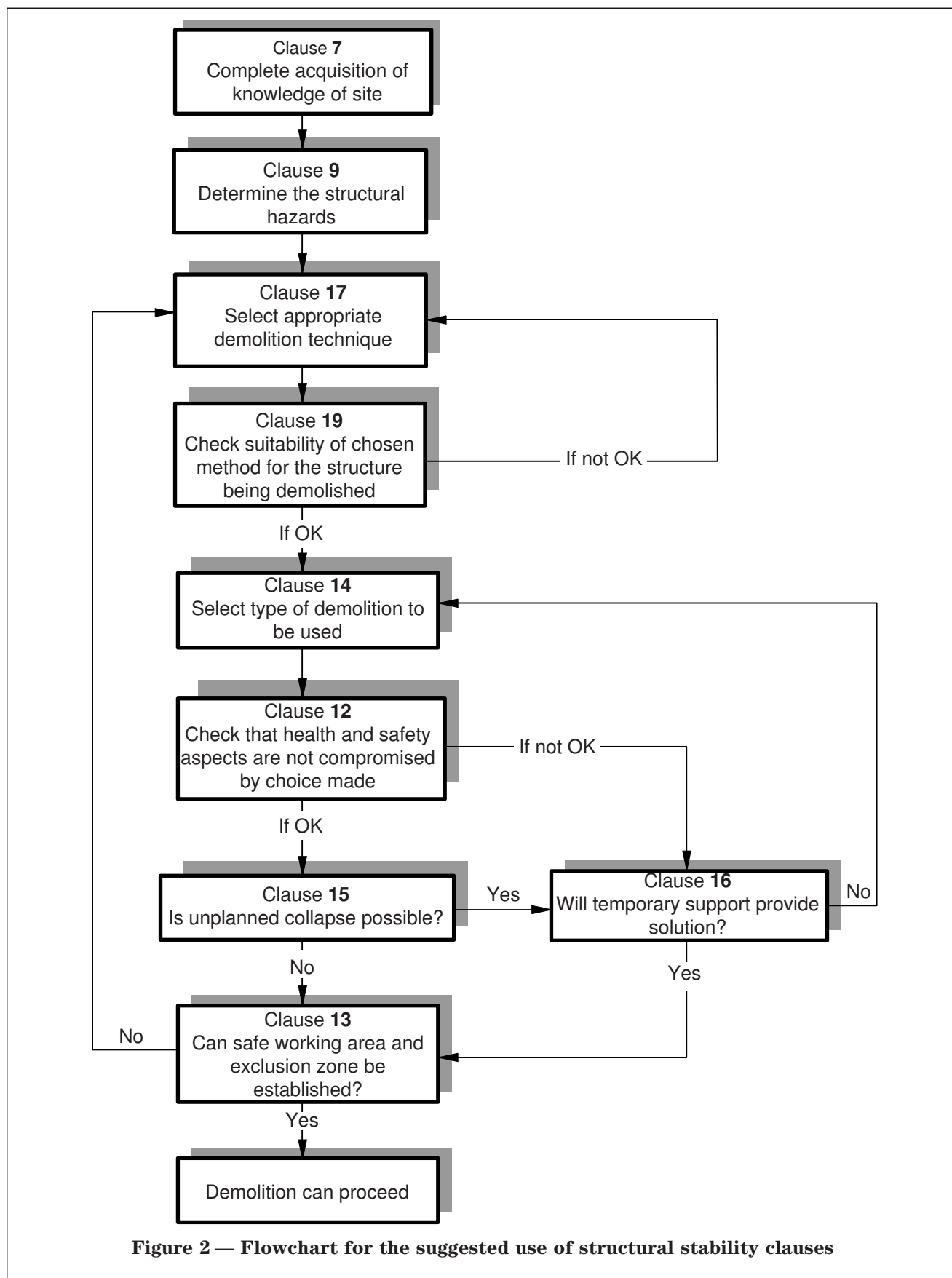


Figure 1 — Outline route map



1 Scope

This Code recommends good practice methods for the demolition (both partial and whole), as well as decommissioning, of sites including buildings and structures. It takes into account safety, health and issues which affect the protection of environment. Recommendations are included for:

- a) the proper, and effective, management of the demolition process;
- b) maintaining structural stability, through the provision of temporary structural support, where necessary;
- c) managing deliberate structural collapse.

The Code gives recommendations for:

- identifying and establishing responsibilities during all phases of the demolition process;
- acquiring a knowledge of the site, including its former uses;
- appropriate environmental management;
- managing health and safety hazards;
- carrying out risk assessments, and planning the work accordingly;
- establishing and managing procedures effectively;
- determining and managing safe exclusion zones.

2 Normative references

The following normative documents contain provisions, which, through reference in this text, constitute provisions of this Code of Practice. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. For undated references, the latest edition of the publication referred to applies.

BS 5228-1, *Noise and vibration control on construction and open sites — Part 1: Code of practice for basic information and procedures for noise and vibration control.*

BS 5228-2, *Noise and vibration control on construction and open sites — Part 2: Guide to noise and vibration control legislation for construction and demolition, including road construction and maintenance.*

BS 5228-4, *Noise and vibration control on construction and open sites — Part 4: Code of practice for noise and vibration control applicable to piling operations.*

BS 5607, *Code of practice for safe use of explosives in the construction industry.*

BS 5837, *Guide for trees in relation to construction.*

BS 5973, *Code of practice for access and working scaffolds and special scaffold structures in steel.*

BS 5974, *Code of practice for temporary installed suspended scaffolds and access equipment* (partially superseded by BS EN 1808).

BS 5975, *Code of practice for falsework.*

BS 6100, *Glossary of building and civil engineering terms.*

BS 6164, *Code of practice for safety in tunnelling in the construction industry.*

BS 6399-2, *Loading for buildings — Part 2: Code of practice for wind loads.*

BS 6472, *Guide to evaluation of human exposure to vibration in buildings (1 Hz to 80 Hz).*

BS 6482, *Guide to measurement and evaluation of human exposure to vibration transmitted to the hand.*

BS 7121-1, *Code of practice for safe use of cranes — Part 1: General.*

BS 7121-2, *Code of practice for safe use of cranes — Part 2: Inspection, testing and examination.*

BS 7121-3, *Code of practice for safe use of cranes — Part 3: Mobile cranes.*

BS 7121-4, *Code of practice for safe use of cranes — Part 4: Lorry loaders.*

BS 7121-5, *Code of practice for safe use of cranes — Part 5: Tower cranes.*

BS EN 1808, *Safety requirements on suspended access equipment — Design calculations, stability criteria, construction — Tests.*

3 Terms and definitions

For the purposes of this Code of Practice, the definitions in BS 6100, together with the following apply.

3.1

adjoining owners

freeholders, owners, lessees, tenants and/or occupiers of a property adjoining the site of demolition

3.2

attachment

assembly of components forming the working tool that can be mounted onto the base machine or (optional) equipment for specific use (see Figure 3)

3.3

base machine

machine without equipment and attachment, that includes the mountings necessary to secure equipment, as required, e.g. operator protective structures for demolition (see Figure 3)

3.4

building owner

person or organization having the right to demolish or partly demolish a building, including plant or other structure, by virtue of legal ownership or other legal authority

3.5

client

initiator of the demolition project (usually the building owner) or, e.g. a main contractor

NOTE 1 Client can also have a particular meaning in contractual relationships.

NOTE 2 Client has a specific meaning under the Construction (Design and Management) Regulations 1994 (CDM Regulations 1994) [1] (see 4.2.9.4).

3.6

cold cutting

method of cutting with the generation of no incendiary sparks and little or no heat

3.7

competent person

person who has training and experience relevant to the matter being addressed, and has an understanding of the requirements of the particular task being approached (see annex A)

NOTE Such a person should understand the hazards and the methods to be implemented to eliminate or reduce the risks that may arise. For example, when on site, such a person should recognize at all times whether it is safe to proceed.

3.8

complex structure

structure with unusual or complicated load paths or internal forces which, because they may not be obvious, makes the prediction of safe modes of failure during demolition difficult (and hence the need for the involvement of an appropriately competent person)

3.9

contaminated site

site which harbours residual health hazards resulting from the presence of biological or chemical entities

3.10

decommissioning

process whereby an area is brought from its fully operational status to one where all live or charged systems are rendered dead or inert and reduced to the lowest possible hazard level (see also 3.24)

NOTE Decommissioning includes decontamination where appropriate. Some industries, e.g. the nuclear industry, have specific meanings for this term which include dismantling. In practice different hazard levels will apply. In this Code of Practice decommissioning does not include demolition or dismantling.

3.11

deliberate collapse

controlled removal of key structural members causing complete collapse in a planned way of the whole or part of the building or structure being demolished

3.12

deliberate removal

controlled removal of selected components of the structure by dismantling or deconstruction

3.13

equipment

set of components mounted onto the base machine to fulfil the primary design function when an attachment is fitted (see Figure 3) (see also 3.25)

3.14

exclusion zone

designated three-dimensional space from which all persons, including the public, are excluded during demolition activities

NOTE In certain circumstances key site personnel may remain within the zone for a specific task provided they are adequately protected.

3.15

facade retention

method of maintaining the outer wall of a building or structure in its original position during and after demolition by using appropriately designed temporary structures (see also 3.33)

3.16

fan

temporary platform at height, usually formed in scaffolding projecting from a building or structure at an inclined angle, used solely to contain any debris accidentally dropped in the demolition process, preventing such debris from being a danger to persons or property below (see also 3.17)

NOTE Fans are not intended to be used for access or as working platforms.

3.17

gantry

temporary structure providing a covered way that protects people from unplanned falls of materials (see also 3.16)

3.18

hand-held equipment

powered portable equipment or manual tools for operation in the hand of one or two operatives

3.19

health and safety file

record of information as required by the CDM Regulations 1994 [1], for the client or for the end user, on the key health and safety risks that will need to be addressed during subsequent work on the site, which can include land development or, where appropriate, maintenance, repair and eventual demolition

3.20

health and safety plan

document which contains the arrangements for securing the health and safety of everyone carrying out the demolition work and all others who may be affected by it, as required by the CDM Regulations 1994 [1] (see clause 5, Table 1)

3.21

high-pressure water jetting

cutting, removal or cleaning of material by the use of high-pressure water

3.22

hot cutting

method of cutting where heat is applied, e.g. by flame, or is generated, and/or where there is potential for producing incendiary sparks

3.23**mobile demolition machine**

self-propelled machine made for, or adapted for use on, demolition sites which comprises a base machine (3.3), equipment (3.13), optional equipment (3.25) and attachments (3.2), as appropriate (see Figure 3)

3.24**mothballing**

process of decommissioning and then preserving buildings, plant or structures in such a way that they can be readily brought back into service if required (see also 3.10)

3.25**optional equipment**

optional items of equipment mounted onto the base machine to increase, e.g. capacity, flexibility, comfort and/or safety (see Figure 3) (see also 3.13)

3.26**permit to work procedure**

procedure which sets out the agreed work to be undertaken on identified equipment, or in an identified area, and the precautions to be taken and managed as part of a safe system of work (see 12.7)

3.27**planning supervisor**

person or organization that has responsibility for co-ordinating health and safety issues relating to design activities, as required by the CDM Regulations 1994 [1]

3.28**prestressed element**

structural element in which compressive stresses are built in to the parent material, for example, concrete or blockwork, by tensioning wires or bars to give strength prior to working loads being imposed

3.29**post-tensioned prestressed element**

prestressed structural element in which the wires or bars are tensioned after the material to be compressed is in place and has reached a suitable strength

