

Code of practice for

Safe use of explosives in the construction industry

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- Construction Health and Safety Group
- Construction Industry Training Board
- Department of the Environment (Property Services Agency)
- Federation of Civil Engineering Contractors
- Health and Safety Executive
- Institute of Explosives Engineers
- Institution of Civil Engineers
- Institution of Structural Engineers
- Ministry of Defence
- National Federation of Demolition Contractors
- National Federation of Master Steeplejacks and Lightning Conductor Engineers

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Foreword

This revision of BS 5607 was prepared under the direction of the Building Structures Standards Committee and supersedes BS 5607:1978, which is withdrawn.

This code of practice aims to define good practice in handling, transport and storage of explosives during the varied uses to which explosives may be put by the construction industry. Emphasis throughout the code has been placed on safety, particularly the safety of those engaged in using explosives for work on site and the safety of others who may be in the vicinity of that work.

Sections 1 and 2 contain general recommendations and information on legislative requirements relating to most uses to which explosives are put in the construction industry. Sections 3 to 7 are major specialist use sections where particular general recommendations are extended and more added.

The importance of security is recognized but this standard is not intended to address detailed security measures.

The code also lists the legislative requirements at present in force concerning explosives. These should be closely studied and carefully followed.

All legislative requirements relating to explosives in Great Britain form “relevant statutory provisions” as defined in the Health and Safety at Work etc. Act 1974. The advice on legal requirements given in this code relates to the law at the date of the publication of this code.

In this revision of the 1978 edition the following principal changes have been made.

- a) The section on underwater blasting has been modified considerably following experience gained in recent years.
- b) Text has been added covering the transport of explosives by air.
- c) Appendix A on safe practice in demolition has been amplified to provide guidance on procedure when dealing with defined “special structures”.
- d) Appendix B has been added, giving details of known educational establishments which provide blasting courses.

NOTE In three cases the word “must” has been used to indicate the importance of the safety procedures involved.

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.

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 40, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

Section 1. General

1 Scope

This code of practice gives recommendations for the safe storage, handling, transport and use of blasting explosives and accessories in construction and demolition operations.

Section 2 covers general requirements for handling and safety. Subsequent sections are concerned with safety in the use of explosives in special applications and situations such as tunnelling, demolition, excavation and underwater working.

NOTE The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definitions

For the purposes of this code the following definitions apply.

2.1

air blast

the production of air over-pressure caused by an explosion

2.2

ANFO

mixture of ammonium nitrate and fuel oil that can be used as an explosive

NOTE Preparation of ANFO outside a licensed explosives factory should be in conformity with the Health and Safety Executive licence granted under the provisions of the Ammonium Nitrate (mixtures) Exemption Order, 1967.

2.3

approved

authorized for use by an authority having jurisdiction

2.4

authorized explosive

explosive that is available legally in the United Kingdom

NOTE Such explosives are listed annually by the statutory authority of central government.

2.5

blackpowder

gunpowder used in blasting

2.6

blasting agent

mixture used for blasting that does not contain self-explosive ingredients such as nitroglycerine or TNT

NOTE This term is not used in official British classifications.

2.7

blasting area

area in which danger may arise from the preparation and handling of explosives prior to blasting, and from which outside hazards have to be excluded (e.g. flame, radio signals.)

2.8

canister

portable container specifically intended and designed to carry a small quantity of explosives or accessories

2.9

capped fuse

length of safety fuse fitted with a plain detonator

2.10

cartridge

wrapped or otherwise protected cylinder of defined size of a homogeneous explosive material

2.11

competent person

a person who, by reason of theoretical and practical training or actual experience or both, is competent to perform the task or function or assume the responsibility in question and is authorized to perform such a task or function

2.12

danger area

defined area or zone in which there exists a possibility of hazard to persons or property due to the use of explosives

2.13

delay detonator

detonator with a predetermined delay between initiation and detonation

2.14

detonating cord

flexible cord of spun textile fibres containing an explosive, and with a plastics coating. When initiated, it propagates a detonation along its length

NOTE There is a significant explosive effect outside the cord as the detonation propagates (see also 2.41 shock tube).

