



Explosives at Quarries

**Quarries (Explosives) Regulations
(Northern Ireland) 2006**

**APPROVED CODE OF PRACTICE
AND GUIDANCE**

This publication contains the text of the Quarries (Explosives) Regulations (Northern Ireland) 2006, together with an Approved Code of Practice and Guidance. These elements are identified as follows.

Regulation

The Regulations are marked thus in the margin and are in *italic* text.

ACoP

The Approved Code of Practice is marked thus in the margin and is in **bold** text.

Guidance

The Guidance is marked thus in the margin and is in normal text. Footnotes and appendices are guidance material unless explicitly stated.

**Approved
Code of
Practice**

This Code has been approved by the Health and Safety Executive for Northern Ireland, with the consent of the Secretary of State. It gives practical advice on how to comply with the law. If you follow the advice you will be doing enough to comply with the law in respect of those specific matters on which the Code gives advice. You may use alternative methods to those set out in the Code in order to comply with the law.

However, the Code has a special legal status. If you are prosecuted for breach of health and safety law, and it is proved that you did not follow the relevant provisions of the Code, you will need to show that you have complied with the law in some other way or a court will find you at fault.

Guidance

This guidance is issued by the Health and Safety Executive for Northern Ireland. Following the guidance is not compulsory and you are free to take other action. But if you do follow the guidance you will normally be doing enough to comply with the law. Health and safety inspectors seek to secure compliance with the law and may refer to this guidance as illustrating good practice.

Acknowledgement

This Approved Code of Practice and Guidance publication is based on Part V (“Explosives”) of the Approved Code of Practice *Health and safety at quarries* approved by the Health and Safety Commission in Great Britain, whose assistance is gratefully acknowledged.

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**Notice of
Approval**

By virtue of Article 18(1) of the Health and Safety at Work (Northern Ireland) Order 1978, after consultation in accordance with Article 18(2) of that Order and with the consent of the Secretary of State pursuant to Article 18(2) (read with Article 53(1)) of that Order, the Health and Safety Executive for Northern Ireland (“the Executive”) has on 27th July 2006 approved the Code of Practice entitled *Explosives at Quarries: Quarries (Explosives) Regulations (Northern Ireland) 2006*.

The Code of Practice is approved for the purposes of providing practical guidance with respect to the requirements of the Quarries (Explosives) Regulations (Northern Ireland) 2006. The Code of Practice comes into effect on 1st August 2006.

Reference in this Code of Practice to another document does not imply approval by the Executive of that document except to the extent necessary to give effect to this Code of Practice.

Signed

Jim Keyes

T J Keyes

Chief Executive of the Health and Safety Executive for Northern Ireland

27 July 2006

Introduction

The Quarries Regulations (Northern Ireland) 2006 (“the Quarries Regulations”) and the Quarries (Explosives) Regulations (Northern Ireland) 2006 (“the Explosives Regulations”) were made under the Health and Safety at Work (Northern Ireland) Order 1978. Both came into operation on 1st August 2006. The Regulations apply to all quarries. The full text of the Regulations can be obtained from TSO¹ or they may be viewed by clicking on the following links: [the Quarries Regulations](#) [the Explosives Regulations](#)*.

The Great Britain Approved Code of Practice (ACoP) *Health and safety at quarries*† has been approved for use with the Quarries Regulations with the exception of Part V, which relates to explosives. This document contains an ACoP and Guidance on the duties in the Explosives Regulations.

The Quarries Regulations and the Explosives Regulations are intended to protect the health and safety of people working at a quarry and others who may be affected by quarrying activities. They apply to both employees and the self-employed. They are also intended to safeguard people not working at the quarry (e.g. those living, passing or working nearby, or visiting, for example to buy materials)‡.

It is important to remember that a legal duty under one of these Regulations cannot be passed on to someone else by means of a contract. For example an operator who appoints a contractor as Explosives Supervisor still has the ultimate legal responsibility under regulation 4 to ensure that explosives work is carried out safely.

Other health and safety legislation also applies to quarry work. These Regulations do not relieve anyone of his or her duties under such legislation. The most relevant legislation is listed the table on the following page.

* 16 Arthur Street, Belfast BT1 4GD; telephone: (028) 9023 8451; fax: (028) 9023 5401
e-mail: belfast.bookshop@tso.co.uk.

† *Health and safety at quarries: Quarries Regulations 1999: Approved Code of Practice* L118; ISBN 0 7176 2458 7.

‡ Other specific legislation will take precedence in some cases. This includes the Road Traffic (Northern Ireland) Order 1995 for vehicles on public roads and the Industrial Pollution Control (Northern Ireland) Order 1997 for off-site dust, noise and vibration.

<i>Title</i>	<i>Summary</i>
Health and Safety at Work (Northern Ireland) Order 1978 ²	General duties to ensure health and safety of employees and others so far as is reasonably practicable.
Manual Handling Operations Regulations (Northern Ireland) 1992 ³	Control of risks from handling heavy and awkward loads.
Personal Protective Equipment at Work Regulations (Northern Ireland) 1993 ⁴	Provision and use of personal protective equipment.
Workplace (Health, Safety and Welfare) Regulations (Northern Ireland) 1993 ⁵	General workplace issues, inside and out including traffic routes and prevention of falls.
Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (Northern Ireland) 1997 ⁶	Duties to report accidents, diseases and dangerous occurrences.
Confined Spaces Regulations (Northern Ireland) 1999 ⁷	Safe working in confined spaces, i.e. where there is a risk of death or serious injury from hazardous substances or dangerous conditions (e.g. lack of oxygen).
Lifting Operations and Lifting Equipment Regulations (Northern Ireland) 1999 ⁸	Requirements regarding the use of lifting equipment.
Provision and Use of Work Equipment Regulations (Northern Ireland) 1999 ⁹	Machinery, vehicle and other work equipment suitability and safety.
Management of Health and Safety at Work Regulations (Northern Ireland) 2000 ¹⁰	General management of health and safety including availability of health and safety advice and risk assessment.
Control of Substances Hazardous to Health Regulations (Northern Ireland) 2003 ¹¹	Control of health risks.
The Control of Noise at Work Regulations (Northern Ireland) 2006 ¹²	Control of exposure to noise.