3.30**pretensioned prestressed element**

prestressed structural element in which the wires or bars are tensioned prior to the placing of the material to be compressed, e.g. before concrete is poured, and then released after the material has reached a suitable strength

3.31**pre-weakening**

deliberate weakening of a structure as part of a more efficient controlled design collapse mechanism to be effected a short time afterwards (see also 3.34)

3.32**progressive demolition**

controlled in situ removal of parts of the structure whilst maintaining the stability of the remainder

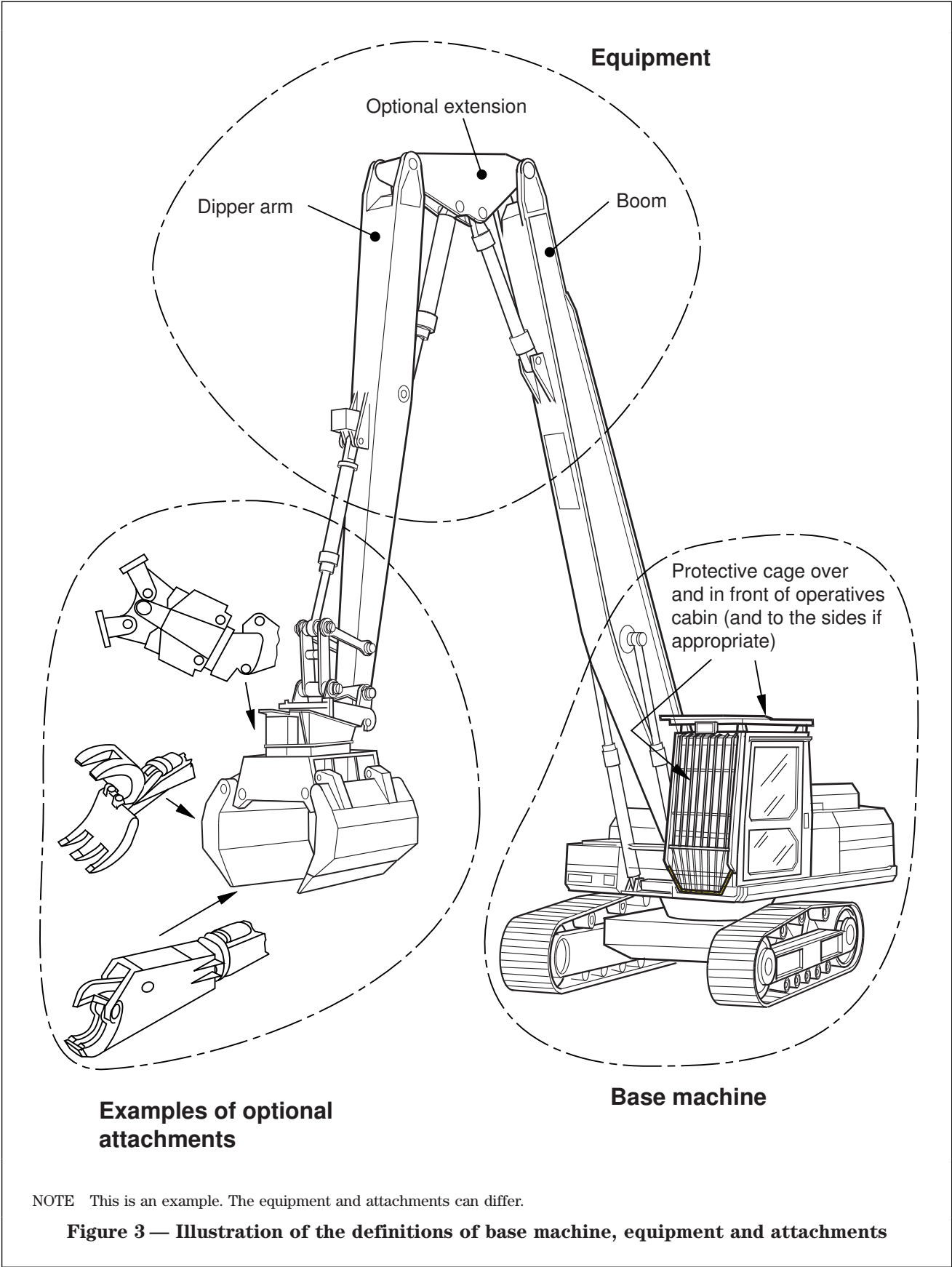
3.33**shoring (including propping)**

system of temporary supports which provide a load path to maintain stability (see also 3.15)

3.34**weakening**

deliberate removal of parts of a structure that can reduce its ability to resist loadings, including imposed loadings and its own self-weight

NOTE Weakening may be undertaken to create openings (for example, in walls and floors) for removal of materials, for example, but excludes deliberate structural pre-weakening (see 3.31).



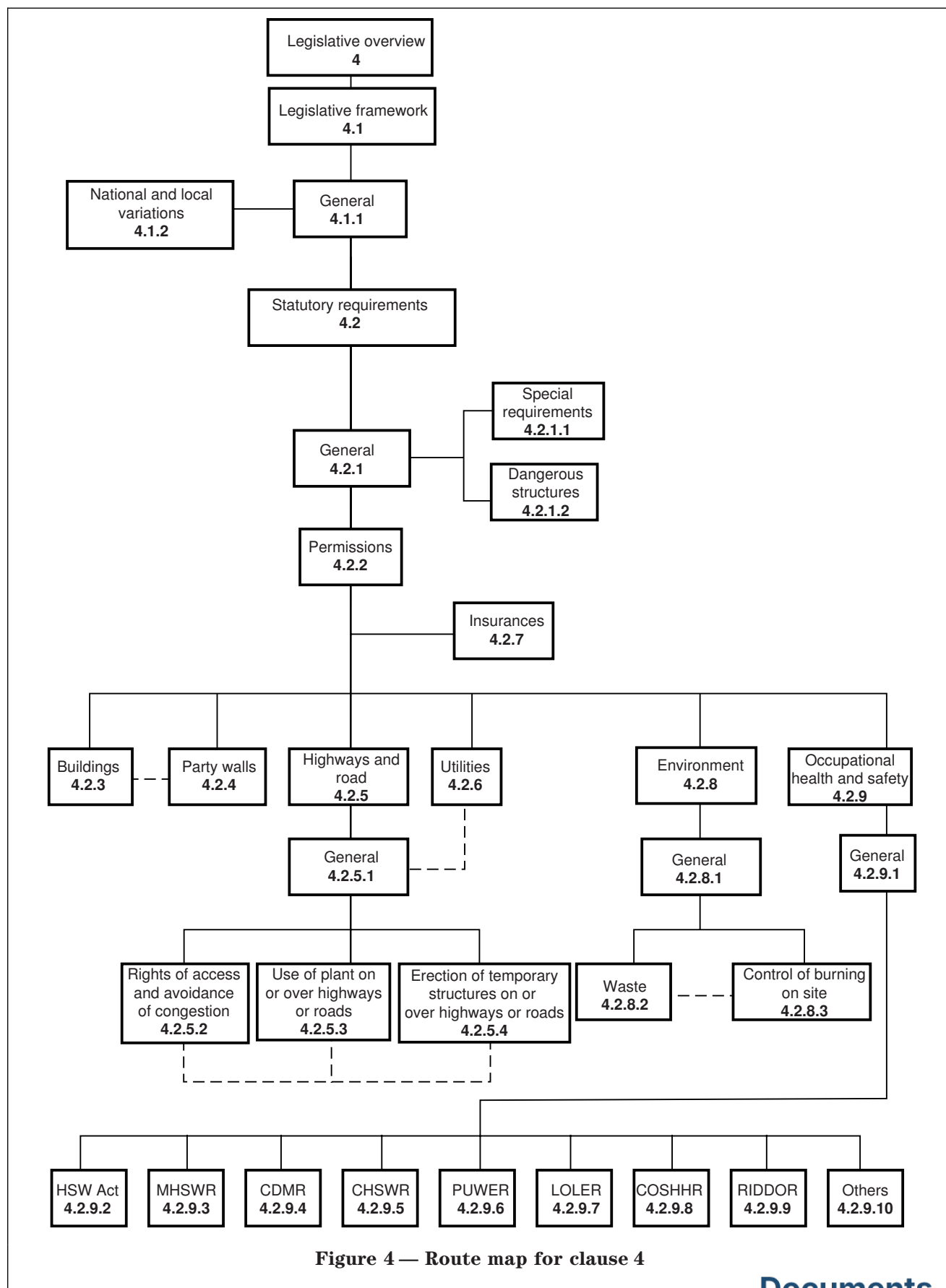


Figure 4 — Route map for clause 4

4 Legislative overview (see Figure 4)

4.1 Legislative framework

4.1.1 General

All demolition work should be carried out in accordance with appropriate acts and their supplementary regulations and the relevant British Standards. Equipment, materials and designs used in the work should conform to these regulations and British Standards.

Statutory requirements can alter during the currency of this standard and all such requirements should be checked for accuracy at the time of use.

When the value of a contract is estimated to be above the European Union (EU) limit, it should be advertised in the Official Journal of the European Community.

NOTE This is covered by British law in the Utilities Contracts Regulations 1996 [2].

4.1.2 National and local variations

Legislation can vary nationally, such as in Scotland, Wales, Northern Ireland or under local authorities, and the requirements of any particular site should be ascertained (see **B.2** for contact points of government departments, agencies, authorities and enforcers).

NOTE 1 National and local statutory requirements are enforced by local and other authorities and agencies.

NOTE 2 Information and advice can be obtained from enforcing authorities such as the Health and Safety Executive, the Environment Agency and local authorities (see **B.2**). Further advice can be sought, for example, from the relevant professional institutions and industry associations.

4.2 Statutory requirements

NOTE This clause gives examples of relevant legislation but is not exhaustive.

4.2.1 General

4.2.1.1 Special requirements

Special requirements should be applied, where appropriate on some sites or parts of sites, for example, which may be or may have been subject to the Nuclear Installations (Dangerous Occurrences)

Regulations 1965 (as amended) [3] or the Control of Major Accident Hazards Regulations 1999 (COMAH Regulations 1999) [4]. Early consultation between licensees and/or duty holders and all relevant regulatory authorities should be undertaken in such cases.

4.2.1.2 Dangerous structures

When a dangerous structure is dealt with by a local authority or equivalent regulatory authority under statute for exempt sites, the demolition or remedial works should be completed to the authority's satisfaction and may include the provision of temporary supports or shoring. Discussions should be held with the authority to ensure that an acceptable solution is implemented.

4.2.2 Permissions

As permissions are required under a variety of acts and regulations, the property owner/developer (client) should obtain approvals including any planning permission, as appropriate. Contractors should ensure that such approvals have been granted before work commences. Contractors should obtain all permissions for which they are responsible, and comply with the conditions imposed by the local authority or any other appropriate body, particularly in relation to any licenses, deposits and indemnities required, e.g. for hoarding, fencing, lighting, barriers, platforms, ramps and handrails for public safety. In addition, the requirements of any regulatory authority for exempt sites should be taken into account.

Examples of primary acts are:

- a) Town and Country Planning Act 1990 [5] (Tree Preservation and Conservation Areas Orders are covered in Section 197 et seq. of the Act);
- b) Planning (Listed Buildings and Conservation Areas) Act 1990 [6];
- c) Building Act (England and Wales) 1984 [7], see **4.2.3.1**;
- d) Building (Scotland) Acts 1959 [8] and 1970 [9], see **4.2.3.2**;
- e) Highways Act 1980 [10], see **4.2.5**;
- f) Roads (Scotland) Act 1984 [11], see **4.2.5**;
- g) New Roads and Street Works Act 1991 [12], see **4.2.5**;
- h) Party Wall etc. Act 1996 [13], see **4.2.4**.

