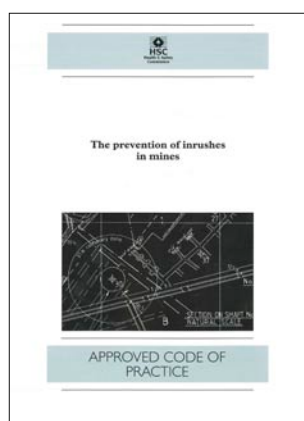


# The prevention of inrushes in mines

Approved Code of Practice



**This is a free-to-download, web-friendly version of L46 (First edition, published 1993). This version has been adapted for online use from HSE's current printed version.**

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**ISBN 978 0 7176 0620 7**

**Price £5.50**

This Approved Code of Practice gives practical guidance on the Mines (Precautions Against Inrushes) Regulations 1979 as well as parts II and IV of the Management and Administration of Safety and Health at Mines Regulations 1993. It is aimed at coal mine workers.

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First published 1993

ISBN 978 0 7176 0620 7

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This Code has been approved by the Health and Safety Executive, 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.

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# Notice of Approval

By virtue of Section 16(1) of the Health and Safety at Work etc Act 1974 and with the consent of the Secretary of State for Employment, the Health and Safety Commission has on 22 September 1993 approved the Code of Practice entitled *The Prevention of inrushes in mines*.

The Code of Practice gives practical guidance with respect to the Mines (Precautions Against Inrushes) Regulations 1979 (SI 1979 No 318) as well as to Parts II and VI of the Management and Administration of Safety and Health at Mines Regulations 1993 (SI 1993 No 1897) in so far as these Parts have effect in relation to protection against inrushes.

The Code of Practice comes into effect on 1 October 1993.

Signed

TA GATES  
*Secretary to the Health and Safety Commission*

22 September 1993.

**The Health and Safety Commission (HSC) and the Health and Safety Executive (HSE) merged on 1 April 2008 to form a single national regulatory body. From that date, the Health and Safety Executive became responsible for approving Codes of Practice, with the consent of the Secretary of State.**

## Foreword

1 The Approved Code of Practice (ACOP) on the Prevention of Inrushes comes into effect on 1 October 1993. It gives practical guidance with respect to the Mines (Precautions Against Inrushes) Regulations 1979 and to Parts II and VI of the Management and Administration of Safety and Health at Mines Regulations 1993, in so far as these Parts have effect in relation to protection against inrushes.

2 The full text of both sets of regulations is published separately but relevant regulations from each set are reproduced in the two sections following this foreword. The ACOP then follows as the third part of this publication.

3 The ACOP also refers to relevant passages in the ACOP to the Management and Administration of Safety and Health at Mines Regulations 1993. The full text of the latter is published separately but the passages referred to in this ACOP are reproduced in Appendix 1 for ease of reference.

4 The ACOP has been prepared after full consultation with the industry.

# Mines (Precautions Against Inrushes) Regulations 1979

## Regulation

1

### Regulation 1 Citation and commencement

*These Regulations may be cited as the Mines (Precautions against Inrushes) Regulations 1979 and shall come into operation on 9 April 1979.*

## Regulation

2

### Regulation 2 Interpretation

*-(1) In these Regulations, unless the context otherwise requires 'the 1954 Act' means the Mines and Quarries Act 1954; 'disused workings' includes disused shafts and bore holes; 'the manager' and 'the owner' mean respectively manager and owner for the time being of any mine; and*

*(2) Expressions to which meanings are assigned by the 1954 Act shall have the same meanings in these Regulations.*

## Regulation

3

### Regulation 3 General duty to take precautions against inrushes

*With respect to every working in a mine, it shall be the duty of the manager to prevent any inrush into the working of:*

- (a) gas from disused workings (whether mine workings or not); or*
- (b) water or material that flows or is likely to flow when wet from any source.*

## Regulation

4

### Regulation 4 Duty of mine owner and manager to obtain information

*-(1) The owner and the manager shall each have the duty to:*

- (a) ensure that they are at all material times in possession of all information which indicates or tends to indicate the presence or absence, in the vicinity of any working being carried on or proposed to be carried on in the mine, of:
  - (i) any disused workings (whether mine workings or not),*
  - (ii) any rock or stratum containing or likely to contain water (whether dispersed or in natural cavities),*
  - (iii) any peat, moss, sand, gravel, silt or other material that flows or is likely to flow when wet; and**
- (b) take such steps as may be necessary for the purpose of substantiating any such information which comes into their possession (whether in consequence of the discharge of the duty imposed on them by the foregoing sub-paragraph or not).*

Regulation

4

- (2) Where any:
- (a) information mentioned in paragraph (1) (a) of this Regulation comes into the possession of either the owner or the manager (whether in consequence of the discharge of the duty imposed by that paragraph or not), that owner or manager, as the case may be, shall ensure that the other of them is immediately furnished with that information;
  - (b) steps are taken in discharge of the duty imposed by paragraph (1) (b) of this Regulation, the owner or manager, as the case may be, shall ensure that the other of them is immediately furnished with details of the steps he has taken and of any conclusion he has reached as a result of taking those steps.

Regulation

5

### Regulation 5

-(1) The owner and manager shall each have the duty to take, with respect to any workings being carried on or proposed to be carried on in the mine in the vicinity of the sea, a lake or river or any other body of surface water (whether accumulated naturally or artificially) such steps as may be necessary:

- (a) to ascertain the total thickness of the strata lying between the workings and the surface water;
- (b) to satisfy themselves that the strata are sufficiently reliable to prevent an inrush of water from the surface.

(2) Where any information is obtained by either the owner or the manager in consequence of the discharge of the duty imposed by paragraph (1) of this Regulation, that owner or manager, as the case may be, shall ensure that the other of them is immediately furnished with that information.

Regulation

6

### Regulation 6 Mine workings in potentially hazardous areas

-(1) A working in a mine which would be within:

- (a) 45 metres (measured in any plane) of:
  - (i) the surface;
  - (ii) any rock or stratum containing or likely to contain water (whether dispersed or in natural cavities);
  - (iii) any peat, moss, sand, or gravel, silt or other material that flows or is likely to flow when wet;
  - (iv) any disused workings not being disused mine workings; or
- (b) 37 metres (measured in any plane) of any disused mine workings, shall not be carried on unless the manager has complied with the provisions of paragraph (2) of this Regulation.

(2) The manager shall obtain sufficient information to enable him to consider whether an inrush to which regulation 3 of these Regulations refers may occur if the working is carried on without taking precautionary measures.

Regulation

(3) *If the manager is of the opinion that such an inrush will not occur he shall ensure that the working is not carried on unless he has given notice of the reasons for that opinion to the inspector for the district and to the workers' representatives for that mine, if any, at least 30 days in advance or such shorter period in advance as the inspector may allow in any particular case.*

(4) *If, in the case of a working in respect of which the manager has given notice in accordance with paragraph (3) of this Regulation, there is an occurrence which tends to indicate that an inrush to which regulation 3 of these Regulations refers may occur unless the precautionary measures are taken, the manager shall give notice of that occurrence as soon as practicable to the inspector for the district and to the workers' representatives for that mine, if any.*

(5) *Where paragraph (3) of this Regulation does not apply, the manager shall ensure that the working is not carried on, unless:*

- (a) *he has prepared a scheme of work ('the scheme') which lays down the procedure to be followed in the working designed to ensure that an inrush does not occur; and*
- (b) *he has sent to the inspector for the district and to the workers' representatives for that mine, if any, a copy of:*
  - (i) *the scheme at least 30 days in advance or such shorter period in advance as the inspector may allow in any particular case, and*
  - (ii) *any modifications of the scheme as soon as practicable.*

(6) *Where any such working is being carried on the manager shall:*

- (a) *ensure that the provisions of the scheme, if any, and any modifications to it are executed and enforced;*
- (b) *keep a copy of the scheme, and any modifications to it, or notice, as the case may be:*
  - (i) *in the office of the mine or such other place as may be approved by the inspector, and*
  - (ii) *in the covered accommodation provided in pursuance of section 135 of the 1954 Act,*

*until such time as the working is completed.*

(7) *In this Regulation 'workers' representatives' means:*

- (a) *in relation to a coal mine, such persons, if any, as may for the time being be nominated for the purposes of these Regulations by associations or bodies which represent persons employed underground at the mine;*
- (b) *in relation to any other mine, such persons, if any, as may for the time being be appointed for that mine under section 123 of the 1954 Act or be appointed to be safety representatives within the meaning of the Safety Representatives and Safety Committees Regulations 1977 for that mine.*