Regulation 1

Regulation

Citation and commencement

These Regulations may be cited as the Quarries (Explosives) Regulations (Northern Ireland) 2006 and shall come into operation on 1st August 2006.

Regulation 2

Regulation

Interpretation

In these Regulations—

“appoint” in relation to a person means appoint in writing with a written statement summarising his duties and authority;

“competent” in relation to a person means a person with sufficient training, experience, knowledge and other qualities to enable him properly to undertake the duties assigned to him;

“detonator” means an initiator for explosives that contains a charge of high explosive fired by means of a flame, spark, electric current or shock tube;

“excavation” means any place at the quarry where minerals are or have been extracted and includes the ground, faces or sides of the quarry and any other incline;

“exploder” means a device designed for firing detonators;

“explosive” means an explosive article or explosive substance;

“explosive article” means an article containing one or more explosive substances;

“explosive substance” means—

(a) a solid or liquid substance, or

(b) a mixture of solid or liquid substances or both,

which is capable by chemical reaction in itself of producing gas at such a temperature and pressure and at such a speed as could cause damage to surroundings or which is designed to produce an effect by heat, light, sound, gas or smoke or a combination of these as a result of non-detonative self-sustaining exothermic chemical reactions;

“explosives” means explosive articles or explosive substances;

“explosives store” means—

(a) premises registered in accordance with section 21 of the Explosives Act 1875(a) (“the 1875 Act”);

(b) a store licensed in accordance with section 15 of the 1875 Act; or

(c) a magazine licensed in accordance with sections 6 to 8 of the 1875 Act;

“misfire” means an occurrence in relation to the firing of shots where—

(a) 1875 c. 17

Regulation

(a) *testing before firing reveals broken continuity which cannot be rectified; or*

(b) *a shot or any part of a shot fails to explode when an attempt is made to fire it;*

“operator” in relation to a quarry means the person in overall control of the working of the quarry;

“quarry” has the meaning assigned to it by the Quarries Regulations (Northern Ireland) 2006(a);

“safety fuse” means a 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 black powder, without initiating burning in a similar fuse that may be in lateral contact;

“shot” means a single shot or a series of shots fired as part of one blast;

“shotfirer” means a person appointed pursuant to regulation 4(2)(a)(ii) to be responsible for shotfiring operations;

“shotfiring operations” include—

(a) *checking to ensure that the blasting specification is still appropriate for the site conditions at the time the blasting is to take place;*

(b) *mixing explosives;*

(c) *priming a cartridge;*

(d) *charging and stemming a shothole;*

(e) *linking or connecting a round of shots;*

(f) *withdrawal and sheltering of persons;*

(g) *inspecting and testing a shotfiring circuit;*

(h) *firing a shot; and*

(i) *checking for misfires;*

“trainee shotfirer” means a person appointed pursuant to regulation 4(2)(a)(ii) to undergo training in shotfiring operations under the close personal supervision of a shotfirer; and

“vehicle” means any mechanically propelled vehicle (including mechanically propelled plant).

Regulation 3

Application

Regulation

These Regulations shall apply to the storage, transport and use of explosives at a quarry to which the Quarries Regulations (Northern Ireland) 2006 apply.

Guidance

1. In most cases it ought to be clear from a product’s label if it is an explosive.

(a) S.R. 2006 No. 205

Guidance

2. Detonators are an explosive article and so are explosives for the purposes of these Regulations.
3. Legislation which may apply to explosives in quarries in addition to these Regulations includes:
 - (a) the Explosives Act 1875¹³ (this is gradually being replaced by more modern legislation);
 - (b) the Explosives Regulations (Northern Ireland) 1970¹⁴;
 - (c) the Explosives Act (Northern Ireland) 1970¹⁵ (the Act is mainly concerned with security and is enforced, in most cases, by the police);
 - (d) the Explosives (No. 2) Regulations (Northern Ireland) 1976¹⁶; and
 - (e) the Carriage of Explosives Regulations (Northern Ireland) 2006¹⁷.

Regulation 4

Operator's duties

Regulation

- (1) *The operator shall—*
 - (a) *ensure, so far as is reasonably practicable, that all explosives are stored, transported and used safely and securely;*
 - (b) *appoint one or more competent individuals to organise and supervise all work at the quarry involving the use of explosives (“the Explosives Supervisor”);*
 - (c) *ensure that at no time is there more than one person acting as the Explosives Supervisor at the quarry; and*
 - (d) *keep a copy of the written statement of duties of the person or persons appointed under paragraph (1)(b) for at least twelve months after the date on which the appointment ceased to have effect.*
- (2) *It shall be the duty of the operator to ensure that—*
 - (a) *there are suitable and sufficient written rules and procedures for—*
 - (i) *shotfiring operations at the quarry;*
 - (ii) *appointing shotfirers, trainee shotfirers and storekeepers;*
 - (iii) *authorising other persons who will be involved with the storage, transport or use of explosives;*
 - (iv) *dealing with misfires; and*
 - (v) *ensuring, so far as is reasonably practicable, that such rules and procedures are complied with;*
 - (b) *an adequate written specification (whether produced by him or not) is prepared for each shotfiring operation at the quarry to ensure, so far as is reasonably practicable, that when such firing occurs it will not give rise to danger; and*

Regulation

(c) a copy of the specification referred to in sub-paragraph (b) is given to any person upon whom it imposes duties.