4.2.3 Buildings

4.2.3.1 England and Wales

Local authority control of demolition in England and Wales is covered by the Building Act (England and Wales) (1984) [7], with very few exceptions, e.g. some sections of this Act do not apply in inner London. Apart from certain exemptions listed in Section 80 of the Act, any person intending to carry out demolition works is required to give notice under Section 80 to the local authority. That authority then has six weeks in which to serve a "Counter Notice" under Section 81 of the Act.

In the "Counter Notice" the local authority, or equivalent regulatory authority for exempt sites, has powers to require that, for example:

- a) any building adjacent to the building to which the notice relates be shored up;
- b) any surfaces of an adjacent building that are exposed by the demolition be weatherproofed;
- c) any damage to an adjacent building caused either by the demolition or by the negligent act or omission of any person engaged upon it be repaired and be made good;
- d) any material or rubbish resulting from the demolition and clearance of the site be removed;
- e) any sewer or drain in or under the building be disconnected and sealed at such points that the authority may require;
- f) any such sewer or drain be removed and any connecting sewer or drain, be sealed;
- g) the surface of the ground disturbed by anything done under e) or f) above be made good to the satisfaction of the authority;
- h) arrangements are made with the services providers for the disconnection of the supply of, for example, gas, electricity and water to the building;
- i) arrangements be made for the burning of structures or materials on the site by the fire authority (but see also 4.2.8.3);
- j) steps relating to the conditions subject to which the demolition is to be undertaken, and the condition in which the site is to be left on completion of the demolition, are taken, as may be considered reasonably necessary for the protection of the public and the preservation of public amenity.

4.2.3.2 Scotland

Demolition is subject to the Building (Scotland) Acts 1959 [8] and 1970 (as subsequently amended) [9]. The Acts require that before any work can commence, a warrant be obtained from the local authority. The warrant will be issued only if the authority is satisfied that the work will be carried out in accordance with the Building Operations (Scotland) Regulations 1975 [14] and that it will be completed within the period of time specified in the warrant. The Building Procedure (Scotland) Regulations 1981 [15] as amended by the Building Procedure (Scotland) Amendment Regulations 1991 [16] should be consulted for the procedures for obtaining the warrant. Section 1 of these regulations deals with demolition and includes:

- (1) a statement showing by what manner the applicant proposes to demolish the building;
- (2) a statement providing information on the construction of the building proposed to be demolished;
- (3) a section drawing of the building proposed to be demolished.

NOTE Site protection and clearance are covered by, e.g. The Building Operations (Scotland) Regulations 1975 [14].

4.2.4 Party Walls

The Party Wall etc. Act 1996 [13] provides a framework designed to prevent and resolve disputes which frequently occur between neighbouring owners when works are undertaken to party walls. It applies to commercial and residential premises alike. The Act applies in England and Wales and the provisions are also recommended for application elsewhere.

The Act covers three main areas:

- a) the construction of a new wall which straddles the boundary between adjoining properties in separate ownership;
- b) repairs and works to existing party walls;
- c) excavation works within 3 m of any building on a neighbour's land.

The Act applies to existing walls that straddle the boundary line between adjoining properties. It therefore applies to an internal boundary wall dividing a semi-detached or terraced house, for example, and also to external boundary walls dividing gardens of the properties.

Prescriptive rights can exist in the building owner's structure. In such cases any rights of support acquired by the adjoining owner/occupier over a period should be maintained. The Party Wall etc. Act 1996 [13] procedures do not strictly apply to such circumstances but it is recommended that they be applied.

4.2.5 *Highways and roads*

4.2.5.1 *General*

Where the demolition works would be helped by a partial or total closure of public and/or private roads and highways, the relevant roads or highway authorities (or other owner) should be approached at an early stage to obtain the necessary permissions. As periods of notice are involved, sufficient time should be allowed for the process to be completed within the requirements of each particular case.

NOTE Temporary closures will often only be granted at weekends or between evening and early morning. The Road Traffic (Temporary Restrictions) Act 1991 [17] applies.

Consideration should be given to making arrangements for temporary diversions of both pedestrian and vehicular traffic and discussions should take place at an early stage with, for example, the emergency services and bus operators.

The requirements of pedestrians and all statutory undertakers should be taken into account (see 4.2.6).

Where temporary traffic management is to be provided, chapter 8 of the Traffic Signs Manual [18] and the Code of Practice for Signing and Guarding at Road Works [19] should be consulted for guidance, even when the New Roads and Streetworks Act 1991 [12] does not apply.

4.2.5.2 *Rights of access and avoidance of congestion*

The roads or highways authority and police should be consulted about site access, safety and matters of transport to avoid or minimize congestion, particularly in densely populated areas.

Where access to a site is across a footway the demolition contractor should consult the roads or highways authority or other owner to obtain all necessary permissions. Suitable access to adjacent and nearby properties should be maintained. Access across such properties is a matter for the relevant owners; agreements should be negotiated and any indemnities confirmed. Footways, over which there are crossings, should be adequately strengthened to the authority's (or other owner's) satisfaction and at the contractor's expense.

All works affecting features outside the curtilage of the site, e.g. footway lights, vaults and other voids under the highway, require the approval of the authority, which should be sought.

NOTE 1 The relevant roads or highways authority can require vaults and voids to be filled in accordance with their specification, under their supervision and to their satisfaction, at the contractor's expense.

Any proposals to use local streets as holding areas for site vehicles should be planned and should consider users and residents.

NOTE 2 In some areas local streets would not be appropriate for use as holding areas for site vehicles.

4.2.5.3 *Use of plant on or over highways or roads*

For any form of plant or equipment using the public highway for support, or oversailing the public highway to any extent, the permission of the appropriate authority should be obtained and applications and consents formally recorded.

NOTE In some cases permits or licences are required.

Where scaffolding or a crane jib will pass over adjoining property, a licence is required which should be sought from the freeholder/lessee/tenant/occupier. Proposals should be discussed with the authority at an early stage, before starting work on site, in order to facilitate the operation, reduce the risk of delay and place relationships with the community on a sound footing.

4.2.5.4 *Erection of temporary structures on or over highways or roads*

Consent for the erection of all temporary structures (including scaffolds, fans, screens, hoardings and any supports to the remaining structure) on or over highways and roads should be obtained. These structures should be included as part of the contractor's "temporary structures" and the consent should be for however long they remain in place. Such structures, when completed, should conform to the requirements of the statutory regulations and with any local authority requirements. Designs for support to remaining structures, e.g. façades, or basement retaining walls, should be submitted to the local authority for approval. (See clause 16 for further advice.)

NOTE 1 In some cases authorities will insist on such support being at the rear face of the structure.

NOTE 2 Copies of the appropriate planning permission, and where necessary approval of details, is required to accompany applications for the approval of temporary structures.

4.2.6 *Utilities*

Utilities, when they are statutory undertakers, have specific rights particularly of permanent and continuous access to their equipment. Arrangements should be made to ensure that those rights are planned for. Utilities that can be affected should be identified and consulted (see also 4.2.5.1 and B.3).

NOTE Statutory undertakers are subject to the provision of the New Roads and Street Works Act 1991 [12].

4.2.7 Insurances

Contractors should have public and employer's liability insurance and should abide by the terms of that insurance.

Clients should ensure that demolition contractors have appropriate and adequate insurance cover for the work being undertaken, paying particular attention to the insurance policy, contractor's business description, limits of indemnity, policy exclusions and any hotwork conditions.

CAUTION Often only restrictive insurance protection is offered by underwriters for demolition and ancillary works.

4.2.8 Environment

4.2.8.1 General

NOTE The term "environment" covers many topics, including waste management and emissions from site such as fumes, fluids, noise, dust, smoke and vibration.

Clause 11 should be referred to for more detail and further legal issues, including polluting emissions.

4.2.8.2 Waste

Those concerned with controlled waste should comply with the waste management licensing system and with the duty of care, as provided for by Part II of the Environmental Protection Act 1990 [20]. Controlled waste should be considered to be household, commercial and industrial waste and any other such waste, including unwanted surplus substances, building and demolition waste and anything that is disposed of as broken, worn out, contaminated or spoiled in some other way.

Account should be taken of the Special Waste Regulations 1996 as amended [49] in respect of the most hazardous wastes that are classified and subject to stricter controls. Account should also be taken of regulations on the transport of such wastes. (See 11.4.)

4.2.8.3 Control of burning on site

The control of the burning of materials on site is generally subject to Section 80 (Nuisance provisions) of the Environmental Protection Act 1990 [20] and the Clean Air Act 1993 [21]. (See also clause 11.)

4.2.9 Occupational health and safety

4.2.9.1 General

Demolition and decommissioning processes are required to conform to occupational health and safety legislation. This should be taken into account in the procurement, management and execution of such work.

NOTE The reference numbers following the regulations give the full reference in the Bibliography to the regulation and also, where appropriate, include the Approved Code of Practice (ACOP) and guidance associated with the regulations. The ACOP and guidance provide explanations for the application of the regulations.

4.2.9.2 Health and Safety at Work etc. Act 1974

The Health and Safety at Work etc. Act 1974 (HSW Act 1974) [22] is the primary legislation under which many regulations have been made and apply, and should be read in conjunction with these regulations.

The HSW Act 1974 [22] sets out duties, in a general way, of employers, including directors and managers, as well as employees, suppliers and manufacturers. The Act requires employers to provide and maintain systems of work that are safe, so far as is reasonably practicable. This includes the provision and maintenance of all premises, plant and systems of work, of safe access ways and of the handling and transport of materials.

Those in control should reduce the risks to health and safety to the point at which the cost of further risk reduction greatly exceeds the benefits, but if the lives of operatives are placed at risk it is necessary to seek an alternative method of carrying out the work. Employees and the self-employed should take care of their own health and safety, as well as that of others, who can be affected by their work activity.

Those who should be considered for protection from harm due to work activities include:

- a) employees;
- b) the self-employed;
- c) employees of other companies working on the job;
- d) visitors;
- e) members of the public in the vicinity, or outside the site.

4.2.9.3 *Management of Health and Safety at Work Regulations 1999*

The Management of Health and Safety at Work Regulations 1999 (MHSW Regulations 1999) [23] set out more detailed requirements for industry in general, and are aimed at effective management of health and safety by employers and the self-employed following the concepts of risk assessment. They also require the appointment of a person or persons to assist in health and safety management, appropriate health surveillance, emergency procedures, information to employees, co-operation and co-ordination, and training.

NOTE The principles of risk assessment are given in 5.2.2.2.

4.2.9.4 *Construction (Design and Management) Regulations 1994*

The Construction (Design and Management) Regulations 1994 (CDM Regulations 1994) [1] apply specifically to construction work, including demolition, decommissioning, alteration, renovation, dismantling, site clearance and ground works, as well as most other construction industry activities including building, civil engineering and works of engineering construction.

Duties are placed on clients (see 3.5) or clients' agents, designers, planning supervisors, principal contractors and other contractors (see also 5.3 and 7.3).

The CDM Regulations 1994 [1] apply to all demolition work irrespective of the duration of the work and the number of people working on site. They also require that any works expected to last more than 30 days, or involve more than 500 person days, be notified to the Health and Safety Executive (HSE) as soon as practicable after the appointment of the planning supervisor and again as soon as practicable after the appointment of the principal contractor. In any event the HSE should be notified before the start of work on site.

These regulations require that the client ensures the preparation of a Health and Safety Plan before work commences and that a Health and Safety File is completed at the end of the work. Examples of matters to be considered when preparing the Health and Safety Plan are given in Table 1.

