HSE

Health and Safety Executive

Consultation on Dangerous Substances and Explosive Atmospheres Regulations 2002

This consultative document is issued by the Health and Safety Executive in compliance with its duty to consult under section 16 of the Health and Safety at Work etc Act 1974.

Comments should be sent to:

DSEAR ACOP Team
Health and Safety Executive
5S1 Redgrave Court
Merton Road
Bootle
L20 7HS

E-mail: DSEARACOPconsultation2@hse.gsi.gov.uk

to reach there no later than **23 August 2013**.

The Executive tries to make its consultation procedure as thorough and open as possible. Responses to this consultation document will be lodged in the Health and Safety Executive's Knowledge Centre after the close of the consultation period where they can be inspected by members of the public.

Information provided in response to this consultation, including personal information, may be subject to publication or disclosure in accordance with the access to information regimes (these are primarily the Freedom of Information Act 2000 (FOIA), the Data Protection Act 1998 (DPA) and the Environmental Information Regulations 2004 (EIR)). Statutory Codes of Practice under the FOIA and EIR also deal with confidentiality obligations, among other things.

If you would like us to treat any of the information you provide, including personal information, as confidential, please explain your reasons for this in your response. If we receive a request under FOIA or EIR for the information you have provided, we will take full account of your explanation, but we cannot give an assurance that confidentiality can be maintained in all circumstances. An automatic confidentiality disclaimer generated by your IT system will be disregarded for these purposes. Requests for confidentiality should be made explicit within the body of the response.

HSE will process all personal data in accordance with the DPA. This means that personal data will not normally be disclosed to third parties and any such disclosures will only be made in accordance with the Act.

CD254
Consultative Document

Consultation on draft revised Approved Codes of Practice (ACOPs)
Dangerous Substances and Explosive Atmospheres Regulations 2002

Contents

How to Respond

The proposals and the consultation questions can be found at the end of this document and also at http://www.hse.gov.uk/consult/condocs/cd254.htm. You are welcome to comment on any issue raised by this document.

You can:

Complete the online questionnaire - the preferred method;

Respond by email if you cannot complete online - you should send this to DSEARACOPconsultation2@hse.gsi.gov.uk

or,

Respond on paper – you can do this either by:

- Printing the online questionnaire; or
- Making a written response in whatever format you wish.

Send your completed response to:

DSEAR ACOP TEAM
Health and Safety Executive
5 S1 Redgrave Court
Merton Road
Bootle
L20 7HS

We would be grateful if you could provide an email address when you provide your response so that we may contact you if, for example, we have a query in respect of your response.

Responses must be received by **23 August 2013**.

If you require a more accessible format of this document please send details to creative@hse.gsi.gov.uk and your request will be considered.

What happens next?

We will provide a summary of those who responded to this consultation and produce a summary of the relevant views expressed for each question; this information will be placed on the HSE's website.

Consultation principles

HSE is committed to best practice in consultation and to the Government's Consultation Principles. The Government is improving the way it consults by adopting a more proportionate and targeted approach, so that the type and scale of engagement is proportional to the potential impacts of the proposal. The emphasis is on understanding the effects of a proposal and focussing on real engagement with key groups rather than following a set process. The key Consultation Principles are:

- Departments will follow a range of timescales rather than defaulting to a 12-week period, particularly where extensive engagement has occurred before;
- Departments will need to give more thought to how they engage with and consult with those who are affected;
- Consultation should be 'digital by default', but other forms should be used where these are needed to reach the groups affected by a policy; and
- The principles of the Compact between government and the voluntary and community sector will continue to be respected.

How your responses will be handled

HSE will give full consideration to the substance of arguments in the responses received and then decide on how best to take the proposals forward based on an interpretation and analysis of those responses.

We will acknowledge all responses where possible to do so.

Queries and complaints

If you do not believe that this document or the consultation on these proposals meet the criteria on consultations set out above, or if you are not satisfied with the way this consultation exercise has been conducted, please either write to:

Teresa Farnan at:
Health and Safety Executive
7th Floor
Caxton House
6-12 Tothill Street
London
SW1H 9NA

Or send an email to teresa.farnan@hse.gsi.gov.uk

We aim to reply to all complaints within 10 working days. If you are not satisfied with the outcome, you can raise the matter with HSE's Chief Executive, Geoffrey Podger, at Health and Safety Executive, Redgrave Court, Merton Road, Bootle, Merseyside, L20 7HS. You can also write and ask your MP to take up your case with us or with Ministers. Your MP may also ask the independent Parliamentary Commissioner for Administration (the Ombudsman) to review your complaint.

Summary

1. This consultative document invites views on the revised Approved Code of Practice (ACOP) Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR).

2. This ACOP provides practical guidance on how to comply with the requirements of the DSEAR. It is relevant to a wide cross section of industry including general manufacturing and repair businesses as well as chemical and food manufacture, printing, supply chains and many other activities where flammable substances or dusts may occur.

3. This consultation is undertaken in compliance with Section 16 of the Health and Safety at Work etc Act 1974 which requires HSE to consult on revisions to ACOPs prior to seeking the Minister's consent to approve the revised ACOP.

4. The proposed revised document consolidates the contents of five existing ACOPs into a single new ACOP as proposed by the first consultation. As a consequence, the following four ACOPs will be withdrawn:

   - L134 – Design of plant, equipment and workplaces – Dangerous Substances and Explosive Atmospheres Regulations 2002
   - L135 – Storage of dangerous substances - Dangerous Substances and Explosive Atmospheres Regulations 2002
   - L136 – Control and mitigation measures - Dangerous Substances and Explosive Atmospheres Regulations 2002
   - L137 – Safe maintenance, repair and cleaning procedures – Dangerous Substances and Explosive Atmospheres Regulations 2002

   The content of these ACOPs has been consolidated into a revised and updated version of ACOP L138 – Dangerous Substances and Explosive Atmospheres Regulations 2002.

5. This consultation presents the draft revised ACOP L138 and associated guidance as prepared by HSE and seeks views on some specific questions. These are set out at the end of this consultation document.

Background to the revised ACOP

6. On 28 November 2011 Professor Ragnar Löfstedt published his independent review of health and safety legislation '[Reclaiming health and safety for all]'. The review reported that overall a wide range of stakeholders supported the principles of ACOPs and saw them as a vital part of the system, forming a key link between goal setting legislation and guidance, though many also felt there was room for improvement.

7. In his report Professor Löfstedt made the following recommendation:

   > HSE should review all its Approved Codes of Practice (ACOPs). The initial phase of the review should be completed by June 2012 so

businesses have certainty about what is planned and when changes can be anticipated.

8. The Government accepted this recommendation and asked HSE to review its ACOPs to the timetable recommended by Professor Löfstedt.

9. Following an initial review of 32 ACOPs, HSE launched a consultation on 25 June on proposals for the review of 30 of those ACOPs. The consultation closed on 14 September 2012. That consultative document is available on the HSE website alongside an analysis of responses at hse.gov,uk/consult/condocs/cd241.htm.

The outcome of the initial consultation on proposals to review the DSEAR ACOPs

10. The initial consultation sought views on the following proposal for reviewing the DSEAR ACOP.

11. To consolidate the five ACOPs (L134-138) into a single revised ACOP (L138) to be published by end of 2013. These five ACOPs (L134-L138) provide advice on compliance with the Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR) with a considerable amount of repetition across the documents. It is proposed that all five ACOPs are consolidated into a single revised L138 which brings together the ACOP advice from all of them with suitable navigation to enable the duty holder to find the advice that is of most interest to them.

12. The consultation received 137 responses which provided a view on the proposal. Of these 123 (90%) supported the proposal. A further 3 responses were received which provided no clear view on the proposal.

13. The HSE Board considered the outcome of the initial consultation in December 2012 and agreed that the proposed revision of the ACOPs should be taken forward.

14. The consultation responses mainly registered concerns about potential loss of valued detail if the ACOP material was radically reduced in length. The objectives of the revisions have accordingly been limited to condensing text to remove duplication and increase clarity following consolidation. Navigation issues have been addressed by increased use of headings and contents listing. Work on navigation will continue during the consultation period.

The draft ACOP

15. The draft ACOP is at Appendix 1. We are seeking views on the whole publication, i.e. the advice provided as ACOP and the associated guidance material. The differences in presentation and status of the different material in the publication are explained in the draft ACOP.

16. The main revisions and changes of note that have been made are:

- Following a critical review of the ACOP and guidance text, some guidance has been assigned ACOP status under Regulation 7. In a few other instances, text has changed from ACOP to guidance status or vice versa. These changes do not impact on practical compliance requirements.
- Schedules have been repositioned for clarity. For example Schedule 2 which is relevant to regulation 6 has been moved from the end of the document next to the text of Regulation 6.
- Obscure and specialist terminology has been simplified where possible.
- References to guidance published by trade organisations and similar bodies have been reduced because they quickly become outdated and web searches are now a more usual method of researching current guidance.
- The review included identification of any ACOP text that might require more than the regulations require. No significant instances were identified but the need for proportionality and avoiding proliferation of overlapping risk assessments has been emphasised.

17. The use of more lists and bullet points is intended to increase the speed of assimilation of key points. Additional annexes have been used, eg to provide current information on the direct acting European 'CLP' Regulations and on matters relating to self employment.

18. HSE is grateful for the help given by a number of key trade and professional organisations including trades unions during the development of the revised ACOP.

19. In addition to revising the guidance in this ACOP, HSE is revising a number of DSEAR related publications, in particular those relating to flammable liquids, These will be republished on HSE's website later this year.

Impact of changes

20. In line with the findings of the Löfstedt review, the ACOP has been reviewed primarily to bring it up to date and to make it clearer and more understandable for users. The legal duties it provides advice on and the nature of the method of compliance it describes are substantively unchanged other than to update their descriptions to reflect current positions. Dutyholders already complying with the law should not therefore need to change what they are doing. The benefits arising from the revised ACOP will predominantly be realised by new users seeking advice on achieving compliance and those using it to refresh their knowledge.

Consultation questions

21. We are interested in your views on the following questions:

Q1.1 Is the draft ACOP and associated guidance sufficiently clear for you to be confident about how you can comply with the Dangerous Substance and Explosive Atmospheres Regulations?

Q1.2 If not, which parts are not clear and why?

Q2.1 Are there any comments you wish to make on the method(s) of compliance described in the draft publication?

Q3.1 Are there any impacts from the revision of this ACOP that we should be aware of?

Q4.1 Do you think the repositioning of schedules 1 and 2 is helpful?

Q5.1 Are there any further issues we should consider before withdrawing ACOPs L134-L137?

Q5.2 If you think there is a need for guidance in addition to that which is available on HSE's Fire and Explosion website or in this ACOP guidance, please explain briefly.

22. Please note that this consultation is not seeking views on the regulations with respect to which this ACOP is approved.

Next steps

Following consultation a final draft of the ACOP will be prepared for approval by the HSE Board and subsequent publication. The ACOP is due for publication by December 2013. The outcome of this consultation will be made available on the HSE website

L138

Dangerous Substances and Explosive Atmospheres

Dangerous Substances and Explosive Atmospheres Regulations 2002

Approved code of practice and guidance

First published 2013

ISBN 978 0 7176 XXXX X

Approved Code of Practice

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.

Guidance

This guidance is issued by the Health and Safety Executive. Following the guidance is not compulsory, unless specifically stated, 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.

Contents

Introduction

About this book

1 The Dangerous Substances and Explosive Atmosphere Regulations 2002 (DSEAR) Approved Code of Practice (ACOP) text and associated guidance provide practical advice on how you can comply with the requirements of the Regulations.

2 The ACOP is intended primarily for an informed and experienced audience such as professional health and safety staff and those who may give advice to smaller businesses rather than the small businesses themselves. The leaflet INDG 370[1] provides a short guide to DSEAR and is aimed at small and medium-sized businesses. Information on DSEAR can also be accessed via the Fire and Explosion pages of HSE's website[2].

3 This publication is for places of work that manufacture, store, process or use dangerous substances as defined in paragraph 22. It contains an ACOP explaining what is required for compliance, together with guidance on the duties in DSEAR. It has been prepared by the Health and Safety Executive (HSE) after consultation with stakeholders in industry, trades unions, local authorities and fire authorities. Whilst *Unloading petrol from road tankers*[3] continues as a separate ACOP, four DSEAR ACOP publications from 2002 have been merged into the original main existing ACOP L138, *Dangerous Substances and Explosive Atmospheres* namely :

(a) L134, *Design of plant, equipment and workplaces*

(b) L135, *Storage of dangerous substances*

(c) L136, *Control and mitigation measures*

(d) L137, *Safe maintenance, repair and cleaning procedures*

4 The ACOP text and guidance have been simplified, streamlined and any previous ambiguities removed. The changes, which are summarised below, have been widely consulted on.

5 Changes in this edition include:

- Some guidance has been assigned ACOP status and vice versa. For example, previously no ACOP material existed for regulations 7 and 10. However these changes were introduced to provide clarification on how to comply and do not introduce any new requirements.
- Adjustments in light of European and other legislation introduced, amended or revoked after DSEAR came into force such as:
  - General fire safety legislation[15,16,17];
  - Classification for labelling and packaging (see Appendix 4);
- Clarification on the scope of the regulations in relation to incompatible substances being outside the scope of DSEAR but within the scope of the Health and Safety at Work Act (HSWA) (see paragraph 230);
- Schedules to the regulations have been moved from the end of the document to sit with their respective regulation;
- Where possible, ACOP and guidance text from the source ACOPs has been laid out to follow the order of the clauses in the regulation to which it refers;
- Reduction in the density of text where possible by use of bullet points and lists.
- The list of references and further reading has been condensed.

About ACOPs

6 Approved Codes of Practice are approved by the HSE Board with the consent of the Secretary of State (see Appendix 1: Notice of Approval for details).

7 The ACOP describes preferred or recommended methods that can be used (or standards to be met) to comply with the Regulations and the duties imposed by the Health and Safety at Work etc

Act. The accompanying guidance also provides advice on achieving compliance, or it may give information of a general nature, including explanation of the requirements of the law, more specific technical information or references to further sources of information.

8 The legal status of ACOP and guidance text is given on the copyright page.

Presentation

9 The ACOP text is set out in **bold** and the accompanying guidance in normal type, the text of the Regulations is in *italics*. Coloured borders also indicate each section clearly. Each regulation is preceded by a short summary of the main duties imposed by that regulation and aims to help the reader navigate the document. This summary text is for information only.

Introduction

1 The Dangerous Substances and Explosive Atmospheres Regulations 2002[4] (DSEAR) set minimum requirements for the protection of workers from fire and explosion risks related to dangerous substances and potentially explosive atmospheres. The regulations apply to employers and the self-employed at most workplaces in Great Britain where a dangerous substance is present or could be present (see Appendix 3 for notes about DSEAR and the self-employed).

2 DSEAR revoked, or modified a large amount of old legislation relating to flammable substances and dusts including the Highly Flammable Liquids and Liquefied Petroleum Gases Regulations 1972[5] and section 31 of the Factories Act 1961. Safety standards were maintained through a combination of the requirements of DSEAR and Approved Codes of Practice (ACOP) reflecting practices in the preceding legislation.

Scope of 'employer'

3 The term employer is used throughout the document and should be understood to include the self-employed as a consequence of regulation 4(2). Less frequently the less specific term dutyholder may also be used which includes both.

Information for use in risk assessment

4 A key part of compliance with DSEAR is the risk assessment and an important principle is to separate storage areas from process areas where the two occur on the same or shared premises. Employers will find generic information on the storage of dangerous substances in many pieces of HSE and non-HSE guidance. In contrast process activities are, by their nature, very variable, and the employer will need to consider these in much more detail and apply the principles of risk assessment themselves as there may be less guidance available.

5 Health effects from substances and preparations are not within the scope of DSEAR and are covered by legislation such as the Control of Substances Hazardous to Health Regulations 2002 (COSHH)[6].

The legislative background

6 DSEAR 2002 was made under the Health and Safety at Work etc Act 1974 (HSW Act)[7]. The Regulations apply to workplaces in Great Britain. The Regulations implement two European Directives: the safety aspects of the Chemical Agents Directive 98/24/EC (CAD)[8] and the Explosive Atmospheres Directive 99/92/EC (ATEX 137)[9].