(3) The operator shall ensure that operations involving the storage, transport or use of explosives are carried out by—

(a) a duly authorised and competent person; or

(b) a trainee under the close supervision of a duly authorised and competent person.

(4) The operator shall ensure that—

(a) such facilities and equipment as are necessary to enable shotfiring operations to be carried out safely are provided;

(b) any vehicle which is provided for use in relation to shotfiring operations is so marked as to be readily identifiable from a distance;

(c) detonators are stored in separate containers from other explosives; and

(d) explosives are kept at all times either in a locked explosives store or under the constant supervision of a suitable person.

(5) The operator shall ensure, so far as is reasonably practicable, that each shotfiring operation is carried out safely and in accordance with the rules required to be made in pursuance of paragraph (2)(a) and any specification required to be prepared in pursuance of paragraph (2)(b).

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4. The operator's key responsibility regarding the use of explosives, as in relation to other risks, is to ensure that the work is properly managed, planned, co-ordinated and supervised. The duties placed on the operator under this regulation reflect this. This is the case whether shotfiring operations are undertaken by a quarry worker or by a specialist blasting contractor.

5. The duties imposed on operators by regulation 4 are in addition to any duties imposed on them by other legislation e.g. the Explosives Act (Northern Ireland) 1970. As a result any directions given by a person appointed by the Chief Constable of the Police Service of Northern Ireland about security matters in relation to the carriage, storage, use and destruction of explosives and detonators must be fully complied with at all times.

6. Therefore, while the operator may authorise the movement of explosives and detonators to and from the place of use, any instruction about security from a person appointed by the Chief Constable of the Police Service of Northern Ireland supervising the operation must be obeyed.

Explosives supervisors

7. The Explosives Supervisor is the person in overall, day-to-day, charge of work with explosives at a quarry. Exactly who is appointed as an Explosives Supervisor will vary. It may, for example, be the quarry

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manager, another manager or supervisor, a blasting contractor, one of the contractor's employees or an outside consultant.

ACoP

8. The operator must be satisfied that an Explosives Supervisor has sufficient practical and theoretical knowledge and experience for the work he is expected to do. To obtain the necessary theoretical knowledge, an Explosives Supervisor needs, as a minimum, to have successfully completed a course of training covering:

- (a) blast calculation and design;**
- (b) ground vibration and air blast overpressure; and**
- (c) shotfiring (see Appendix 1).**

9. A quarry may need several Explosives Supervisors to cover all the work, for example where blasting takes place on several shifts. If this is necessary for the working of the quarry:

- (a) only one person may act as the Explosives Supervisor at any one time;**
- (b) all Explosives Supervisors must be familiar with the shotfiring rules and the site, as far as that relates to the safe use of explosives; and**
- (c) there needs to be good communication and co-ordination between them, for example to deal with any hand-over or maintenance issues.**

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Blasting contractors

10. The operator may appoint a contractor, the blasting contractor, to carry out some or all of the explosives work. The operator is, nevertheless, always responsible for the overall management of the quarry and safe use and security of explosives. The operator is similarly responsible for the shotfiring rules and blast specifications, even if a contractor or consultant actually draws them up.

11. Although the legal duties relating to explosives are placed on the operator, the blasting contractor may also be legally liable in some cases (see paragraph 45 of the Great Britain Code of Practice *Health and safety at quarries**).

Shotfiring rules

12. The shotfiring rules are the practical operating procedures which are in place to ensure that shotfiring operations at the quarry take place without endangering the workforce or the public.

13. The rules need to take proper account of local circumstances, for example any risk of accidental initiation due to radio frequency

* L118; ISBN 0 7176 2458 7. Obtainable from HSE Books. This Code of Practice (except Part V *Explosives*) is approved for use with the Quarries Regulations (Northern Ireland) 2006.

Guidance

transmitters, electrically powered plant and overhead power lines. If there is such a risk, a suitable method of initiation must be chosen.

14. They need to be well-publicised throughout the quarry, and personal copies given to those who have duties under them. The operator must ensure that arrangements are made to monitor compliance with the rules.

ACoP

15. The rules need to cover arrangements for:

- (a) the appointment and authorisation of shotfirers, trainee shotfirers, storekeepers and others working with explosives;**
- (b) the Explosives Supervisor to check that:**
 - (i) the equipment provided is suitable and safe; and**
 - (ii) site conditions are in line with the blast specification before work with explosives is carried out;**
- (c) times when shotfiring is permitted*;**
- (d) the determination of the danger zone[†] likely to be created by the firing of each shot, evacuation of the danger zone and the provision of effective shelters when a shot is tested or fired;**
- (e) warning systems including, as appropriate:**
 - (i) the use of flags or notices;**
 - (ii) a system of audible signals[‡] to warn people to withdraw from the danger zone and to give the all-clear;**
 - (iii) the posting of sentries before each shot; and**
 - (iv) the direct personal notification of local residents who may be affected;**
- (f) inspection of the blast site after firing to check the state of the face and whether a misfire has occurred;**
- (g) ensuring that normal working is resumed only when the shotfirer is fully satisfied that it is safe and the all-clear has been sounded;**
- (h) safeguarding charged, but unfired[§], shotholes at the end of a working day. These arrangements should ensure that someone is in attendance, or within sight of the charged holes, to prevent theft or unauthorised initiation of the explosives (including detonators);**

* See regulation 8(4)(a). These times should also be posted where anyone who might be affected can see them.

† The danger zone does not include any safe refuge, for example one from which a shot is to be fired, which is deliberately excluded from what would otherwise be the danger zone.