(8) *Where an association or body nominates or appoints more than one workers' representative for a mine then the manager shall not be required by paragraphs (3), (4) or (5) of this regulation to notify, or send copies of a scheme or modifications to, more than one of the persons nominated or appointed by that association or body.*

# Parts II and VI of the Management and Administration of Safety and Health at Mines (MASHAM) Regulations 1993

## Part II Owners of mines

### Regulation

### Regulation 6 General duties of the owner of the mine

*-(1) A mine shall not be worked unless its owner is an individual or a body corporate or its owners are partners in it.*

*(2) It shall be the duty of the owner of the mine -*

- (a) to make such financial and other provision to secure; and*
- (b) otherwise to secure, so far as is practicable,*

*that the mine is managed and worked in accordance with the relevant statutory provisions (which are applicable to the mine) and is so planned and laid out as to enable that purpose to be readily secured.*

*(3) Without prejudice to the generality of paragraphs (1) and (2), the owner may appoint persons for the purposes of securing the fulfilment in relation to the mine of his statutory responsibilities, and in such a case the owner shall forthwith send copies of those appointments to the manager of the mine concerned and to the Executive.*

*(4) Without prejudice to section 2(3) of the 1974 Act, it shall be the duty of every owner of a mine to prepare and, as often as may be appropriate, to revise a written statement of his general policy with respect to the health and safety at work of all persons at work at the mine and the organisation and arrangements for the time being in force for carrying out that policy, and to bring the statement and any revision of it to the notice of all persons at work at the mine.*

*(5) Subject to paragraph (6), the duty imposed on the owner to secure that the mine is managed, worked, planned and laid out in accordance with the relevant statutory provisions shall apply in relation to all such provisions whether or not they expressly impose duties on him or on some other person.*

*(6) Paragraph (5) shall not apply to those provisions of the 1954 Act listed in Schedule 1 (which expressly provide that a person is to be guilty of an offence).*

6

Regulation

7

## Regulation 7 Notification of mining operations

*-(1) A mine shall not be worked unless the owner thereof has notified the Executive of the information specified in Part I of Schedule 2 at least 28 days in advance of the intended commencement of the mining operation.*

*(2) Where an event specified in Part II of Schedule 2 occurs, the owner shall notify the Executive of the event within 28 days of its occurrence.*

*(3) In the case of a mine which was in existence or under construction on the date of coming into force of these Regulations, notification under section 139 of the 1954 Act, in so far as it provided the information required by Schedule 2 to these Regulations, shall be deemed to be notification under paragraph (1).*

Regulation

27

## Part VI Surveyors and plans

### Regulation 27 Appointment of surveyors

*-(1) No mine shall be worked unless the owner has appointed a suitably qualified and competent person to be the surveyor for the mine.*

*(2) Where the post of surveyor becomes vacant the mine may be worked without a surveyor for a period up to 28 days or for such longer period as the Executive may approve.*

Regulation

28

### Regulation 28 Duties of the surveyor

*It shall be the duty of the surveyor for the mine to ensure so far as is practicable -*

*(a) that the plans, sections and working papers of the mine which are required under the relevant statutory provisions (whether prepared by him or not) are suitable, complete and accurate;*

*(b) before ceasing to be the surveyor for the mine -*

*(i) that those plans and sections and the working papers referred to in regulation 29 are transferred to the owner of the mine unless they are already kept at the office of the mine or at some other place approved by the Executive; and*

*(ii) that a report in writing is prepared and sent to the owner of the condition of those plans and sections.*

Regulation

29

### Regulation 29 Working plans, ventilation plans and geological map

*-(1) There shall be suitable, complete and accurate plans of all the workings in a mine and of its boundaries and as far as practicable of any other workings which may affect the safety of the mine (whether or not the workings are discontinued or have been abandoned) and accurate sections of the seams or vein-systems currently being worked in the mine and of the surrounding strata.*

Regulation

29

- (2) *The plans and sections referred to in paragraph (1) shall be -*
- (a) *kept at the office of the mine or at some other place approved for this purpose by the Executive;*
  - (b) *prepared and revised at suitable intervals by the surveyor or a suitably qualified and competent person working under his supervision;*
  - (c) *prepared in such form and in such quantity as is requisite to enable the mine to be worked safely;*
  - (d) *prepared on such scale and marked with such features as are requisite for -*
    - (i) *the provision of accurate information relevant to the safe working of the mine; and*
    - (ii) *the provision of accurate information on the position and conditions of existing workings and as far as practicable workings that have been discontinued or abandoned;*
  - (e) *marked with the date on which the plan or section was commenced, prepared and revised; and*
  - (f) *permanently and clearly drawn or printed on suitable and durable material and maintained in good condition.*

(3) *The surveyor shall ensure that all working papers relating to the plans and sections referred to in paragraph (1) are signed and dated by the person who prepared them and are retained.*

(4) *The owner of a mine shall make the plans of that mine required by paragraph (1) and the working papers referred to in paragraph (3) available to the owner of, or the surveyor for, a neighbouring mine, if those plans are needed to assist in the preparation for compliance with any of the relevant statutory provisions of the plans for that neighbouring mine.*

(5) *There shall be kept at the office of the mine or some other place approved for that purpose by the Executive a plan showing the system of ventilation at the mine and, in particular, the general direction of the flow of ventilation, the points at which the quantity of air passing is assessed and the location of the principal devices for regulating the flow of ventilation.*

(6) *There shall be kept at the office of the mine or some other place approved for this purpose by the Executive, a suitable geological map of the district in which the mine is situated showing the boundaries of superficial and drift deposits.*

Regulation

30

### Regulation 30 Facilities and information to be given to the surveyor

*The owner and the manager shall provide the surveyor for the mine with all plans, drawings and other relevant documents and information which are requisite for preparing the plans and sections required under regulation 29(1) and (5) and so far as is practicable the manager shall give the surveyor access to all the workings of the mine (including those which have been discontinued) for the purposes of preparing or revising those plans and sections.*

Regulation

### Regulation 31 Plans relating to abandoned mines or discontinued seams and vein-systems

*-(1) In the event of -*

- (a) the abandonment of a mine; or*
- (b) the working of a seam or vein-system in a mine being discontinued for a period of more than twelve months,*

*it shall be the duty of the person who was the owner at the time of the event to send to the Executive within three months of that date, or within such longer time as the Executive may approve, the plans and sections referred to in regulation 29(1) of, and the working papers referred to in regulation 29(3) relating to, the abandoned mine or of the discontinued seam or vein or, in either case, accurate copies thereof*

*(2) The plans and sections required to be sent to the Executive in accordance with paragraph (1) shall be accompanied by-*

- (a) a certificate given by the surveyor, or by some other suitably qualified and competent person authorised to act on behalf of the owner, who can so certify and report from his own knowledge that to the best of his knowledge and belief the plan or section is accurate; and*
- (b) a certificate given by the manager, or by some other suitably qualified and competent person authorised to act on behalf of the owner, who can so certify and report from his own knowledge that no further work, for the purpose of getting minerals, has taken place after a stated date which would affect the accuracy of the plan or section.*

31

Regulation

### Regulation 32 Retention and availability of plans etc

*- (1) Where, in pursuance of regulation 31, plans and other documents have been sent to the Executive they shall be retained by the Executive or in accordance with arrangements approved by the Executive.*

*(2) Where plans and other documents or copies thereof have been sent to the Executive in pursuance of regulation 31, and subsequently it is proposed to resume working at any mine, seam or vein-system to which those documents relate, on reasonable notice being given, the Executive shall send those plans and documents (or the copies thereof) to the owner of the mine to which they relate.*

32

Regulation

### Regulation 33 Faulty plans

*Section 19 of the 1954 Act (which relates to the powers of the Executive in relation to faulty plans) shall apply to plans and sections prepared under regulation 29(1) of these Regulations as it applied to plans and sections prepared for the purposes of that Act.*

33

# Approved Code of Practice - The prevention of inrushes in mines

## Introduction

1 This Approved Code of Practice (ACOP) gives practical guidance with respect to the Precautions Against Inrushes Regulations (PAIR) 1979 and to Parts II and VI of the Management and Administration of Safety and Health at Mines (MASHAM) Regulations 1993, in so far as these Parts have effect in relation to protection against inrushes.

2 The ACOP gives guidance on precautions against inrushes and in particular gives guidance on investigation, identification, and assessment of inrush hazards and the procedures to be followed in working under the sea and other surface water. However, it cannot specify every possible detail or circumstance; managers should remain alert to developments and hazards that may not be fully dealt with in the ACOP or in other guidance material and should use their expertise to assess what further measures are desirable in the light of good working practice and local circumstances.