2.15

detonating relay

device for inserting into a detonating cord to produce a predetermined delay in transmission of a detonating wave

2.16

detonator

initiator for explosive materials that contains a charge of high explosive fired by means of a flame, spark, electric current or shock tube

2.17

emulsion explosive

explosive that contains sensitizers, oxidizers and fuels dispersed in an emulsion

2.18

exploder

device designed for firing electric detonators

2.19

explosive

substance or mixture of substances which is manufactured to produce a practical effect by explosion

2.20

explosives store

building or structure for the storage of up to 1 800 kg of explosive and licensed by a local authority

2.21

fly-out

projection of debris by an explosion

2.22

fume characteristics

qualitative nature of fumes produced by the detonation of an explosive, particularly as regards the percentages of noxious gases contained therein

2.23

fuse-lighter

device designed for igniting safety fuse and igniter cord

2.24

high explosive

explosive that detonates and produces an intense shock wave

2.25

lay-on blasting

blasting by placing an explosive against a rock boulder or other object without confining it in a shot hole

2.26

low explosive

explosive that produces large volumes of gases without creating an intense shock wave

2.27

magazine

building or structure used for the storage of explosive and licensed by the Health and Safety Executive for this purpose

2.28

misfire

complete or partial failure of an explosion, after action to initiate it

2.29

permitted explosive

explosive approved for firing in gassy mines

2.30

igniter cord

flexible cord of incendiary composition used mainly to ignite individual safety fuses when groups of shots are being fired in a sequence

NOTE An intense side flame is emitted when burning.

2.31

pop shooting

method used for the secondary breakage of material and employing small explosive charges confined in shot holes

2.32

pre-splitting

blasting technique used in solid ground in which relatively light charges are fired in closely spaced shot holes to effect a split

2.33

primary blasting

blasting by which material is dislodged from its original location

2.34

primer

cartridge or container of explosive into which a detonator or detonating cord is inserted or attached and which is designed to initiate a larger charge

2.35

registered premises

premises registered with the local authority and used for the keeping of small quantities of explosives

2.36

round

group of shots fired in one operation

2.37

safety fuse

flexible cord that contains an internal burning medium by which fire is conveyed at a continuous and uniform rate for the purpose of firing plain detonators or blackpowder, without burning in a similar fuse that may be in lateral contact alongside

2.38

secondary blasting

blasting to reduce oversize material to the dimensions required for handling

2.39**sensitivity**

ease with which a substance can be made to explode, or its liability to explode, when subjected to deliberate or accidental shock, friction or heat

2.40**shaped charge**

explosive charge shaped to concentrate the explosive force in a particular direction

NOTE A shaped charge is sometimes known as cavity or hollow charge.

2.41**shock tube**

plastics tube coated on the inside with explosive that, when initiated, propagates a shock wave along its length and initiates a detonator

NOTE It has virtually no effect outside the tube.

2.42**shotfirer**

person in immediate control of the use of explosives

2.43 Signals**2.43.1****warning signals**

predetermined visual and/or audible signals prior to the initiation of an explosion

2.43.2**all clear signals**

predetermined visual and/or audible signals given after an explosion and after checking that debris is free from misfires

2.44**slurry explosive**

explosive that contains sensitizers, oxidizers and fuels dispersed in a gel

2.45**stemming**

inert incombustible material used to confine or separate explosives in a shot hole