7 The primary purpose of DSEAR is to protect the safety of workers and others who may be at risk from dangerous substances that can cause a fire, explosion or similar energy-releasing event, such as a runaway exothermic reaction.

8 Each regulation in this ACOP is preceded by a brief summary to assist readers who may not be familiar with the Regulations. The summary is not a substitute for reading the complete text of the regulation, but it is intended to help decide whether a regulation applies to the reader's particular situation. The text of each regulation, is followed by ACOP text and associated guidance.

DSEAR and other legislation on dangerous substances or hazardous activities

9 Subject to regulation 3(1), risks from dangerous substances or explosive atmospheres may also be subject to other specific legislation dealing with, for example:

(a) risks from major hazard activities, covered by the Control of Major Accident Hazards Regulations 1999 (COMAH)[10].

(b) the prevention of fires and explosions offshore through the Offshore Installations (Prevention of Fire and Explosion, and Emergency Response) Regulations 1995 (PFEER)[11] or the Offshore Installations and Pipeline Works (Management and Administration) Regulations 1995[12]; and

(c) the transport of dangerous goods, covered by specific carriage legislation, such as the Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2007 (CDG)[13] (These have been superseded by The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009. Reference to the amendment has yet to be reflected formally in DSEAR but, section 17(2)(a) of the Interpretation Act 1978 means that reference to the earlier regulations includes the later Regulations).

The above list is not exclusive and other legislation includes provisions on preventing fires and explosions for example in quarries, mines and harbour areas. In many cases, compliance with the specific requirements of such other legislation will go a long way towards meeting the requirements of DSEAR.

Relationship with other health and safety legislation

10 The duties in DSEAR apply alongside the HSW Act, other regulations made under the Act, and legislation on fire precautions and within a wider legislative context. See Appendix 2 for more information. Certain significant regulations are highlighted below.

General Fire Safety Legislation

11 Separate legislation covers general fire safety requirements in the workplace in England and Wales, through The Regulatory Reform (Fire Safety) Order 2005[14]. The Scottish equivalent, The Fire (Scotland) Act 2005[15] and the Fire Safety (Scotland) Regulations 2006[16]. The legislation consolidated and revoked legislation that previously covered general fire safety, including the requirement for fire certification. The current legislation requires the employer to carry out a risk assessment to determine the general fire safety requirements for their workplace and implement these, including maintaining a general fire safety management plan.

12 General fire safety legislation is normally enforced by the local Fire and Rescue Authority or the Joint Fire and Rescue Board for the area. However for certain specific workplaces/worksites, including licensed nuclear premises, shipbuilding and construction sites, HSE is the enforcement authority.

13 The provisions of Regulations 1-6, 8, 9 and 11 of DSEAR as they relate to General Fire Safety are covered under this general fire safety

legislation, enforcement responsibility falling to the relevant authority, depending on the activity at the premises.

The Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 1996[17]

14 The Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 1996 as amended (EPS) implement Directive 94/9/EC[18] ('the ATEX product Directive'). EPS applies to both electrical and mechanical equipment and protective systems intended for use in potentially explosive atmospheres.

15 New equipment, etc, supplied for use in places where an explosive atmosphere may occur must meet the requirements of EPS whatever its source. Second-hand equipment and equipment already on the shelf (for example, as spares) brought into use after 1 July 2003 also has to meet the requirements of EPS.

16 Regulation 7(6) of DSEAR made provisions in regulation 17 for transitional delays before certain requirements of regulation 7 and Schedule 3 (in relation to equipment in hazardous areas) became entirely active. All of the transitional delay periods have now expired but guidance on regulation 17 can now be found on page 86 under regulation 7.

Environmental issues

17 DSEAR deals only with risks to people from dangerous substances but such substances could also harm the environment, during disposal or in the event of a spill. In undertaking any risk assessment, or developing emergency arrangements, the potential for environmental harm should also be considered. Judgements may need to be made when balancing both safety and environmental risks when considering substitution or other risk control/mitigation measures. Further guidance[19] on environmental considerations is available from:

- the Environment Agency (EA) in England
- the Scottish Environment Protection Agency (SEPA) in Scotland and;
- from April 2013, Natural Resources Wales (NRW) Cyfoeth Naturiol Cymru

Enforcement arrangements

18 DSEAR is enforced by HSE or local authority inspectors in accordance with the Health and Safety (Enforcing Authority) Regulations 1998[20] except at commercial premises holding petroleum licences. At these premises the regulations are enforced by petroleum licensing authorities (PLAs) in respect of any activities related to refuelling motor vehicles.

19 At most workplaces, fire authorities will enforce those parts of DSEAR that relate to general fire precautions.

Consulting employees and safety representatives

20 Proper consultation with those who know precisely how the work is done, including short cuts, is crucial and helps to build a culture of awareness of health and safety. It can benefit the business by making it more efficient and reducing losses and damage.

21 Employers must consult safety representatives appointed by

recognised trades unions under the Safety Representatives and Safety Committees Regulations 1977[21]. Employees who are not covered by such representatives must be consulted either directly or indirectly, through elected representatives of employee safety under the Health and Safety (Consultation with Employees) Regulations 1996[22].

The Regulations

Regulations 1 to 4 deal with preliminary issues, ie the date of entry into force of the regulations, scope and definitions.

Please be aware that the DSEAR regulations printed in this ACOP include amendments made since 2002 up to mid 2013 only. It is important to ensure that the most recent version of any regulation is consulted subsequently.

Regulation 1 Citation and commencement

Summary 1

All parts of the regulations are now in force.

Regulation 1

These Regulations may be cited as the Dangerous Substances and Explosive Atmospheres Regulations 2002 and shall come into force--

(a) as respects all regulations except for regulations 5(4)(c), 7, 11, 15(2), 16(2) and 17(1) to (3) on 9th December 2002;

(b) as respects regulations 15(2) and 16(2) on 5th May 2003; and

(c) as respects regulations 5(4)(c), 7, 11 and 17(1) to (3) on 30th June 2003.

Regulation 2 Interpretation

Summary 2

Use the definitions listed here to check the exact meaning of terms used eg, ‘a dangerous substance’.

Regulation 2

In these Regulations--

"approved classification and labelling guide" means the "Approved Guide to the Classification and Labelling of Dangerous Substances and Dangerous Preparations" (5th edition[1]) approved by the Health and Safety Commission on 16th April 2002;

"the CHIP Regulations" means [the Chemicals (Hazard Information and Packaging for Supply) Regulations 2009];

"dangerous substance" means--

(a) a substance or preparation which meets the criteria in the approved classification and labelling guide for classification as a substance or preparation which is explosive, oxidising, extremely flammable, highly flammable or flammable, whether or not that substance or preparation is classified under the CHIP Regulations;

(b) a substance or preparation which because of its physico-chemical or chemical properties and the way it is used or is present at the workplace creates a risk, not being a substance or preparation falling within subparagraph (a) above; or

(c) any dust, whether in the form of solid particles or fibrous materials or otherwise, which can form an explosive mixture with air or an explosive atmosphere, not being a substance or preparation falling within subparagraphs (a) or (b) above;

"explosive atmosphere" means a mixture, under atmospheric conditions, of air and one or more dangerous substances in the form of gases, vapours, mists or dusts in which, after ignition has occurred, combustion spreads to the entire unburned mixture;

"hazard" means the physico-chemical or chemical property of a dangerous substance which has the potential to give rise to fire, explosion, or other events which can result in harmful physical effects of a kind similar to those which can be caused by fire or explosion, affecting the safety of a person, and references in these Regulations to "hazardous" shall be construed accordingly;

"offshore installation" has the same meaning as it is given by regulation 3 of the Offshore Installations and Pipeline Works (Management and Administration) Regulations 1995 insofar as that regulation extends to mineral extracting industries within the scope

[1] *Approved Guide to the Classification and Labelling of Dangerous Substances and Dangerous Preparations (6th edition) is the most current version*

of Article 2(a) of Council Directive 92/91/EEC concerning the minimum requirements for improving the safety and health protection of workers in the mineral-extracting industries through drilling;

"personal protective equipment" means all equipment which is intended to be worn or held by a person at work and which protects that person against one or more risks to his safety, and any addition or accessory designed to meet that objective;

"preparation" means a mixture or solution of two or more substances;

"public road" means (in England and Wales) a highway maintainable at public expense within the meaning of section 329 of the Highways Act 1980 and (in Scotland) a public road within the meaning assigned to that term by section 151 of the Roads (Scotland) Act 1984;

"risk" means the likelihood of a person's safety being affected by harmful physical effects being caused to him from fire, explosion or other events arising from the hazardous properties of a dangerous substance in connection with work and also the extent of that harm;

"risk assessment" means the assessment of risks required by regulation 5(1);

"safety data sheet" means a safety data sheet within the meaning of [Regulation (EC) 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals];

"substance" means any natural or artificial substance whether in solid or liquid form or in the form of a gas or vapour;

"workplace" means any premises or part of premises used for or in connection with work, and includes--

(a) any place within the premises to which an employee has access while at work; and

(b) any room, lobby, corridor, staircase, road or other place--

(i) used as a means of access to or egress from that place of work, or,

(ii) where facilities are provided for use in connection with that place of work,

other than a public road; and

"work processes" means all technical aspects of work involving dangerous substances and includes--

(a) appropriate technical means of supervision,

(b) connecting devices,

(c) control and protection systems,

(d) engineering controls and solutions,

(e) equipment,

(f) materials,

(g) machinery,

(h) plant,

(i) protective systems, and

(j) warning and other communication systems.

Amendment

In definition "the CHIP Regulations" words "the Chemicals (Hazard Information and Packaging for Supply) Regulations 2009" in square brackets substituted by SI 2009/716, reg 17, Sch 6.

Date in force: 6 April 2009: see SI 2009/716, reg 1(1).

In definition "safety data sheet" words from "Regulation (EC) 1907/2006" to "Restriction of Chemicals" in square brackets substituted by SI 2009/716, reg 17, Sch 6.

Guidance 2

22 In this regulation:

- 'other events' under the regulation 2 definition of 'hazard' of the dangerous substance include exothermic runaway reactions.
- 'connecting devices' under the regulation 2 definition of 'work processes' are the means by which discrete parts of the process are interconnected, eg conveyor belts, trunking, pipe work etc.
- 'dangerous substance' includes any substance or preparation, which because of its properties or the way it is used could cause harm to people from fires and explosions. Dangerous substances include those with potential energy releasing events similar to fire and explosion such as exothermic reactions. Examples include: petrol; liquefied petroleum gas (LPG); paints; varnishes; solvents; and dusts which when mixed with air could cause an explosive atmosphere, for example, dusts from milling and sanding operations.

23 Substances and preparations are potentially within the scope of the regulations - whether in solid, liquid or gaseous form. This includes substances that are naturally occurring or produced in a chemical or manufacturing process. Substances are also included if they are produced by a work activity - for example intermediates in a chemical process, waste products of any kind, or substances produced in accident conditions eg, in a runaway chemical reaction.

24 The Regulations apply wherever a dangerous substance is, or is liable to be, used or present in connection with a work activity carried out by an employer.

25 Although the chemical and petroleum industries will by their very nature store, use and process the majority of dangerous substances, most other sectors, such as manufacturing, food, retailing, etc will also have

dangerous substances present but possibly in small quantities.

Key terms explained

The following provides definition of some terms used within this ACOP.

- 'control' is used to describe steps taken or provisions put in place to reduce the likelihood of a fire, explosion, or similar event happening. Control measures should be considered before considering mitigation.
- 'mitigation' is used to describe what steps are taken to minimise the consequences during and after the occurrence of a fire, explosion or similar event.
- certain combustible dusts are explosible. This means when dispersed in air in the right dust /air mixture they can cause an explosion if ignited. For simplicity the term 'explosive' is used in this ACOP to describe these dusts. In this context the term does not mean materials which are in the class of intentionally explosive materials (UN class 1).
- reducing risk so far as reasonably practicable, and 'as low as reasonably practicable' means balancing the level of risk against the measures needed to control the risk in terms of money, time or trouble. The decision is weighted in favour of health and safety so that the measures are adopted unless they are grossly disproportionate. More guidance on the principles of ALARP may be found on the HSE website[23].

Approved classification and labelling

26 See Appendix 4 which explains changes in classification arrangements.

Explosive atmospheres

27 This definition sets out the criteria to determine whether an atmosphere is explosive within the scope of the regulations. The definition is particularly important in deciding when certain requirements in DSEAR will apply, particularly regulations 7 and 11.

28 The following three points are consistent with the guidance on EPS, where explosive atmosphere is similarly defined. This is relevant to regulation 7 of DSEAR and the selection of equipment for use in explosive atmospheres. For the purposes of DSEAR the following elements must all be present for an explosive atmosphere to form:

- Atmospheric conditions – for the purposes of standardisation, normal atmospheric conditions are defined as: -20°C to 40°C, and 0.8 to 1.1 bar.
- Mixtures of air and dangerous substances - dangerous substances or mixtures of such substances, that are explosive with an oxidant other than air, for example pure oxygen or chlorine, are outside the scope of the definition of explosive atmosphere. The provisions of regulations 7 and 11 do not apply although other requirements in DSEAR may do.
- Combustion - the definition of explosive atmosphere in regulation 2 is intended to make clear that where it can be ensured that the gas or dust is present in a concentration below the lower explosive limit, the atmosphere is not explosive, and regulations 7 and 11 do not apply. Note, in

this guidance, the terms ‘flammable limit’ and ‘explosive limit’ as used for example in 'lower flammable limit', the words ‘flammable’ and ‘explosive’ are intended to have the same meaning and are interchangeable. For simplicity, the term ‘lower explosive limit’ (LEL) is used throughout this document.

Hazard

29 In common usage, a hazard is anything with the potential to cause harm in any way, but a more restricted meaning is specified within DSEAR when considering dangerous substances and preparations. In DSEAR the term hazard is confined to the properties of a substance that can potentially lead to fire or explosion or other similar energetic effects which could affect a person’s safety.

30 The regulations are concerned with dangerous substances that can create harmful physical effects. However, DSEAR does not apply to all possible physical effects, such as crushing injuries, resulting, for example, from the storage and handling of heavy containers of dangerous substances and preparations. The regulations are intended to include coverage of the following harmful physical effects caused directly or indirectly by fires, explosions and other similar events including:

(a) thermal radiation (burns caused by radiating heat);

(b) thermal injury (burning substances on the skin);

(c) over-pressure (blast injuries);

(d) smoke, fire gases, unintended releases (asphyxiation).

Other events

31 Harmful physical effects can also be caused by other energetic events such as runaway exothermic reactions or decompositions of unstable substances - for example, decomposition of peroxides. These words are included in the definition of hazard to ensure that not only fires and explosions are covered, but also other similar energetic events.

Physico-chemical or chemical property

32 Ultimately the hazard is created by the physico-chemical and chemical properties of the substance or preparation and the way it is used or present.

33 Examples of relevant physical properties include:

- boiling point, flash-point, auto-ignition temperature,
- flammability, vapour pressure, thermal sensitivity,
- mechanical sensitivity and oxidising properties.

Relevant chemical properties would include:

- reactivity, heat of reaction
- self-acceleration and decomposition temperature.

Other properties of substances relating to radioactivity, toxicity and ecotoxicity are not within the scope of the regulations.

Test methods that can be used to determine physico-chemical

properties are detailed in The Test Methods Regulation (TMR) (EC) No 440/2008 (as amended) or the UN Manual of Tests and Criteria. Further information on the TMR can be found on the European Chemicals Agency website[24].

34 For materials that could be dispersed in air to give rise to a risk of a dust explosion, the consequences and magnitude of this are significantly influenced by the composition and nature of the material, including its particle size. A number of European Standards for test methods to assist in the determination of the risk and the precautionary measures required are available[25].

Safety data sheets

35 SDS are no longer covered by the CHIP Regulations. The legal requirements to provide a SDS have been transferred to the direct acting European REACH Regulation.

Workplace

36 The definition of 'workplace' is based on that used in the Workplace (Health, Safety and Welfare) Regulations 1992[26]. It is however wider in scope as it also includes areas in private dwellings where work is carried out.

37 The term 'premises', used in the definition of 'workplace', means any place - whether or not there is a structure at that place. It includes, subject to the disapplications in regulation 3, vehicles, vessels, any land-based or offshore installations, movable areas to which employees have access while at work and their means of access to and egress from, the workplace. Thus, common parts of shared buildings, private roads and paths on industrial estates and business parks are included.