3 Although failure to observe any provision of this ACOP is not in itself an offence, that failure may be taken by a Court in criminal proceedings as proof that a person has contravened the Regulation or Section of the Health and Safety at Work etc Act 1974 (HSW Act) to which the provision relates. In such a case, however, it will be open to the person to satisfy the Court that the Regulation or Section of the HSW Act has been complied with in some other way. When proposing to depart from a provision in the ACOP, the manager should consult the Inspector of Mines in charge of the district, inform the owner or owner's representative and keep a record to help in any future revision of the ACOP.

## The legal framework

4 The Regulations and ACOP are intended to operate within the framework of the HSW Act. Under mining statute, persons employed at a mine are required to obey certain directions and instructions given to them, and rules issued, by those on whom duties are laid. Section 7 of the HSW Act requires employees to take reasonable care and to co-operate with those on whom duties are laid by these and other regulations. Section 2 of the HSW Act places responsibility for general duties on employers for the protection of their employees; eg to provide, so far as is reasonably practicable, a safe system of work, as well as information, training and supervision necessary to safety. Sections 3 and 4 provide for the protection of non-employees from the effects of work activities while Section 6 puts general duties on those who design, manufacture, import or supply articles for use at work. The general duties complement the more specific duties created by PAIR and MASHAM and therefore must also be fulfilled.

5 The legal status of the ACOP is set down in Section 17 of the HSW Act. Reference in the ACOP to another document does not imply approval by the Health and Safety Commission of that document except to the extent necessary to give effect to this ACOP.

6 Enforcement of mining safety legislation is carried out by the Health and Safety Executive through the Inspectors of Mines it appoints. Sections 21 and 22 of the HSW Act give inspectors the power to issue improvement and prohibition notices which can be used to require persons to take action to improve safety standards or to prevent accidents. Such notices are backed by law and persons can be prosecuted for failure to comply.

### ACOP availability

7 The relevant sections of the ACOP should be drawn to the attention of those concerned at the mine. A copy of the ACOP should be posted in the statutory covered accommodation.

## ACOP

### Risk assessment

8 In addition to the general duties in the HSW Act, particular note should be made of the provisions of the Management of Health and Safety at Work Regulations 1992.

Regulation 3 of these Regulations states that:

- (1) *Every employer shall make suitable and sufficient assessment of -*
- (a) *the risks to the health and safety of his employees to which they are exposed whilst they are at work; and*
  - (b) *the risks to the health and safety of persons not in his employment arising out of or in connection with the conduct by him of his undertaking.*

9 This publication brings together in one document the main statutory duties and protective measures dealing with the hazard of inrushes into mine workings. It describes the methods of identifying whether the hazard of inrushes exists, assessing the extent of the risk and the measures to be taken to protect against it.

10 Regulation 3 of the Management of Health and Safety at Work Regulations 1992 not only requires that every employer must assess the risks to his employees arising from his undertaking but also the risks to persons not in his employment. The risk assessment identifies the protective and preventive measures to be taken by the employer in meeting his statutory duties. Mine owners therefore need to establish whether the safety of others, either underground or on the surface (for example coal quarry workers), may be affected by their mining activities and to assess any risks to them. The guidance in this document, especially the paragraphs on information gathering, is equally relevant to this assessment. Owners will also need to have appropriate consultation with other employers who may be affected, should the risk assessment identify possible hazards to persons not in the employment of the owner.

11 Equally, other employers such as coal quarry operators and drilling contractors, whose activities may cause or aggravate inrush hazards, have the same duty to ensure in conducting their undertakings that they do not expose persons not in their employment (for example, underground miners) to risks to their health and safety.

ACOP

## Duties to prevent inrush

12 The main thrust of protective and preventive measures (PPM) to deal with the hazard of inrush (whether of gas or water or material that flows or is likely to flow when wet) from any source into current mine workings is developed from three basic statutory provisions:

- (a) the duties placed on an identifiable sole owner;
- (b) the duties placed on appointed, qualified, managers and surveyors;
- (c) the duty to maintain suitable working plans.

### The duties of an owner

13 Regulations 6(3) and 6(5) of the Management and Administration of Safety and Health at Mines (MASHAM) Regulations 1993 place the duty on the owner to secure, so far as is practicable, that the mine is managed and worked in accordance with the relevant statutory provisions and is so planned and laid out as to enable that purpose to be readily secured. The relevant statutory provisions include duties placed on others. In the case of inrushes this means that, in addition to the duties placed on him by the Precautions Against Inrushes Regulations (PAIR), the owner has a duty to ensure that the manager's duty to prevent inrushes (regulation 3) can be secured. Other duties placed on the owner include the duty:

- (a) to appoint a suitably qualified manager and surveyor;  
*(MASHAM: regulations 8 and 27(1))*
- (b) to ensure that suitable complete and accurate plans of all the workings in a mine, and of its boundaries and, so far as is practicable, of all other workings which may affect the safety of a mine (even if discontinued or abandoned) are properly kept, and that the plans are prepared and revised at suitable intervals, to provide information in such a way as is requisite to enable the mine to be worked safely. Where there are any doubts as to the accuracy of the plans of abandoned workings these need to be recorded and taken into account in assessing potential inrush hazards;  
*(MASHAM: regulation 29(1))*
- (c) to provide the surveyor for the mine with all plans, drawings and other relevant documents and information requisite for preparing suitable plans;  
*(MASHAM: regulation 30)*
- (d) to make plans of a mine available to the owner or surveyor for a neighbouring mine, if those plans are needed to assist in the preparation of statutory plans for that neighbouring mine;  
*(MASHAM: regulation 29(4))*
- (e) to make all necessary facilities available to any surveyor appointed by HSE to prepare plans where existing plans are unsatisfactory;  
*(MASHAM: regulation 33 and Mines and Quarries Act (MQA) section 19)*
- (f) to give 28 days advance notice to HSE of the start of operations for a new mine or resumption of working in certain circumstances in established mines;  
*(MASHAM: regulation 7 and Schedule 2 Part I)*
- (g) to inform HSE within 28 days of the abandonment of a mine or cessation of working in certain circumstances.  
*(MASHAM: regulation 7 and Schedule 2 Part II)*

## ACOP

### Joint duties on the owner and manager

14 There are also the following duties which fall jointly on both the manager and the owner:

- (a) to ensure that they are (at all material times) in possession of all information relating to disused workings\*, including disused mineworkings and strata likely to contain water or deposits likely to flow when wet, and to take steps to substantiate such information;  
*(PAIR: regulation 4(1))*
- (b) (when working or proposing to work in the vicinity of bodies of surface water) to ascertain the total thickness of strata lying between the workings and the surface water and to satisfy themselves that the strata is sufficiently reliable to prevent an inrush from the surface;  
*(PAIR: regulation 5)*
- (c) to immediately pass on to the other any information obtained under paragraphs (a) and (b). This is information that should also be furnished to the surveyor in accordance with paragraph 13(c);  
*(PAIR: regulation 4(2))*
- (d) to provide the surveyor of the mine with all plans, drawings and other relevant documents and information which are requisite for preparing the plans required under MASHAM regulations 29(1) and 29(5).  
*(MASHAM: regulation 30)*

### Limitation of delegation of owner's duties

15 The duties of the owner are comprehensively drawn to deal with the prevention of inrushes. Although the fulfilment of some of the duties may be delegated, by written instruction (copies of which must be sent to HSE), the owner cannot divest himself of responsibility for the duties placed upon him†. It should also be noted that where the manager of a mine believes that owner's instructions given to him are prejudicial to safety he can refuse to carry them out unless they are given in writing by an authorised person who is suitably qualified and competent to be the manager.  
*(MASHAM: regulation 16)*

\* 'Disused workings' includes any form of excavation underground or on the surface (eg quarries) that has been or is being used in connection with the extraction of minerals in their natural state. It also includes any shaft or borehole not in use, whether open or not.

† It should be noted that a prime reason for introducing the duty to secure that the mine is planned and laid out in accordance with the relevant statutory provisions and to issue written instructions to owners' appointees was an inrush at Knockshinnoch Colliery (7 September 1950) in which, of 129 men who were trapped, 13 lost their lives. This was first introduced in section 1 of the Mines and Quarries Act and is carried forward in regulation 6 of MASHAM.