If a Health and Safety File is already available for premises where demolition work is to be undertaken, the new information should be amalgamated into this file. Where a Health and Safety File does not exist one should be prepared.

There is no direct legal duty to pass on the Health and Safety File if the facility (or part thereof) is sold. If the file is not passed on however, the original client retains the legal (criminal) duty to make the file available for any inspection by any person who may need information from the file. It is therefore recommended that the file should be passed on when ownership changes.

4.2.9.5 *Construction (Health, Safety and Welfare) Regulations 1996*

The Construction (Health, Safety and Welfare) Regulations 1996 (CHSW Regulations 1996) [24] set out the health, safety and welfare requirements for specific activities within the construction industry (including demolition) and are aimed at protecting not only everyone who carries out construction work but also those who can be affected by such work.

The main duty-holders under these regulations are employers, the self-employed and those who control the way in which construction work is carried out.

4.2.9.6 *Provision and Use of Work Equipment Regulations 1998*

The Provision and Use of Work Equipment Regulations 1998 (PUWER 1998) [25] place duties on all employers providing work equipment to ensure that it is suitable, properly maintained etc. The self-employed, and persons in control of non-domestic premises, are required to achieve the same goals with the equipment they use at work. Principal contractors should co-ordinate the provision and use of items of plant and equipment which are shared by a number of contractors. All contractors are required to co-operate and exchange information to ensure the safe use of shared equipment.

Every employer is required to ensure that work equipment is so constructed (or adapted) as to be suitable for the purpose for which it is used or provided. When selecting work equipment, every employer should take account of the working conditions and the risks posed to health and safe use of that equipment. Every employer should also ensure that work equipment is only used for operations and under conditions for which it is suitable.

4.2.9.7 *Lifting Operations and Lifting Equipment Regulations 1998*

The Lifting Operations and Lifting Equipment Regulations 1998 (LOLER 1998) [26] address, for example, the requirements for cranes, lifts and hoists, and components such as chains, ropes, slings, hooks, shackles and eyebolts.

4.2.9.8 *Control of Substances Hazardous to Health Regulations 1999*

The Control of Substances Hazardous to Health Regulations 1999 (COSHH Regulations 1999) [27] place duties on employers who are using substances hazardous to health.

The duty holders should ensure, for example, that work is not carried out which is liable to expose employees to any substance hazardous to health, unless a suitable and sufficient assessment of the risk created by that work has been made and appropriate measures have been taken to remove the risk or control the effect of any residual risk.

NOTE These duties extend to employees and to any other person, whether at work or not, who can be affected by the work carried out, including members of the public.

4.2.9.9 *Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995*

The Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995 (RIDDOR 1995) [28] require that employers, the self-employed or those in control of work premises report certain accidents, dangerous occurrences and certain work related diseases.

Accidents that result in death, major injury or hospitalization of a member of the public should be notified immediately to the HSE (or the local authority where appropriate) and followed up by a report on the appropriate HSE form. Disease and accidents resulting in absence from work for more than 3 days should be reported within ten days.

NOTE Dangerous occurrences include the unintended collapse or partial collapse of buildings or structures in excess of 5 tonnes, and of falsework or scaffolding over 5.0 m high.

4.2.9.10 *Other regulations*

Further health and safety regulations including, for example, the Confined Spaces Regulations 1997 [29] and those relating to asbestos which may need to be consulted, are included in the Bibliography and are also referred to elsewhere in this Code. For details of appropriate legislation in Northern Ireland, the HSE NI should be consulted (see **B.2**).

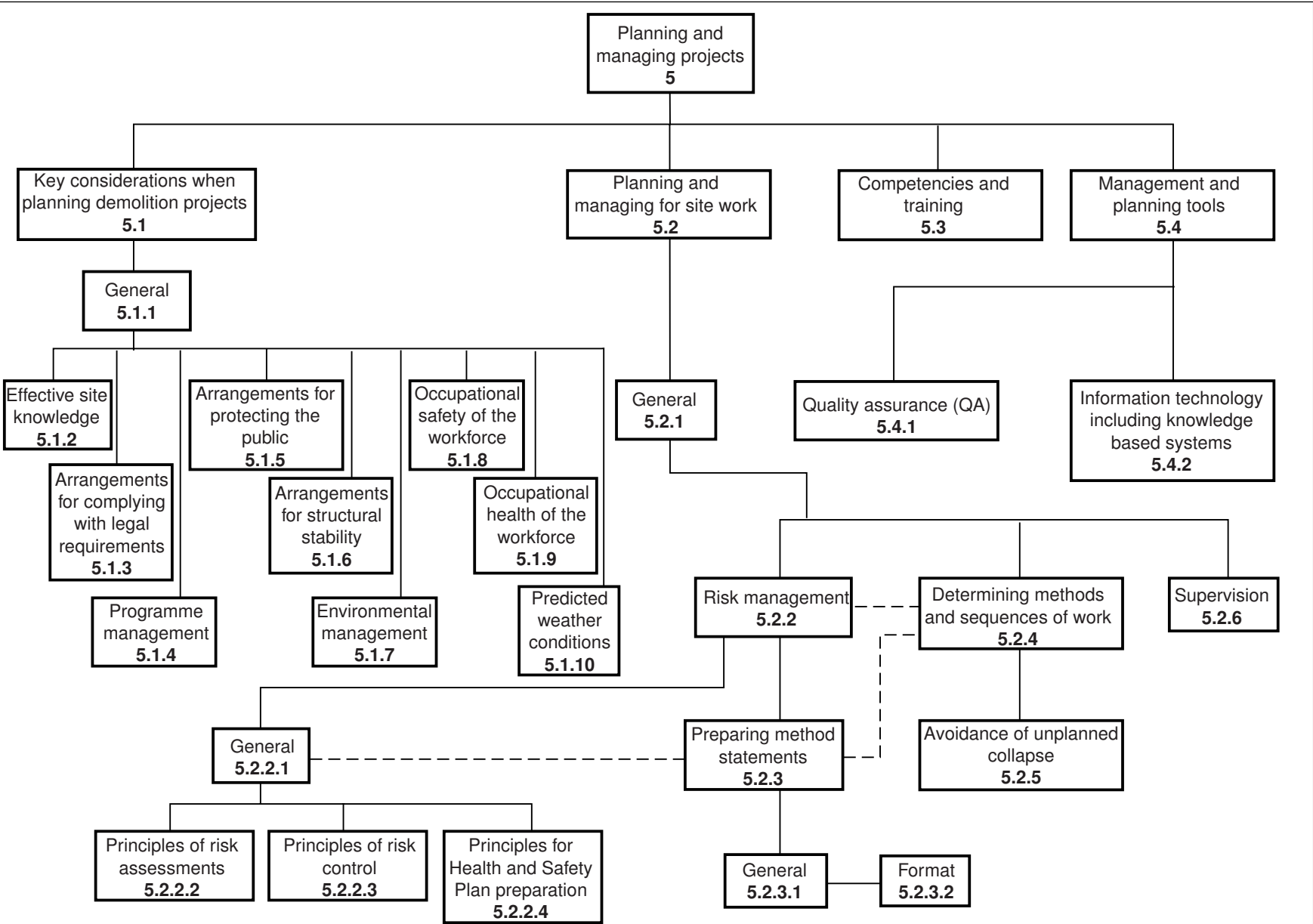


Figure 5 — Route map for clause 5

5 Planning and managing projects (see Figure 5)

5.1 Key considerations when planning demolition projects

5.1.1 General

Demolition is undertaken on a very wide range of structures and site variations. The items to be addressed should be identified as part of the planning process for the proposed works, as appropriate.

NOTE The key considerations listed below are relevant at many stages from scheme concept and development, through tender development, tendering procedure and contract awarding procedures to contract management and work on site.

Clauses 5.1.2 to 5.1.10 give groupings of considerations that should be assessed, and included, where appropriate, when planning demolition projects. The examples are broad and not exclusive, and should be read in conjunction with each other.

5.1.2 Effective site knowledge (see e.g. clauses 7 and 8)

Considerations should include:

- a) extent of decommissioning;
- b) details of the isolation or removal of services and details of temporary supplies;
- c) knowledge of the structure;
- d) isolation and protection of adjacent structures.

5.1.3 Arrangements for complying with legal requirements (see e.g. clauses 4 and 11)

Activities should include, where appropriate:

- a) obtaining permissions from and for liaison with, for example, the police, roads and highways and local authorities, utilities, rail and waterways companies and others as necessary;
- b) prior agreement with the local environmental health departments in respect of environmental noise;
- c) application to the local authorities for licensing of crusher or screening plant;
- d) possible permission from the local authorities for site burning of waste materials;
- e) prior consents or other agreements with the relevant enforcer in respect of the disposal of ground water or waste water and other fluid discharges;
- f) waste management including waste disposal in accordance with the Environmental Protection (Duty of Care) Regulations 1991 [30] and Waste Management — The Duty of Care — A Code of Practice 1991 [31].

5.1.4 Programme management (see e.g. clause 6)

Considerations should include:

- a) the sequence and method of proposed demolition;
- b) details of the plant required, including the capacities and location of the cranes and the methods of placing and recovering plant to be used, including those within the structure;
- c) a site traffic plan, detailing arrangements for, and the control of site traffic, see HS(G) 144 [32];
- d) details of debris management including removal and temporary storage on-site and disposal (including re-use and recycling) where appropriate;
- e) contingency arrangements in case of, for example, partial collapses or misfires when explosives are used;
- f) a detailed programme and timetable of events, as appropriate.

5.1.5 Arrangements for protecting the public (see e.g. clauses 12 and 13)

Considerations should include:

- a) site security including the provision of, e.g. suitable fencing and/or barriers;
- b) the control of spectators and/or site visitors;
- c) exclusion zones outside the site boundaries during critical aspects of the work, when appropriate;
- d) containment of demolition materials.

5.1.6 Arrangements for structural stability (see Figure 2 and also, e.g. clauses 9 and 14 to 16)

Considerations should include:

- a) avoidance of unplanned, including premature, collapses and maintenance of residual structural integrity;
- b) details of any pre-weakening and knowledge of the remaining structural stability, which should be designed by a competent engineer, including the sequence of the operation;
- c) details of any temporary works to provide support, which should be designed by a competent engineer.

5.1.7 Environmental management (see e.g. clause 11)

Considerations should include:

- a) assessment and control of noise at the site boundaries;
- b) control of dust emissions;
- c) waste minimization including re-use and recycling;
- d) minimization of materials haulage;
- e) bunding arrangements for storage and dispensing of fuel oils;
- f) wheel washing plant and road-cleaning arrangements, where required;
- g) skip or truck sheeting arrangements;
- h) arrangements for dealing with, e.g. flammable materials, gases, hazardous liquids and asbestos;
- i) anticipated values of air over-pressure and ground vibration;
- j) areas of conservation, including flora and fauna.

5.1.8 Occupational safety of the workforce (see e.g. clauses 12 and 16)

Considerations should include:

- a) details of personnel access and working platforms, including the procedure for their maintenance and subsequent removal as the structure is reduced;
- b) establishing appropriate working spaces and exclusion zones;
- c) arrangements for the protection of the workforce, including reference to any permit to work procedures;
- d) effective communications including details of warning signs and signals.

5.1.9 Occupational health of the workforce (see e.g. clauses 10 and 12)

Considerations should include:

- a) hazard recognition, risk assessments and control measures for substances potentially hazardous to health e.g. from heavy metals or other toxic substances, including when working with materials which can be re-used or recycled;
- b) hazard recognition, risk assessments and control measures for exposures to harmful substances such as asbestos and radioactivity;
- c) assessments and control measures for noise on sites;
- d) identification of deleterious atmospheres such as oxygen deficiency in confined spaces;
- e) hazard recognition and risk assessments for the need for, and the provision of, appropriate personal protective equipment (PPE);
- f) appropriate welfare arrangements, including for when the work involves exposure to contaminated materials or dirty work.