‡ The signals must be audible throughout the danger zone.

§ This includes explosives left after a misfire which have not been recovered by the end of the working day.

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- (i) **dealing with misfires and the discovery of unfired explosives from previous operations. There must always be a competent person available***, normally the Explosives Supervisor, to ensure that any: misfire is dealt with safely; and
- (j) **monitoring arrangements for operations to ensure the rules are complied with.**

Blasting specification

16. The purpose of the blasting specification is to prevent danger during the firing of shots. The blasting specification must be tailored for each blast, in view of the conditions on the site.

17. The specification should be designed to:

- (a) **ensure that the risk of flyrock being projected outside the declared danger zone is as low as reasonably practicable, and should state any special precautions required to achieve this;**
- (b) **minimise the risk of misfires;**
- (c) **enable the location of any misfired shots to be determined accurately; and**
- (d) **ensure that faces are left in a safe condition after a blast.**

18. The specification should take account of:

- (a) **experience gained from previous blasts at the quarry;**
- (b) **any unusual circumstances which are present or likely to arise; and**
- (c) **the design of the excavation.**

19. Appendix 2 lists matters to be considered when preparing for a blast and details which need to be recorded.

Guidance

Security of explosives

20. The arrangements and responsibilities for the storage and security of explosives on site must minimise the risk of loss or theft. Requirements regarding the security of explosives at a particular site may be set out in the store's explosives licence. If necessary, advice should be obtained from the licensing authority and/or the police.

21. Only authorised people may handle explosives at a quarry (see regulation 8(1)).

22. The storekeeper's letter of appointment should specify his duties including the safe storage and security of explosives, custody of keys, record keeping and the issue and receipt of explosives and detonators,

* This does not mean that there must always be an Explosives Supervisor on site, but there should always be someone of that level of competence who can be contacted to advise how to deal with a misfire and, if necessary, to take personal charge.

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including those delivered directly to the blast site for use on the same day as they are delivered.

23. The keys to the explosives store must be kept safe in the custody of a person appointed by the Chief Constable of the Police Service of Northern Ireland. Where a blasting contractor is the licensee of the explosives store the operator is still responsible for compliance and should agree with the contractor a system of authorisation for the movement of all explosives and detonators and for the custody of the keys. Any such system is subject to any direction by the Police Service of Northern Ireland.

24. To ensure the safety and security of the explosives there should be appropriate arrangements for authorising all movements of explosives to and from the place of use. Authorisation is usually by the Explosives Supervisor.

25. The duties of the storekeeper in charge of the explosives store include:

- (a) the security and safe storage of explosives, including detonators;
- (b) record-keeping;
- (c) the issue and receipt of explosives; and
- (d) immediately reporting any loss or theft of explosives to a designated person.

Custody of explosives etc.

26. Explosives must be issued only to an authorised person, such as a shotfirer or trainee shotfirer. They must remain under the control of such a person.

27. If the shotfirer needs to leave the charging area he should ensure that—

- (a) all charging ceases;
- (b) no detonators, explosives or charged holes are left unattended; and
- (c) all detonators are locked in their containers and retained by the person appointed by the Chief Constable of the Police Service of Northern Ireland to supervise the operation.

28. Containers for detonators must be fitted with secure locks. Electrically operated detonators must be stored so that they are electrically isolated, with no part of any detonator or lead exposed. The container must be lined with shock-absorbing, antistatic material, kept clean and used only for detonators. Containers should be unlocked for as short a time as possible—only while detonators are actually being inserted or removed.

29. Other explosives must be carried in the manufacturer's packaging or other suitable, robust containers, and only removed from the packaging or container immediately before use.

30. Ammonium nitrate needs to be kept in weatherproof and well-ventilated conditions. It must be protected from contamination by fuel oil or other organic material. This can usually be achieved by keeping it 25 m away from any stored explosives, fuel or lubricating oil. To minimise the

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risk of fire, the surrounding area needs to be kept clear of grass, shrubbery, spilled fuel oil, or other organic material.

31. On delivery of explosives and detonators to the quarry, or on the issuing of explosives from an explosives store, the shotfirer and the person appointed by the Chief Constable of the Police Service of Northern Ireland should check either the delivery note or the issuing documentation to ensure that the quantities are correct. The delivery note or issuing documentation should be personally signed by the shotfirer and passed to the person in charge of the explosives store or to the operator. The shotfirer should take control of the explosives. The person appointed by the Chief Constable of the Police Service of Northern Ireland should remain with the explosives and should retain the detonators ensuring that they are contained in a suitably constructed detonator container (see paragraph 27); the detonators should be issued to the shotfirer only when they are required. To enable accurate record-keeping, the delivery note needs to be passed to the person in charge of the explosives store.

32. When charging is completed, any surplus explosives and detonators should be removed from the blast site before any attempt is made to fire the shot. The shotfirer should ensure that any surplus explosives and detonators are not left unattended and are destroyed or returned to the explosives store after the blast has successfully been fired.

Disposal of empty cases and deteriorated explosives

33. There should be arrangements to check that no explosive remains hidden or lodged within any explosives cases before disposal. Manufacturers can advise on the removal or destruction of deteriorated explosives¹⁸.

Use of vehicles to transport explosives etc.

34. Parts of vehicles where explosives are carried must be kept clean and free of grit. Detonators must be kept in appropriate containers and enclosed in a strong, locked compartment when they are being carried on a vehicle. Explosives must be loaded safely, so that they cannot fall out of the vehicle.

35. Nothing which creates a fire or detonation risk must be carried on a vehicle containing explosives or ammonium nitrate. Anything else which is carried must be safely stored, normally in suitable separate compartments or containers. It is good practice to ensure that only essential shotfiring equipment (circuit-testers, stemming rods and shotfiring cable) is carried on such vehicles.