Section 2. General requirements

3 Preliminary procedures

3.1 Legislation

3.1.1 Reference should be made to the following legislation, as appropriate:

- a) Health and Safety at Work etc. Act, 1974.
- b) Explosives Acts 1875 as amended and 1923 and Orders in Council and Orders of Secretary of State made under them. (Guide to the Explosives Act obtainable from HMSO.)
- c) The Quarries (Explosives) Regulations 1959.
- d) The Miscellaneous Mines (Explosives) Regulations 1959.
- e) The Stratified Ironstone, Shale and Fireclay Mines (Explosives) Regulations 1956.
- f) The Coal Mines (Explosives) Regulations 1961 SI 1961 no. 854.
- g) The Construction (Lifting Operations) Regulations 1961.
- h) The Construction (General Provisions) Regulations 1961.
- i) The Construction (Health and Welfare Regulations) 1966.
- j) The Construction (Working Places) Regulations 1966.
- k) Control of Pollution Act 1974.
- l) The Clean Air Acts 1956 and 1968.
- m) Highly Flammable Liquids and Liquefied Petroleum Gas Regulations 1972, no. 917.
- n) Public Health (Recurring Nuisances) Act 1969.
- o) Control of Asbestos at Work Regulations¹⁾.
- p) Ammonium Nitrate Mixtures (Exemption) Order 1967.
- q) The Classification and Labelling of Explosives Regulations 1983.

3.1.2 Certain local authorities have special powers of control granted under local act of parliament.

3.1.3 Special regulations may apply in Northern Ireland, the Channel Islands, Isle of Man and the Scilly Isles, and should be checked prior to operations in these areas.

3.2 Survey

3.2.1 Before any works involving the use of explosives are started, a detailed survey and examination of the site, buildings or structures and adjoining areas and property should be made. Procedures for the survey of sites is set out in BS 5930. When earthworks, tunnelling or demolition are involved, reference should be made to the relevant British Standard codes of practice (BS 6031, BS 6184 and BS 6187 respectively).

3.2.2 Special attention should be given to the character and structure of the geological strata present on site to ensure that it is not specially liable to transmission of ground vibration to areas where it is likely to cause damage to property or slip of strata. Due care should also be taken to avoid disruptions or damage to underground wells, tunnels, storage tanks, mine workings and other underground voids.

3.2.3 Utilities also require special consideration, and the proximity of underground and overground services should be carefully considered before blasting operations are carried out. Consultations should be carried out with the necessary authorities who are responsible for concealed underground works (see **3.4.3**).

3.2.4 Special attention should be paid to the presence of power cables, radar, radio and television transmitting stations near intended blasting operations, since under special conditions these can cause premature firing of electric detonators (see BS 6657). On site use of citizen's band radios, site radio transmitters and radio telephones should be strictly controlled during blasting operations.

Extreme caution should be exercised when using electric detonators adjacent to public highways as illegal over-powered transmitters could be carried on vehicles passing close to the area of blasting. Serious consideration should be given to the use of non-electric detonating systems or electric systems incorporating additional safeguards (such as high firing current fuseheads or transformer coupled circuits). **WHERE ANY POSSIBLE DOUBT REMAINS NON-ELECTRICAL MEANS OF FIRING SHOULD BE ADOPTED.**

3.2.5 Blasting operations carried out close to public highways and railways also require other special considerations, and it is necessary to give prior notification of intended blasting to the appropriate authority.

¹⁾ In preparation.

3.2.6 Expert advice or help should always be sought before proceeding with any work where the following sources of danger are found or could be expected.

- a) Flammable or toxic gases, liquids or dusts including carbon monoxide, sulphur compounds, carbon dioxide, deoxygenated air, town gas, natural gas, methane, oxides and nitrogen. (This list is not necessarily comprehensive.) Consult: HM Inspector of Factories and HM Inspector of Mines.
- b) Flammable liquids. Consult: HM Inspector of Factories, or local authority petroleum officer as appropriate.
- c) Sewage and draining. Consult: Regional water authority.
- d) Unexploded missiles or mines. Consult: Police.
- e) Waste explosive. Consult: Explosives supplier or HM inspector of Explosives.

NOTE When working in existing industrial plants or areas, the appropriate managements should be consulted.