5.1.10 Predicted weather conditions

Arrangements should be made where appropriate for liaison with, for example, the Meteorological Office to provide forecasts with respect to sudden and severe weather changes, such as strong winds, lightning, snow and heavy rain, and how these can affect the planned works and programme.

5.2 Planning and managing for site work**5.2.1 General**

Demolition work should be planned in such a way that it is undertaken using systems of work that take into consideration safety, health, environmental and efficiency issues.

All those involved from concept through tender to contract execution should ensure effective planning and communication and the provision of sufficient time to allow the execution of a successful and efficient project.

The time scales required for the acquisition of any licences or permits should be allowed for in the programming of works.

After the contract has been awarded and before starting work, the contractor should determine the proposed safe sequence of operations as a result of an assessment of the comparative risks, related specifically to the site and conditions. This sequence should be used to assess and expand the Health and Safety Plan for the tender and proposed programme of works (see 5.2.2.4). The expanded plan for the tender should form the basis of the Health and Safety Plan for the demolition.

The methods of work should allow for completion of demolition and site clearance as stipulated by the contract, taking account of any constraints that the client will have identified to be complied with by the tenderer/contractor.

5.2.2 Risk management

5.2.2.1 General

When planning methods of work, a suitable and sufficient risk assessment should be carried out and recorded. Methods, materials and equipment should be selected to remove or minimize risk from work. Tenderers/contractors who are selected should look for the hazards in the job, including how and where it could be done, and what equipment and materials should be used.

5.2.2.2 Principles of risk assessments

The principles of risk assessments listed below should be adhered to when determining methods and sequences of work:

- a) identification of the hazards involved with the proposed work;
- b) assessment of the risk (likelihood and severity) of any harm arising;
- c) removal of risks, possibly by changing the proposed methods or processes;
- d) control of the remaining risks;
- e) review and, if appropriate, update.

The risk assessments should address any constraints that the client has identified, but the tenderer/contractor should be given the freedom to determine the proposed methods of demolition.

The result of risk assessments should identify the risks associated with the work and enable the contractor to select appropriate demolition solutions that remove or reduce the risks before the work commences.

The contractor should then select the most suitable methods of demolition which include measures to properly control any remaining risks (see 5.2.2.3).

5.2.2.3 Principles of risk control

The following principles should be applied to the control of risk:

- a) if possible, avoid the risk completely by using alternative methods or materials;
- b) combat risks at source, rather than by superficial measures that leave the risk in place;
- c) wherever possible, adapt the work to the individual, particularly in the choice of work equipment and methods of work. This will make the work less monotonous, improve the concentration and reduce the temptation to improvise equipment and methods;
- d) take advantage of technological progress, which often offers opportunities for safer and more efficient working methods;
- e) incorporate the protective and preventive measures into a coherent plan to reduce progressively those risks which cannot altogether be avoided and which takes into account working conditions, organizational factors, the working environment and social factors.

5.2.2.4 Principles for Health and Safety Plan preparation

A Health and Safety Plan should be prepared taking into account all available information supplied by the client or his professional adviser, together with any surveys and investigations that are deemed necessary.

The Health and Safety Plan (see Table 1) should be prepared and applied on the basis that criteria such as the following are in place:

- a) principles of risk control;
- b) employees and the self-employed should understand their responsibilities in, for example, training, instruction and communication of plans and risk assessments;
- c) all the organizations involved in developing and executing any project should have an active safety culture.

Table 1 — Items to be included in Health and Safety Plans (examples)

Tender stage ¹⁾	Demolition stage ²⁾
a) General description of the project	g) Items developed from a) to f)
b) Time constraints of the project	h) Arrangements for ensuring health and safety of all who may be affected by the work
c) Details of risks remaining to people as a result of work activity	i) Arrangements for the management of the work and the monitoring of compliance
d) Information reasonably required of the tenderer to demonstrate competency and adequacy of resources	j) Sufficient information, including arrangements for welfare
e) Information for the purposes of preparing the Health and Safety Plan for the demolition and provision of welfare facilities	k) Emergency procedures (see 12.6)
f) Any requirements for permits to work	
¹⁾ The planning supervisor should ensure that the Health and Safety Plan for the tender is prepared. ²⁾ The principal contractor should ensure that the Health and Safety Plan for the demolition, which is a development of the tender Health and Safety Plan, is prepared before commencing work.	

On individual projects, the Health and Safety Plan should act as the focus for bringing together and co-ordinating the individual policies of everyone involved.

5.2.3 Preparing method statements

5.2.3.1 General

Method statements should address the particular needs of the site and should detail the planned sequences and methods of demolition. The proposed working methods of demolition should be assessed to determine whether a number of method statements are required, particularly where the operations are phased.

Method statements should be prepared in such a way that they enable supervisors and managers to ensure that persons on site are made aware of how the work should be carried out including the sequence of operations, the plant and types of equipment to be used and the precautions to be taken, as appropriate.

NOTE Methods such as “tool box” talks are recommended to help in disseminating the information, especially for those carrying out the work.

Method statements should be regarded as live documents and should be modified as required to cater for planned changes in systems of work. Any modifications should be made in accordance with **5.2.2** and **5.2.4**.

5.2.3.2 Format

Each method statement should be succinct and should form a single document, including site plans, annotated diagrams and a detailed programme for the work, to clearly communicate to those carrying out the work on site what is required. A logical order should be followed. It should be easy to understand, agreed by and known to all levels of management and supervision. Repetitive tasks may be covered by standard sheets but critical activities should be specified in full.

The document should be clearly marked with the date of preparation and any revision number or letter, so that the latest edition can be readily identified.

5.2.4 Determining methods and sequences of work

The chosen methods of work should be determined in accordance with **5.2.1** and **5.2.2** and detailed in each method statement (see **5.2.3**).

When proposed methods of work need to be altered because of changed and/or unforeseen circumstances, the cycle of determining methods and sequences of work should be repeated commencing at **5.2.1**.

New methods should not be applied on site unless agreed by all concerned. They should then be included in a revised method statement that should then be promulgated before implementation.

5.2.5 Avoidance of unplanned collapse

The chosen methods of work should not compromise structural integrity. Demolition should be carried out in such a way that danger arising from the unplanned collapse of any part is avoided by maintaining the structural integrity of the remaining parts at all times.

NOTE Unplanned collapse can result from instability caused by, e.g. the interruption of load paths or from overloading individual elements.

A detailed structural assessment should identify any weak elements, supports or connections and consider the overall stability throughout demolition to avoid danger from unplanned collapse. The findings should be recorded within the risk assessment.

When methods of work require modification, a fresh assessment should be undertaken.

5.2.6 Supervision

Managers and supervisors should ensure that the planned method of work arising from any assessment is monitored for its correct implementation during the demolition process, and that the actual conditions found on site, e.g. concerning the type and strength of the structure, confirm the assumptions made in the structural survey, risk assessment and planned method of work.

NOTE 1 The demolition contractor is required, by health and safety legislation (see 4.2.9) to employ a competent person to supervise and control the work on site.

Where two or more demolition contractors take part in work on the same site, each should appoint persons to supervise the work. To ensure the safety of the whole works these persons should collaborate in the planning and execution of the work.

NOTE 2 This does not prevent the joint appointment of one person by two or more demolition contractors. It is in the interest of the building owner to arrange for adequate supervision and co-ordination of the work on site.

The demolition contractor should maintain competent supervisory staff on site throughout the working day. The extent of supervision and management should be appropriate to the complexity and size of the work to be undertaken. Supervisory staff should have direct access to higher management at all times.

5.3 Competencies and training

5.3.1 Competencies

All personnel should be competent for the tasks that they undertake. The CDM Regulations 1994 [1] place responsibilities on the client and other persons involved with demolition works to ensure that competent persons are employed on the project. The client should make reasonable enquiries to ensure that the person(s) appointed as planning supervisor and principal contractor is/are competent to undertake that role. No person should appoint a designer or contractor unless reasonably satisfied that the person is competent to undertake the role (see 4.2.9.4 and 7.3).

5.3.2 Training

Management should ensure that the necessary levels of competencies exist and are developed by appropriate training as required.

The objectives of industry recognized training schemes should be to make positive contributions to ensuring that managers, supervisors and operatives in the demolition industry are competent at the level of experience that they claim and to ensure that they have received suitable training in e.g. health and safety.

NOTE Bodies providing industry recognized demolition training schemes are shown in B.6.

5.4 Management and planning tools

5.4.1 Quality assurance (QA)

As part of rigorous project management, consideration should be given to using QA systems to help compliance with environmental, health, safety and legal requirements.

NOTE Users of this Code of Practice are advised to consider the desirability of quality system assessment and registration against the appropriate standard in the BS EN ISO 9000 and BS EN 14000 series by an accredited third-party certification body.

5.4.2 Information technology (IT) including knowledge based systems

Consideration should be given to the advantages of using computer based information technology (IT) in recording, accessing, searching, updating and retrieving information pertinent to the demolition process, to aid efficiency.

The potential for the use of innovative IT systems should be explored, for example:

- a) virtual reality;
- b) knowledge based and expert systems;
- c) robotics;
- d) sensing and recording devices including lasers.

To enhance project management and project control some systems have been developed for the construction industry which can be applied to demolition and consideration should be given to using appropriate systems.

The internet should be considered for use as a source of information, e.g. the Department of the Environment, Transport and the Regions (DETR) Materials Information Exchange (MIE) database [33], hosted by the Building Research Establishment (BRE), which offers advice and an exchange facility for construction and demolition materials (see annex B for other useful website addresses).

NOTE The Data Protection Act 1998 [34] can apply.

6 Tenders and contracts

6.1 Professional advice

The initiator of the demolition project should be aware of any direct responsibilities for their duty of care and receive professional advice as appropriate.

NOTE The initiator will usually be the building owner (but see 3.4 and 3.5).

A formal contract, in writing, should be entered into and signed by both the client (or their legal representatives) and the demolition contractor. The use of standard forms of contract are recommended and can be obtained from, e.g., professional bodies and industry associations (see B.1 and B.4).

6.2 Tender and contract documents

Aspects and documents to be considered when preparing the tender and contract documents should include, as appropriate, the following.

- a) The location and site of the works.
- b) Plan or plans showing the ownership and nature of boundary walls, fences, hedges, trees and location of buildings, structures or subterranean features that are to be the subject of the works or that are to be preserved.
- c) Plans obtained from services providers showing the alignment, position and depth of all their cables, pipes, ducts, tunnels, apparatus and equipment, together with any special requirements that they have in order to safeguard their installation and service. (Written confirmation should be obtained from each of the utilities providing services on the site, e.g. gas, electricity, telecommunications, that they have disconnected their supply outside the site boundary.) The results of the survey carried out round the site perimeter, for example, to ensure that there are no live power cables remaining, unknown to the electricity supply company, should be taken into account.
- d) Roads and highways authorities and/or police requirements regarding the position of points of access to and egress from the site to the surrounding highways and to the periods of the day when such access/egress will be permitted.
- e) Local requirements relating to the provision of hoardings, gantries, walkways, fans, scaffolding, working arrangements and notices prior to commencement of work by the demolition contractor.
- f) Insurance provisions to indemnify the building owner and cover employer's, public and third party liabilities to a specified level and also to cover any specified risks arising as part of the works. (See also 4.2.7.)
- g) The action to be taken by the demolition contractor to protect specified features of historical, archaeological, or geological importance during the works and, if unknown at the commencement of works, provisions as to the notification of such items and costs arising from the need to preserve them.
- h) The appointment and duties of the person supervising the demolition for the building owner.
- i) Provisions relating to bankruptcy and completion of the works by the building owner, should the contractor be unable to complete his works at the required time.
- j) Financial provisions, which should include management of retention monies; such monies are not appropriate where sites have been cleared. Provision for assessment of liquidated and ascertained damages arising from delay in commencement or completion of the works should be included.