36. All vehicles transporting explosives (including detonators) in the quarry must be provided with enough suitable fire extinguishers. They must also be easily recognisable from a distance, for example by means of signs, distinctive flashing lights or flags.

37. Trailers must have efficient brakes and a properly designed rigid tow bar with a safety chain, which will cause the brake to be applied in the event of separation.

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Provision and maintenance of equipment

38. The equipment provided for shotfiring operations must be suitable and properly maintained. Inspection and maintenance arrangements must be set out in the scheme required under regulation 12 of the Quarries Regulations (Northern Ireland) 2006. Regulations 4, 5, 6 and 7 of the Provision and Use of Work Equipment Regulations (Northern Ireland) 1999 are also relevant.

39. The Explosives Supervisor should check that the equipment provided is suitable and safe. Any equipment the Explosives Supervisor does not believe is safe should be taken out of use.

Shotfiring equipment

40. Circuit-testers must be capable of measuring the resistance of the circuit without any adverse effect on the detonators. Where transformer coupled electric detonators are used, an impedance test facility is required. This often forms an integral part of the exploder.

41. Exploders and circuit-testers need detailed inspection, including appropriate tests, at periods specified by the manufacturer or every six months, whichever is shorter. Such inspection is also needed after any significant repair or an unexplained misfire.

42. The inspections and tests should be designed to ensure that exploders and circuit-testers are in good order and meet their designed performance ratings and that exploders can fire shots up to their rated capacities. A record of the results of any inspections and tests must be retained for a period of three years (see regulation 38 of the Quarries Regulations (Northern Ireland) 2006).

43. Tools used for piercing cartridges, mixing explosives or in shotholes (e.g. for charging, stemming or testing) must be made of non-sparking materials such as wood, antistatic plastic or non-ferrous metal.

44. Electric detonators must not be used inside shotholes where there is a risk of premature detonation due to the build-up of a static electric charge. This is an issue when, for example, shotholes are lined with a plastic sleeve or where rigid plastic containers are used, unless the lining is antistatic.

45. Explosives mixing trucks must be earthed during mixing and transfer operations to dissipate static charges.

46. Delay detonators should be clearly marked with the period of delay when supplied. This period should, preferably, also be marked on the detonator lead.

ACoP

Shotfiring operations

47. Shotfirers must ensure that shotfiring operations are conducted in accordance with the rules and the blasting specification.

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48. Explosives mixed under licence on site must comply with the conditions set out in the licence. They must be mixed where they are to be used and only in sufficient quantities for immediate use.

49. The shotfirer must be fully satisfied that each shothole has been drilled and charged in accordance with the blasting specification. The rise of explosives in holes should be checked at regular intervals to ensure that the shothole is being correctly charged.

50. If it is not possible to conform to the specification, or the danger zone appears to be different from that shown, shotfiring operations should be suspended until any change to the specification has been authorised by its author or other designated person.

51. The shotfirer should only connect a tester to a shotfiring circuit when ready to test or fire the shot. If a shotfirer, using an ohmmeter suitable for the purpose, is testing a shotfiring circuit containing standard electric detonators connected in series, a “safe place” may be at the face in the vicinity of the shothole. In such circumstances an “ohmmeter suitable for the purpose” is one which has been approved by a body approved by the Health and Safety Executive for Northern Ireland. The exploder should be disconnected immediately after firing or in the event of an unsatisfactory test on the firing circuit. No one but the shotfirer should be able to operate the exploder.

52. Workers must obey any relevant instructions in relation to shotfiring operations, for example from the shotfirer or sentry. Sentries are there to keep people out of the danger zone and must not leave their post until the all-clear signal has been given, or until they are released by the person who posted them.

Avoidance of misfires

53. Connections need to be checked immediately before a blast to ensure the integrity of the system and to minimise the risk of a misfire. Where in-hole initiation is used, i.e. with the detonator placed inside the hole, two detonators are needed for each deck or column of explosives to minimise the possibility of a misfire. This is because faulty detonators cannot be easily identified or recovered¹⁹.

54. Shock tube connectors need to be covered with enough material to prevent damage to surface lines by shrapnel; about 200 mm of damp dust or chippings is usually enough.

Safe use of explosives

55. It is recommended that:

- (a) only one container of explosives is open at a shothole at anyone time;
- (b) explosives are not used on or inside machinery or used for clearing blockages except where all other means, for example hydraulic breakers, have failed and the explosives are used in accordance with recognised guidance²⁰.

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56. Explosives should not be taken into a room or other place where people congregate, or where there is a possible source of initiation, for example machinery, electrical equipment or a naked flame.

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Charging shotholes etc.

57. The shotfirer must be present during charging. Detonators, other explosives and charged holes must not be left unattended. All detonators must be locked in their containers.

Guidance

58. Any surplus explosives (including detonators) must be removed from the blast area before any attempt is made to fire the shot. The shotfirer must ensure that surplus explosives are not left unattended. At the earliest opportunity, not later than the end of the shift, they should be returned to the explosives store or, where there is no explosives store on site, destroyed in accordance with the manufacturer's recommendations and the records amended accordingly.

Regulation 5

Supervision of shotfiring and trainee shotfirers and records of appointment

Regulation

(1) The operator shall take all reasonable steps to ensure that —

(a) a trainee shotfirer at the quarry does not fire shots and is not required to fire shots, except when he is under the close personal supervision of a shotfirer, until the operator is satisfied that he has completed a suitable period of training and has appropriate practical experience; and

(b) all shotfiring operations are carried out under the close personal supervision of the shotfirer.