38 Public roads which are used to get to or from the workplace, are not included in the definition. However, in some circumstances, a public road may itself become the workplace, and if dangerous substances are used or produced during the work activity concerned, these Regulations may apply, for example during road repairing or work on utilities.

Work processes

39 This includes the use of the 'hardware' aspects of work involving dangerous substances that are of a technical nature eg, gas detectors, flameproof enclosures, regulating devices. It excludes systems of work, eg, management and non-technical supervisory arrangements, but does include appropriate technical measures for supervision. Work processes can involve a range of activities, for example, storage, manufacture, disposal, cleaning and some forms of energy generation.

Technical supervision measures

40 Technical means of supervision are those technical measures that are required by the risk assessment to prevent employees from working in or entering an explosive atmosphere. They will include monitoring and interlock devices that are designed to stop a process or alert an employee in the event of a mechanical fault, procedural error or foreseeable process deviation that could result in the formation of a hazardous explosive atmosphere. Examples of such technical measures include:

(a) gas monitoring and alarm systems for employees working in confined spaces where flammable vapours may be present

or likely to be released by the activity;

(b) interlocks on coating operations that would stop the application of flammable coating products if the associated mechanical exhaust ventilation is interrupted.

41 Technical means of supervision may be used as a separate supervisory function or as part of a wider management system for controlling risks.

Regulation 3 Application

Summary 3

To avoid overlaps with other more specific legislation regulation 3 disapplies some named work activities from some individual DSEAR regulations. These work activities include maritime, medical, gas appliances, explosives manufacture, mines and quarries and offshore installations.

Regulation 3

(1) These Regulations, apart from regulations 15, 16 and 17(4) to (5), shall not apply to the master or crew of a ship or to the employer of such persons in respect of the normal ship-board activities of a ship's crew which are carried out solely by the crew under the direction of the master and, for the purposes of this paragraph--

(a) "ship" includes every description of vessel used in navigation, other than a ship forming part of Her Majesty's Navy or an offshore installation; and

(b) the reference to the normal ship-board activities of a ship's crew includes--

(i) the construction, reconstruction or conversion of a ship outside, but not inside, Great Britain; and

(ii) the repair of a ship save repair when carried out in dry dock.

(2) Regulations 5(4)(c), 7 and 11 shall not apply to--

(a) areas used directly for and during the medical treatment of patients;

(b) the use of gas appliances burning gaseous fuel (that is to say, any fuel which is in a gaseous state at a temperature of 15°C under a pressure of 1 bar) which--

(i) are used for cooking, heating, hot water production, refrigeration, lighting or washing; and

(ii) have, where applicable, a normal water temperature not exceeding 105°C

including forced draught burners and heating bodies to be equipped with such burners but not including an appliance specifically designed for use in an industrial process carried out on industrial premises;

(c) gas fittings within the meaning of the Gas Safety (Installation and Use) Regulations 1998 located in domestic premises, not being gas appliances falling within subparagraph (b);

(d) the manufacture, handling, use, storage and transport of explosives or chemically unstable substances;

(e) any activity at a mine within the meaning of section 180 of the Mines and Quarries Act 1954 carried out for the purposes of the mine;

(f) any activity at a quarry within the meaning of regulation 3 of the Quarries Regulations 1999 carried out for the purposes of the quarry;

(g) any activity at a borehole site within the meaning of regulation 2(1) of the Borehole Sites and Operations Regulations 1995 carried out for the purposes of the borehole site;

(h) any activity at an offshore installation carried out for the purposes of the offshore installation; and

(i) the use of means of transport by land, water or air which is regulated by international agreements and the European Community Directives giving effect to them insofar as they fall within the disapplication in Article 1.2.(e) of Council Directive 99/92/EC on minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres, except for any means of transport intended for use in a potentially explosive atmosphere.

(3) Regulations 5(2)(f), (g), (h) and (i), 6(4)(d), 6(5)(b) and (e) and 8(1)(d) and (e) and the requirements of paragraphs 5 and 6 of Schedule 1 shall not apply to any activity at an offshore installation carried out for the purposes of the offshore installation.

Guidance 3

Maritime activities

42 The Regulations do not apply to most activities on ships carried out solely by a ship's crew involving dangerous substances on ships under the direction of the ship's master. For example, use of flammable paints for maintenance purposes. Similarly when the ship is tied-up in a port or harbour, minor 'running repairs' involving dangerous substances (eg, repairs involving flammable adhesives) carried out solely by the crew under the direction of the ship's master are not covered by DSEAR . The crew's safety is subject to maritime legislation enforced by the Maritime and Coastguard Agency, who also deal with navigation and other operational matters.

43 However, DSEAR does apply when a ship is in a British port and 'shoreside' workers and the ship's crew work together,

- in dock operations;
- in carrying out construction, reconstruction, or conversion repairs to the ship in dry dock; and
- any work on offshore installations(is not regarded as normal shipboard activities). BUT where only the offshore staff are involved the operations are only excluded from DSEAR regulations 5(2) (f),(g),(h) and (i), 6(5)(b) and (e), 8 (1)(d) and (e) and paragraphs 5 and 6 of Schedule 1. (There are specific requirements in offshore legislation.)

44 Regulation 3(1) also enables the provisions of regulations 15, 16, 17(4) and 17(5) to be applied in full to water transport and shipping activities where they may be subject to the legislation referred to in those regulations.

Exclusions from regulations 5(4)(c), 7 and 11

45 Regulation 3(2) lists a number of areas and activities to which regulations: 5(4)(c) (recording information where an explosive atmosphere may occur at the workplace); 7 (places where explosive atmospheres may occur); and regulation 11 (duty of coordination) do not apply because other more specific legislation exists.

Areas used directly for and during the medical treatment of patients

46 Only specific areas where medical treatment takes place such as treatment rooms and operating theatres are excluded. Other areas in hospitals or surgeries where treatment does not take place such as waiting rooms, corridors, boiler rooms, laundries, fitters' workshops or in treatment areas closed for repairs or refurbishment are not excluded.

The use of gas appliances burning gaseous fuels in accordance with Directive 901396IEEC - Gas Appliances (Safety) Regulations 1995[27]

47 Appliances excluded from DSEAR are those which burn gaseous fuels used for cooking, heating, water heating, refrigeration, lighting and washing with, where applicable, a normal water temperature not exceeding 105°C. Appliances designed for use in industrial processes on industrial premises and appliances that heat water to a temperature greater than 105°C are covered by DSEAR. Points to note:

- 'Gaseous fuels' means any fuel which is a gas at a temperature of 15°C and a pressure of 1 bar (normal atmospheric pressure).
- 'Use of appliances' does not include installation and maintenance.
- The pipe work supplying an appliance is not included in the term ‘use of the appliance’ though the section between (and adjacent to) the appliance and the isolation valve may be.
- The use of gas appliances is covered by the Gas Appliances (Safety) Regulations 1995.

Gas fittings

48 The requirements of regulations 5(4)(c), 7 and 11 do not apply to work in domestic premises involving the installation and use of gas fittings as defined in the Gas Safety (Installation and Use) Regulations 1998[28].

The manufacture, handling, use, storage, and transport of explosives or chemically unstable substances

49 Regulations 5(4)(c), 7 and 11 do not apply to activities involving the manufacture (which includes the storage of raw materials at the manufacturing site), handling, use and storage of explosives and chemically unstable substances, or to their transport by road, rail, water and air. These activities are covered, by other more specific safety legislation including the Explosive Act 1875[29], The Manufacture and Storage of Explosives Regulations 2005 (MSER)[30] and relevant legislation on the carriage or transport of explosives and dangerous goods.

50 In DSEAR 'chemically unstable substances' means substances or preparations which in foreseeable conditions and without the need for air, either individually or when mixed with another substance can undergo a self sustaining chemical reaction. This reaction can produce heat and/or gas at

such a temperature or rate, that it poses a risk to safety from blast, thermal or projectile effects. They include many organic peroxides[31] and various blowing agents of the 'azo' type.

51 Some specific substances have both the properties of a flammable gas that can form an explosive atmosphere with air and can also explode in the absence of air. Examples include acetylene, methyl acetylene and ethylene oxide. Regulations 5(4)(c), 7 and 11 apply to these substances in relation to the possible formation of explosive atmospheres. DSEAR does not apply, in relation to their explosive/chemically unstable properties.

Mineral extracting industries

52 Regulations 5(4)(c), 7 and 11 do not apply to activities at mines, (within the meaning of the Mines and Quarries Act 1954) quarries (within the meaning of the Quarries Regulations 1999) or borehole sites (Borehole Sites and Operations Regulations 1995) where these are carried out for the specific purpose of the extraction. Activities at an offshore installation carried out for the purposes of the installation are also excluded from these regulations.

53 Specifically the requirements for visual or audible warnings (regulations 5(2)(f), (g), (h) and (i), 6(4)(d), 6(5)(b) and (e)) and escape facilities in emergencies (regulations 8(1)(d) and (e)) and appropriate systems of work (paragraph 5 and 6 of Schedule 1) also do not apply to activities at offshore installations because similar requirements exist in other specific offshore legislation.

Use of means of transport

54 The provisions in regulations 5(4)(c), 7 and 11 do not apply to means of transport of dangerous goods covered by international agreements as implemented nationally, unless the transport is intended to be used in a potentially explosive atmosphere.

55 Loading/unloading operations which take place in an area where there is a potentially explosive atmosphere are not excluded and the requirements of regulations 5(4)(c), 7 and 11 apply to the means of transport. If an explosive atmosphere is likely to occur solely as a result of a loading/unloading operation itself then the operation would be excluded. For example, a road tanker transporting petrol would not bring application of DSEAR to the site it was visiting, where the loading/ unloading site is not initially considered to have a potentially explosive atmosphere because of its location with respect to the storage facility.

56 The more specific provisions of the legislation on the transport of dangerous goods apply as normal to ensure safety during transport, loading and unloading.

57 Any transport of dangerous goods outside the scope of international agreements etc is not excluded from DSEAR and is fully subject to regulations 5(4)(c), 7 and 11. This includes vehicles that remain on the employer's premises, such as fork lift trucks, working in potentially explosive atmospheres.

Regulation 4 Duties under these Regulations

Summary 4

This explains the scope of the regulations as they apply to the duties of employers and the self-employed who are included within the term 'employer'. (See Appendix 3 for notes on DSEAR and the self-employed). Duties to employees and others are outlined including provision of protective equipment and instruction.

Regulation 4

(1) Where a duty is placed by these Regulations on an employer in respect of his employees, he shall, so far as is reasonably practicable, be under a like duty in respect of any other person, whether at work or not, who may be affected by the work carried on by the employer, except that--

(a) the duties of the employer under regulations 6(5)(f) and 7(5) (which relate, respectively, to the provision of suitable personal protective equipment and the provision of appropriate work clothing) shall not extend to persons who are not his employees; and

(b) the duties of the employer under regulations 8 and 9 (which relate, respectively, to dealing with accidents and to provision of information, instruction and training) shall not extend to persons who are not his employees, unless those persons are at the workplace where the work is being carried on and subject to the following, namely, that, in relation to the application of regulation 9 to such persons, regulation 9 shall apply to the extent that is required by the nature and the degree of the risk.

(2) These Regulations shall apply to a self-employed person as they apply to an employer and an employee and as if that self-employed person were both an employer and employee.

Guidance 4

58 These Regulations place specific duties on employers to assess and control the risks from dangerous substances. For the purposes of these Regulations, employers include contractors, sub-contractors and self-employed people. The duties under these Regulations apply to a self-employed person as if they were both an employer (as long as their activities could affect others) and an employee.

59 In addition to their own employees, employers are required under DSEAR (and by section 3 of the HSWA) to take account of the risks to people who are not employed by them but who may be at risk from the use or presence of a dangerous substance. This includes employees working for other employers, visitors to the work site, members of the public, living or working nearby etc.

60 However, under regulation 8 (arrangements to deal with accidents, incidents and emergencies) and regulation 9 (information, instruction and training), employers only have duties to people other than their employees when those people are at the site of the work activity. In addition, employers are not required by law to provide people other than their employees with

appropriate personal protective equipment or work clothing. Information, instruction and training need only be provided to the extent required by the nature and degree of the risk to non employees.

61 Where employees of one employer work at another employer's premises, both employers have duties under the Regulations. Each employer has duties to their own and the other employer's employees. The employers should co-operate and collaborate to ensure that all the duties imposed by these Regulations are fulfilled. Arrangements for this may need to be agreed between them, but each employer will need to satisfy themselves that any arrangements adopted are adequate.

62 Where an explosive atmosphere may occur, the employer responsible should co-ordinate the implementation of any explosion protection measures.(See later regulation 11)

Regulation 5 Risk assessment

Summary 5

The regulation requires all employers and the self-employed to assess all potential risks to employees and others whose safety may be affected by the use or presence of a dangerous substance at the workplace. (See Appendix 3 for notes on DSEAR and the self-employed).

Employers should check that measures are in place before beginning any new work activity or processes and recheck arrangements periodically.

If five or more people are employed, a written record of the significant findings is required. The record can either be a separate record or integrated into the record made of overall assessment under the Management Regulations[91] or the fire safety regulations[14,15,16].

Regulation 5

(1) Where a dangerous substance is or is liable to be present at the workplace, the employer shall make a suitable and sufficient assessment of the risks to his employees which arise from that substance.

(2) The risk assessment shall include consideration of--

(a) the hazardous properties of the substance;

(b) information on safety provided by the supplier, including information contained in any relevant safety data sheet;

(c) the circumstances of the work including--

(i) the work processes and substances used and their possible interactions;

(ii) the amount of the substance involved;

(iii) where the work will involve more than one dangerous substance, the risk presented by such substances in combination; and

(iv) the arrangements for the safe handling, storage and transport of dangerous substances and of waste containing dangerous substances;

(d) activities, such as maintenance, where there is the potential for a high level of risk;

(e) the effect of measures which have been or will be taken pursuant to these Regulations;

(f) the likelihood that an explosive atmosphere will occur and its persistence;

(g) the likelihood that ignition sources, including electrostatic discharges, will be present and become active and effective;

(h) the scale of the anticipated effects of a fire or an explosion;

(i) any places which are or can be connected via openings to

places in which explosive atmospheres may occur; and

(j) such additional safety information as the employer may need in order to complete the risk assessment.

(3) The risk assessment shall be reviewed by the employer regularly so as to keep it up to date and particularly if--

(a) there is reason to suspect that the risk assessment is no longer valid; or

(b) there has been a significant change in the matters to which the risk assessment relates including when the workplace, work processes, or organisation of the work undergoes significant changes, extensions or conversions;

and where, as a result of the review, changes to the risk assessment are required, those changes shall be made.

(4) Where the employer employs five or more employees, the employer shall record the significant findings of the risk assessment as soon as is practicable after that assessment is made, including in particular--

(a) the measures which have been or will be taken by him pursuant to these Regulations;

(b) sufficient information to show that the workplace and work processes are designed, operated and maintained with due regard for safety and that, in accordance with the Provision and Use of Work Equipment Regulations 1998 (as amended) adequate arrangements have been made for the safe use of work equipment; and

(c) where an explosive atmosphere may occur at the workplace and subject to the transitional provisions in regulation 17(1) to (3), sufficient information to show--

(i) those places which have been classified into zones pursuant to regulation 7(1);

(ii) equipment which is required for, or helps to ensure, the safe operation of equipment located in places classified as hazardous pursuant to regulation 7(1);

(iii) that any verification of overall explosion safety required by regulation 7(4) has been carried out; and

(iv) the aim of any co-ordination required by regulation 11 and the measures and procedures for implementing it.

(5) No new work activity involving a dangerous substance shall commence unless--

(a) an assessment has been made; and

(b) the measures required by these Regulations have been implemented.