NOTE The Scheme for Construction Contracts (England and Wales) 1996 [35] affects procedures for demolition contracts. It will automatically be applied to all contracts signed after the scheme that brings the Housing Grants Construction and Regeneration Act 1996 [36] into effect. See also similar schemes for Scotland and Northern Ireland.

- k) The date, where known, for commencement of the works and the date, or time allowed, for the completion of the works.

l) Any party wall agreements and schedules of condition, including photographic materials, agreed between the building owner and adjoining owners/occupiers which are to form the basis of any claims by them against the building owner. This should include a list of adjoining owners' (see 3.1) names and addresses together with those of their agents.

m) Indication of any known prescriptive rights of support or way which have been acquired, for example, by adjoining owners/occupiers by virtue of enjoyment over a long period.

NOTE Such rights can include rights of support provided by a part or parts of the building owner's building to an adjoining owner's building.

n) Assignment or underletting of the whole or part of the works should only be permitted with the prior written consent of the building owner. Where such consent is granted, the terms of the contract should be the same as those between the building owner and demolition contractor.

o) The specification of the works which should be clear and unambiguous and provide the contractor with the building owner's requirements. A list of all documents, plans, notices and information obtained by the building owner for incorporation in the contract should be included as an annex to the specification.

p) Specific constraints imposed on working methods.

q) The results of all relevant site surveys.

r) The decommissioning report for the site.

s) The Health and Safety Plan.

t) The Health and Safety File (for previous work when available).

6.3 Tender procedure and administration

Tendering for demolition work should generally follow the procedures used in good construction industry practice. Professional advice should be sought to assist the building owner in the selection of tenderers and the preparation of tender documentation. (See also 4.1.1 regarding estimated contract values.)

The tender procedure should include steps such as the following.

a) *Pre-qualification of contractors.* Professional advice should be sought to ensure that the contractor's competence and resources match the complexity and the size of the proposed project, thus complying, for example, with the CDM Regulations 1994 [1].

b) *Invitation.* Arrangements should be made for each tenderer to inspect the site.

c) *Information to tenderers.* This should include compliance with the invitation requirements, specification, client statement, state of the site, history of use, legal and other requirements. Non-compliance with the invitation should be assessed as this can invalidate the tender.

d) *Tenderers bid preparation.* Account should be taken of the considerations given in 5.1, with a proposed work plan, an outline programme and a statement of sub-contracted elements.

e) *Clarification.* Any information for clarification should be given to all tenderers in writing.

f) *Tender submissions.* These should be received by a set date and all submissions should be opened at the same time to ensure fair competition.

g) *Examination of tenders.* This should include clarification and removal of anomalies and qualifications in submissions. Method statements should be assessed.

h) *Acceptance.* This should include agreement of start and completion dates and complete contract details.

i) *Notification.* All tenderers should be notified of the names of other tenderers and consideration should be given to issuing a list of non-attributed tender figures upon award of contract.

j) *Submission to all authorities and adjoining owners* (see 3.1). This should state when work will commence, its duration, the name and address of the contractor and the site agent's name.

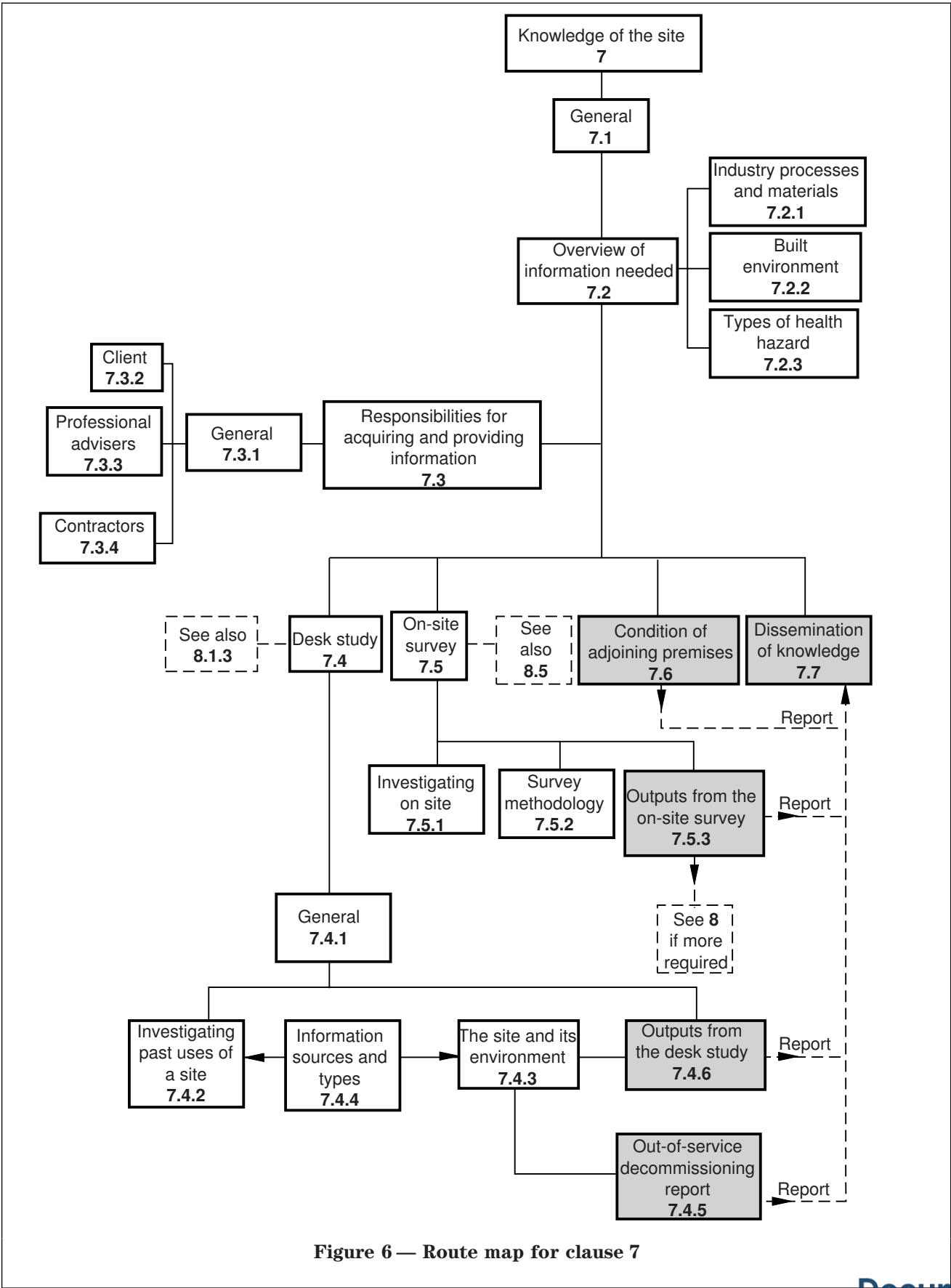


Figure 6 — Route map for clause 7

7 Knowledge of the site (see Figure 6)

7.1 General

The site should be assessed and surveyed sufficiently such that all relevant information is established to provide a clear understanding of the state and condition of the site.

NOTE 1 This understanding is fundamental to the completion of a successful project in respect of environment, efficiency and safety and health, and will include physical and health hazards. The information will be needed initially for the tender stage.

The knowledge should be elicited by an initial desk study that should be followed by an on-site survey to augment the desk study. Off-site features that can affect work on site should also be determined.

NOTE 2 In this context “the site” includes everything above, at or below ground level, within the area under consideration.

The recommendations in clause 7 should be applied additionally when work starts on site, because however thorough the information gathering process was prior to the start of the contract, more information will be revealed as demolition proceeds. This can be regarded as the continuing and next phase of the survey and should be recognized as such by all parties. Any additional information should be incorporated into the risk assessment process and reviewed to establish if the methods of work on site need amending.

The recommendations in 7.2 to 7.5, clause 9 and 10.1 should be followed through all stages of the project, from concept to completion of demolition on site.

7.2 Overview of information needed

7.2.1 Industry processes and materials

The information to be gathered should identify the industrial processes and associated materials, particularly residues that can form health and physical hazards, including:

- a) materials forming, and within, the fabric of the buildings and structures;
- b) raw materials;
- c) end-products;
- d) by-products or wastes;
- e) ingress from neighbouring sites;
- f) organic deposits.

7.2.2 Built environment

The information to be gathered should also relate to the built environment, where there can be potential for health and physical risks, including:

- a) site physical features, either natural or built, such as buried tanks or waste materials;
- b) form, type, elements and other features of the structures and buildings;
- c) design philosophy, load paths, including stability features, of the structures and buildings;
- d) construction materials and strengths of constituent materials;
- e) any peculiarities plus any modifications of the structures and buildings;
- f) other potential physical hazards, e.g. from plant, machinery and equipment;
- g) claddings and coverings which can be a health risk, e.g. asbestos lagging or sheeting;
- h) health risks from the building fabric, such as treated timber.

7.2.3 Types of health hazards

From the information gathered in 7.2.2 the types of health hazard associated with these materials which can be toxic, carcinogenic, pathogenic, sensitizing, corrosive or irritant should be identified, such as those listed below:

- a) radioactive;
- b) fibres which can be harmful, such as asbestos and man-made mineral fibres;
- c) chemicals which can be harmful, such as polychlorinated biphenyls (PCBs).

7.3 Responsibilities for acquiring and providing information

7.3.1 General

The responsibilities for providing information are addressed by criminal law, civil law, common law and professional liabilities and those with such duties should be aware of their responsibilities, examples of which are summarized in 7.3.2 to 7.3.4.

7.3.2 Client

The client should initiate the desk study and site survey. A detailed report should be produced which describes the current state of the property and the steps that should be taken to complete any decommissioning prior to demolition, if this is required. As part of this, the client should provide drawings and sketches for information that should also take account of any alterations that may have taken place.

The client should have a decommissioning report (see **8.1.3**) prepared which should, amongst other things, identify specific areas of concern relevant to future demolition work. The decommissioning report and results of surveys should be made available at the tender stage to assist in the provision of a tender that will cover the cost of dealing properly with the identified issues.

The client should appoint a planning supervisor. It is also the client's responsibility to engage other professional advisers, where appropriate, to carry out, for example, structural surveys and contamination surveys to aid in the preparation of the tender documentation.

When professional advisers are engaged, the client should make available all relevant information known to them and should ensure that the advisers make suitable and sufficient investigations to establish information concerning the site.

In cases where there is a possibility of the presence of toxic materials, including asbestos, a site survey detailing the extent and identifying the type of the materials, should be carried out. The survey findings should then form a report, which could include an "Asbestos Register" (see **10.3.2.2**).

NOTE The appointment of a professional adviser will not ultimately relieve clients of their responsibilities.

The client is responsible for the appointment of the principal contractor and should ensure that the principal contractor has full and accurate information before work commences.

The client should be receptive to requests from the contractor for further information.

7.3.3 Professional advisers

Professional advisers such as consulting engineers and planning supervisors should be aware that they are responsible for ensuring that surveys and assessments are made effectively, and that the client is informed of any additional information that may affect subsequent activities.