(2) The operator shall ensure that a record of the appointment at the quarry of any shotfirer or trainee shotfirer is kept at a suitable place until three years after that shotfirer's employment or trainee shotfirer's employment at the quarry ends.

Guidance

Training of shotfirers

59. A person must not be employed as a shotfirer unless he is an authorised shotfirer, and only an authorised shotfirer may fire a shot in any blasting operation (regulation 4 of the Explosives (No. 2) Regulations (Northern Ireland) 1976). To become "authorised" the person concerned (and this may be the operator) must apply to the Secretary of State for a licence in accordance with the 1976 Regulations.

60. Before being licensed as an authorised shotfirer a person has to be over 21, a fit and responsible person in the eyes of the Police Service of Northern Ireland and he has to be certified to be competent to carry out blasting operations either by his employer or by an Inspector of Quarries. Such certification will be granted only to a person who possesses evidence of having successfully completed a course of training covering the subjects set out in Appendix 1 and who possesses also sufficient knowledge and experience for the performance of the full range of duties imposed by the 1976 Regulations.

ACoP

61. A trainee shotfirer must work under the close personal supervision of an experienced shotfirer, with the trainee following a programme of practical instruction by the shotfirer. A written training programme which is given to everyone involved helps ensure that the training is well-structured. The training must continue until the necessary competence has been acquired and demonstrated.

Guidance

Appointments and authorisations

62. The shotfiring rules should set out arrangements for the appointment of shotfirers, trainee shotfirers and storekeepers and for authorisation of others to work with explosives. The operator, or the blasting contractor if there is one, may make the appointments or authorisations depending on what is required by the rules (see also paragraph 21).

ACoP

63. As part of ensuring competence, references should be taken up to check that a new shotfirer has sufficient experience and knowledge. An on-site interview and practical test of the applicant's abilities are also needed before anyone is given a job as a shotfirer.

Regulation 6

Shotfirer's duties

Regulation

Before a shot is fired, a shotfirer shall—

- (a) check the shotfiring system or circuit to ensure that it has been connected correctly;*
- (b) where electrical detonators are used, ensure that they have been correctly connected to the shotfiring system or circuit and that the shotfiring system or circuit is tested with an instrument suitable for the purpose from a position of safety;*
- (c) where appropriate, ensure that the electrical integrity of the shotfiring system or circuit is such as to make a misfire unlikely; and*
- (d) ensure that the shot is fired from a safe place.*

ACoP

64. A shotfirer should be conversant with the operator's shotfiring rules and should ensure that the rules and the blasting specification for the particular shot are followed; he should also comply fully with any direction in relation to security given by any person appointed by the Chief Constable of the Police Service of Northern Ireland who may be supervising the operation.

Regulation 7

Misfires

Regulation

In the event of a misfire the operator shall consult the individual appointed under regulation 8(1)(c) of the Quarries Regulations (Northern Ireland) 2006 (if this is not the same person) and shall ensure, so far as is reasonably practicable, that—

- (a) apart from himself, no person other than the Explosives Supervisor, shotfirer, trainee shotfirer or any other person authorised by him enters the danger area until a period of five*

Regulation

minutes has elapsed since the misfire and any shotfiring apparatus has been disconnected from the shot;

- (b) appropriate steps are taken to determine the cause of and to deal with the misfire;*
- (c) a suitable record is kept of the misfire for at least three years; and*
- (d) appropriate steps are taken to prevent theft of the explosives and detonators or their initiation by an unauthorised person.*

Guidance

65. All misfires must be investigated to determine the cause and to enable action to be taken to avoid any recurrence.

66. The blasting specification endorsed with details of any misfire would be a suitable record of misfires.

67. A misfire is reportable to HSENI under the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (Northern Ireland) 1997⁶.

Misfire records

68. The blasting specification endorsed with details of any misfire would be a suitable record.

69. A copy of the record of the misfire should either be given or sent as soon as possible to the Police Service of Northern Ireland.

Regulation 8

Prohibited activities

Regulation

(1) A person other than a person appointed by the Chief Constable, an inspector appointed by the Health and Safety Executive for Northern Ireland and the Secretary of State as an Explosives Inspector, a person engaged in the transport of explosives to or from the quarry, a shotfirer, a trainee shotfirer, a person authorised to handle explosives at a quarry or a person appointed to be in charge of the explosives store shall not handle explosives at a quarry.

(2) A person shall not bring any substance or article (other than explosives) likely to cause an unintended explosion or fire within ten metres of any explosives or take any naked flame within ten metres of any explosives.

(3) A person shall not forcibly remove any detonator lead or other system for initiating shots from a shothole after the shothole has been charged and primed.

(4) A person shall not charge or fire a shot—

(a) unless there is sufficient visibility to ensure that work preparatory to shotfiring, the shotfiring operation and any site inspection after the shot is fired can be carried out safely;

(b) in a shothole which has previously been fired, unless he is dealing with a misfire in accordance with action taken in pursuance of regulation 7(b); or

Regulation

(c) *in any tunnel or other excavation (not being merely a shothole) in the face or side of the quarry for the purpose of extracting minerals or products of minerals.*

(5) *A person shall not fire a shot—*

(a) *unless he is a shotfirer or trainee shotfirer; and*

(b) *other than by means of a suitable exploder,*

and for the purpose of this regulation, a safety fuse shall not be deemed to be a suitable exploder.

Guidance

70. Only those who have been explicitly appointed or authorised, in accordance with the rules, are allowed to handle explosives in the quarry. Requirements for delivery drivers are covered separately, under the transport legislation (for further information see the transport legislation in the Introduction).

71. The following methods of shotfiring are prohibited:

(a) springing—where a succession of gradually increased charges is fired in a shothole to form a cavity or chamber to accommodate a final heavy charge; and

(b) heading blasts—blasts in any tunnel or other excavation for the purpose of extracting minerals or products of minerals.