3.3 Contract

A formal contract in writing should be entered into between the owner of the structure or site and the contractor appointed to carry out the construction or demolition operations. Professional advice should be taken in the preparation of tender and other contract documents.

3.4 Statutory notices

3.4.1 Before any construction or demolition works are started in England and Wales, whether or not it is intended to use explosives, the site owner or the appointed agent should give notice to the local authority (District Council) as required under the Public Health Act 1961 and the Building Act 1984 and should comply with any requirements the Local Authority may make under this Act.

In Scotland before any work is commenced a warrant is required from the Building Authority of the Region, District or Island Councils as laid down by the Buildings (Scotland) Act 1959 and the Scottish Development Department. In Northern Ireland, the police and local authorities should be advised before any work is undertaken.

No work should take place until permission from the appropriate authority is obtained.

Application for prior consent should also be made under Section 61 of part III (Noise) of the Control of Pollution Act 1974.

3.4.2 Special requirements come into force if it is intended either to transport explosives between sites or where it is intended to store explosives on site. If more than 1 800 kg of explosives are to be stored, a licence is required from the Health and Safety Executive who will also specify the construction requirements of the magazine.

For quantities between 75 kg and 1 800 kg the store has to be licensed by the appropriate local authority, who will lay down the requirements for the siting and construction of the store within the terms of their jurisdiction and powers.

Smaller quantities than 75 kg can be stored in the appropriate registered premises. In case of difficulty it is advisable to obtain guidance from the police or the Explosives Inspectorate for their advice on security.

3.4.3 Prior to the commencement of any works using explosives, the site owner or his appointed agent is required to give notice to all statutory undertakings who may be affected, for example, water, gas and electricity authorities, telephones, railways, police, and airports. Notice should also be given to those responsible for other installations, such as relay radio and television lines, hydraulic pressure mains overhead lines so that arrangements may be made for cutting off, diverting and stopping and for ensuring that all services have been rendered safe. Notification should be given at as early a date as possible but never later than 24 h before the planned blasting operation. Where there is any fire risk to explosives or associated with their use the local fire authority should be informed.

3.4.4 When other property may be affected by the blast the owner or occupier should be given sufficient notice for consideration of such matters as the need for temporary and permanent protection, the effects of disturbance by noise or vibration, and that ensuring no damage or inconvenience is caused to the adjoining owner's rights and interests. In many cases this will mean the preparation of schedules of condition of adjoining property and contents. Photographs have proved to be of great assistance in this.

3.5 Code of signals

3.5.1 Before any blasting commences on the construction site, both audible and visual signalling systems giving warning of blasting operations should be established.

These should be such that they can be clearly heard and seen by site personnel working within the site areas, and also by the general public who may be affected.

3.5.2 Audible warnings should comprise a series of readily recognizable signals such as may be given by a hooter or whistle with a distinctive tone. Typical codes might be as follows.

a) For minor blasting operations where there is a small danger area the shotfirer makes several short blasts on a whistle indicating that blasting is imminent. The shot-firer then checks that the danger area is clear, checks circuit, connects firing cable to exploder, makes three long blasts on the whistle immediately followed by the initiation of the blast. After checking that there have been no misfires and the area is safe to enter the “all clear” is given by one long blast on the whistle.

b) In major blasting operations where there is a large danger area and particularly where the public is affected, the danger area is physically cleared by site personnel and police and lookouts posted. Five 5 s hoots at 5 s intervals are made 5 min before blasting is due. 10 s before initiation of blast one 5 s hoot or a small detonation is made giving a 5 s or 10 s countdown.

After checking that there are no misfires and the area is safe to enter the “all clear” is given by one 20 s hoot.

No persons should return to their work location until the “all clear” signal has been given.

The actual code of signals may be varied from the above to suit site conditions, but once established for a particular site, it is essential that they are not altered without good reason and adequate warning to personnel.