It should be noted that the planning supervisor's duties include ensuring that the required information concerning the site and proposed work is collected in the Health and Safety Plan (see **5.2.2.4**).

Professional advisers should be receptive to requests from the contractor for further information.

Adequate information should be provided by professional advisers to enable the demolition contractor to execute the planned work safely.

During the execution of the work, the planning supervisor should ensure that any additional relevant information is collected and incorporated into the Health and Safety File which should be given to the client on completion of the project.

7.3.4 Contractors

Contractors should be satisfied that they have all the information necessary to undertake the work in a safe and efficient manner. Such information should include that provided by the client.

The contractor should confirm receipt of all such information provided by the client, and should request any additional information they require. The information received should be verified before use and is required for the preparation of proposed methods of work and development of the Health and Safety Plan.

7.4 Desk study

7.4.1 General

The desk study should be used as the basis for determining more accurately, via the on-site survey, what exists and thus what has to be taken into account (for reasons of health, safety, environment and efficiency) when planning the demolition.

7.4.2 Investigating the past uses of a site

Past uses of a site, including its buildings, need to be known and should be investigated. This should be established through a comprehensive desk study in the first instance. All former uses of the site together with details of manufacturing processes and what materials were likely to have been present, as well as details of physical features should be included.

Any contamination is likely to be concentrated in particular areas of a site, and the desk study should show where on the site hazards are most likely to be encountered. The investigations can become complex when many changes of use have occurred during the site's history of occupation, and arrangements should be implemented, as appropriate, to deal with this.

Where adequate information or detail cannot be obtained for a specific site, a more general review of processes and practices appropriate to the industry should be made to give a good indication of potential hazards.

NOTE For a given industry, the materials and processes are often similar regardless of geographical location.

A study of the past uses of the site should give a good indication of the likely presence of hazardous gases or chemical contaminants that may be present. The initial survey of the site should include the identification and scheduling of all locations where hazards from gas or chemicals may exist. The schedule should give a preliminary assessment of the nature of the hazard at each location and suggest suitable means of dealing with it.

7.4.3 The site and its environment

In addition to investigating the past uses of a site (including buildings) the following topics should be investigated at the desk study stage with respect to the past and current general site environment, in readiness for the site survey:

- a) access routes that are safe and convenient to use, and that have been established to and from the site, around the site, and to and from places of work;
- b) topographical features such as trees and water courses which can require protection (see **11.6**), or otherwise affect the planning of the work;
- c) ground conditions, including the water table, the potential for flooding (see also **12.9**), ground types, and the presence of sink holes, mineshafts and shallow workings;
- d) location and type of services, both above and below ground, as these can pose a hazard or require protection, isolation or diversion, including details of relevant contact(s);
- e) extent of buried features such as basements, cellars, tanks and vaults with no structures on top should be established, including proximity to the boundaries of the site;
- f) extent of above-ground structures, including those with basements, etc. and including those at or near the boundaries of the site;
- g) presence of neighbours who require special consideration because their premises or equipment can be sensitive to, for example, impact vibration, noise, dust or electronic transmissions;
- h) presence of neighbours who can affect the contractor's activities, for example, by producing radio transmissions that may affect the use of electric detonators when demolition by the use of explosives is being considered.

7.4.4 Information sources and types

Archives can provide information concerning a site, however, archive material should not be totally relied upon as, e.g., the conditions can have changed since the archive was prepared, or original information may have been inaccurate. Account should be taken of any modifications that have taken place on site since the creation of the archive.

Types of information that should be considered include:

- a) graphical, such as drawings and historical maps;
- b) pictorial, such as photographs, engravings and paintings;
- c) textual, such as trade directories and special interest books;
- d) verbal, such as personal recollections.

Sources of information that should be considered include:

- a) county and national record offices, local history societies, libraries, museums and industry based records offices;
- b) local government departments such as planning and building control, and central government based organizations including agencies such as the HSE, the Environment Agency (EA) and the Scottish Environment Protection Agency (SEPA);
- c) sources of information such as the Internet and data warehouses.

7.4.5 Out-of-service decommissioning report

The existence of a decommissioning report should be ascertained. This should usually be prepared when the facility or site is taken out of service. The extent of decommissioning on the site should be known, e.g. it might not have included the whole site.

CAUTION The decommissioning and hence the report might not have been for demolition as there might have been plans to bring the facility back into service at a later date after being mothballed.

The status, including the date, of the decommissioning should be known, including whether it is:

- a) out of service for re-fitting, repair or refurbishment;
- b) out of service for mothballing;
- c) out of service for some time prior to demolition which can lead to, e.g., health and safety hazards not present at the time of decommissioning;
- d) immediately prior to demolition.

Such a report should be regarded as an essential part of the desk study; the extent of its value, however, will depend on its age and accuracy.

See clause 8 for more on decommissioning procedures and reports.

7.4.6 Outputs from the desk study

The findings should be compiled into a report to give the most accurate picture of the site, to ensure that the best possible information goes forward for confirmation and augmenting or development as appropriate by on-site investigation and survey.

7.5 On-site survey

7.5.1 Investigating on site

The investigation should be undertaken to augment the knowledge gained during the desk study to enable a more accurate understanding of:

- a) indications of past features;
- b) present features;
- c) existing condition.

Existing information, including drawings, should be used when investigating the site. The information should be confirmed as accurate or otherwise. The correct information should then be used as a basis for extending knowledge, e.g. by taking account of any differences such as alterations or modifications that have taken place. Records should then be updated with the current knowledge and their status confirmed. Items that should be identified in the survey and some of the more commonly found features, are described in clauses 9 and 10.

A survey of adjoining premises should be prepared when appropriate, to help resolve any dispute that arises about alleged property damage.

7.5.2 Survey methodology

When planning the survey the desk study should be taken only as an indication of what is present, as other substances and conditions can occur in practice.

Surveying should be undertaken in a planned, safe manner. Caution should be exercised and continual alertness should be maintained (clause 12 gives further advice on personal safety).

Methods of measuring and recording information can vary, but those used should be appropriate to the circumstances to minimize the risk of harm to any individuals undertaking such measurements and recordings, e.g. for lone-working (see 12.12).

The survey methodology should be undertaken as a progressive, information gathering process, should not impair the safety of the structure and should include, where and as appropriate:

- a) observation;
- b) close inspection;
- c) dimensional measurement;
- d) removal of, for example, panels and cladding, where appropriate, for the location of hazardous materials, including asbestos;
- e) on-site identification of materials, e.g. residues;
- f) sampling.

Key features that should be considered when organizing and planning sampling are included in Table 2.

Table 2 — Examples of key features for sampling

Key features	Potential hazards
Atmospheres	Breathable quality and explosive potential
Residues of chemicals	Toxicity and detrimental vapours
Organic deposits and growths	Pathogens
Water/moisture contents and residues	Toxicity, pathogens and materials strengths
Ground water	Assessment of migrated or deposited contaminants
Materials used in the construction	Chemicals and fibres
Structural materials and connections	Type, condition and thus residual strength
Materials changed during maintenance/refurbishment	Potential entrapment of hazardous material/weaker construction
Insulating materials	Chemicals and fibres
Paints and other preservatives	Lead and other chemicals

7.5.3 Outputs from the on-site survey

The findings from the site survey should be produced in a report which details the current state of the site and buildings, including true decommissioning status, and structural and health hazards (see clauses 9 and 10).

Full decommissioning should be achieved prior to the commencement of any demolition, however, where the site is not fully decommissioned the measures needed to achieve full decommissioning should be included in a supplementary decommissioning action plan (see 8.1.2).

7.6 Condition of adjoining premises

The results of the condition surveys of adjoining premises should be compiled into a report [see 6.2l)].

7.7 Dissemination of knowledge

A site report should be prepared which combines the outputs of the decommissioning work, the desk study, the site survey and the adjoining premises surveys. The site report should give the most accurate knowledge of the site available. The report should be regarded as a “live” document that should be updated whenever more information becomes available during the progress of the project. It should be used when developing projects, through the procurement process and into the works stage.

To ensure that all parties are aware of the current state of the site, the report should be made available to all appropriate parties as part of the dissemination of information for the site.

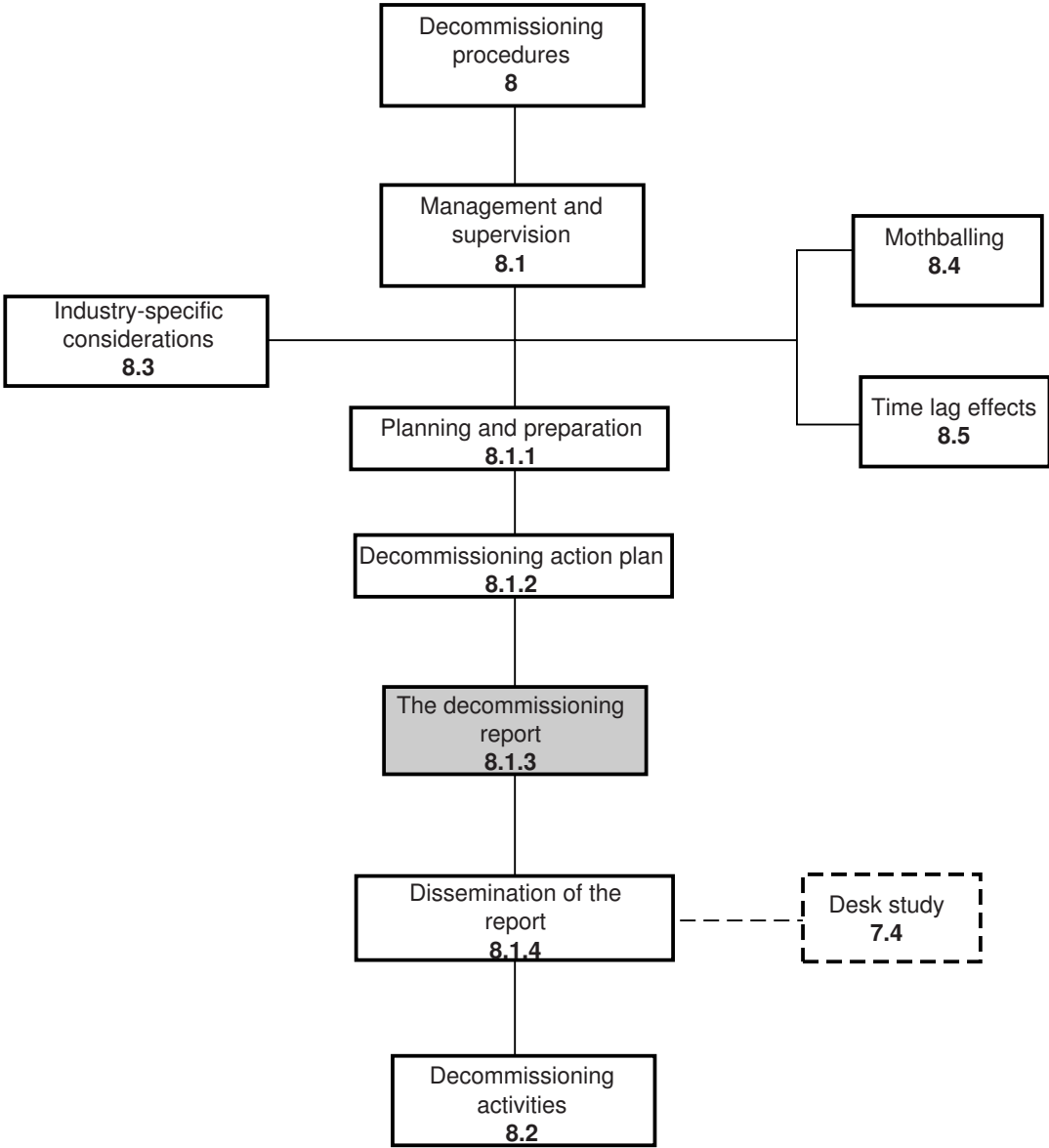


Figure 7 — Route map for clause 8

8 Decommissioning procedures (see Figure 7)

8.1 Management and supervision

8.1.1 Planning and preparation

A planned decommissioning procedure should be carried out by the client or body responsible for the premises, before the demolition of any buildings, structures or industrial plant. The objective of this procedure should be to bring the area to be demolished from its fully-operational status to one where all “live” or charged systems are rendered “dead” or reduced to the lowest hazard level.