ACOP 5 Paragraph 1

Risk assessment

63 **During the risk assessment employers should identify safety risks arising out of, or in connection with, work or the conduct of their undertaking that relate to dangerous substances and should identify who is at risk. The findings should then be used to take practical action (regulations 6 and 7) to eliminate or reduce the risk. The two aspects (identification of risk and resulting action) are interlinked and so regulations 5, 6 and 7 should be considered together. For the risk assessment to meet the legal requirement to be suitable and sufficient, employers should cover all points in regulation 5(2) to 5(3) inclusive as a minimum and should:**

(a) **include a determination of the hazardous properties of the dangerous substance(s).**

(b) **identify those different groups of workers and people who may be harmed and the likelihood and severity of the consequences;**

(c) **consider any employees who may be at increased risk because of lack of awareness eg inexperienced trainees and those under 18;**

(d) **consider others including workers of another employer in the workplace or nearby, members of the public and other visitors, both on and off site.**

(e) **satisfy themselves that where a 'model' risk assessment is being used from plants elsewhere using similar processes, in each case, the model:**

(i) **reflects the core hazards**

(ii) **is adapted to the detail of the particular situation**

(iii) **is appropriate to the type of work.**

Guidance 5 paragraph 1

64 The risk assessment required by regulation 5 involves identification and careful examination of any dangerous substances present or liable to be present in the workplace and consideration of how fire, explosion and similar events might harm employees and any other people affected by the work concerned. Its purpose is to enable employers to decide what they need to do to eliminate or reduce the risks from dangerous substances, so far as is reasonably practicable.

65 The assessment (including the recording of significant findings) enables employers to demonstrate to themselves, and to others who may have an interest, eg inspectors, employees' representatives (including safety and trade union representatives) etc, that they have followed a structured and thorough approach in considering the risks to the safety of employees and the control measures that are needed. Whoever carries out the assessment should be competent to do so.

66 Employers should carry out hazardous area classification (see regulation 7) as an integral part of the risk assessment so as to identify places where controls over ignition sources are needed and those places where they are not. Schedule 2 of the Regulations sets out definitions of the

zones to be used when classifying hazardous areas.

67 The DSEAR risk assessment may be carried out as part of that required by the Management Regulations. Where this is not done, a separate DSEAR risk assessment will be required.

68 Many factors influence the risks from a fire involving dangerous substances. In particular, employers should consider:

- whether a fire could lead to an explosion,
- how fast a fire might grow,
- what other materials might be rapidly evolved,
- any dangers from smoke and toxic gases given off,
- and whether those in the vicinity would be able to escape.

69 Further information on how to undertake a suitable and sufficient risk assessment is available in *Five steps to risk assessment,* INDG 163[32] and on HSE's website[33].

70 The risk assessment could, where appropriate, be completed alongside goal-orientated risk assessments, such as the BS EN 61508-1:2010[34] or BS EN 61511-2:2004[35] sector standards used by process industry, providing that risks from fire, explosion and other events arising from dangerous substances are addressed, including the requirements specified by DSEAR.

71 Employers' risk assessments (and the record of the assessment where one is required) should take account of the presence of dangerous substances on the effect of the general fire precautions/safety requirements. The general fire safety legislation follows the same approach as DSEAR in requiring the employer to carry out a risk assessment to identify the risks to persons from a fire at the employer's premises and the practical actions taken to eliminate or reduce the risk.

General fire precautions include provision of:

(a) adequate and appropriate means of detection and giving warning in case of fire;

(b) adequate means of escape;

(c) suitable means of fighting fire;

(d) specifying the action to be taken in the event of fire; and

(e) appropriate and adequate training of staff in company fire safety procedures.

72 An explanation of how to comply with the law relating to general fire safety requirements and how to carry out a fire risk assessment can be found for England and Wales in the 'Guide - Fire safety in the workplace'; and for Scotland in 'Fire Law - Are you aware of your responsibilities - Fire Safety Risk Assessment[36]. For construction sites, guidance is available in HSE Guidance Note HSG 168 *Fire Safety in Construction* HSG168[37].

73 In most workplaces, the local fire authority enforces the general fire safety precautions legislation and also those parts of DSEAR which cover general fire safety precautions required in case of fire. In so far as they relate to general fire precautions, regulations 1-6, 8, 9 and 11 of DSEAR are made part of the 'workplace general fire safety precautions' legislation. Other requirements for preventing and controlling fires under DSEAR - such as

measures to prevent leaks of dangerous substances and avoiding sources of ignition, are enforced by HSE or the local authority, depending on the activity in the premises.

Guidance 5 paragraph 2

The hazardous properties of a substance

74 A suitable and sufficient risk assessment, should give consideration to the overall risk presented by dangerous substances as well as assessing each factor individually.

75 Employers will need to identify any dangerous substances that may be present at the workplace and the hazards they present (eg their flammable or explosive properties). This includes substances which are:

(a) brought into the workplace and handled, stored and used for processing;

(b) produced or given off (eg as fumes, vapour, dust etc) by a process or activity, or as a result of an incident or accident;

(c) used for, or arise from maintenance, cleaning, and repair work; or

(d) produced as a by-product of any work or process (eg waste, residues, scrap materials etc);

(e) naturally occurring in the workplace (eg methane may be present in tunnelling and mining operations.

76 When considering information on the hazardous properties of dangerous substances employers should identify any adverse conditions that need to be avoided. These could include excessive heat, sunlight, exposure to air or moisture and contact with other incompatible substances.

77 Some substances are obviously hazardous to safety, other substances might be hazardous only under certain conditions. Flour dust can form an explosive atmosphere, liquids such as diesel fuel can be raised above their flashpoint temperature by work activities and present a fire or explosion risk. When carrying out hazardous area classification, relevant properties of a dangerous substance include the boiling point and flash point of any flammable liquid, and whether any flammable gas or vapour that may be evolved is lighter or heavier than air.

78 For dusts which are liable to form an explosive atmosphere, information will be needed on particle size and density.

79 A mass of solid combustible material as a heap or pile will burn relatively slowly owing to the limited surface area exposed to the oxygen of the air. A dust explosion involves the rapid combustion of dust particles that releases energy and usually occurs when dusts are dispersed in air, generating gaseous reaction products. A basic knowledge of the material's properties together with the avoidance of deposition and in particular deposition on elevated surfaces of dusts/powders which are capable of rapid explosive burning in air should minimise the risks of a dust explosion.

Information on hazardous properties

80 Useful information on the properties and hazards of dangerous substances may be provided by suppliers eg, in a SDS. This could include

details such as flashpoints or explosive or chemical properties. Other information could relate to safe methods of using, storing and handling the substances. Suppliers are required to make SDS available for chemicals they supply and that is one source of information on the classification of the substance. Further information on the background to this is in Appendix 4.

81 The increased alignment in the EU CLP regulation (no 1272/2008)[38], towards a globally harmonised system of classification and labelling of substances and mixtures has led to a number of substances now meeting the criteria for classification as flammable. This is partly because the upper flashpoint for flammable liquid has been increased from 55°C to 60°C. The changes mean that for example, diesel, gas oil and light heating oils are now classified as flammable liquids.

82 However many substances so classified may in fact not normally present a significant risk of fire as stored. Employers should adopt a proportionate approach in considering whether there are any justifiable further measures needed in addition to those widely used before this change, given that the risk itself has not changed.

83 Many dusts are not classified substances under the *Chemicals (Hazard Information and Packaging for Supply) Regulations 2009*[93] (CHIP) and for these materials there is no legal requirement to provide an SDS. Suppliers should nevertheless be asked if they can supply any data relevant to assessing the fire and explosion risks. Where there is no SDS available in the case of intermediate products, mixtures or novel activities perhaps under non standard conditions, further research and testing might be needed into the flammable/explosive hazards. This is also relevant under regulation 5 (2)(j).

84 An assessment which made no reference to a SDS or similar information on hazardous properties researched in some other way would be unlikely to be considered suitable and sufficient especially if the risk was significant. However, some of the substances classified as flammable that have a high flashpoint may not give rise to a significant risk of fire unless processed at high pressure or at temperatures above their flash point. A detailed risk assessment for these substances on the way they are used or handled may indicate that fire risk reduction requirements can be relaxed to some degree.

ACOP 5

Circumstances of the work

85 **When assessing and/or designing activities involving dangerous substances (such as work processes, process and storage plant and the workplace itself) all relevant factors must be taken into account, including:**

(a) **properties of the substances including: corrosivity, reactivity, volatility, flashpoint, electrical conductivity;**

(b) **quantities and storage methods eg in bulk tanks or in containers;**

(c) **location relative to other features including: adjacent premises, site boundaries, occupied buildings, process areas, heat sources, fixed sources of ignition, other dangerous substances and vehicle thoroughfares;**

(d) **loading/unloading operations and frequency of deliveries.**

86 **The risk assessment should include consideration of whether work processes may give rise to flammable gases, vapours, mists or dusts in sufficient quantity to pose a risk of injury if ignited. The employer should consider the potential for the incident to escalate. Account should also be taken of possible accumulations of combustible dust which could be launched and dispersed into the air during an incident resulting in the formation of an explosive atmosphere.**

87 **When considering risks from releases of dangerous substances the following should be included:**

(a) **unavoidable releases, such as during LPG cylinder/aerosol filling;**

(b) **intentional releases, such as spray coating, solvent vapour emissions from drying ovens etc; and**

(c) **foreseeable releases, for example leaks from process equipment or storage containers or spills during dispensing.**

Guidance 5

88 Adopt a methodical approach to considering the circumstances of the work activity, particularly the production processes. Consider the potential for and consequences of failures and/or errors or other foreseeable deviations from the way the work activity is carried out normally. The approach should be proportionate to the nature of the work activity and the risk it presents. Possible deviations and excursions from the norm are far more numerous for production processes than for a less dynamic storage activity. Whilst there are many codified safe storage requirements, production process permutations mean that identification of potential failure scenarios may need to be carried out from first principles.

89 Employers need to consider potential hazards arising from equipment, etc used in processing or handling dangerous substances. This includes equipment that may be brought into an area where dangerous substances are present as well as the equipment used in process operations themselves.

90 In taking account of the work activities involving dangerous substances when assessing risk employers would normally include such activities as:

(a) loading and unloading operations (and the frequency of delivery/dispatch of dangerous substances);

(b) dispensing and decanting activities;

(c) movement of dangerous substances around the site; and

(d) how spillages and leaks are dealt with.

91 The size of any potential release of dangerous substances is in part related to the amount of dangerous substances present. Industry-specific codes from various sources provide guidance on the quantities of various dangerous substances that can be stored. For example, the Code of

Practice on storage of full and empty LPG cylinders and cartridges produced by the UKLPG[39]. For further guidance on intermediate bulk container (IBC) storage, see joint Chemical Business Association and Solvents Industry Association Guidance: *'Guidance for the storage of liquids in intermediate bulk containers'*[40]. and The Energy Institute's Model Code of Safe Practice Part 15 Area classification Code for Installations handling flammable fluids[41]. HSE's suite of guidance on storage and use also gives guidance (HSG140, HSG176, HSG51 and HSG178)[42]

92 Some combinations of dangerous substances may react together, forming an ignition source, or in combination may form an explosive atmosphere, where singly this does not occur. Such possibilities should be considered in the risk assessment. For example:

(a) where substances are used together in a chemical process it will be necessary to carry out a chemical reaction hazard assessment in a way which identifies any adverse conditions that could give rise to hazardous heat and pressure effects;

(b) where different substances are stored, incompatible materials, such as self-reactive substances and flammable liquids, should not be kept together;

(c) where substances with different properties are processed together the fire properties of any resulting mixture will be different from the individual components. The properties of the mixture need to be known to ensure, for example, any electrical equipment is suitable and any explosion relief provided is appropriate;

(d) oxygen and other oxidising agents make most flammable substances easier to ignite, burn faster and become more difficult to extinguish. Many materials, not classified as dangerous substances will become dangerous in the presence of an oxygen-enriched atmosphere or an oxidising agent. Where oxygen or other oxidising agents are used near to dangerous substances or combustible materials, the assessment will need to take into account the enhanced flammability properties.

ACOP 5

Risk assessment of non-routine maintenance and related higher risk activities

93 **Employers must carry out a risk assessment before undertaking any non-routine activity which potentially increases the risk, such as process scale-up, maintenance, repair, modification, extension, restructuring, demolition or cleaning:**

(a) **in areas where dangerous substances are present or liable to be present, including where they are used, stored or produced;**

(b) **on equipment that has contained a dangerous substance.**

94 **Employers will need to identify and take into account:**

(a) **the types of dangerous substance that may be present or that may become dangerous as a result of the work activity;**

(b) **the fire and explosion hazards arising from the proposed work;**

(c) **the necessary control and mitigation measures to enable the work to be carried out safely;**

(d) **the appropriate system of work to ensure that the control and mitigation measures essential for safety are properly understood and implemented;**

(e) **if written instructions need to be provided for non-routine tasks to ensure appropriate control and mitigation measures are implemented. This could be a written permit-to- work system or method statement/instructions for entry to nominally empty vessels for inspection for example.**

Guidance 5

95 In addition to 'normal' (ie routine production) activities such as storage or manufacturing processes, some activities, such as less routine or less frequent maintenance and repair and cleaning, may require specific procedures, exposing workers to risks from dangerous substances. For example, dismantling equipment containing dangerous substances or introducing ignition sources into a hazardous area. The lack of familiarity and practice alone may increase risk of errors.

96 Non-routine activities need to be considered and included in a risk assessment, as they may create risks not normally present in the place where the activity occurs and may affect the area classification (see regulation 7). It may be possible to remove the dangerous substance before the non-routine work activity starts or take special control measures to prevent the release of any dangerous substance during the work. Any additional risks associated with the activity should be assessed before work starts.

97 Factors which should be considered in the assessment for any maintenance, repair, modification, extension, restructuring, demolition or cleaning activities include:

(a) the materials that are being used or may have been used in the area or plant where the activity is to be carried out;

(b) which materials are dangerous substances or may become hazardous under the conditions of the proposed work, this includes residues or by-products that may occur or build up inside plant or any materials that could be released by the proposed activity, for example;

(i) combustible liquids with a flash point above 60°C but below the temperature of the hot work during which they can evaporate to give rise to an explosive atmosphere (eg diesel fuel or olive oil);

(ii) some materials may not be classified as flammable/combustible and will have either an extremely high or no flashpoint assigned, they may

ignite under certain conditions;

(iii) combustible dusts which may be dispersed to give rise to an explosive atmosphere or cause latent smouldering hazards (eg wood dust);

(iv) any substance that can decompose under the conditions of the hot work to give off flammable components which may then give rise to an explosive atmosphere (eg rubbers or plastics); and

(v) any substance that can decompose under the conditions of the hot work to give rise to hazardous heat or pressure effects (eg dinitrotoluene or sodium hydrosulphite or residues and by-products from reactions and other similar processes).

(c) potential heat or ignition sources that may arise during the proposed activity;

(d) how and where explosive atmospheres can arise;

(e) the consequences of a fire or explosion during the activity;

(f) the basis of safety during the proposed activity;

(g) the training and level of competence required by the operatives;

(h) what additional protective and emergency equipment is required; and

(i) what systems of work will be needed to implement the necessary control measures during the proposed activity.

Cleaning

98 When considering the risk from cleaning activities, as with any other activity, the employer should consider the type of substance that is needed and avoid if at all possible the use of dangerous substances.

99 If a dangerous substance needs to be used for cleaning, then the risk of it generating a hazardous area and the presence of potential ignition sources needs to be considered.

100 Where dangerous substances are introduced into plant or equipment for cleaning purposes employers should assess any additional hazards, including considering their compatibility/reactivity with other dangerous substances present.