ACOP

### Specific duties of the manager

16 In addition to extensive general duties and the joint duties highlighted in paragraph 14, the manager has specific duties related to the hazard of inrush which include:

- (a) a duty to prevent inrush into the workings of gas from disused workings or water or material that flows or is likely to flow when wet from any source;  
*(PAIR: regulation 3)*
- (b) a duty to obtain sufficient information to enable him to consider, in the circumstances specified in regulation 6(1), whether an inrush may occur if no precautionary measures are taken;  
*(PAIR: regulation 6(1) and 6(2))*
- (c) if he considers that an inrush will not occur, to give advance notice to HSE and to workers' representatives of his opinion and the reasons for that opinion;  
*(PAIR: regulation 6 (3))*
- (d) if he considers that an inrush may occur if precautionary measures are not taken he has a duty to prepare a special 'scheme of work' incorporating the precautionary measures and to send it in advance to HSE and to workers' representatives;  
*(PAIR: regulation 6(5))*
- (e) to give the surveyor access, so far as is practicable, to all workings of the mine (including those which have been discontinued) for the purpose of preparing the plans and sections required by MASHAM regulations 29(1) and 29(5);  
*(MASHAM: regulation 30)*
- (f) to certify abandonment plans stating that no mineral extraction has taken place after a certain date which could affect the accuracy of the working plan (but there is provision for some other suitable person to do so).  
*(MASHAM: regulation 31(2) (b))*

### Specific duties of the surveyor

17 The more specific duties placed on the surveyor include:

- (a) a duty to ensure that the working plans are suitable, complete and accurate and that all working papers relating to the working plans are signed and dated by the person who prepared them and are retained. (Any other person who prepares or revises working plans must do so under the supervision of the appointed surveyor);  
*(MASHAM: regulation 28(a) and 29(3))*
- (b) a duty to certify the accuracy of abandonment plans.  
*(MASHAM: regulation 31 (2))*

## ACOP

### Plans

18 The working plans referred to in paragraph 13(b) are of crucial importance to safe working and are dealt with in regulation 29 of MASHAM and the ACOP. The more significant features of these working plans for coal mines are that plans must:

- (a) be suitable, complete and accurate, normally on a scale of 1:2500, orientated to and correlated with the Ordnance Survey National Grid;  
*(MASHAM ACOP: paragraphs 178 and 179)*
- (b) show all current workings in each seam including all connections to the seam made by shafts or boreholes and any abandoned or disused workings, including disused mine workings. It is necessary to show the boundaries of the mine on the plan and to include any old workings whether of that mine or of any other mine within 115 m outside the boundaries of the mine which may affect the safety of the mine. Considerable detail is required on levels and gradients;  
*(MASHAM ACOP: paragraphs 180, 182 and 187)*
- (c) show the position, direction, extent and vertical throw of any fault or other displacement together with any wash-out, roll or igneous intrusion which affects the seam;  
*(MASHAM ACOP: paragraph 184)*
- (d) show the position and other details of any water dams, the security of which may affect the workings of the mine;  
*(MASHAM ACOP: paragraph 186)*
- (e) show cautionary zones which draw attention to the existence of the potentially hazardous areas described in regulation 6(1) of the PAIR Regulations (see also paragraph 26).  
*(MASHAM ACOP: paragraph 185 and PAIR: regulation 6)*

### Gathering of Information and records and development plans

19 Paragraph 18 paraphrases the main requirements relating to working plans. The prevention of inrushes, particularly in regions that have been extensively mined in the past, will require a wider approach to secure safety, and the exercise of foresight in the light of all information gathered from whatever source.

20 The duties placed on the owner and manager by regulation 4 of the PAIR Regulations require a rigorous approach to information gathering which should include:

- (a) the thorough examination of all abandonment plans and associated working papers which might affect safe working\*. The examination should not be limited or otherwise affected by the need to indicate old workings which are within 115 m outside the mine boundaries. It should be taken as far as is necessary for safety. Current workings may be affected by old workings many miles distant. Regional gas/water flows and critical parameters (eg pumping levels and operations) for the control of such flows should be established;
- (b) liaison with other bodies, eg local planning authorities, so that other surface workings or boreholes in or near the mine boundaries are known;

\* All coal abandonment plans are currently held by British Coal. All enquiries about abandonment plans of coal mines should be made to the Abandoned Mines Repository, British Coal, Technical Services and Research Executive, Ashby Road, Stanhope Bretby, Burton-on-Trent, Staffordshire DE1S 0QD. For mine plans other than for coal mines enquiries should be made to HSE's Mines Inspectorate in Bootle.

## ACOP

- (c) examination of records held by the Natural Environment Research Council (British Geological Survey) which might be relevant to proposed workings<sup>†</sup>;
- (d) diligent enquiry into other sources of information which may be available, eg from geological memoirs, archives, libraries and persons with knowledge of the area and its history.

21 If the fulfilment of duties relating to the gathering of information are delegated by the owner then any person appointed should hold established professional qualifications in mine surveying and, where relevant, geology. The written instructions required to be given to such an appointee should be clear and unambiguous.

*(PAIR: regulation 4)*

22 The information gathered should be well documented and recorded so that it is readily available to the mine manager and surveyor and to the team referred to in paragraph 24. To the extent that it is practical to do so, such information should be shown, or otherwise referred to, on the working plan.

*(PAIR: regulation 4)*

23 To discharge the owner's responsibilities on planning and layout, a development plan should be maintained for each mine so that potential hazards can be identified well in advance. Normally this should be a five year rolling plan reviewed annually, but for smaller enterprises a shorter lead time may be suitable, although it should not be less than two years.

*(MASHAM ACOP: paragraph 26)*

24 An appropriate team of line managers and specialists should be set up by the owner formally to draw up and review the plan. Agreement with the plan and agreed changes should be recorded in writing. Suitable arrangements should be made for replacement members of the team to be part of the process.

25 Information relevant to the prevention of inrush, eg cautionary zones and the existence of precautionary measures in schemes of work, should also be shown on the development plan.

*(PAIR: regulation 6(5))*

## Procedures and schemes of work to prevent inrushes

26 Regulation 6 of the PAIR Regulations prohibits a mine working which would be within 37 m of any disused mine workings or 45 m of any disused workings (which includes disused shafts and boreholes) or 45 m of any other potentially hazardous areas specified in the Regulations unless the manager follows laid down procedures. Other potentially hazardous areas are the surface, water bearing strata, unconsolidated deposits and disused workings not being mine workings. In all cases the precautionary distance should be measured as the shortest distance between the current or proposed workings and the nearest point of the potential hazard. Such cautionary zones are to be shown on the working plan (see paragraph 18(e)).

<sup>†</sup> liaison with the British Geological Survey, which was established by British Coal following an inrush of water at Lofthouse Colliery in March 1973, in which seven men lost their lives, should be preserved.

ACOP

27 If the statutory provisions and guidance given in this ACOP have been observed, then the circumstances to which prohibition, referred to in paragraph 26 applies, will have been identified, shown on the working plan, and taken into account in preparing the development plan. It then remains for the manager to implement procedures and schemes of work in accordance with the Regulations and ACOP and safe practice. Working under the sea is a special case of an inrush situation and is dealt with separately in paragraphs 39 to 50.

28 Bearing in mind that the duty is to prevent inrush in all cases where working is prohibited (in addition to the general duties relating to the gathering of information), the manager should obtain sufficient information for the specific purpose of enabling him to consider whether an inrush may occur if no precautionary measures are taken.

*(PAIR: regulation 6)*

Following this consideration two options are open to him:

- (a) to conclude that an inrush will not occur even if no precautionary measures are taken. In this case 30 days advance notice of working must be given to HSE (the inspector for the district) and to the workers' representatives for that mine, or such shorter period as the inspector may allow. Should there subsequently be an occurrence in this working which suggests that an inrush might occur, both HSE and workers' representatives must be notified as soon as is practicable and the procedures required by (b) will apply;  
*(PAIR: regulation 6(3))*
- (b) to conclude that an inrush may occur if no precautionary measures are taken, in which case he must give the same advance notice as is required for (a) and further submit the scheme of work which lays down procedures to be followed to ensure that an inrush does not occur. The manager has a duty to execute and enforce such schemes and to keep copies of the scheme at the office of the mine (or such other place as may be approved by an inspector) and in the covered accommodation for the information of employees. Any modifications to the scheme should be notified to HSE and to workers' representatives as quickly as possible.  
*(PAIR: regulation 6(4))*

29 It should be noted that the duty to prevent inrush applies to all workings and not just those which are in potentially hazardous areas. If any signs of inrush appeared in workings that were not in potentially hazardous areas, the matter should be investigated and precautionary and preventive measures drawn up even though a statutory scheme of work is not required.