If there is a delay (see 8.5) between decommissioning for demolition and the demolition itself, or if there is a change of plan such that a mothballed facility is to be demolished rather than brought back into service, the advice in 7.4.5 and 7.5.3 should be followed.

Planning and preparation should also include the elimination of any hazards specific to the process that has been carried out prior to closure of the facility. All hazardous materials should be identified and recorded in the action plan (see below).

Where hazards remain, for whatever reason, these should be made evident on site.

NOTE Further information can be found in *Decommissioning, mothballing and revamping*, published by the Institution of Chemical Engineers [37].

8.1.2 Decommissioning action plan

A decommissioning action plan should be prepared by the client as an aid to the effective management of decommissioning. The plan should identify key target dates, including termination of services, and activities to be achieved for decommissioning.

8.1.3 The decommissioning report

The client should ensure that the decommissioning procedure is fully and accurately documented. A comprehensive report should be produced showing exactly what has been carried out, based on the activities in 8.2, to reduce the inherent hazards. The decommissioning report should clearly state the extent of decommissioning and include details that can have health, safety or environmental implications during the course of demolition.

The report should also provide a general description of the nature of the plant or building, its age, the various processes that are likely to have been carried out, and details of any major changes like replanting or structural alterations.

Comprehensive drawings and plans, particularly those showing underground services and underground chambers or plant rooms, should be included.

8.1.4 Dissemination of the report (see also 7.7)

On completion of the decommissioning report, the client or body responsible for the premises should arrange for the report to be made available to those undertaking pre-contract site surveys and/or contaminated land/building investigations. The report should be made available to the planning supervisor for inclusion in the tender Health and Safety Plan.

8.2 Decommissioning activities

Decommissioning should include a number of activities that should, where appropriate, take into account any earlier decommissioning work which was not completed (for example, because of mothballing, see 8.4). Where relevant, decommissioning activities should include identification and action in respect of, for example:

- a) isolation, earthing, spiking and cutting of high voltage cables at points outside the demolition area;
- b) isolation of low and medium voltage cables not rendered “dead” by the actions taken above;
- c) disconnection of cables crossing the demolition area from buildings that are not to be demolished;
- d) disconnection and separation of emergency/standby direct current (d.c.) battery systems;
- e) removal of bulk process or other chemicals, including battery acids and oils;
- f) draining and purging of all process chemicals from pipework and vessels such that the plant is chemically inert;
- g) draining and purging of vessels and systems that have contained flammable or noxious gases; any such systems should be left vented to the atmosphere and ensuring that accumulation of fluids cannot occur;
- h) draining of all substantial heads of water;
- i) isolation of water and gas supplies at points outside the demolition area, or removal of a section of the pipework and the fitting of blanks or plugs;

- j) controlled release of stored energy in strong springs or suspended counterweights;
- k) removal or elimination of substances that can give rise to biological, chemical, explosive or radiological hazards;
- l) giving consideration to the removal of all asbestos, however present, or if not removed, to the preparation of an "Asbestos Register".

8.3 Industry-specific considerations

Particular industrial hazards related to, for example, the industries listed below, should be taken into account:

- a) chemical;
- b) power;
- c) offshore;
- d) nuclear;
- e) manufacturing industries;
- f) mineral extraction;
- g) food processing;
- h) health care;
- i) munitions.

8.4 Mothballing

Mothballing should be planned and executed in the same way as decommissioning, ensuring that every operation is undertaken with due regard for health, safety and environment, and is recorded.

In order to determine the method of mothballing, the following should be considered:

- a) the probability of re-commissioning ever being required;
- b) the extent of operation after re-commissioning;
- c) the length of period of preservation;
- d) the current state of the plant.

When planning the demolition of a previously mothballed facility, the decommissioning procedure should be re-activated and consideration should be given to the effect of the time lag.

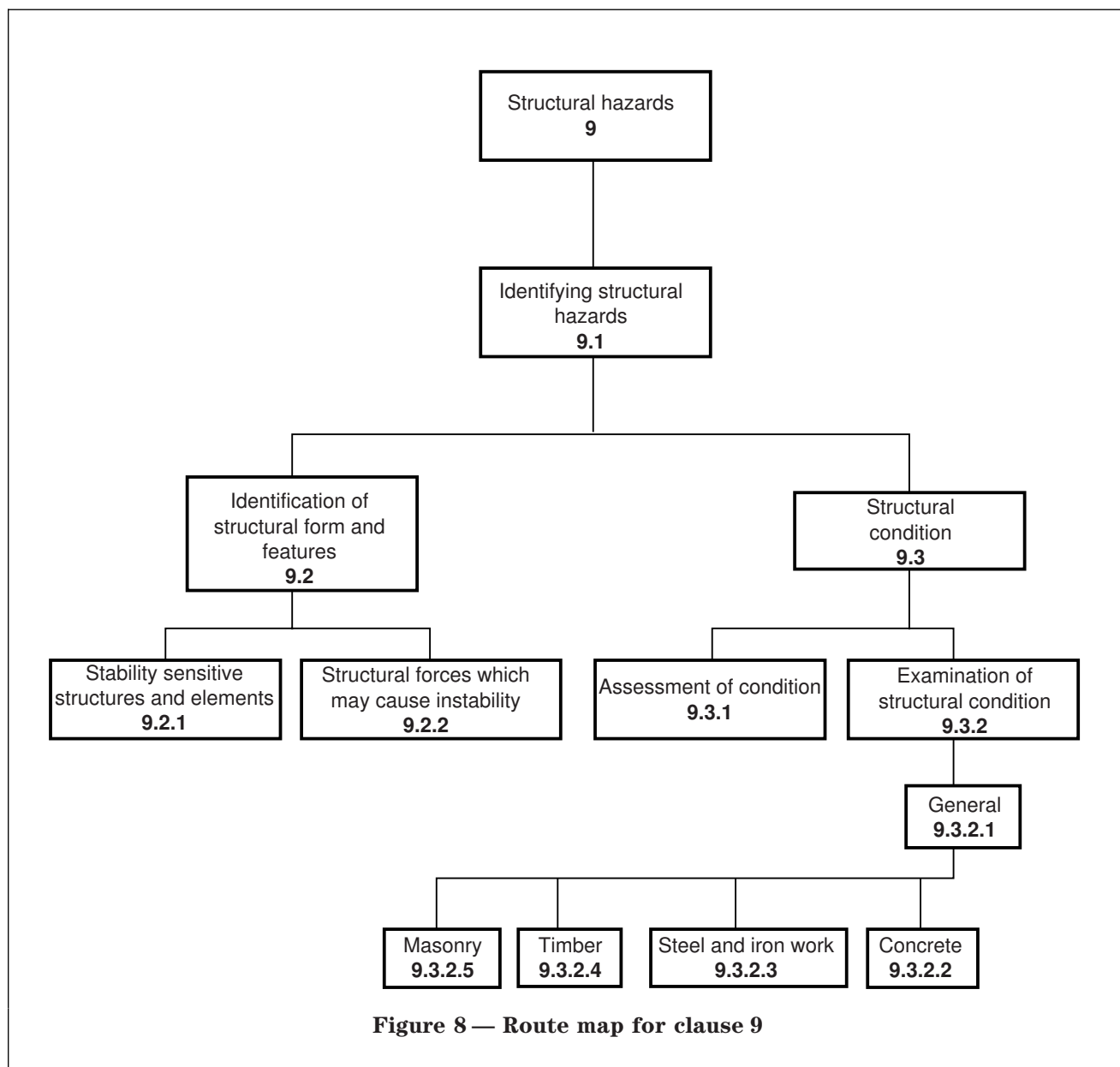
8.5 Time lag effects

The effects of time lag between taking a facility or part of a facility out of service and its demolition should be taken into account (see 8.1). The extent of the effects can vary and the following aspects should be considered and the length of time involved should be taken into account:

- a) the environment in which the facility is located;
- b) the extent of any earlier decommissioning (either full or partial);
- c) whether mothballed or not;
- d) the effects of weather;
- e) variations in water table;
- f) possible vandalism.

The effects to be considered should include:

- a) deleterious atmospheres;
- b) ingress and egress of fluids;
- c) the chemical action of contained substances;
- d) the deterioration of structures and containment vessels;
- e) reduced stability, e.g. weakening of foundations;
- f) impact damage;
- g) reduced strength of any support intended to be temporary, e.g. scaffolding;
- h) deliberate removal of parts of the facility for other uses elsewhere (cannibalizing).



9 Structural hazards (see Figure 8)

9.1 Identifying structural hazards

Structural form and features should be identified in order to reduce the risk of unplanned collapse of any parts of structures, whatever the size, during the demolition process. This information should be used to complement the advice given in clause 15 on avoidance of unplanned collapses. To achieve this, however, the ways in which loads are transmitted to the ground, i.e. the load paths, should be identified. The behaviour of the structure and its elements under the action of those loads will vary and should be understood. Structures that are designed with load paths which might not be immediately obvious from an initial inspection should be identified, e.g. when they are covered by cladding or suspended ceilings, or structures which have been altered during their lifetime, e.g. for a change of use, extension of the premises or provision of additional services.

9.2 Identification of structural form and features

9.2.1 *Stability sensitive structures and elements*

Structural features should be identified which are stability sensitive, and/or where structural problems are known to occur and can lead to particular problems in demolition. Consideration should be given to calling upon expert engineering advice to confirm the type of structure present. Problems that arise can be due to:

- a) inherent form, elements and features including those that rely on interdependency for stability of structures and buildings, including any modifications;
- b) intrinsically weak features of structures and buildings, including any modifications;
- c) stability features, including those that may be novel, of structures and buildings, as well as their effect on adjoining buildings and structures;
- d) site physical features, either natural or built, including those that are buried and that can affect stability, e.g. ground anchors.

Stability sensitive structures and elements that should be identified include:

- a) structures in which the floors are suspended by hangers, e.g. hanging bolts, from overhead cross beams supported by a structural central core;
- b) cable stayed roofs;
- c) shell or membrane structures such as barrel roofs and domes;
- d) space frame roofs;
- e) high bay warehouses;
- f) stressed-skin structures;
- g) low and high rise panel buildings including proprietary “system-buildings”;
- h) structures with unbalanced thrusts such as single and multiple arches, kilns, domes and single and multi-bay portal frames;
- i) structures, roofs and floors that rely on tie bars for stability;
- j) lift slab structures;
- k) retained facades;
- l) prestressed structures and components, e.g. in concrete;
- m) cantilevered features, e.g. balconies, staircases or heavy cornices;
- n) segmental, stayed and suspension bridges;
- o) tanks and silos;
- p) walls having been formerly restrained by roofs or floors;
- q) structures retained by features such as ground anchors.

NOTE See 15.2 and clause 19 for factors to be taken into account, and for examples of demolition techniques appropriate, for such structures.