ACOP 5

The effect of measures already in place or which will be taken as a result of DSEAR

101 **Assess how the current measures, along with those to be taken, will impact on the risk and safeguard employees and others who may be affected by an incident involving the dangerous substance. In carrying out this assessment, the employer should follow the hierarchy required by these Regulations and consider in order:**

(a) **the effect of the measures aimed at preventing the incident;**

(b) **the effect of the control measures aimed at preventing its escalation; and**

(c) **the effect of the mitigation measures to limit the effects of the incident, including the procedures to deal with accidents, incidents and emergencies.**

102 **When considering what measures are reasonably practicable to address, hazards arising from the presence of dangerous substances, and assessing design of plant, equipment and workplaces, all relevant factors should be taken into account including:**

(a) **the adequacy of separation by distance or barrier;**

(b) **the design standards for the installation together with those for inspection and maintenance;**

(c) **protection from unauthorised access;**

(d) **adequate distance from potential ignition sources so that any gas or vapour from any dangerous substance will have dispersed sufficiently to be rendered non-flammable before reaching these;**

(e) **protection of the storage or process area from fires occurring elsewhere including the spread of fires or explosions through interconnected plant and equipment and to other parts of the premises;**

(f) **ensuring thermal radiation effects from fires in the locality do not threaten dangerous substances;**

(g) **avoidance and minimisation of:**

(i) **risk of spillage;**

(ii) **explosive atmospheres within and outside of plant and equipment;**

(iii) **unintentional or uncontrolled chemical reactions;**

(iv) **ignitions of dangerous substances and dangerous atmospheres;**

(h) **provision of safe access to the emergency services for firefighting and rescue;**

(i) **minimising the number of people exposed to any potential explosion and the risk of a fire preventing or delaying the escape of individuals;**

(j) **training and supervision of site operatives taking into consideration incidents and emergencies.**

The likely presence and persistence of explosive atmospheres, and the need for hazardous area classification

103 **As part of the risk assessment, the employer must assess whether an explosive atmosphere is likely to form and how long it is likely to remain.**

Guidance 5

104 Gases, vapours, mists and dusts can give rise to explosive atmospheres when dispersed in certain concentrations in air. The risk assessment carried out under regulation 5 informs the hazardous area classification and preparation of an area classification plan, required by regulation 7, and is intended to identify places where, because of the potential for an explosive atmosphere, controls over sources of ignition are required. The results of the classification or zoning are then used to control the equipment that may be used, or the work activities that may be carried out in these areas so as to prevent ignition. Employers should consider the likelihood of releases of an explosive atmosphere as well as the quantity of such releases when considering area classification.

105 To identify hazardous and non-hazardous areas, and then subsequently to assign zones to those areas classified as hazardous, an assessment should consider matters including:

(a) the hazardous properties of the dangerous substances involved;

(b) the amount of dangerous substances involved;

(c) the work processes, and their interactions, including any cleaning, repair or maintenance activities that will be carried out;

(d) the temperatures and pressures at which the dangerous substances will be handled;

(e) the containment system and controls provided to prevent liquids, gases, vapours or dusts escaping into the general atmosphere of the workplace;

(f) any explosive atmosphere formed within an enclosed plant or storage vessel; and

(g) any measures provided to ensure that any explosive atmosphere does not persist for an extended time, eg ventilation.

106 When special precautions are required eg to allow short-term maintenance or repair, there is no requirement to draw up a revised area classification plan but there is still a requirement to take a proportionate approach to risk assess the short-term conditions.

107 Some potential sources of release may be so small that there is no need to specify a zoned area (see regulation 7 for guidance on hazardous area classification). This will be the case if the consequence of an ignition following a release is unlikely to cause danger to people in the vicinity. For example, if a dangerous substance is being carried through a seamless pipe, and that pipe has been properly installed and maintained, it is extremely unlikely that the substance will be released. Thus an explosive atmosphere would not be expected to occur from this source and the area surrounding the pipe would be non-hazardous.

108 However, in the wrong circumstances ignition of quite small

quantities of flammable gas/vapour mixed with air can cause danger to anyone in the immediate vicinity. Where this is the case, as in a relatively confined location from which rapid escape would be difficult, area classification may be needed even where quite small quantities of a dangerous substance are present.

109 Likewise, dangerous substances in small pre-packaged containers for sale, display, etc in retail premises would not normally require the area to be classified as hazardous. However, procedures to clean up and dispose of any spillage/release and control ignition sources in the event of such a release would be needed.

110 Additional information relating to the process rather than the substance should also be taken into account. Some substances do not form explosive atmospheres unless they are heated some liquids if released under pressure will form a fine mist that can explode. For example, hydraulic fluids in high-pressure lines as with gas turbines.

111 Taken together these factors are the starting point for hazardous area classification, and should allow for the identification of any zoned areas.

112 For further information on the use of signs to warn of areas where an explosive atmosphere may occur, please refer to regulation 7(3).

ACOP 5

Consideration of ignition sources

113 **As part of the risk assessment for their work areas employers must identify which ignition sources, including electrostatic discharges, may arise with the potential to cause a fire, explosion, energetic chemical decomposition or similar event, and will need to be controlled. The likelihood of any potential ignition source occurring should also be considered. Certain ignition sources may have to be present if required in the process, but employers must identify and consider all possible ignition sources in areas where dangerous substances are present. As a minimum the following forms of energy should be included when considering potential ignition sources but there may be others:**

- **heat;**
- **electrical;**
- **mechanical;**
- **chemical.**

Employers should;

- **consider all sources of ignition appropriate to their work activities;**
- **plan to introduce (under regulation 6) measures to prevent those ignition sources occurring where they could cause harm;**
- **ensure ignition sources do not come into contact with dangerous substances or explosive atmospheres. This includes preventing mobile sources of ignition (persons/equipment) moving into an area where dangerous substances are present.**

Guidance 5

114 Flammable substances (particularly when in the form of an explosive atmosphere) are readily ignited. An ignition source is a release of energy, often of short duration and localised, which can ignite dangerous substances in the presence of air.

115 The information obtained from the assessment of the hazardous properties of the substance and provided by the supplier should be considered together with the identified sources of ignition to assess how likely it is that the particular ignition source will ignite the dangerous substance present. The reference to 'active' in this regulation means that the potential sources present are capable of causing ignition. For static electricity, this means that a static charge is present and is capable of discharging. 'Effective' means that the energy of the potential source of ignition is sufficient to ignite the particular dangerous substance present. In the case of static electricity it means that the level of charge is sufficiently high to ignite the substance present.

116 When identifying potential ignition sources, employers will need to take into account the properties of the dangerous substance and the manner and state in which it is, or might foreseeably, be kept and handled. On heating, some dangerous substances could create a hazard as a result of auto-ignition, self-decomposition or an exothermic reaction. Employers should consider the effect of heat from sources such as steam pipes, heaters, flames, processing etc. Employers should also consider how the ignition of combustible materials, including packaging or rubbish, could occur and the possible escalation to involve any dangerous substances.

117 Many sources of ignition are easy to identify. Examples of potential ignition sources include:

(a) heat energy, eg:

- heating installations;
- internal combustion engines;
- open fire and flame;
- hot surfaces;
- smoking;
- hot work, including welding spatter, laser or other intense radiation sources.

(b) electrical energy, eg:

- electrical lighting devices such as lamps,;
- electromagnetic radiation;
- radio frequency sources;
- short circuit;
- electrical arc;
- earth fault;
- conductor fault;
- lightning strike;
- discharges of static electricity;
- loose contact;
- excessive temperature rise due to overload;
- induction heating;
- resistive heating;
- connection to inappropriate electrical supply.

(c) mechanical energy, eg:

- friction (eg overheating);

- ultrasonic;
- impact;
- grinding;
- compression (including adiabatic compression and shock waves).

(d) chemical energy (refer to SDS/technical information sheets or data), eg:

- self-heating;
- impact and heat sensitive materials (eg pyrophoric substances);
- reactions between dissimilar metals (eg. thermite reaction sparks);
- runaway exothermic reaction.

118 In considering whether controls on ignition sources are required or not, employers may take into account other control measures or the likely size of a fire.

ACOP 5

Scale of the anticipated effects and extent of harm

119 **Employers need to consider the likely scale of the fire, explosion or other event and the potential consequences. The risk assessment should be proportionate to the risks from the quantities and nature of the dangerous substances present. The contrast between localised easily limited effects and potentially large spreading damage should be reflected in the risk assessment.**

Guidance 5

120 Where there is potential for an explosion, the scale of effects and the extent of harm will depend on:

(a) the substance, the amount involved and how quickly it can be consumed. Internal building configuration or obstructions will have an effect on the rate of burning;

(b) the size of the potential explosive atmosphere and the magnitude of the direct and indirect forces created;

(c) the amount of heat radiated;

(d) how the incident could escalate and whether conditions exist or could develop to cause a further fire, explosion or similar event.

121 Consideration of these factors will allow an assessment of who will be affected by an accident, and to what extent, and what mitigation measures will be required. Providing the risk assessment has shown that there is little or no risk of injury to people, controls on ignition sources and mitigation measures may not be required. In these cases the basis of safety should be detailed in the risk assessment for the activity so as to justify the level of precautions to be taken.

ACOP 5

The need to consider places connected via openings to places in which explosive atmospheres may occur

122 **The employer should consider the possible consequences of a potentially explosive atmosphere, or the resultant effects of any explosion, spreading through interconnected plant or entering a room, building or other enclosure where the plant is located via any openings.**

Guidance 5

123 The assessment should consider areas away from the source of the hazard to which an explosive atmosphere may spread, for example through ducts. Such areas should be included in the classification system for places where explosive atmospheres may occur.

ACOP 5

Additional information for the risk assessment

124 **For many mature activities, additional information to inform the drafting of the risk assessment may be readily available and should be used. If an employer is planning to undertake novel activities using new emerging technologies, further research may be required into their potential fire and explosion risks together with a description of steps taken to ensure those changes to their activities are adequately managed.**

Guidance 5

125 Additional information could include details of:

(a) the skills, knowledge and experience of employees and their representatives;

(b) the training and supervision of employees;

(c) activities in adjacent areas or on adjacent premises, particularly where this could present an ignition risk; and

(d) possible misuse of dangerous substances, for example, to burn waste.

126 If the dangerous substances present are also a risk to the health of employees and others (ie they are acutely toxic, carcinogenic, etc), employers will also need to assess health risks as required by COSHH[6].

ACOP 5 paragraph 3

Reviewing and revising the risk assessment

127 **Employers should plan to review their risk assessment at regular intervals. The time between reviews depends on the nature of the risk and degree of change likely in activities. It should also be reviewed if significant changes have taken place if the employer concludes it is no longer valid; and following an accident or dangerous occurrence.**

128 **When reviewing their risk assessment employers should take**

the opportunity to re-examine their control and or mitigation measures. This should include considering whether it is now possible to replace the substance or process with a less dangerous one. The risk assessment should be modified if developments mean it is no longer valid. Records, where required, of significant findings should also be updated.

Guidance 5

129 Employers may find it useful to note the next planned review date each time the risk assessment has been reviewed.

130 When making any change to processes and equipment involving dangerous substances, the employer should assess the effects of that change on the safe operating conditions already established for the process or equipment. For most significant changes, it will be obvious that there are consequences for safety and that a reassessment is necessary but relatively minor changes can also lead to unsafe working conditions. For example, changing the supplier of a coating material that is applied to objects and then dried in a heated oven might be overlooked as requiring a reassessment. The new raw material, while providing the same colour effect may contain a different or higher level of solvent. This could alter the amount of vapours released into the oven raising the concentration from below the LEL to within the explosive range creating a hazardous situation. Changes in the workplace which should require a risk assessment to be reviewed include:

(a) changes to the substances used;

(b) replacement or modification to the plant and/or equipment used;

(c) changes in processes or methods of work which could affect the nature of hazards and risks; and

(d) changes in the workforce - such as reductions in numbers or experience of employees involved in a work activity.

131 Adverse events such as accidents, dangerous occurrences or near misses should be a trigger for reviewing the original risk assessment.

ACOP 5 paragraph 4

Recording the significant findings of the risk assessment

132 **Where an employer employs five or more people, they should record the significant findings of their risk assessment. This should help ensure all the necessary aspects of managing the risks are covered, (highlighting any gaps and actions to remedy them). The amount of information recorded should be proportionate to the level of risks present in the workplace. A chemical works would be expected to carry out detailed hazard and operability studies, whereas a small retail outlet selling a few aerosol cans would be expected to record much less information.**

133 **The recorded risk assessment should follow regulation 5(4) and:**

(a) **describe the relevant workplace activity;**

(b) **identify the dangerous substances present and the**

risks they present;

(c) **identify how risks arise including heat effects on the substances and how all risks impact on those affected;**

(d) **record additional information where an explosive atmosphere may occur;**

(e) **take into account the effects of all measures, including those under DSEAR which have been or will be taken to eliminate or control risks. This includes:**

(i) **zoning and hazardous area classification;**

(ii) **equipment used;**

(iii) **co-ordination between employers;**

(iv) **verification of overall explosion safety by a competent person as required by regulation 7(4).**

134 **Where the DSEAR risk assessment is integrated into an overall assessment, it can be recorded as part of that assessment.**

135 **The risk assessment should be completed and recorded as soon as practicable after the assessment is made, and should be stored on media that is readily accessible. If the risk assessment record cannot be completed for any reason, then a precautionary approach should be taken to ensure employee safety, and a clear timescale for the completion of the assessment documented.**

136 **For risks which are more significant, for example on complex sites or installations, the risk assessment may summarise measures described more fully in other referenced documents. The risk assessment should adequately outline the content of the other references and these reference documents should be readily available on site.**

Guidance 5

137 All employers must carry out a risk assessment, but a record of the significant findings is only required where they employ five or more people are employed. Although employers with fewer than five employees are exempt from this requirement, they may still find it useful to record the significant findings of their assessment, including preventive measures taken to control risk in accordance with these Regulations.

138 The record should provide a description of the hazards and risks from dangerous substances which lead employers to take the relevant actions to protect safety. Where appropriate it should be linked to other health and safety records or documents describing procedures and safeguards, particularly the record of risk assessment made under the Management Regulations[91], COSHH[6], and the written health and safety policy statement required by section 2(3) of the HSW Act[7]. It may be possible to combine these documents into one health and safety management document. It should be readily retrievable for use by management in reviews, for safety representatives or other employee representatives, and visiting inspectors. It is good practice to have a system of document version control in place.

139 The amount of information that should be recorded depends on the

level of risk present in the workplace. In cases where a dangerous substance poses little or no risk, employers may only need to record:

(a) the identity of the dangerous substances present and the risks they present;

(b) the measures taken under DSEAR; and

(c) if appropriate, because of the safeguards taken, an explanatory statement that a further detailed assessment is unnecessary.

140 However, where dangerous substances in the workplace present a greater risk, the assessment record should be more comprehensive. It should include:

(a) the preventive measures in place to control the risks, including those required by regulation 6 (this can include reference to measures described more fully in other documents);

(b) enough information to demonstrate that the workplace and work processes are designed, operated and maintained with due regard to safety;

(c) information showing that adequate arrangements have been made for the safe use of work equipment, in accordance with PUWER[95].

141 For the workplace the record should show, for example, that its design allows for a process to be carried out safely such as by the provision of a storage area for dangerous substances, or to allow sufficient space to segregate incompatible substances.

142 For work equipment, the record should show that equipment is suitable for work with the dangerous substance(s) involved.

ACOP 5

Information to be recorded when an explosive atmosphere may occur

143 **Safety devices, controlling devices and regulating devices, contributing to or required for the safe functioning of equipment or protective systems within a potentially explosive atmosphere are subject to EPS. EPS applies whether or not they are intended for use inside or outside the potentially explosive atmosphere. Such devices and equipment should be identified and their details and purpose, including maintenance regime recorded.**

Guidance 5

144 Equipment intended for use in an explosive atmosphere can be shown to be suitable by reference to the classification of hazardous places into zones under regulation 7(1), and evidence of the selection of a suitable category of equipment in accordance with the manufacturer's or supplier's instructions.

145 For safety and economic reasons, it will often be preferable to install

such devices in a non-hazardous area where possible. Examples include:

(a) a pump, pressure regulating device, backup storage device, etc. ensuring sufficient pressure and flow for feeding a hydraulically actuated safety system within the potentially explosive atmosphere;

(b) a remote controller unit connected to sensors within the potentially explosive atmosphere, for example: measuring temperature, pressure, flow, gas concentration etc., which is designed to provide executive actions on one or more items of equipment or protective systems within the potentially explosive atmosphere.

146 EPS does not apply to devices, including safety, controlling and regulating devices that do not contribute to, nor are required for the safe functioning of equipment or protective systems within a potentially explosive atmosphere. Examples of these devices include: gas detection systems providing an alarm signal and initiation of action outside the hazardous area, such as operation of an emergency ventilation system; water spray systems designed to protect plant from fire. In this case, record sufficient information to demonstrate the design, operation and maintenance of the device is will provide the safety function required (see paragraphs 135 to 139).

ACOP 5

Records concerning co-ordination

147 **Where there are two or more employers at a workplace where an explosive atmosphere may occur, the risk assessment must detail the clear agreement between those employers so that the aims and requirements of regulation 11 (Duty of co-ordination) have been met.**

Guidance 5

148 Regulation 5(4)(c)(iv) requires that the record should explain the purpose of the coordination measures required by regulation 11. For example, the aim could be to alert employees of another employer to the presence of hazardous substances or places, or to facilitate emergency arrangements in the event of an accident.