*(PAIR: regulation 3)*

30 The manager may conclude that precautionary measures are not required to prevent an inrush in a potentially hazardous area. It is normal for seams to be worked within 37 m of other workings in the same seam which are disused (sealed-off districts) or within 37 m of another seam. Where such disused mine workings are recent and their history is well known and sufficient access is maintained to confirm that no danger exists, then the opinion that no inrush will occur can be justified. The notice given by the manager may cover a large area, provided that he explains the reasons for his opinion and that these reasons are sound and acceptable.

*(PAIR: regulation 6(3))*

## ACOP

31 If it is the case, however, even for recent disused workings, including disused mine workings, that the prevention of inrush depends on the maintenance of water/gas drainage or pumping systems, then a scheme of work should be prepared which includes information on these precautionary and preventive measures.

*(PAIR: regulation 6(5))*

32 Records of past workings may be suspect for accuracy and content. Where there is doubt, this should be made clear in the investigative reports and on the working plan and allowances made for the possibility of inaccurate information. Any other additional source of information should be used to check suspect information, eg old shaft and borehole records and exploratory drilling.

33 Another example of a case where a manager might decide that a scheme of work was not necessary is in the case of workings near a borehole where there existed:

- (a) accurate records of the location of the top and bottom of the borehole including any deviation;
- (b) documentation certifying that it has been sealed with a suitable type and quantity of cement.

34 Owners should establish written procedures, suitable for their organisation, to deal with these matters in an organised way. The matters to be covered include:

- (a) ensuring that all potentially hazardous areas of a mine are identified, checked and recorded in writing and, as far as it is practicable to do so, shown on the working plans;
- (b) making and maintaining development plans (covering planning and layout) so that any working proposed in a potentially hazardous area is identified at an early stage;
- (c) detailed investigation of the potential hazard (the hazard assessment);
- (d) carrying out measures to prevent inrush (the scheme of work);
- (e) ensuring effective communication between all persons who hold statutory duties relating to the hazard. This should include formal recorded meetings.

## Notices

35 Notices to HSE and workers' representatives should include:

- (a) the name of the mine;
- (b) identification of the area to be worked and the proposed date of starting work;
- (c) a description of the potential hazards;
- (d) a summary of the source material used in making the hazard assessment;
- (e) the manager's assessment of the hazards and opinion (with reasons) for not adopting precautionary measures where this opinion has been reached. A suitable plan should be sent with the notice.

*(PAIR: regulation 6)*

36 Owners will wish to make additional arrangements for informing employees generally of notices of schemes of work as distinct from the statutory requirements.

## ACOP

### Schemes of work

37 Schemes of work should be tailor-made for each situation and should describe:

- (a) the method of working;
- (b) any de-watering or de-gassing operations that are proposed;
- (c) the equipment to be used;
- (d) the rules that are to be applied and the supervisory and inspection arrangements for monitoring and enforcing such rules.

### Working under bodies of surface water

38 Further specific information needs to be gathered when workings are, or will be, in the vicinity of surface water. In such cases, the duty to ascertain the total thickness and nature of the strata between the water and the workings is fundamental to the prevention of inrush. The methods used to secure accurate and sufficient information should be appropriate to the circumstances and, in addition to normal surveying, may include exploratory drilling supplemented with seismic or other hydrographic survey techniques to determine the configuration of the underlying rock head, allowing for drift deposits and buried channels. Investigation of the nature of the intervening strata should establish its strength and permeability as well as the position of any incrop and aquifer.

### Undersea workings

39 Undersea workings are a special case of working under bodies of surface water and owners should make additional effective arrangements for workings to be planned, laid out and otherwise managed and controlled to prevent inrush. The arrangements should include the procedures and limitations described in this section in paragraphs 40 to 50.

40 Undersea workings comprise those workings lying beneath the sea and tidal water. The landward boundary of such workings should be taken as the high water mark, as shown on the 1:2500 Ordnance Survey plan, transposed landward by a distance equal to half the depth of workings at the high water mark. The landward boundary should be shown on the working and development plans.

### *Longwall working*

41 Unless there is a total thickness of cover between the top of the seam and the sea-bed of 105 m, of which at least 60 m in thickness must be carboniferous strata (including igneous rocks), then longwall working should not be practised.

42 In other circumstances, where longwall working is practised, seams should be extracted at such thickness and depths that the predicted tensile strain induced at the sea-bed should not exceed 10 mm/m. The tensile strain should be calculated in accordance with the principles described in the *Subsidence engineer's handbook* related to monitored subsidence information relevant to the locality. The calculation should be made for first and subsequent seams worked so that the predicted accumulative effect of all workings is derived.

43 Partial extraction by longwall working may be designed to restrict the tensile strain and the position of working edges (both rib sides and face line) may also be staggered by varying designed distances to achieve this. In all cases due allowance should be made for the increase in tensile strain caused by pillars and a considered assessment of the stability of pillars should be made. Table 1 gives a guide to the thickness which may be worked by total extraction at varying depths for a single seam or closely adjacent seams.

**Table 1**

Cover (m)	Thickness which may be extracted (m)
105	1.7
110	1.8
120	2.0
140	2.3
160	2.7
180	3.0
200	3.3
220	3.7
240	4.0

*Pillar and stall working*

44 Pillar and stall working should not be practised unless the total thickness of cover between the top of the seam and the sea-bed is more than 60 m (of which 45 m must be carboniferous strata).

45 In other circumstances where pillar and stall working is practised, the width of extraction should not exceed 6 m and the size of pillars should be stipulated in the design of the layout. Pillar size should be related to depth so that:

- (a) for seams not greater than 2 m in thickness the minimum dimension of a pillar should be not less than one-tenth of the depth of the seam to its roof;
- (b) for seams greater than 2 m in thickness the minimum dimension of a pillar should be not less than one-tenth of the depth of the seam to its roof plus the seam thickness;
- (c) for seams where the floor is known to become plastic to the extent that the stability of pillars may be affected, then the fraction 'one-tenth' in (a) and (b) should be taken to be 'one-sixth';
- (d) in (a), (b) and (c), the depth of the seam used should be calculated as the depth from the sea-bed plus an allowance of half the depth of sea water.

*Pillar extraction*

46 Where pillar extraction is practised, the limitations described for longwall working should be adopted for both the minimum thickness of cover (paragraph 41) and maximum tensile strain (paragraph 42).

ACOP

*Aquifers*

47 The protection afforded by a minimum thickness of cover, a maximum tensile strain and a minimum pillar dimension can be seriously reduced by the presence of aquifers. In the process of investigation undertaken by the owner, particular attention should be paid to locating probable aquifers and their extent and the foreseeable effects of working under them. Where these matters can be established, then the workings should be planned and laid out so that inrush is prevented. Where they cannot be established, then working by longwall or pillar extraction should not be practised.

48 The scheme of work should include a table setting out cover to sea-bed or aquifer, thickness of extraction and maximum tensile strains of the aggregated layout to form part of the agreed development plan for the seam.

*Development plan*

49 The development plan should show all the available information regarding:

- (a) the levels of the top and bottom (with an indication of likely margins of error) and the nature of all aquifers which could transmit large feeders of water;
- (b) the sea-bed levels, the estimated thickness and nature of sea-bed drift deposits and the position of known or suspected buried river channels;
- (c) the positions of faults known or suspected to be within or near the proposed workings which could either:
  - (i) critically reduce the carboniferous rock cover above or ahead of the proposed working area (in the case of longwall extraction no workings other than proving headings shall approach nearer to the top of the carboniferous rock cover than 60 m in any plane - this position to be marked on the plan);
  - (ii) outcrop into the sea-bed or incrop against sea-bed drift deposits; and/or
  - (iii) intersect a known aquifer (the likely margin of error relating to the positions of faults should be indicated and recorded on the plan).

Paragraph 185 of the ACOP to the MASHAM Regulations makes it clear that this detail is also appropriate to be shown on the working plan.

*General*

50 The guidance given on undersea working is designed to prevent inrushes and covers a wide range of foreseeable conditions. There may be circumstances where safety can be ensured even if the guidance is not followed precisely. In such circumstances, deviation from the guidance should be authorised from the most senior level of owner's responsibility and duties after full discussion with mining engineers, surveyors and geologists of high professional standing.