72. The use of safety fuse is now prohibited by the Regulations. Its use was formerly not permitted by the police.

Visibility

73. The Quarries (Explosives) Regulations (Northern Ireland) 1991 prohibited blasting between one hour after sunset and one hour before sunrise. This was intended to ensure that there was enough daylight for the blast and other associated work to be carried out safely. This has been replaced with a more general prohibition on blasting when there is not enough visibility to carry out the work safely.

74. Compliance can, largely, be achieved by stating what time a blast may be carried out in the blast specification. The timing should allow for any inspections required before or after the blast. Fog, rain and snow may reduce visibility and make it unsafe to blast. The effect of such factors should be addressed in the shotfiring rules and, if necessary, also in the blast specification.

75. In addition to the visibility considerations, the timing of the blast will be influenced by the nuisance it may create to neighbours. The district council, usually the Environmental Health Department, can provide advice on this.

Regulation 9

Exemptions

Regulation

(1) *Subject to paragraph (2), the Secretary of State may, by a certificate in writing, exempt any quarry, part of a quarry or class of quarries, any person or class of persons or any operation or class of*

Regulation

operations from all or any of the prohibitions and requirements of these Regulations, and any such exemption may be granted subject to conditions and to a limit of time and may be revoked at any time by a further certificate in writing.

(2) The Secretary of State shall not grant any such exemption unless, having regard to the circumstances of the case and in particular to—

(a) the conditions, if any, which he proposes to attach to the exemption; and

(b) any other requirements imposed by or under any enactment which apply to the case,

he is satisfied that the health and safety of persons who are likely to be affected by the exemption will not be prejudiced in consequence of it and that the security of explosives or detonators will not be so prejudiced.

Regulation 10

Revocation

Regulation

The Quarries (Explosives) Regulations (Northern Ireland) 1991(a) are hereby revoked.

Regulation 11

Amendment

Regulation

The Carriage of Explosives Regulations (Northern Ireland) 2006(b) regulation 2(1), for the definition of “quarry” there shall be substituted the following definition—

“quarry” has the meaning assigned to it by regulation 3 of the Quarries Regulations (Northern Ireland) 2006.

*(a) S.R. 1991 No. 233
(b) S.R. 2006 No. 182*

Appendix 1

ACoP

Training Course for Shotfirers

On completion of a course, shotfirers should be able to demonstrate an adequate understanding of the types of explosives, detonators and shotfiring equipment available, their characteristics, properties and the following topics.

On-site mixed explosives

Practical requirements of Secretary of State's licences.

Storage, issue, conveyance of explosives and detonators.

Recognition, handling and safe disposal of deteriorated explosives, including detonators.

Design

Blast specification.

Prevention of flyrock.

Determination of the danger zone.

Drilling

Methods and equipment.

The plotting of profiles of the face.

Setting up and alignment of drills.

Checking and measurement of drill holes.

Recognition of natural joints and other relevant information from drill holes.

Shotfiring operations

Safe shotfiring procedure, warning and shelter.

Methods of primary and secondary blasting.

Inspection and measurement of quarry faces.

Factors affecting vibration and projection of material.

Stemming of shotholes.

Methods of initiation.

Testing of equipment and circuits.

Examination of the blast site after firing.

Relevant legislation and guidance material.

Misfires and methods of dealing with them.

Appendix 2

Blasting Specification

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The following matters need to be addressed when planning, preparing for and undertaking a blast.

1. The part of the quarry where minerals are to be broken up or loosened by the blast, shown on a plan.
2. The intended hole positions, marked on a drilling plan, showing the length, diameter and the angle of inclination and direction at which the drill is to be set for each hole.
3. The surface position* and number or other identifier for each shothole.
4. The angle of inclination, direction, length and diameter and the extent of any sub-grade drilling for each completed shothole.
5. Where the minerals form a face, the profiles or other data required to determine the burden around each shothole.
6. Any geological anomalies which could affect the blast, in particular those identified during drilling and inspection. These might include the presence of cavities, clay bands, joint planes, bedding planes or discontinuities.
7. Using the available information, particularly that from items 4, 5 and 6, shown using plans and sections, the burden for each shothole should be determined and consequently the amount, type and placement of explosives to be used, so that the blast can be carried out safely.
8. The amount, type and position of explosives, the description and position of any detonator and the type and position of any stemming actually used for each shothole.
9. The system of initiation, including full details of any delay sequence and timing.
10. The danger zone, shotfiring position and sentry positions should be determined. (These may be marked on the plan prepared for item 1.)
11. The visibility and other precautions required to minimise the risk of:
 - (a) material being projected by the blast;
 - (b) misfires; and
 - (c) injury during inspection of the site before and after the blast.
12. The date and timing of the blast and prevailing weather conditions.

* The position needs to be identified with sufficient accuracy to enable the explosives to be located in the event of a misfire. Positions can be indicated: on a plan, relative to one or more identified fixed points or using co-ordinates obtained, for example, using the Global Positioning System (GPS).

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The blast specification should record information on all of these issues.