149 The record should also show the arrangements the employer has in place to achieve the aims. This is likely to require reference, for example, to instructions given to other employers or their employees. It will also include information for contractors when they first start on site, including a specification of the work to be done and arrangements for supervision, and handover procedures for particular items of plant or parts of the premises.

150 The duty extends only to the potential for one employer to create a flammable atmosphere which could affect another employer's staff and matters flowing from that risk. The practicalities of implementation of the arrangements are dealt with under regulation 11.

ACOP 5 paragraph 5

Risk assessment of new work activity

151 **A risk assessment must be undertaken before any new work activity involving dangerous substances begins. This includes risks**

that may arise from handling, storage, plant and equipment modification, treatment and disposal of dangerous waste and by-products.

Guidance 5

152 For a new work activity, the employer should record the significant findings of the risk assessment as soon as is practicable after the assessment is made. In some circumstances, further information may be needed before the significant findings can be resolved and fully recorded. Examples of such situations include:

(a) in a research/ development process setting or during a crisis with dynamic changes to events and reaction

(b) situations where product formed is not as expected or predicted

(c) delivered reagents are not what they were supposed to be or contain impurities that affect the reaction or

(d) in circumstances where there is a pilot operation which must be run for a period before being assessed completely.

The employer should update the findings as soon as the information becomes available. In the meantime the employer should adopt a precautionary approach, taking additional steps to safeguard employees.

Regulation 6 Elimination or reduction of risks from dangerous substances

Summary 6

Regulation 6 sets out how to eliminate or reduce risk to people's safety from the presence of dangerous substances by removing or controlling risks, and by providing measures to limit or mitigate the consequences for people, should an incident occur.

A hierarchy of control measures is set out in regulation 6(4) and the measures required to reduce the effects of an incident are listed in regulation 6(5). The employer has a duty to provide and to maintain the measures.

The measures in Schedule 1 are an integral part of regulation 6 and for this reason, the Schedule now appears immediately after regulation 6.

Regulation 6

(1) Every employer shall ensure that risk is either eliminated or reduced so far as is reasonably practicable.

(2) In complying with his duty under paragraph (1), substitution shall by preference be undertaken, whereby the employer shall avoid, so far as is reasonably practicable, the presence or use of a dangerous substance at the workplace by replacing it with a substance or process which either eliminates or reduces the risk.

(3) Where it is not reasonably practicable to eliminate risk pursuant to paragraphs (1) and (2), the employer shall, so far as is reasonably practicable, apply measures, consistent with the risk assessment and appropriate to the nature of the activity or operation--

(a) to control risks, including the measures specified in paragraph (4); and

(b) to mitigate the detrimental effects of a fire or explosion or the other harmful physical effects arising from dangerous substances, including the measures specified in paragraph (5).

(4) The following measures are, in order of priority, those specified for the purposes of paragraph (3)(a)--

(a) the reduction of the quantity of dangerous substances to a minimum;

(b) the avoidance or minimising of the release of a dangerous substance;

(c) the control of the release of a dangerous substance at source;

(d) the prevention of the formation of an explosive atmosphere, including the application of appropriate ventilation;

(e) ensuring that any release of a dangerous substance which may give rise to risk is suitably collected, safely contained, removed to a safe place, or otherwise rendered safe, as appropriate;

(f) the avoidance of--

(i) ignition sources including electrostatic discharges; and

(ii) adverse conditions which could cause dangerous substances to give rise to harmful physical effects; and

(g) the segregation of incompatible dangerous substances.

(5) The following measures are those specified for the purposes of paragraph (3)(b)--

(a) the reduction to a minimum of the number of employees exposed;

(b) the avoidance of the propagation of fires or explosions;

(c) the provision of explosion pressure relief arrangements;

(d) the provision of explosion suppression equipment;

(e) the provision of plant which is constructed so as to withstand the pressure likely to be produced by an explosion; and

(f) the provision of suitable personal protective equipment.

(6) The employer shall arrange for the safe handling, storage and transport of dangerous substances and waste containing dangerous substances.

(7) The employer shall ensure that any conditions necessary pursuant to these Regulations for ensuring the elimination or reduction of risk are maintained.

(8) The employer shall, so far as is reasonably practicable, take the general safety measures specified in Schedule 1, subject to those measures being consistent with the risk assessment and appropriate to the nature of the activity or operation.

ACOP 6 paragraph 1

Overall framework

153 **Where it is necessary to work with dangerous substances, employers are not expected to eliminate all risk but to reduce risks, so far as is reasonably practicable, and to implement measures to control the remaining risks and mitigate the consequences of any fire or explosion or other harmful physical event that could arise.**

ACOP 6 paragraph 2

Substitution

154 **Employers should first consider eliminating the risk if a suitable, non-harmful, (or, failing that, a less harmful), substitute for the dangerous substance is feasible or if a safer process exists. All aspects of the properties of the proposed substitute must be considered when substituting a dangerous substance, and the risks balanced against all the overall risks, not just its flammability or**

explosivity.

155 **A substance that is less flammable may not be a suitable alternative if it were of higher toxicity or more harmful to the environment than the original substance.**

ACOP 6 paragraph 3

Control and mitigation measures

156 **Having considered whether risk can be eliminated, eg by substitution, the employer should next give consideration to risk control measures before finally considering mitigation measures. Regulations 6(3) and 6(4) should be considered together when selecting control measures. The measures specified in regulation 6(4) should be applied subject to reasonable practicability and the information from the risk assessment. The measures should be applied in the order of priority set out in regulation 6(4). The list of measures is not exhaustive. There might be other effective and appropriate measures.**

157 **If the measures set out in regulation 6(4) or other measures devised by the employer do not adequately address the risk, employers should then, so far as is reasonably practicable, consider the application of the mitigation measures as set out in regulation 6(5). Regulation 6(5)(f) must be a measure of last resort.**

ACOP 6 paragraph 4

Reduce the amount of dangerous substance to a minimum

158 **Only the minimum amount of dangerous substances needed for the work activity should be kept in process areas, workrooms, laboratories and similar working areas. Dangerous substances that are not in use should be returned to the designated storage area. For dangerous substances in closed containers at retail premises, the quantity stored at point of sale must be kept to a minimum consistent with the needs of the business.**

Guidance 6

159 The extent of harmful effect from fires or explosions is directly related to the quantity of dangerous substance involved. Employers should ensure their work procedures, including the selection and design of plant are consistent with minimising the quantity of dangerous substances present in process areas, workrooms, laboratories and similar working areas. Employers should especially consider the risks posed by transfer operations involving dangerous substances and preference should be given to piped and enclosed delivery and export systems to minimise the quantity of dangerous substance in these process areas etc. Where the dangerous substances is necessarily present as feed-stock and/or product, this should be the minimum necessary for the production activity and, as a guide, should not exceed that required for use or produced during half a day or one shift.

160 Employers should use plant and equipment with the smallest capacity consistent with operational needs. Replacing a batch process with semi-batch process, or by process intensification would result in a reduced inventory of dangerous substances.

Storage of flammable liquids in process areas, workrooms, laboratories and similar working areas

161 Many work activities will require the convenient availability of flammable liquids and/or flammable liquid based products. To facilitate this a limited quantity in suitable closed vessels may be stored in suitable cabinets or bins of fire-resisting construction and which are designed to retain spills (capacity should be 110% volume of the largest vessel normally stored in it).

162 These should be located in designated well ventilated areas that are:

- away from the immediate processing area where possible; and
- do not jeopardise the means of escape from process and other areas.

163 The flammable liquids should be stored separately from other dangerous substances that may increase the risk of fire or compromise the integrity of the container or cabinet/bin; such as energetic substances, oxidizers and corrosive materials. Sometimes these other dangerous substances may be flammable liquids in their own right or held in a flammable liquid. However, it is still inappropriate to store these in the same cabinets or bins with other flammable liquids.

164 The recommended maximum quantities that may be stored in cabinets and bins are as follows:

- no more than 50 litres for extremely, highly flammable and those flammable liquids with a flashpoint below the maximum ambient temperature of the workroom/working area;
- no more than 250 litres for other flammable liquids with a higher flashpoint of up to 60°C.

165 These quantities are intended to be viewed as recommended maxima representing industry safe practice, rather than absolute limits. There is some flexibility with these limits, where for example the design of modern day buildings and the pattern of work can make it difficult to work within these limits for example, in large or open-plan workrooms/working areas. Where the employer proposes to store quantities in excess of the recommended maxima, a robust justification should be recorded and the risk assessment should take into account:

- The properties of the materials to be stored or handled in the process areas, workrooms, laboratories and similar working areas (for mixed storage the worst-case situation should be applied, ie all materials in the storage cupboard or bin should be considered as being the same material as the one that has the lowest flashpoint);
- The size of the process area etc. and the number of people working in it;
- The amount of flammable liquids being handled in the process area etc. and the quantities of liquid that may be accidentally released or spilled;
- Ignition sources in the process area etc and potential fire spread in the event of an ignition:
- Exhaust ventilation provision to the process area etc. and / or the storage cupboard or bin;
- The fire resisting performance of the storage cupboard or bin;

- The arrangements for closing the cupboard or bin doors/lid in the event of a fire;
- Means of escape from the process area etc.

166 The objective, in the event of an incident, is to ensure that people can safely escape from process and other areas. The purpose of storing dangerous substances in cupboards and bins of appropriate construction and design is to provide a physical barrier to defer their involvement in a fire. If the dangerous substances become involved, limiting the passage of fire and hot gas should allow sufficient time for safe evacuation and for the implementation of the employer's immediate emergency procedures.

167 Paragraphs 174 to 177, together with Appendices 5 and 6 detail the performance requirements for fire resisting cupboards and bins. These do not specify an absolute test or standard for the cupboard or bin itself, rather they relate to nominal construction principles. Namely that:

- the materials used to form the sides, top, bottom, door(s) and lid are capable of providing the required fire resistance (ie 30 minutes integrity) and reaction to fire (ie minimal risk);
- the joints between the sides, top and bottom of cupboards and bins should be free from openings or gaps;
- the lid / doors should be close fitting against the frame of the bin/cupboard, such that there is a nominal overlap between the frame and lid/doors in their closed position;
- the supports and fastenings should be of a material with a melting point greater than 750°C.

168 These criteria are the minimum performance requirements for compliance with current legislation. However, there are a number of more demanding standards and design specifications, which refer to the fire performance of the complete cabinet structure, including: BS EN 14470-1:2004 'Fire safety storage cabinets. Safety storage cabinets for flammable liquids'[43] Factory Mutual, Underwriters Laboratories and ANSI/NFPA 30 standards[44]. Where standards go beyond the minimum requirements of UK health and safety legislation, it should be emphasised that their implementation in the UK is not a legal requirement. However, for quantities in excess of the recommended maxima employers/dutyholders may find the use of cabinets with enhanced fire performance can help them demonstrate that the measures they are taking are sufficient to reduce the risks so far as is reasonably practicable.

169 It is the responsibility of the employer/dutyholder to ensure that cabinets to any particular standard or design specification meet the minimum legal requirements. Equally, the use of cabinets with enhanced fire performance should not be seen as a substitute for providing dedicated store rooms and outdoor storage areas for the safe keeping of containers which are nominally empty or are not needed for current work.

Storage and use of compressed and liquefied flammable gas cylinders, oxygen and other oxidising gas cylinders in process areas, workrooms, laboratories and similar working areas

170 In general gas cylinders and cartridges should be kept below 50°C as there is an increased risk of over pressurisation and gas discharge or rupture in the event of them being subject to elevated temperatures, For example this is a risk in the event of a fire in a building containing gas cylinders, even if the cylinders are remote from the source of the fire. The

employer should therefore minimise the number of gas cylinders kept indoors. Further guidance on this is below.

171 Ordinarily gas cylinders containing dangerous substances should not be kept in process areas etc. An exception is for gas cylinders connected to portable appliances, but the number should be limited to the minimum necessary for operational requirements. Where the appliance is fixed, the gas cylinders should normally be sited in a safe location outdoors and the gas piped indoors to the appliance. Gas cylinders that are not in use; ie not connected to an appliance should be stored in safe, secure uncongested locations in the open air that provide ready dispersal of any released gas, and prevent accumulations or entry of gas into any enclosed area. Nominally empty cylinders should also be stored in safe location outdoors so as to separate them from gas cylinders in use ie connected to an appliance.

172 Exceptionally, gas cylinders may be stored indoors where there is a specific safety, security or process quality consideration. For example, for toxic or ultra-high-purity gases needed in the electronics industry, where gases have to be temperature controlled for process reasons, or there is potential risk of deterioration/corrosion of the cylinder/cartridge, the gas cylinders may be stored indoors. The amounts kept should be minimised and the gas cylinders should preferably be housed/stored in a dedicated storeroom of adequate fire-resisting construction (see regulation 6(5)(b)).

173 Where the number of gas cylinders required indoors is so few that a dedicated storeroom is not justified, a dedicated cabinet/cupboard of adequate fire-resisting construction should be used. The same storeroom/cabinet/cupboard should not be used for both stored gas cylinders and those nominally in use; (connected to an appliance). Nor should it be used to store other incompatible substances or materials that pose a risk to the cylinders.

174 Fire resistance is discussed at the section ‘Physical barriers of fire-resisting construction-design and performance requirements (paragraphs 241 - 255). Other design requirements also apply to both storerooms and cabinets/cupboards in which gas cylinders are kept, including the provision of adequate ventilation to the outside (see regulation 6(4)(d)) and the provision of appropriate measures to mitigate the effects of any potential explosion (see regulation 6(5)(c)). Where the risk assessment and/or regulation 10 of DSEAR or advice from emergency services indicates that adequate signage is required to indicate compressed gas cylinders this may be appropriate.

175 Further advice on the storage and keeping for use of gas cylinders and cartridges should be available from the supplier or the relevant trade association, such as British Compressed Gas Association and UKLPG. Information on the location of such cylinders should be given to attending emergency services at the earliest appropriate opportunity.

176 The employer should justify the need to house/store gas cylinders and cartridges indoors and ensure that any storeroom, cabinet or cupboard provided for the purpose meets the minimum legal requirements.

177 A number of cabinets are commercially available that meet more demanding standards and design specifications; for example BS EN 14470-2:2006 Fire safety storage cabinets. Safety storage cabinets for pressurised gas cylinders[45] Factory Mutual, Underwriters Laboratories and ANSI/NFPA 3044 standards. Where standards go beyond the minimum requirements of UK health and safety legislation, it is to be emphasised that their implementation in the UK is not a legal requirement, nor should the use of such cabinets be seen as a substitute for siting gas cylinders in a safe

location outdoors where it is reasonably practicable to do so.

ACOP 6

Design of plant and equipment to minimise release of dangerous substance

178 **Plant and equipment used to handle, store or produce dangerous substances should be designed to an appropriate domestic national or international standard (where available) so as to avoid or minimise any unintended release of dangerous substances. If there is no appropriate standard the employer should be able to show that the plant or equipment is fit for the purpose of containment during its expected life and during foreseeable, normal and emergency conditions. Employers should ensure so far as is reasonably practicable that:**

(a) **work processes minimise releases by use of pipework or enclosed systems and a scheme/system is in place to ensure their contents are identifiable in accordance with regulation 10;**

(b) **plant is corrosion and abrasion resistant, manufactured of compatible material or treated to impart resistance;**

(c) **loading or unloading operations and facilities are designed, located and operated to minimise the risk of leaks, spills, overfilling and the inadvertent mixing of incompatible materials;**

Employers must also ensure that:

(d) **new pressure systems comply with the *Pressure Equipment Regulations 1999*[46] and existing pressure systems comply with the requirements of the *Pressure Systems Safety Regulations 2000 (PSSR)*[47]**

Guidance 6

179 Where any plant or equipment operates at a pressure greater than 0.5bar (7.25psi) above atmospheric pressure there are duties on the supplier and user under the PSSR. These duties are for the user to provide any person operating the system with adequate and suitable instructions for:

(a) the safe operation of the system; and

(b) the action to be taken in the event of any emergency.

Detailed guidance and ACOP requirements for the PSSR are available in the publication *Safety of pressure systems*[48].

180 Dangerous substances that give rise to a significant risk of fire during handling or processing include those classified under CHIP[93] as explosive, oxidising, extremely flammable, highly flammable and flammable.