# Appendix 1 Approved Code of Practice to Parts II and VI of the Management and Administration of Safety and Health at Mines (MASHAM) Regulations 1993

**Note:** The paragraph numbers relate to the MASHAM ACOP.

## Part II Owners of mines

### ACOP

## Regulation 6 General duties of the owner of the mine

### Sole owner

24 It is essential for the safe working of a mine that an identifiable person should have ultimate responsibility for its planning and safe working. He should be the person who has the greatest authority in relation to the mine and this is the owner. No mine may be worked unless there is an owner.

25 The requirement is that there shall be a sole owner. This may be an individual, a body corporate such as a limited company or other corporation or a partnership (which is in Scotland a body corporate). The duties placed upon an owner are extensive and onerous and it is necessary therefore that where more than one person wishes to operate a mine they shall ensure there is a structure that is identifiable in law.

### Owner's duties and responsibilities

26 Regulation 6(2) places a specific duty on the owner in addition to his general duties under the 1974 Act and duties under the other relevant statutory provisions. In order to secure that the mine is managed and worked in accordance with the relevant statutory provisions and is planned and laid out for that purpose, he must make financial and other provision. The words "other provision" include, for example, the preparation of development plans, the supply of materials, the employment and training of qualified staff, making specialist services available and anything else necessary to ensure compliance with the law. He must also take other practicable steps to secure those ends. These would include ensuring that an effective management structure is set up to operate the mine and conducting such checks as are necessary to ensure that it is functioning effectively. In discharging these responsibilities the owner may need recourse to specialist advice.

## ACOP

27 Regulation 6 makes clear that if a statutory provision is contravened (even if it is by a duty holder other than the owner) the owner is guilty of an offence. So whether an owner directly contravenes a statutory provision or there is a contravention by someone else, the owner is guilty of an offence. In the latter case, however, the owner has a defence under section 156 of the 1954 Act if he can prove that he used all due diligence to secure compliance. A list of the relevant statutory provisions referred to in regulation 6(6) is in Schedule 1 to the Regulations.

### Delegation of duties by the owner

28 Some owners of mines or of groups of mines may have staff, or indeed a hierarchy, which includes people senior to their mine managers. The directors of a company or partners in a partnership which constitutes the legal person which owns a mine also carry owner's responsibilities. Sections 36 and 37 of the 1974 Act also apply. Under these sections, individuals, even if they are not identifiable with the directing mind of the owner but discharge senior management and other duties on his behalf, may be held guilty of an offence, should one be committed. It is essential therefore that the owner and those to whom he gives duties should be clear about which duties he discharges personally and which he discharges through other persons. An owner who, under regulation 6(3), appoints another person for the purpose of securing the fulfilment of his statutory responsibilities must define in writing the matters for which that person is to be responsible. A copy of each such appointment should be sent to the manager of the mine concerned and to the Executive.

29 An owner's organisation may include those qualified to manage a mine or other qualified persons. Such persons may provide expert or other assistance to a mine manager or, subject to regulation 16, give the manager instructions. Any instructions they give should not be such as to cause contravention of the relevant statutory provisions and an owner should take due cognisance of advice from the mine manager.

### Safety policy

30 It is required that there should be a health and safety policy for everyone who works at a mine. The owner of the mine has overall control of the mine and it is therefore appropriate that he should prepare a policy statement as required by section 2(3) of the 1974 Act.

31 For the purposes of regulation 4(4) other employers whose employees work at the mine will need to take account of the owner's safety policy and make sure that their safety policies conform with it. The owner should therefore make available a copy of his policy or relevant extracts to other employers.

32 If an owner has more than one mine it may be that he will prepare a general safety policy to cover all the mines which he owns. Where this is done the policy should nevertheless be appropriate to the individual needs of the mines in his ownership, and if any variations to the general policy are needed these should be noted both at the office of the relevant mine and at the owner's headquarters office.

## ACOP

33 The duty on the owner to prepare a policy statement for the mine does not relieve other employers of their duty under section 2(3) of the 1974 Act. Their policies should accord with that of the owner of the mine but where their employees may work at a number of sites in the course of their employment it is important that the employers should take into account this wider aspect of potential risk to their employees. This is particularly important in relation both to those matters over which the employer exercises control (eg provision of personal protective equipment) and also to long-term monitoring and protection of health, for example exposure to respirable dust.

### Regulation 7 Notification of mining operations

34 The information which needs to be notified to the Executive under this regulation should be notified to the HSE inspector responsible for the district in which the mine is situated.

#### Part VI Surveyors and plans

### Regulation 27 Appointment of surveyors

172 For mines of coal, shale and fireclay, specific qualifications have been approved by the Executive. These are set out in Appendix 1. Appointees to the post of mines surveyor must be in possession of the appropriate qualification and should normally have three years' relevant post-certification experience.

173 For other mines, in considering the qualifications of a surveyor, the owner should take into account such matters as education, knowledge and experience, having regard to the type and size of the mine and the nature and complexity of the technology employed.

174 In considering competence, the owner should take into account such matters as fitness and capacity to exercise the skills required in the particular mines. The surveyor's competence may need to be reviewed if and when events require or circumstances change.

### Regulation 28 Duties of the surveyor

#### Plans (general)

175 These Regulations\* require plans for:

- (a) recording the extent of workings - normally called working plans which are required by regulation 29 and are dealt with in that regulation;
- (b) ventilation systems - normally called the ventilation plan, which is required by regulation 29 of these Regulations and dealt with in that regulation;

\* Other relevant statutory provisions also require plans and Appendix 2 lists these. Appendix 3 deals with the accuracy of the plans.

## ACOP

- (c) inspection districts - regulation 12(1) of these Regulations requires the division of a mine into suitable inspection districts. Suitable plans should show clearly the limits of each district and where different districts are defined in relation to different shifts or different days of the week or both this should be clearly indicated; and
- (d) parts of a mine which is divided in accordance with regulation 15(3). Guidance is given in that section of the Code.

A geological map of the district which shows the boundaries of superficial and drift deposits as required by regulation 29 of these Regulations is also required to be kept.

176 The purpose of the written reports required by regulation 28(b) (ii) is to ensure that an incoming surveyor is able to make a proper assessment of his predecessor's work. Consequently, the report should cover the history of survey work and accuracy and identify any reservations or doubts.

## Regulation 29 Working plans, ventilation plans and geological map

### Working plans (general)

177 There should be kept at the mine, copies of all working plans referred to in regulation 29(1) and these should be available for immediate use at all times. The date on which the plan was started should be shown. Working plans of the mine should be updated at intervals not exceeding three months and up to a point not more than 100 metres from the actual position at any time. The new or revised positions of the workings should be annotated with the date of revision. More frequent revision should be undertaken where necessary to ensure completeness such as when the thirling of roadways may affect ventilation or means of egress, or when absence of up-to-date information could present a potential hazard to further working.

### Scale

178 Working plans of the mine should normally be on a scale of 1:2500, but may be on a scale of not less than 1:2500 where this is more suitable for a particular mine.

### Correlation

179 All plans should be orientated to and correlated with the Ordnance Survey National Grid. They should be marked with numbered squares which correspond to the full kilometre grid reference system adopted by the Ordnance Survey. The direction of National Grid North should be shown on the plan.

## ACOP

### *Working plans of mines - features which should be shown*

180 A separate plan should be made and kept at the mine for each seam or vein being worked in the mine. It should show clearly and accurately all the workings in that seam or vein-system together with all shafts, outlets, drifts, staple-pits or boreholes driven from or to it which are inside the boundaries of the mine or within 115 metres (375 feet in the case of plans made before 12 December 1978) outside the boundaries of the mine. For coal mines the extracted thickness should be shown at regular intervals on the working plan. Sections of seams or vein-system being worked should be kept to show any variation in thickness or character. Where possible, sections should be kept of the strata sunk through or driven through in the mine, or proved by boring. These should enable the relationship between the seams or vein-system to be determined within the boundary of the mine.

181 It may be that circumstances which exist at the mine make it impracticable to keep a separate plan for each seam or vein. In these cases a plan showing the workings in more than one seam or vein may be suitable provided that the workings in each seam or vein-system are clearly shown on the plan and are easily distinguished by the use of different colours, or in some other way.

182 All plans should show as clearly and accurately as possible the extent and position of any abandoned or disused workings whether of the mine or of any other mine which are inside the boundaries of the mine or within 115 metres (375 feet in the case of plans made before 12 December 1978) outside the boundaries of the mine which may affect the safety of the mine. In the case of mines other than coal, stratified ironstone, shale or fireclay the plans need not show workings where operations have not been carried out since 1 January 1872 but where these can be prepared it should be done.