3.5.3 Visual signs should comprise clearly painted notices, posted on all access roads to the site and sited safely outside the danger zone. Sentries should be posted at the accesses at blasting times with clear instructions as to when they have to stop access to the site, and when they can allow access. Where public roads pass close to the site there may be danger to traffic from projected material. The assistance of the police should be sought in controlling traffic.

Special sentries should be appointed to warn personnel who might fail to hear warning signals, because of noisy machinery or other diversions during blasting.

In situations where controlling public access to the site is difficult, it is important to consider the use of additional visual signals such as a red flag or flags, which are commonly indicative of danger. These should be displayed in prominent positions, e.g. on a tower, flag pole or high fence when blasting is in progress, so as to be generally visible over a wide area.

Where control of site personnel is awkward because of the presence of different contractors and progression of different jobs on the site, special shelters with sentries should be appointed. Each sentry should check that all working groups and individuals under his control have retired to shelter during the blasting period.

3.6 Smoking and fires

3.6.1 Smoking, fires, use of flame or heat producing equipment such as welding or cutting torches, or equipment which could cause or produce sparks should not be allowed near stored explosives or any place where explosives are being handled, transported or used except with the authority of the site manager and under the supervision of the shotfirer.

3.6.2 If a fire should occur in the vicinity of explosives, the fire brigade and police should be called and all persons, apart from the fire fighting team, kept at a safe distance. If the fire involves or reaches the explosives or the store all personnel should be moved to a safe distance.

3.6.3 Special precautions should be taken when using explosives in the presence of waste paper, dry timber and vegetation, especially after a hot dry spell of weather which might produce unusual hazards. Should an occasion arise where there is a need to burn rubbish to clear a site, this should be done before explosives are brought on site or after their removal. If explosives are already present on site, then predetermined procedures should be followed to ensure that the fire produces no hazard. Any such fires should be closely contained and well supervised. Fire fighting procedures should be established.

3.6.4 No explosive or blasting agent should be taken into an area where there has been a fire until the fire is completely out and the ground cooled.

3.7 Supervision and responsibility

3.7.1 It is essential that only competent persons (see 2.11) are employed as shotfirers for the type of work involved.

3.7.2 When one or more contractors are taking part in the work on the same site, the main or managing contractor should ensure close liaison and collaboration with the contractor responsible for the explosives work in the planning and execution of the work so as to prevent any hazard to personnel, materials or equipment when carrying out work with explosives. It should be arranged that all site personnel present during blasting operations should come under the control of the explosives contractor and his shotfirer.

It is also important that contractors agree hazard areas with particular reference to the danger of fire.

3.8 Security

3.8.1 General. In a licensed store, registered premises or magazine, which are authorized storage places, the explosives are under the control of the occupier. Once removed from the place of storage the explosives should be under the control of an authorized person or the shotfirer. Under no circumstances should explosives be left unattended or abandoned. At all times explosives must be either in a locked authorized storage place or constantly supervised. All unused explosives should be returned to an authorized store.

Proper precautions should be taken to ensure the security of explosives during storage and transport.

The exploder key should be in the shotfirer's possession all the time the explosives work is in progress.

3.8.2 Loaded shot holes. Loaded shot holes should not be left unattended.

3.9 Damaged or contaminated explosives

These should be handled with particular care and disposed of on site if possible. If they are returned to store they should be kept separate from serviceable material until adequate disposal arrangements can be made. All reasonable speed should be used to dispose of such material (see 5.13).

4 Protective precautions

4.1 General

This clause is concerned with matters affecting the safety of all persons, including the general public, property and equipment on a construction site where explosives are to be used and in the adjacent area likely to be affected by their use. A written system of work should be prepared that defines the overall plan of work and the duties and responsibilities of the persons and authorities involved.

4.2 Protection of site personnel and installations

4.2.1 The handling of explosives on the site should be restricted to personnel who are required to do so in the discharge of their duties and who are authorized, preferably in writing, by the site management. All site personnel should, however, be warned against maltreatment of explosives and blasting accessories, and of the dangers of accidental ignition or initiation of explosives and explosive devices by severe impact, friction, flame or electrical impulse.