181 Control rooms and other occupied buildings on sites processing or handling significant quantities of dangerous substances should be positioned or designed to provide protection from potential fires, explosions and ingress of dangerous substances. Additional guidance on protecting buildings for chemical plant is contained in the Chemical Industries Association (CIA)

Guidance for the location and design of occupied buildings on chemical manufacturing sites[49] .

182 182. To minimise the risk of fire arising from the release of a dangerous substance:

(a) Ducts, trunks and casings should be designed and installed to:

(i) minimise condensation of vapour or deposition of solids;

(ii) maintain adequate velocity throughout its length with smooth inner surfaces and large radius bends;

(iii) incorporate suitable inspection and cleaning access points.

(b) Plant and equipment should be designed and operated to:

(i) prevent unintentional accumulation of dangerous substances and their flammable residues;

(ii) avoid reaching a surface temperature that may cause residues to catch fire and ignite any explosive atmosphere that may be present.

183 Mitigation measures for plant and equipment processing highly flammable solids and dusts include rotary valves, explosion suppression barriers, fast acting valves, chokes and baffles. Mitigation measures for interconnected plant and equipment processing flammable gases and vapours include flame arresters[50], fast acting valves and suppression barriers.

ACOP 6

184 **Where plant contains openings such as inlets and outlets, these have the potential to release dangerous substance and employers must ensure:**

(a) **(a) plant doors, access points or charge/discharge points are provided with interlocks, valves or systems of work to prevent or minimise release;**

(b) **(b) plant is fitted with isolation valves to minimise leaks after use, to control leaks during use and to enable safe isolation of the plant for maintenance;**

(c) **(c) where personnel would be exposed to danger when operating valves manually during an emergency, plant is fitted with remotely operated isolation/shut off valves (ROSOVs).**

Ventilation

185 **Elimination or minimisation of the release of dangerous substances by using closed systems or suitable processing and handling methods should be the first consideration. Employers should ensure proportionate, appropriate measures are taken to prevent the formation of hazardous explosive atmospheres or to limit their extent. Ventilation is (and should be) designed to dilute the concentration of**

any dangerous substances to a safe level (below that which could form an explosive atmosphere) by providing air changes through:

(a) **an adequate number of appropriately sized openings, for natural ventilation, on all external walls at high and low levels (where reasonably practicable);**

(b) **mechanical extract ventilation (MEV), local exhaust ventilation (LEV) and/or forced ventilation at process and storage areas where natural ventilation cannot achieve the required air change rate to safely disperse the dangerous substance(s). LEV should be provided for processes where there is unavoidable release of a dangerous substance;**

(c) **any required mechanical ventilation system should be monitored for continuous operation, including a flow failure detection and alarm or other system which is suitable for the plant size and configuration. For complex areas adequate air flow should be verified by flow measurements throughout each compartment.**

186 **Where the release of a dangerous substance could give rise to explosive atmospheres the following measures, ranked in preference order and forming a hierarchy of control, should be considered in order to dilute the concentration of foreseeable releases to a safe level:**

(a) **location in the open air. Where weather protection is required, it should be designed to prevent the accumulation of dangerous substances;**

(b) **adequate natural ventilation for any potential source of release inside any enclosure or building where the flow of air is liable to be restricted. The ventilation should be designed to dilute the concentration of foreseeable releases of dangerous substances to a safe level by maintaining the average concentration during normal operations to below that which could form an explosive atmosphere;**

(c) **enclosure within a cabinet or other suitable enclosure which is constructed of fire-resisting materials and directly provided with LEV exhausting to a safe place;**

(d) **adequate LEV should be provided and positioned to prevent or minimise releases of potentially unsafe concentrations, into the work area or room;**

(e) **adequate mechanical general ventilation should be provided to the workspace in the event that closely positioned LEV is either not reasonably practicable or is insufficient by itself to dilute concentrations of releases of dangerous substances to a safe level.**

The following steps should also be taken where appropriate:

(f) **prevent the formation of explosive atmospheres in enclosed spaces forming part of plant, equipment or ductwork;**

(g) **dryers, ovens, cabinets, connecting ducts, trunks and**

their associated ventilation casings should be fire-resisting structures;

(h) **safely disperse vapourising liquid leaks from fixed liquefied gas vessels away from vulnerable populations and locations.**

Guidance 6

Ventilation: First choice – Natural dispersion

187 Location of plant and storage facilities in the open air normally ensures the best possible dispersion of dangerous substances to limit the formation and extent of hazardous explosive atmospheres. Certain features may affect the ready dispersal dispersion of any releases of dangerous substances; eg buildings, pits, and structures providing weather protection - employers should take the following measures as appropriate:

- ensure these are sufficient distance away; or
- of suitable design to prevent the accumulation of dangerous substances; and
- where necessary, the ground should be graded to direct vapours away from occupied buildings and vulnerable populations; eg to provide safe dispersal of vapourising liquid leaks from fixed liquefied gas vessels.

Ventilation: Second choice – Indoors and ventilated from open air

188 Where plant and storage facilities handling dangerous substances are located indoors, the employer should ensure that ventilation is adequate to limit the formation and extent of hazardous explosive atmospheres. The greater the air flow from and to open air (natural ventilation), the better. If possible one or more solid sides to an enclosure should be removed. Ventilation should:

- ensure there are no stagnant or poorly ventilated areas in the building, room or enclosure containing plant or stores where the dangerous substance can accumulate to form a hazardous explosive atmosphere; and
- prevent the formation of such atmospheres in any other parts of the building.

189 When considering the design and size of the ventilation requirement the employer needs to consider the nature and location of potential leak scenarios – typically this will be in two parts:

- the ventilation required to limit the formation and extent of hazardous explosive atmospheres that might occur during normal operations, including foreseeable deviations or excursions from normal conditions; and
- the emergency measures required to deal with substantial leaks that might arise in the event of accident or incident (regulation 8). Regulation 6(4)(d) is specifically concerned with the ventilation requirements for normal operations and foreseeable departures from normal.

190 In determining the ventilation requirement, the employer should take account of the range of dangerous substances that may be present and the conditions under which all activities take place, including the temperature of

the workplace.

191 In a workplace where combustible dusts are likely to be present, the design of the ventilation system should take into consideration any deposits that may arise. For example, dust leaks from the plant, should not be allowed to build up in such quantity that if disturbed or dispersed, they could form a hazardous explosive atmosphere.

192 Adequate ventilation can sometimes prevent the formation of an explosive atmosphere. The variations associated with work activities, mean however that in reality typical effectiveness is likely to be limited to a reduction in the likelihood (chances) of a hazardous explosive atmosphere forming and/or a reduction in the extent of the hazardous area (zones). This may be sufficient ventilation in some circumstances for the extent of the hazardous area to be treated as a zone 2, of negligible extent (zone 2^{NE}) because a sufficiently small volume of explosive atmosphere would have insignificant overpressure or thermal effects if it ignited. See Regulation 7 and Schedule 2 for classification.

193 Where necessary, check that the ventilation is adequate; for example, congestion or obstructions may affect the air flow. Checks may be carried out using smoke or tracer gas tests. Alternatively, where a more detailed assessment is sought, computational fluid dynamics (CFD) modelling may be used if appropriate.

194 Typically adequate ventilation is taken to be that which limits the average concentration to no more than 25% of the LEL within the building, room or enclosure containing the dangerous substance.

195 When storing dangerous substances indoors, natural ventilation, provided by an adequate number of appropriately sized openings on the external walls at high and low level is usually sufficient. For buildings, the openings should be provided on opposite walls to ensure through-ventilation to prevent stagnant or poorly ventilated areas. Roof ventilation openings may provide the high-level ventilation. It is acceptable for compartments and rooms to have one external wall with high and low level ventilation, providing stagnant or poorly ventilated areas are unlikely to occur.

196 Further guidance on assessing and designing for natural ventilation is available[51].

197 Generic advice on the ventilation requirements for flammable liquids, compressed gases and LPG is available[52].

Ventilation: Third choice – mechanical ventilation

198 If sufficient natural ventilation cannot be achieved, MEV should be provided. This should be designed to ensure the space is adequately ventilated. Ventilation openings should be correctly located in the external wall(s) of the building, room or enclosure.

199 Process areas where releases of dangerous substances might be expected to occur during normal operations will typically require LEV to ensure adequate ventilation to limit the formation and extent of hazardous explosive atmospheres. Ventilation should also take account of the potential toxicity of any dangerous substance that might foreseeably be released to make sure people are not exposed to concentrations of the substance that are likely to cause injury or ill health. This requirement under COSHH[6] will often result in a higher standard of ventilation requirement than that required to prevent or limit the extent of an explosive atmosphere. Further information on ventilation requirements under COSHH may be found in the

following:

- Clearing the air. A simple guide to buying and using local exhaust ventilation (LEV). INDG 408[53];
- Time to clear the air! A workers' pocket guide to local exhaust ventilation. INDG 409[54];
- Controlling airborne contaminants at work: A guide to local exhaust ventilation HSG258[55];
- Local exhaust ventilation (LEV) workplace dust and fume extraction[56] HSE webpages.

200 LEV (and MEV) systems should be monitored to detect any reduction in exhaust flow that would result in inadequate ventilation. Should this occur, appropriate warning and/or automatic actions should be initiated.

201 The LEV extraction openings should be located as close as possible to the sources of potential release of the dangerous substance, to limit the extent of any hazardous explosive atmosphere. LEV should be provided in other locations where explosive atmospheres might accumulate. The exact position should take account of the density of the dangerous substance (which for the majority of substances will normally be at low/floor level).

202 LEV (and MEV) systems should discharge to a safe location outdoors.

Ventilation: Fourth and last choice – extraction ventilation to the entire workspace

203 Where it is not reasonably practicable, or considered unnecessary to provide LEV, adequate ventilation may be achieved by general MEV to the workroom. However, such ventilation systems can affect the comfort of the occupants.

Ventilation of plant and machinery

204 Plant and machinery containing dangerous substances should be provided with adequate ventilation to prevent hazardous explosive atmospheres from occurring so far is reasonably practicable. For plant and machinery purchased from within the EU, this should be confirmed by the supplier in compliance with their duties under the Machinery Directive 2006/42/EC[57] implemented in UK law by the Supply of Machinery (Safety) Regulations 1992[57]. Documentary information should show that 'machinery is designed and constructed to avoid any risk of explosion posed by the machinery itself or by gases, liquids, dusts, vapours or other substances produced or used by the machinery'.

205 Where the plant or machinery is manufactured by the employer or imported from outside the EU, the employer takes on the responsibility for ensuring its safe design and use.

206 Plant and machinery should be properly installed to ensure the ventilation operates as designed and exhausts to a safe place, a recovery unit or a disposal unit.

207 Plant burning dangerous substances (not covered by the Gas Appliances (Safety) Regulations 1995)[27] should be provided with means of purging the combustion chamber and other parts in which a hazardous explosive atmosphere might occur before starting and completing an ignition cycle.

Adequate ventilation

208 Ventilation for plant and machinery is normally considered adequate if it limits the average concentration of any dangerous substance that might potentially be present to no more than 25% of the LEL. However, an increase up to a maximum 50% LEL can be acceptable where additional safeguards are provided to prevent the formation of a hazardous explosive atmosphere. For example gas detectors linked to emergency shut down of the process might be used together with maintaining or increasing the exhaust ventilation on solvent evaporating ovens and gas turbine enclosures.

Temporary exhaust ventilation systems

209 Temporary exhaust ventilation systems may be provided for non routine higher risk activities, such as cleaning, repair or maintenance in tanks and other confined spaces or in an emergency after a release. The work procedures for such activities should be carefully considered. The atmosphere should be continuously monitored to ensure that ventilation is adequate and the area remains safe. Where workers will enter the space, the ventilation should ensure that the concentration of the dangerous substance does not exceed 10% of the LEL,(irrespective of the provision of suitable breathing apparatus).

210 Industry guidance on ventilation at sites storing and handling LPG has been produced by UKLPG[58].

ACOP 6

Containment and collection of spillages and leaks

211 **To avoid contaminating other parts of the workplace in the event of a loss of containment, employers should take measures as far as is reasonably practicable to:**

(a) **contain spillages of dangerous substances;**

(b) **ensure flammable vapours/gases cannot discharge from the point of spillage into other parts of the building or into other buildings on the premises;**

(c) **contain and collect spills or leaks likely to give rise to a hazardous situation by means of run off to a container or to a safe place, or otherwise treated to make it safe;**

(d) **provide underground storage tanks for flammable liquids and associated pipework and fittings with secondary containment or leak detection to identify leaks before a hazardous situation can arise;**

(e) **store solids or powders in closed vessels constructed to an appropriate domestic (or international) standard where available. Granular materials contain a proportion of dust and may be stored in designated open compounds provided adequate dust control measures are in place.**

Guidance 6

212 Employers should use the risk assessment carried out in accordance with regulation 5 to decide on the need, location and type of valves necessary for isolating the supply after use, during maintenance and in the event of an emergency. Additional information on the containment of large volumes of flammable liquids may be found in:

- Safety and environmental standards for fuel storage sites[59]
- Secondary and Tertiary Containment of Bulk Hazardous Liquids at COMAH Establishments[60].

ACOP 6

Control and avoidance of ignition sources including electrostatic discharges

213 **Unnecessary ignition sources should be avoided throughout the workplace as a general principle. Ignition sources include open flames, electrostatic discharges, unprotected powered mobile plant etc. Where the risk of a flammable atmosphere cannot be eliminated, the employer may have to control risks of ignition. Consideration of ignition sources under regulation 6 should include those that employers need to consider under hazardous area classification.**

214 **If an employer decides to create a designated smoking area for employees and visitors, this should not be sited in or near hazardous zone.**

215 **Ignition sources outside the hazardous (classified) areas should also be considered where they could pose a risk of a fire or similar event spreading into a zone where there could be an explosive atmosphere.**

216 **In areas where the ignition of dangerous substances could affect safety, measures must be introduced to avoid ignition sources occurring or being brought into those areas. The measures employers should take include:**

(a) **selecting and installing appropriate electrical and non-electrical equipment that has been designed to be safe in hazardous areas. All equipment for places where an explosive atmosphere may occur should meet the essential safety requirements appropriate to the equipment category as detailed in EPS[17];**

(b) **implementing inspection, testing, cleaning and maintenance regimes for equipment to minimise ignition sources occurring as a result of overheating or fault conditions;**

(c) **ensuring that any portable or mobile equipment brought into hazardous areas is either suitably protected or is only brought into those areas under safe conditions ensured by implementation of a permit-to-work scheme. See regulation 6 (8) and part 6 of Schedule 1 of DSEAR and paragraphs 283 to 329 of this ACOP (safe maintenance, repair and cleaning procedures);**

(d) **prohibiting the use of open flames;**

(e) **implementing controls and procedures to prevent the**

occurrence of hazardous electrostatic discharges;

(f) **ensuring heating equipment installed in areas where dangerous substances are stored or used cannot act as an ignition source. Ensuring that heating equipment or storage conditions cannot cause dangerous substances to reach their auto-ignition temperature or, where relevant, their self-accelerating decomposition temperature (SADT) for packaged materials, or the onset temperature at which thermal decomposition occurs within bulked materials;**

(g) **preventing the accumulation of waste materials or deposits that are liable to spontaneously combust or are readily ignited. Such materials should be placed in a closed metal bin or removed to a safe place. Deposits should be removed in such a way that their removal does not create a risk of ignition;**

(h) **avoiding incompatible materials that could either react together to produce heat or flames or give rise to incendive sparks following frictional contact during impact, machining, grinding or polishing. The employer's assessment of where incompatible materials could occur should consider the dangerous substances being processed and the materials of construction of plant, equipment, process areas and tools.**

217 **In identifying potential ignition sources, the employer should consider the properties of the dangerous substance in relation to how it is handled or may accumulate, whether unintentionally or not. If accumulations of certain fugitive dusts might self-heat and potentially ignite then such accumulations should be prevented.**

218 **The following factors are amongst the most likely ways that electrostatic discharge events presenting a risk of ignition may be generated and therefore should be avoided:**

(a) **personnel wearing clothing and/or footwear capable of generating a build up of static electricity;**

(b) **containers and equipment handling dangerous substances/flammable liquids that have not been earthed/bonded correctly or constructed of unsuitable materials;**

(c) **manual cleaning operations using unsuitable equipment and/or materials;**

(d) **incompatible reactive materials, this includes both tools and other plant as well as dangerous substances;**

(e) **humidity not maintained to a range that reduces static build up.**

219 **Employers should ensure that all visitors who are given access to hazardous areas of the premises are wearing appropriate antistatic clothing and are made aware of the hazards before entering any location where a potentially explosive atmosphere may exist.**

220 **Where mechanical ventilation is provided and after having**

eliminated or minimised any releases to reduce the hazardous area, employers should then establish controls on ignition sources by considering the following factors in relation to the MEV systems:

(a) **electric motors of fans should not be sited within ducts containing dangerous substances where build up of residues may lead to overheating.**

(b) **design (protect) and install only fans suitable for such use if they are in hazardous area eg inside ductwork.**

(c) **provide equipment inspection testing cleaning and maintenance schemes to minimise overheating or fault conditions;**

(d) **for an explosive atmosphere, select and install equipment designed to be safe in hazardous areas. Such equipment supplied after June 2003 should meet the essential safety requirements detailed in the EPS[17];**

(e) **MEV should be equipotentially bonded so as to prevent electrostatic build up;**

(f) **preventing the accumulation of readily ignited waste and ensuring safe removal of waste deposits.**

Guidance 6

221 Guidance on preventing ignition from non-electrical equipment e.g, by use of sensors is contained in BS EN 13463:-6:2005 Non-electrical equipment for potentially explosive atmospheres. Protection by control of ignition source 'b'. (Part 6).