Appendix 3

Further Reading

Guidance

Misfires; EPIC; Guideline Series No. 1. Available from EPIC Training Limited, Alban Row, 27–31 Verulam Road, St. Albans, Herts. AL3 4DG. Telephone: 01727 869008; Fax: 01727 843318; [E-mail: clare@epicLtd.co.uk](mailto:clare@epicLtd.co.uk)

Manager's rules for shotfiring operations EPIC; Guideline Series No. 2

Blasting specification; EPIC; Guideline Series No. 3

Training, competence and appointments EPIC; Guideline Series No. 4

Surveying EPIC; Guideline Series No. 5

Duties EPIC; Guideline Series No. 6

Guidance Note on brake testing schemes EPIC

National Occupational Standards EPIC

Competence Assurance Guidance Note EPIC

Handbook on the hydrogeology and stability of excavated slopes in quarries TSO (HMSO) 1988 ISBN 0 1175 2126 4

Handbook on the design of tips and related structures TSO (HMSO) 1992 ISBN 0 1175 2539 1

Technical review of the stability and hydrogeology of mineral workings for the Department of the Environment TSO (HMSO) 1988 ISBN 0 1175 2133 7

The safe use of vehicles on construction sites HSE Books 1998 HSG 144 ISBN 0 7176 1610 X

Health surveillance. Available from the Quarry Products Association, 156 Buckingham Palace Road, London. SW1W 9TR. Tel: (0171) 730 8194; Fax: (0171) 730 4355; e-mail: <mailto:info@gpa.org>.

The safe use of tipping road vehicles Quarry Products Association.

Appendix 4

References

- ¹ The Quarries Regulations (Northern Ireland) 2006; S.R. 2006 No. 205; TSO, 16 Arthur Street, Belfast BT1 4GD; ISBN 0 337 96494 7 and the Quarries (Explosives) Regulations (Northern Ireland) 2006; S.R. 2006 No. 204; TSO; ISBN 0 337 96493 9.
- ² *Legal Framework of Health and Safety at Work in Northern Ireland; The Health and Safety at Work (Northern Ireland) Order 1978* HSENI 02 03 B; obtainable free from HSENI.
- ³ *Manual handling: Manual Handling Operations Regulations (Northern Ireland 1992: Guidance on Regulations* HSENI 02 03-A; the Stationery Office 2002; ISBN 0 33 708554 7.
- ⁴ *Personal protective equipment at work: Personal Protective Equipment at Work Regulations (Northern Ireland) 1993: Guidance on Regulations* HSA 69; the Stationery Office 1994; ISBN 0 337 11194 4.
- ⁵ *Workplace Health, Safety and Welfare: Workplace (Health, Safety and Welfare) Regulations Northern Ireland) 1993: Approved Code of Practice and Guidance* 66/HSA/96; the Stationery Office 1996; ISBN 0 337 11222 3.
- ⁶ *A guide to the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (Northern Ireland) 1997* HSA 31 (Rev 98) ; the Stationery Office 1998; ISBN 0 337 11259 2.
- ⁷ *Safe Work in Confined Spaces in Northern Ireland: Approved Code of Practice*; the Stationery Office 1999; ISBN 0 337 09457 8.
- ⁸ *Safe use of lifting equipment: Lifting Operations and Lifting Equipment Regulations 1998: Approved Code of Practice and Guidance* L113; HSE Books 1999; ISBN 0 7176 1628 2 (approved for use with the Lifting Operations and Lifting Equipment Regulations (Northern Ireland) 1999).
- ⁹ *Safe use of work equipment: Provision and Use of Work Equipment Regulations 1998: Approved Code of Practice and Guidance* L22; HSE Books 1999; ISBN 0 7176 1626 6 (approved for use with the Provision and Use of Work Equipment Regulations (Northern Ireland) 1999).
- ¹⁰ *Management of health and safety at work: Management of Health and Safety at Work Regulations 1999: Approved Code of Practice and Guidance* L21; HSE Books 2000; ISBN 0 7176 2488 9 (approved for use with the Management of Health and Safety at Work Regulations (Northern Ireland) 2000).
- ¹¹ *Control of substances hazardous to health (Fourth edition): Control of Substances Hazardous to Health Regulations 2002: Approved Code of Practice and Guidance* L5; HSE Books 2002; ISBN 07176 2534 6. This Code of Practice has been approved for use with the Control of Substances Hazardous to Health Regulations (Northern Ireland) 2003.
- ¹² *Guidance on Regulations Controlling noise at work: The Control of Noise at Work Regulations 2005.* L108; HSE Books 2005; ISBN 0 7176 6164 4. There is also a leaflet *Guidance for employers on the Control of Noise at Work Regulations 2005*. Single copies may be obtained free from HSE Books or it may be downloaded from <http://www.hse.gov.uk/pubns/indg362.pdf>
- ¹³ 1875 c. 17.
- ¹⁴ S.R. & O. (N.I.) 1970 No. 110.
- ¹⁵ 1970 c. 10 (N.I.).
- ¹⁶ S.R. 1976 No. 369.
- ¹⁷ *Working with ADR: an introduction to the carriage of dangerous goods by road*. Single copies may be obtained free from: DfT Publications, PO Box 236, Wetherby, West Yorkshire LS23 7NB. Tel 0870 1226 236; Fax 0870 1226 237. E-mail dft@twoten.press.net. Web www.publications.dft.gov.uk. It may also be downloaded from: http://www.dft.gov.uk/stellent/groups/dft_transsec/documents/downloadable/dft_trans_sec_029427.pdf
- ¹⁸ *Disposal of explosives waste* CS 23; HSE Books 1998; ISBN 0 7176 1624 X.
- ¹⁹ *Explosives use: drilling and surveying* Ref 853000, available from the Institute of Explosives Engineers, Centenary Business Centre, Hammond Close, Attleborough

Field Industrial Estate, Nuneaton, Warwickshire. CV11 6RY. Tel: (024) 7635 0846
Fax: (024) 7635 0831 e-mail: <mailto:info@ixpe.org>.

²⁰ *Clearing blocked crushers* BACMI. Available from the Quarry Products Association,
156 Buckingham Palace Road, London. SW1W 9TR. Tel: (0171) 730 8194 Fax:
(0171) 730 4355: e-mail: <mailto:info@qpa.org>.