4.2.2 The contractor should provide all tools and equipment used in charging and firing blasts, and the shotfirer should not use tools or equipment other than those provided by the contractor. Items such as connecting wire and insulation tape should be used only once, and other items such as charging/stemming rods, cartridge lowering ropes and shotfiring cables may, because of wear or damage, require frequent replacement, and the shotfirer should inform the management when this is necessary. Shotfiring cables particularly are prone to damage and should be examined before use for cuts or abraded insulation and for broken wires. Damaged shotfiring cables often lead to trouble with misfires because of current leakage in the detonator/cable/exploser circuit, and for this reason lengths of cable which show signs of damage should be discarded.

Circuit testers and exploders should give trouble free service if handled with care and used and maintained in accordance with the manufacturer's instructions. Any malfunction of these items should immediately be reported by the shotfirer to his management, and any repair should be carried out only by a competent person. The regular testing of exploders and calibration of ohmmeters is recommended.

4.2.3 Personnel authorized to handle explosives should not carry any flame-producing equipment such as lighters or matches, when in, or close to, places of storage, or where explosives are being used, except for the express purpose of firing a charge.

4.2.4 At no time when they are being handled on site should explosives be placed in locations where there may be a danger from falling rocks or other objects. Nor should they be placed in or near to the path of vehicles or mobile plant, nor close to sources of heat or sparks, e.g. boilers, steam pipes. It is essential that electric detonators in particular are kept well away from electrical switchgear, cables, batteries, etc. Electrically operated machinery, or mechanical plant and vehicles which have ancillary electrical equipment, such as starter motors, generators, batteries, lights, can also be hazardous. Electric welding equipment can also be particularly hazardous in the vicinity of electric detonators.

4.2.5 The area where explosives are to be used should be defined by warning notices or flags before the charging of blasts. Explosives and accessories other than detonators should be stacked in orderly piles close to the shot holes and should never be left unattended. Vehicles and other mobile equipment should be prohibited from entering the defined blasting area, except as required to deliver or remove explosives.

At other times when explosives are in transit between the explosives store and the blasting area their presence should be clearly indicated by warning signs or flags. Where intermediate standing points cannot be avoided they should not be left unattended.

4.2.6 Electric detonators should only be transported around a construction site in a box or boxes made of non-conducting material, preferably wood, with a lid and catch. Their design should make it impossible for any detonator leading wire to be exposed when the box is closed. While he is still at the blasting site, the shotfirer should check the number of detonators used against the number issued so as to avoid losing or misplacing detonators. A system of recording issues against usages is essential to establish correct working practices in this respect. Detonator boxes should be kept locked when access is not required to contents. (See **6.2.4** for exceptional circumstances in tunnels.)

4.2.7 After the setting of a charge all surplus explosives, detonators, fuses, etc., should be returned immediately and moved to a safe and secure position under the shotfirer's control. As soon as practicable they should be returned to the store. The only situations in which this procedure may be relaxed are as follows.

- a) In tunnels, where surplus explosive may be kept, between successive blasts, in a lockable reserve station authorized by the site management. If the station is not handed over to the following shift then all explosives have to be returned to the licensed store.

- b) At blasting areas where there are no permanent storage premises, supplies are drawn instead from a distant licensed store as required. In such cases, after setting a charge, surplus explosives and accessories should be returned to the custody of designated senior site supervisors who should be authorized and instructed as to their safe keeping. The supervisor should ensure that such surplus explosives are returned the same day to the licensed store before work is finished for the day.

4.2.8 Blasting should not be carried out in confined spaces without adequate ventilation to disperse and remove the blasting fumes before returning. In tunnels and sinking shafts in particular, where blasting operations are routine, positive ventilation at the working face should be maintained at all times. No one should return to the working face until adequate time has been allowed for fume dispersal. (See **9.6.3**.)