183 Where information required to be shown on a plan cannot be shown fully and clearly on that plan without causing confusion, then a supplementary plan or record may be suitable provided it shows the necessary information fully and clearly. Each such plan and record shall be annotated to refer to the separate planes) and the latter shall be considered to form part of the working plan.

184 Every working plan of a mine should also show, as far as practicable, the position, direction, extent and vertical throw of a fault or other displacement in each seam together with any washout, roll, or igneous intrusion which affects the seam or mineral vein.

### *Accurate information relevant to safe working*

185 The Mines (Precautions Against Inrushes) Regulations 1979 impose duties on the manager and the owner. When information is gathered to fulfil those duties it should be shown on the working plan to the extent that it is practical to do so. In particular, but without prejudice to other requirements of the Mines (Precaution Against Inrushes) Regulations 1979, cautionary zones which draw attention to the situations described in regulation 6(1) of those Regulations should be shown on the working plan.

### *Water dams*

186 Every plan shall show the position of any water dam which may affect the workings, together with the dimensions, date, method of construction and pressure of water being retained so far as can be ascertained.

## ACOP

### *Shafts, adits and boreholes*

187 So far as possible every working plan should show the position and level of the top and bottom of every shaft, outlet, drift or staple-pit which gives access to the workings to which the plan relates, together with the level of every entrance giving access from the workings. Similar information should be shown for every borehole sunk from, or driven to, the surface, or from one seam to another. Records of whether or not shafts, outlets, and boreholes have been treated should be maintained and the plan should be annotated to identify the form and location of the records.

### *Levels, contours and gradient*

188 Plans made before 12 December 1978 may show variations in level from Ordnance Datum, or from a datum below Ordnance Datum specified on the plan in metric or imperial units. Plans made since then and new plans should normally show variations in level in metres from Ordnance Datum.

189 Every working plan should show variations in level at horizontal intervals of up to 100 metres and at as many intermediate points as may be necessary to show any variations in level or changes in gradient:

- (a) on every length of roadway including intake or return airways;
- (b) so far as possible, on the outline of any disused or abandoned workings shown on the plan.

On plans made since 12 December 1978, regulations require that values which lie above the Datum should be prefixed by a plus sign and be enclosed in square brackets unless the plan uses a datum other than Ordnance Datum. Spot levels indicating the level of the floor of a roadway must be shown to the nearest 0.1 metre.

190 Unless the information is otherwise conveyed (eg by vertical section) plans should also show, by means of contour lines, annotated with their value level relative to the datum, the level of the floor of the extracted area. In the case of seams not worked to the seam floor, sufficient information should be given to clarify the position. If the gradient of the seam nowhere exceeds 1:3, the contours shall show vertical variations at intervals of up to 15 metres (50 feet in the case of any plan made before 12 December 1978). If the gradient of the seam at any place is steeper than 1:3, the contours should show vertical variations in multiples of 5 metres (15 feet in the case of plans made before 12 December 1978) being not less than 15 metre nor more than 50 metre (150 feet) intervals. In every case the vertical interval between consecutive contour lines must be the same throughout the plan.

191 If the level of the workings does not change by more than 15 metres, the plan shall show the direction and rate of dip of the seam.

### *Suitable plans*

192 For plans to be suitable, the plans must be made on durable materials and be clearly drawn using an appropriate permanent medium (eg drawing ink).

ACOP

## Ventilation plans

193 A separate plan should be kept to show the ventilation system at the mine. The plan, or a copy, should be available at the mine. The plan should show clearly the general direction of the airflow, the points at which the quantity of air passing is measured and the principal means of regulating the airflow using symbols shown in Appendix 4. Airways which are solely intake airways should be coloured blue, while airways which are solely return airways and do not serve any working face as an intake airway should be coloured red.

194 The ventilation plan should be updated at intervals not exceeding three months and up to a point not more than 100 metres from the actual position at any time. More frequent revision should be undertaken where necessary to ensure completeness such as when the connection of roadways may affect ventilation or means of egress, or when absence of up-to-date information could present a potential hazard to further working. Geological plans should be obtained to a scale of 1:10 000 or the nearest obtainable scale.

## Regulation 30 Facilities and information to be given to the surveyor

195 If the area to be mined contains old workings, the utmost care should be taken to ascertain their position and extent. All diligence in searching for, and investigating, old plans, records, geological field notebooks and other documents held by private and public bodies should be exercised by the owner and manager.

196 The working plan is the primary provision for the safe working of the mine. It is important that all information available including that provided by old records, whether written or anecdotal, is given to the surveyor, listed, investigated and referenced to any proposed working. Geological memoirs can be a useful source of additional information worthy of study.

197 The manager should give suitable notice to the surveyor to facilitate the making of a survey in any part of the mine to which access is to be discontinued. In cases where access is prevented, for example by emergencies such as falls of strata or by the erection of stoppings, the manager and surveyor should make the best estimate of the extent of the workings and the working plan should record this.

## Regulation 31 Plans relating to abandoned mines or discontinued seams and vein-systems

198 When a mine has been abandoned or if 12 months have passed since a seam or vein in a mine was last worked for the purpose of mineral extraction, then all the plans, drawings and sections of that mine or seam or vein-system, whichever is appropriate, should be sent to the Executive within three months of that event. In the case of plans, drawings and sections of a seam or vein-system which is in a mine which is still operating it may be desirable to retain the originals at the mine office. In this case a full-scale copy of a plan, suitably endorsed and accurate, should be sent to the Executive.

ACOP

199 If 12 months have passed since a mine or seam or vein-system was last worked for the purpose of mineral extraction the Executive may, if it is of the opinion that compliance with regulation 31(1) is unnecessary and having regard to the circumstances, exempt the owner from the obligation imposed by this regulation and regulation 7.

200 Plans sent to the Executive under this regulation should be accompanied by all the working papers relating to those plans, drawings and sections. If it is necessary to retain the originals at the mine, authenticated copies may be sent instead. The plans should show (so far as they can be ascertained) as regards the abandoned or disused mine or seam or vein-system:

- (a) the position of any pump in use below ground immediately before the mine or that seam or vein-system was abandoned or was last worked for the purpose of getting minerals or products of minerals and the quantity of water being pumped by each pump;
- (b) any variation in level of the boundaries of the workings from Ordnance Datum or from the datum below Ordnance Datum used for the purposes of the plan;
- (c) the position and extent of any significant source of water, any area known to be waterlogged and any other source of danger which was unusual in that mine, eg outburst conditions; and
- (d) the position and, so far as practicable, the dimensions, date and method of construction of any water dam and the pressure of water being retained by it immediately before the mine or that seam or vein was abandoned or was last worked for the purpose of getting minerals or products of minerals.

201 Any originals or copies of plans, drawings, sections and working papers should be authenticated by the surveyor for the mine, who should attach a certificate to them to state that the documents are accurate and complete and show the actual state of the workings of the mine at the date of completion of working or abandonment, whichever is the later. The surveyor may need to qualify his certification for information relating to old workings which he cannot personally vouch for.

202 Any originals or copies of plans should be authenticated by the manager who should attach a certificate to them to state they show the actual state of the workings of the mine at the date of completion of working or abandonment, whichever is the later.

203 If due to exceptional circumstances the surveyor or the mine manager is not available to authenticate the documents, someone who is similarly qualified and able to attest the accuracy and completeness of the plans from personal knowledge may sign the documents instead.

204 The surveyor, or a similarly qualified substitute, should include a report stating how far the surveyor can certify the accuracy and completeness of the plans, drawings and sections as at the date when the mine or seam or vein-system was last worked and steps taken to ensure such accuracy. If for any reason the documents are not complete and accurate, the surveyor should explain in the report the nature and extent of the deficiencies.

205 If after the abandonment of the mine and submission of plans to the Executive a shaft or entrance to the mine is subsequently treated by the mine owner, for example, by infilling or capping, then supplementary details should be sent to the Executive.

## Regulation 33 Faulty plans

206 Section 19 of the 1954 Act is reproduced here for ease of reference.

'19.- (1) If, in the case of any mine, [the Health and Safety Executive] is satisfied, upon a representation made to [the Executive] by an inspector, that a plan, section or drawing which by virtue of the foregoing provisions of this Act is kept by the manager of that mine is inaccurate, incomplete, dilapidated or wholly or partly indecipherable and that, in the interests of safety, it is desirable for a new plan, section or drawing to be made, [the Executive] may appoint a surveyor to make a new plan, section or drawing.

