



Establishing exclusion zones when using explosives in demolition

Construction Information Sheet No 45

Introduction

This information sheet gives advice to anyone who is involved in developing and assessing exclusion zones for demolition projects which use explosives. The advice concentrates on exclusion zones for the day of the blast. It does not address any other factors about using explosives to demolish a structure. This advice should be considered with other guidance and statutory requirements.

Exclusion zones

When designing for demolition using explosives you need to plan for the possible fly of projectiles. An exclusion zone should be established at a distance from and surrounding any structure which is being demolished using explosives. The zone needs to be designed and managed as part of the overall approach to the demolition. People outside the exclusion zone should be safe from the demolition work. Everyone, with the possible exception of the shotfirer, should be outside the exclusion zone at the time of the blast. If the shotfirer needs to remain within the zone, he or she should be in a safe position.

An exclusion zone is built up from four areas:

1 Plan area: the plan area of the structure that is to be demolished.

2 Designed drop area: the area where the bulk of the structure is designed to drop (ie, the area covered by the main debris pile which will include the plan area).

3 Predicted debris area: the area beyond the designed drop area in which it is predicted that the remainder of the debris from the structure could come to rest (ie, the maximum area in which fragments can be expected).

4 Buffer area: the area between the predicted debris area and the exclusion zone perimeter (ie, to allow an area between predicted maximum extent of debris and the boundary of the exclusion zone).

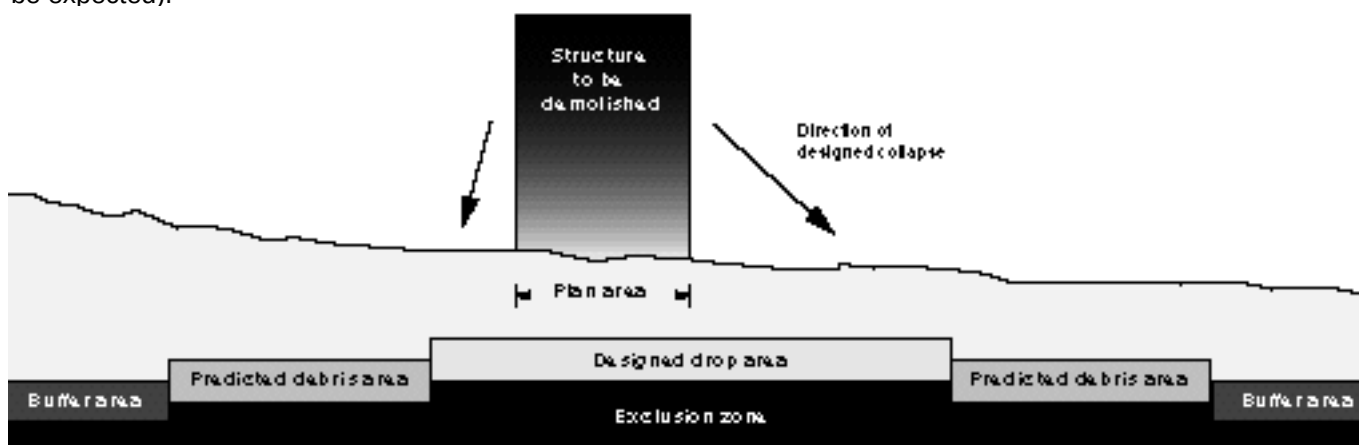
Establishing an exclusion zone

The size of the four areas which make up the exclusion zone should be assessed individually. You can identify the specific hazards and assess the risks for each demolition episode using explosives.

The size of the exclusion zone is not simply related to the height of the structure. The projection of any debris from explosive charges is a function of the energy of the explosion and the effectiveness of any blast protection. Risk assessment results may show that the size of the exclusion zone is not just dictated by the predicted projection of debris. For example, ground vibration which could damage services.

At each stage of the demolition planning process you need to consider the effect on the exclusion zone. The main factors that have a direct influence on the design of the exclusion zone include:

- designed collapse mechanism;
- structural form, materials used in construction and condition of the structure;
- planned pre-weakening;
- types of explosives;
- charge weights, locations and detonation sequences;
- integrity of the detonation system;



- degree and integrity of blast protection.

The following factors should also be considered:

- test blast results;
- historical and mathematical data from use of explosives;
- previous work experience and knowledge;
- site topography;
- the position of surrounding structures;
- possible 'slap effects' due to impact on the drop area, resulting in projectiles such as clods of earth, pieces of hard core used as cushion or other material being thrown from the landing area;
- ground vibration, surface shock wave, or air overpressure;
- noise;
- dust.

In any design for demolition by explosives the system should not depend on one design feature. The design needs to allow for unexpected events, eg by combining planned pre-weakening, the size and position of explosive charges, blast protection and the planned method of collapse and redundancy with the initiating system.

You should make use of the topography of the area to define the exclusion zone boundary. For example, footpaths, canals, rivers, buildings and bridges can form convenient barriers. If these features are outside the planned exclusion zone boundary, you could enlarge the zone so that they are included. This will establish a well defined perimeter to the exclusion zone which can be effectively policed.

The person with prime responsibility for designing the exclusion zone is the explosives engineer. Alterations to the exclusion zone should only be made after an assessment has been carried out by such a person. If the zone is changed, for whatever reason, the details of the alteration need to be communicated to all those involved in establishing and managing the exclusion zone.

Public safety and security

The public must be kept outside the exclusion zone until the all clear is given. After designing the size of the zone you should consider the feasibility and logistics of evacuating people from properties if they lie

within the boundary. Where the public have been evacuated from their houses within the zone, appropriate measures should be taken for their welfare during the evacuation period. Not only should the exclusion zone boundary be well controlled, but also vandalism or burglary of property within the evacuated exclusion zone needs to be prevented. This may involve contact with the local police. These issues of public safety and security are an important consideration when initially planning the demolition.

Further advice

BS 6187:2000 *Code of practice for demolition*

BS 5607:1988 *Code of practice for safe use of explosives in the construction industry*

While every effort has been made to ensure the accuracy of the references listed in this publication, their future availability cannot be guaranteed.

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Legislation

The Health and Safety at Work etc Act 1974
Management of Health and Safety at Work Regulations 1999
Construction (Design and Management) Regulations 1994

This information sheet contains notes on good practice which are not compulsory but which you may find helpful in considering what you need to do.

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