4.2.9 The danger area from each blast has to be determined by the shotfirer, preferably after consultation with the site foreman. All site personnel should be instructed in the signalling systems giving warning of blasting operations. They should also be instructed as to what places of shelter they are to take up. Before firing a blast the shotfirer should satisfy himself that all personnel have cleared the danger area and that sentries are posted at all access points. He should himself take proper shelter.

After a blast no personnel should be allowed to return to the danger area until the shotfirer (and site foreman) have conducted a general examination, declared the area safe and sounded the all clear signal. The examination should include a search for misfires, and general observation of the site security from the point of view of ground stability, rock overhangs, dispersal of blasting fumes, etc.

NOTE It is never safe for shelter points to be located in front of a blasting face. In this context "in front", refers to the direction in which the debris might be expected to be displaced from the blast.

4.2.10 Mobile plant and equipment such as excavators, haul and dump trucks, compressors and drilling machines may be severely damaged by debris projected by blasting. Such equipment should be moved to a place of shelter when a blast is to be fired, switched off, and the operator should also take shelter.

Where blasting is in close proximity to services such as overhead electricity supply lines, telephone lines, water and gas mains, care should be taken both in the choice of blasting technique and in the provision and placing of coverings, barriers, etc., to protect the installations.

4.3 Safety and convenience of third parties

4.3.1 The security of the general public who may reside, work or travel in the vicinity of a construction site should be considered when blasting operations are planned.

4.3.2 Consideration should be given to the possibility of excessive debris projection and to the projection of a small quantity of debris over a greater distance than normally expected. The latter is particularly important because of the natural curiosity of members of the public wanting to observe blasts.

4.3.3 Persons living or working in the vicinity should therefore be thoroughly familiarized with the blasting procedures, frequencies and warning signals. Where necessary they should be advised to vacate their homes or places of work during blasting operations.

Where the hazard is severe, the cooperation of the police should be sought in ensuring that all buildings are vacated.

4.3.4 In areas where there is no property adjoining the site, attention to security may tend to become lax, and members of the general public may approach the site unnoticed. In addition to notices giving warning of blasting on all roads and paths approaching the site, sentries should be posted to maintain an uninterrupted ring of surveillance around the site when blasting is in progress.

4.3.5 The blasting technique should be chosen so that any annoyance to the general public from noise, ground vibration, dust, etc., is limited as far as possible.

In heavily built-up areas, small-scale blasting techniques employing light charges in small diameter holes and delay detonation will often be most suitable. In such situations careful placement of shot holes and the correct choice of charge weights are essential to minimize excessive debris projection. The work should only be done by a shotfirer of wide experience. Such projection of debris is most often from the "collar" or top of the shot holes. It is essential that care is exercised in the selection, placing and securing of screening materials so that the screening does not itself become a missile.

5 Safety and transport and storage on site

5.1 General

5.1.1 Any person who stores explosives or detonators in the United Kingdom is required by law to keep such explosive materials in either a magazine or local authority licensed store or possibly, in the case of smaller amounts, in registered premises. Before he can acquire explosives he will need to be in possession of a certificate from the police certifying that he is a fit and proper person to acquire and keep explosives, and without such a certificate he will be unable to acquire them from the manufacturers or suppliers. Table 1 is a simplification of the requirements for bulk explosives and detonators, and is not correct for fireworks, gunpowder or ammunition.

5.1.2 Persons wishing to keep explosives should apply for the necessary licence in ample time. The local authority officer responsible for explosives should be consulted as soon as the need to keep the explosives has been established.

5.2 Planning

5.2.1 As the requirements regarding transport and storage of explosives will depend to some extent on the type and quantities of materials to be used, it is important to decide the techniques which are to be applied before any action is taken to arrange storage or transport. Once this has been decided the best position for any store needed should be determined in consultation with the local authority officer responsible for explosives. It may not be possible to obtain storage facilities for the required quantity of explosives because of the proximity of structures and services which need to be protected, it should be realized that the local licensing authority has no discretion whatsoever to reduce the safety distances required by the stores under the Explosives Orders [see 3.1.1 b)]. The police should also be consulted when the matter of siting is under consideration as they will be concerned as to the vulnerability of any store to an attempt at theft. There are stringent requirements for the construction of stores to ensure that they are difficult to break into. Local authority explosives officers will be able to give detailed advice as to the standards of construction required, sources from which stores may be purchased and the method of mounting of such stores.