(2) The following provisions shall have effect where a surveyor is appointed under the foregoing subsection to make a new plan, section or drawing in the case of a mine:-

- (a) the owner and the manager of the mine shall afford to the surveyor all necessary facilities and information for the purpose of making the new plan, section or drawing;
- (b) on the completion of the new plan, section or drawing, it shall be sent to the manager of the mine; and
- (c) the cost of making the new plan, section or drawing, or such part of that cost as [the Health and Safety Executive] thinks fit, shall be recoverable by him from the owner of the mine.'

# Appendix 2 Plans required by statutory provisions other than the Management and Administration of Safety and Health at Mines Regulations 1993

## Guidance

- 1 Safe exit: regulation 7(3) of the Mines (Safety of Exit) Regulations 1988 requires a suitable scheme to familiarise people with ways out of a mine and paragraph 28 of that Approved Code of Practice requires details of clearly defined ways to be included in the scheme. These should be illustrated in a sketch plan of the mine showing the main roads and exits from each part of the mine to the surface and the location of communication links and first-aid stations by symbols. The sketch plan should be displayed in the covered accommodation of the mine.
- 2 Use by rescue workers - normally called rescue plans. These are required by regulation 28 of the Coal and Other Mines (Fire and Rescue) Regulations 1956 and should show all the information on the ventilation plan and additionally the location of communications stations and first-aid stations which should be shown by symbols.
- 3 Showing the electrical distribution system - normally called electrical plans. These are required by regulation 24 of the Electricity at Work Regulations 1989 and Approved Code of Practice. Regulation 18 of those Regulations also requires plans for the introduction of electrical equipment.
- 4 Roadway dust zones - regulation 7(4) of the Coal Mines (Precautions Against Inflammable Dust) Regulations 1956 requires a suitable plan which can be used to refer samples of roadway dust to particular lengths of road.
- 5 Giving warning of potential hazards - the Mines (Precautions Against Inrushes) Regulations 1979 do not specifically require plans or sections but it is clearly advantageous for the surveyor to indicate by plans or sections any potential hazard which he is bringing to the attention of the manager.
- 6 Tips - the Mines and Quarries (Tips) Act 1969, the Mines and Quarries (Tips) Regulations 1971 and the Mines and Quarries (Tipping Plans) Rules 1971 require plans and sections to be made prior to, during and upon cessation of tipping.

# Appendix 3 Standards of accuracy in mine surveying

## Guidance

### General

1 For the accurate plans required by regulation 29, the surveyor should ensure as far as possible that all surveys and levellings carried out at or in the mine for the preparation of the plans, drawings or sections consist of a closed circuit which conforms to the standards of accuracy set out in this guidance. Where it is not possible to complete a closed circuit, the accuracy of the survey or levelling should wherever possible be confirmed by an independent check surveyor levelling carried out to the same standards of accuracy as the original survey.

2 The accuracy and the limits of error of the surveys and levellings should be of a standard to enable accurate representation on the plans, drawings or sections. The surveyor should review the necessity for re-correlation of the mine from time to time and at intervals not exceeding five years.

### Surveys

3 All surface and underground surveys made and carried out in accordance with the ACOP should be calculated and plotted by coordinates referenced to the Ordnance Survey National Grid.

### Correlation to National Grid

4 The positions of the shafts, adits and underground workings must be correlated to the Ordnance Survey National Grid. The correlation to Ordnance Survey National Grid may be carried out by:

- (a) triangulation and trilateration or a combination of the two; or
- (b) semi-graphic methods; or
- (c) direct traverse; or
- (d) any other proven system.

5 The correlation to Ordnance Survey National Grid by any of these methods should be in accordance with the following standards of accuracy:

- (a) for a triangulation or trilateration the position of every station calculated from an initial base line must agree with the position of that station calculated from a verification base line within a limit of error of 1:20 000 of the linear horizontal distance of the station from the point of origin; or
- (b) for a semi-graphic intersection and resection the coordinate value of any station established from at least six Ordnance Survey stations or stations established therefrom, with a minimum of two intersecting rays, must lie within a circle of error, the radius of which does not exceed 0.1 metres and which contains not less than 15 probable positions of the station as determined from combinations of the various rays; or
- (c) for a direct traverse from Ordnance Survey stations or stations established therefrom the total angular error of the traverse must not exceed  $10\sqrt{n}$  seconds where  $n$  is the number of observing stations (including the initial and closing stations). The error of closure must not exceed 1:6000 of the sum of the horizontal lengths of the traverse;
- (d) any other proven system of correlation to Ordnance Survey National Grid must be carried out to conform to comparable accuracies.

## Guidance

### Correlation of surface and underground workings

6 The correlation of the surface and the underground workings should be carried out by two or more independent surveys and the difference in bearing between the surface and underground base lines must not exceed one minute of arc.

7 Where the correlation of the surface and underground workings is by means of a direct traverse through an adit or drift, the total angular error must not exceed  $10\sqrt{n} + 10$  seconds where  $n$  is the number of observing stations. Again the difference in bearing of the surface and underground base lines must not exceed one minute of arc as determined by two or more independent surveys. In all cases the error of closure calculated by coordinates after distribution of angular errors must not exceed 1:5000 of the sum of the horizontal lengths of the traverse.

### Precise underground surveys

8 The total angular error of any underground precise survey carried out to check the position of a roadway or to check or establish the survey framework which has been closed polygonally or checked must not exceed  $20\sqrt{n}$  seconds where  $n$  is the number of observing stations. The error of closure must not exceed 1:5000 of the sum of the horizontal lengths of the traverse.

### Subsidiary underground surveys

9 The total angular error of any underground subsidiary survey to determine the position of any line of face or goaf, and the position of road junctions, which has been closed polygonally or checked must not exceed  $60\sqrt{n}$  seconds where  $n$  is the number of observing stations. The error of closure must not exceed 1:1000 of the sum of the horizontal lengths of the survey.

### Plotting errors

10 Surface and underground surveys carried out for plotting on the working plan of the mine at a scale of 1:2500 must be scaled up to their calculated co-ordinate position within a limit not exceeding 1 metre.

### Levellings

#### Surface bench marks

11 Levellings to determine or check mine surface bench marks must start from an Ordnance Survey bench mark and close upon a second Ordnance Survey bench mark within a limit of error not exceeding 0.03 metres.

#### Transfer of levels underground

12 The levels of shaft inset bench marks must be determined or checked by shaft measurements and the difference in level, as determined by two or more independent measurements, must not exceed 1:10 000 of the distance between the surface and underground bench marks.

13 Where the transfer of levels underground is by means of a direct levelling down an adit or drift, the difference in level of underground bench marks determined from two or more surface bench marks by two or more independent levellings must not exceed 1:5000 of the inclined length of the levelling.

## Guidance

14 Any such levellings carried out trigonometric ally must be made with an instrument capable of determining the angle of inclination to an accuracy of 40 seconds of arc and an accuracy of linear measurement of not less than 1:5000.

### *Inbye underground bench marks*

15 Underground levellings made to determine or check the levels of underground bench marks must start from stable bench marks, and must close within 1:5000 of the inclined length of the levelling.

16 Any such levellings carried out trigonometrically must be made with an instrument capable of determining the angle of inclination to an accuracy of 40 seconds of arc and an accuracy of linear measurement of not less than 1:5000.

### *Subsidiary levellings underground*

17 Subsidiary levellings underground to determine the level of any point on a line of face or goaf or any other part of the workings must commence from a bench mark and close within a limit of error not exceeding 1:1000 of the inclined route of the levelling. In any case the error of closure must not exceed 0.5 metres.

18 Any such levellings carried out trigonometric ally must be made with an instrument capable of determining the angle of inclination to an accuracy of two minutes of arc and an accuracy of linear measurement of not less than 1:1000.

# Appendix 4

## Symbols in general use on plans of mines

Guidance

Brick, stone or concrete stoppings, constructed in the manner described in regulation 21(2) of the Coal and Other Mines (Ventilation) Regulations 1956	
Brick, stone or concrete stoppings, other than the above	
Fire dams or seals	
Doors	<b>D</b> <b>d</b>
Regulators	<b>R</b>
Air crossings, explosion proof	
Air crossings other than the above	
Telephones	
Underground ambulance station (in red)	
Direction of air current	
Intake airways: Blue      Return airways: Red	

### **Further information**

For information about health and safety, or to report inconsistencies or inaccuracies in this guidance, visit [www.hse.gov.uk/](http://www.hse.gov.uk/). You can view HSE guidance online and order priced publications from the website. HSE priced publications are also available from bookshops.