5.2.2 If it is proposed to use ANFO types of explosive, prepared on site, it will be necessary for the user to obtain a licence to manufacture such explosives. Application should be made to HM Explosives Inspectorate for such a licence.

Table 1 — Storage of explosives

Maximum quantity allowed	Method	Is a fit persons' certificate needed?
kg		
5	Police Private Use Certificate	Yes
7	Mode B Registered Premises	Yes
30	Mode A Registered Premises	Yes
75	Division A Licensed Store	Yes
150	Division B Licensed Store	Yes
450	Division C Licensed Store	Yes
900	Division D Licensed Store	Yes
1 800	Division E Licensed Store	Yes
Unlimited (by licence)	Magazine	No
	Under Local Authority Control	
	Under HSE Control	

WARNING NOTE. An Immediate Use Certificate from the police force of the county does NOT allow the holder to store explosives.

5.2.3 In general, the types of explosives used in this country may all be stored in the same place whether they be nitroglycerine or TNT based explosives, slurry explosives or of the ANFO type. Detonating fuse may also be stored in the same compartment as such explosives. It is essential that detonators are stored separately but most of the commercially available explosives stores have, attached to them, a separate structure suitable for the storing of detonators. Special conditions apply to explosive devices containing exposed iron or steel. Care should be taken to ensure that any store or magazine used is licensed for the type of explosives to be stored within it and in any case of doubt the explosives officer for the area concerned should be consulted.

5.2.4 Transport of explosives in quantities of more than 50 kg is subject to special regulations (Order of Secretary of State no. 11, Explosives Act 1875) and it will be necessary to use specially constructed vehicles to convey explosives in such quantities. It is usually more convenient to arrange that the suppliers of the explosive, who will normally have special vehicles available to them, should deliver explosives in such amounts when any part of the transport involves conveyance on public roads. If the work proposed will involve conveyance of explosives in quantities of 50 kg or more, on site, and it is proposed to use the contractor's vehicle for this purpose, it is desirable that at least one vehicle be provided which meets the requirements for conveyance of explosives on public roads.

There are also regulations which have to be met for the conveyance of explosives in quantities of less than 50 kg, although these are not quite as stringent. If it is foreseen that it will be necessary to carry explosives, on site, in a motor vehicle, such a vehicle should be provided for use of the shotfirer. While explosives are being handled this vehicle should be used solely for the purpose of conveying explosives and should not be regarded as being available for general site use.

5.2.5 As the techniques to be used and the phasing of work on a site will have a marked effect on both the size of explosives store needed and the transport arrangements necessary, it is essential that these be established at the planning stage.

5.3 Safety during storage

The shotfirer should be made responsible for the explosives store or magazine, for its cleanliness, for the proper location of stock, the keeping of records (see 5.4.2) and for good housekeeping in general. It is a legal requirement that copies of the appropriate general rules for explosives stores (or magazines) be displayed in the place used to store explosives.

5.4 Storage procedure

5.4.1 Extreme caution should always be exercised during the unloading of explosives. Cases containing explosives should never be roughly handled, slid on ramps or dropped. Either the explosives should be handled only by the supplier's own men or by the shotfirer himself, or, if it is necessary to use unskilled men for this purpose, they should be allowed to handle the materials only under the direct supervision of the shotfirer. Care should be taken to ensure that, during delivery of explosives to a storage place or during the removal of material from it, no grit is allowed to contaminate the cases or the store and the floor of any such storage place should be thoroughly swept after any delivery or withdrawal of explosives.