222 Advice on the control of electrostatic hazards is contained in:

- BS5958-1:1991 Code of Practice for control of undesirable static electricity. General considerations[61]. Also in
- Electrostatics. Code of Practice for the avoidance of hazards due to static electricity BSI report PD CLC /TR 50404:2003[62], which includes a range of measures applicable to various industrial situations such as petrochemical installations and flammable powder handling.

223 Some clothing, including footwear, contains materials that can generate electrostatic discharges during use. Such discharges can ignite certain types of explosive atmospheres eg, gases or vapours and even some types of dust that are very easily ignited. Employees working in these atmospheres should be provided with antistatic footwear if the assessment indicates an ignition risk. Providing the floor is not highly insulating, antistatic footwear alone may be sufficient to control the risk because the risk from electrostatic discharges from clothing can be reduced if the wearer is earthed by the footwear and suitable flooring such as concrete or steel grids. Antistatic footwear and flooring should be tested routinely and replaced if it is found that its antistatic properties have deteriorated.

224 Employees such as electricians who need insulated footwear for other purposes will need reminding to change their footwear before entering a hazardous area unless the area can be made safe for them. This is likely to be sufficient for places classified into zone 0,1 or 2 as specified in Schedule 2. In a small number of cases special footwear may also be needed for zones 20, 21 and 22. Other antistatic clothing must also be

provided if the assessment shows this to be necessary.

225 The employer must also ensure that any personal protective equipment provided for other purposes, such as to prevent contact with substances hazardous to health will not create electrostatic discharges if used in an explosive atmosphere.

226 Antistatic or ordinary clothing should not be removed in places where an explosive atmosphere may occur. A safe area should be established where workers are able to remove or change clothing, etc. Electrostatic risks can be created by personal items brought into a hazardous area, and employers may need to provide instructions for employees or visitors. Where necessary, employers should ensure that visitors have appropriate antistatic clothing and should ensure that the rules set out in management procedures are followed.

227 Electric motors should be positioned where they can be readily inspected, cleaned and maintained. Fan impellers necessarily have to be in the path of the dangerous substances being extracted, but the source powering them should be effectively separated from the dangerous substance and never in the duct (for example to avoid ignition or build up of residues leading to overheating).

228 Fans must be properly designed and installed so as not to constitute an ignition source, if they are located in ductwork or places that are considered to be hazardous areas they will need to be suitably designed so that they cannot cause sparking etc, eg through static discharge or rubbing. Where a fan and motor are located in hazardous areas, for example an extractor fan in a wall leading directly to outside, they will need to be ATEX[9] certified.

229 The employer will need to decide whether ignition sources can be allowed into the work area on a temporary basis. This should be based on a consideration of the risks of a flammable/explosive atmosphere being formed during the time such an ignition source is present.

ACOP 6

Segregation of incompatible dangerous substances

230 **Where mixtures of dangerous substances, are incompatible, they should be separated or segregated to minimise the risks. Where limited space at premises mean that it is not feasible to separate substances from other substances or hazards by distance alone, then the only solution may be segregation via physical partitions of fire resisting construction.**

Guidance 6

231 Where incompatible dangerous substances are separated by distance, the risk assessment should demonstrate that the risk of propagation of fire between those substances is low. General guidance on storing packaged dangerous materials is contained in *Chemical warehousing: The storage of packaged dangerous substances*[63].

232 Although DSEAR requires only dangerous substances which are incompatible to be segregated, the general duties under HSWA mean segregation of any incompatible substances is required. For example, a risk arises where corrosive materials are stored if a release of the corrosive material could cause the containers for dangerous substances to fail.

Materials defined as dangerous substances will include those that have been classified because of hazardous properties such as accelerated burning or because they can release flammable gas products.

233 Mixing of incompatible dangerous substances, may occur if :

- a dangerous substance is sent to the wrong tank;
- if the contents of a delivery vehicle are not the same as the dispatch note or are out of specification; or
- if a tank is used to store a new material before the residues of the previous contents are adequately cleaned out.

234 The risks may be controlled by measures such as:

- clear labelling of transfer lines;
- provision of dedicated transfer lines rather than temporary flexible hoses with complex valve manifolds;
- use of different types of couplings for incompatible products;
- simple checks on the contents of incoming road tankers;
- written systems of work concerning tank cleaning.

ACOP 6 paragraph 5

Mitigation – Avoidance of propagation

235 **Regulation 6(5) details the measures which 6(3)(b) requires which should be applied to reduce the consequences of an incident. Premises layout and equipment installation can mitigate the effects of a fire or explosion in cases where substance quantity/properties would have particular influence on the scale or nature of an incident. The following list is not in priority order. Employers should ensure:**

(a) **adequate separation of process areas from:**

(i) **other parts of the premises;**

(ii) **the site boundary;**

(iii) **bulk storage areas;**

(b) **measures are taken to prevent fire and explosion from spreading to other equipment;**

(c) **process areas are separated from the rest of the building by physical barriers that are fire-resisting structures;**

(d) **physical barriers are provided where they will help to prevent damage to containers, vessels, pipework and other equipment;**

(e) **nominally empty containers are removed from process and work areas back to a safe place;**

(f) **adequate separation of storage areas:**

(i) **from site boundaries;**

(ii) **from occupied buildings;**

(iii) **from process areas;**

(iv) **from fixed ignition sources and other features that pose a threat;**

(v) **between other dangerous substances within storage areas;**

(g) **sufficient separation to allow people to escape from fire at a store and which prevents or delays fire spread;**

(h) **any store is constructed to protect it from unauthorised access and from fire occurring elsewhere including on the boundary;**

(i) **where rooms storing dangerous liquids or gases are inside buildings they are either:**

(i) **a clearly identified dedicated room or building adequately separated from other buildings, workrooms or hazards; or**

(ii) **fire-resisting structures (and again their contents clearly identifiable);**

(j) **bulk compressed gas and liquefied flammable gas tanks are not sited within buildings;**

(k) **that where storage is underground, compressed flammable gases and liquefied flammable gases such as LPG are stored in suitable underground reservoirs and caverns are not sited beneath any building or similar structure where accumulation of gas could occur;**

(l) **cupboards, bins, tanks, vessels and containers (whether nominally empty or not) which contain a dangerous substance are clearly identified and any openings in them are kept closed except when in use or operation or being maintained;**

(m) **dispensing or decanting are not carried out in a bulk storage area where other dangerous substances are stored.**

Guidance 6

236 Where lack of space means that a physical barrier of fire resisting construction must be provided to protect (or protect against) any feature, the design and performance requirements for the barrier depend on its particular function.

237 Structures required to serve as a physical barrier of fire-resisting construction where the dangerous substance is either extremely or highly flammable or where a substance is stored or used at a temperature above or near to its flashpoint should meet the relevant fire safety performance requirements detailed in paragraphs 241 to 255.

238 For outdoor storage, adequate separation can be achieved by locating the storage facility at an appropriate distance from other specific features or potential hazards. Alternatively, a physical barrier such as a fire-

resisting wall or partition can be used. For products which are dusts, or contain a proportion of dusts, these issues are covered in *Safe handling of combustible dusts*[64].

239 For most dangerous substances, advice on adequate separation is detailed in HSE or industry Codes of Practice and guidance. These may be specific to the dangerous substance (eg LPG), or be of a generic nature (eg flammable liquids).

240 Where such advice is not available or is inappropriate due to the quantity of dangerous substance stored or manner of its use, the necessary separation distances to achieve safety will need to be determined from first principles and by taking into account any additional fire mitigation measures such as water deluge systems or monitors.

ACOP 6

Physical barriers of fire-resisting construction – design and performance requirements

241 **The periods of fire resistance required should be determined by assessment of the fire hazard, taking account of its anticipated duration and severity.**

Guidance 6

242 Physical barriers of fire-resisting construction should be capable of maintaining adequate fire protection to allow sufficient time for evacuation and for emergency procedures to be implemented. Fire walls are a physical barrier of fire-resisting construction and may be part of a building or free-standing structures in the open air. This fire safety performance is specified in terms of:

(a) resistance to fire; and

(b) reaction to fire.

243 Definitions and technical specifications for these terms are given in Appendix 5 - Fire resistance and Appendix 6 - Fire reaction.

244 Although these fire safety performance standards are not mandatory, they may be suitable in cases where the dangerous substance present is known to be flammable.

245 Compliance with the fire resistance and reaction to fire test standards referred to above may be demonstrated by testing, or by building the structure using materials and construction methods that are capable of providing the required fire safety performance.

ACOP 6

246 **Storerooms and workrooms required to be of fire-resisting construction (fire resisting) should meet the following minimum requirements:**

(a) **every enclosing element that acts as a fire-resisting physical barrier should provide a minimum of 30-minutes' fire resistance in respect of integrity, insulation and, where applicable, load-bearing capacity. 'Enclosing element' includes every internal wall**

(including any door), floor (other than a floor on the ground), ceiling and its associated floor (other than the top or ceiling of a single-storey building or of a top-floor room), and any external wall that serves as a fire wall;

(b) **if the room is within a building that also contains residential accommodation the partition between the two should provide a minimum of 60-minutes' fire resistance with no connecting doors or direct access between the two parts of the building;**

(c) **storerooms should not contain any glazed area in any fire resisting physical barrier except as permitted in a door;**

(d) **any door in a fire-resisting physical barrier should be self-closing from any position. Such a door may have a glazed viewing panel provided that it does not exceed an area of 20% of the door. Any glazing should satisfy the integrity requirements, which can be achieved by using Georgian wired glass or a proprietary fire-resisting glazing panel. The area of such panels should be kept to a minimum so far as is reasonably practicable.**

(e) **the materials used in the construction of a store or workroom should as a minimum have a 'low risk' in respect of their reaction to fire (see Appendix 6) (for storerooms in which LPG cylinders are stored, only materials that have a 'minimal risk' should be used). This limitation does not apply to doors and windows together with their associated frames and any provision made for explosion relief;**

(f) **openings in the internal partitions of a workroom are allowed, provided:**

(i) **where they are to accommodate ducts trunks and casings, these are of fire-resisting construction as detailed at paragraph 249;**

(ii) **where they are for any other purpose (such as to allow the movement of items on a production line), a fire/smoke damper should be installed that, together with its frame, can provide a minimum of 30-minutes' fire resistance in respect of integrity;**

(g) **the junction between each part of a fire-resisting physical barrier should be sufficiently bonded or fire-stopped to ensure that the fire resistance is not compromised.**

247 **Cabinets, enclosures (including any oven used solely for the evaporation of dangerous substances from materials contained therein), cupboards and bins that are required to be of fire resisting construction (fire resistant) should meet the following minimum requirements:**

(a) **every side, top, floor, door and lid should provide a minimum of 30-minutes' fire resistance in respect of**

integrity. This requirement may be waived in respect of:

(i) **the glazed panel of any fume cabinet or glove box;**

(ii) **any booths where a screen is provided for environmental or quality control purposes;**

(iii) **where provision is made for explosion relief;**

(iv) **cupboards and bins where provision is made for ventilation.**

248 **If there is need for a view panel on an oven used for the evaporation of dangerous substances, this should be provided by using Georgian wired glass or a proprietary fire-resisting glazing panel. In all other circumstances, the fire resistance integrity requirements should be maintained for cabinets, enclosures cupboards and bins which should:**

(a) **be constructed of materials which are, so far as is reasonably practicable, of 'minimal risk' in respect of their reaction to fire (see Appendix 6);**

(b) **be supported and fastened to prevent structural collapse in case of fire for at least 30 minutes. The supports and fastenings should be of high melting point material (in excess of 750°C).**

249 **Ducts, trunks and casings that are required to be of fire resisting construction should meet the following minimum requirements:**

(a) **provide 30-minutes' fire resistance in respect of integrity and be constructed from materials that have a 'minimal risk' (see Appendix 5) in respect of their reaction to fire, so far as is reasonably practicable, except at points where provision is made for explosion relief;**

(b) **be supported and fastened to prevent structural collapse in case of fire for at least 30 minutes. The supports and fastenings should be of high melting point material (in excess of 750°C).**

250 **Cabinets, ovens, cupboards, bins, ducts, trunks and casing should be bonded or fire-stopped to prevent or retard the passage of flame and hot gases for a period of at least 30 minutes.**

251 **Fire walls, storerooms, workrooms, cabinets, ovens, cupboards, bins, ducts, trunks and casings must be sufficiently robust so that their integrity in respect of fire resistance will not be damaged by any foreseeable event. This includes wear and tear from normal operational activities such as collision damage from vehicles or forklift trucks and blast overpressure when the risk assessment identifies an explosion as a likely event.**

252 **Where fire walls and fire-resisting structures provide containment for leaks of dangerous substance and/or prevent any escaping vapours from reaching an ignition source while still flammable, such barriers should not be perforated by any openings.**

They should be constructed to withstand contact with the dangerous substance in the form and quantity that might foreseeably occur in the event of an accident.

253 **The reaction to fire of the external surface of a storeroom, workroom or fire wall should be to the standard required under the relevant building legislation or that appropriate to the activity being carried out on that (external) side of the barrier whichever is the higher standard.**

254 **When any surface of a structure is liable to be coated with residues, the structure should be sufficiently durable so that removing the residues will not reduce its capacity to resist spread of flames or fire resistance.**

Guidance 6

255 The risk assessment should consider the need for suitable pressure relieving devices and appropriate fire protection and take into account foreseeable events including:

(a) Fires involving releases of dangerous substances from other plant;

(b) Other fires on site or at the boundary not involving a dangerous substance;

(c) Sudden warming of cryogenic substances as a result of normal and abnormal operating conditions or following changes in atmospheric conditions; and

(d) Thermal expansion of enclosed or trapped liquids caused by atmospheric warming or fire.

ACOP 6

Measures to mitigate the effects of an explosion (including explosion relief, suppression and pressure resistant plant)

256 **Where there is the potential for an explosion to occur involving dangerous substances used, generated or otherwise present employers must provide appropriate and sufficient protective systems to halt incipient explosions immediately an/or to limit the range of an explosion to minimise the risk. Protective systems may be either:**

(a) **plant that is constructed to withstand the pressure that may potentially result from an explosion without failure; or**

(b) **explosion protection measures taken to restrict the spread and effects of the explosion within both the plant and the workplace.**

257 **For highly toxic substances, explosion suppression or explosion-resistant plant should be used, or vented materials should be otherwise safety dealt with.**

258 **The employer should ensure any such mitigation measure has been designed, constructed, assembled and installed, and is maintained and operated, to minimise the risk of exposing people to**

the physical effects of the explosion, which includes pressure, flame, projectiles and the operation of the mitigation measure.

259 **Steps should be taken to prevent any measures provided to counteract propagation through interconnected plant failing in a manner that might expose persons to the harmful effects of the explosion.**

260 **Protective systems provided for use after 30 June 2003 should comply with the requirements of regulation 7(2) and Schedule 3 of these Regulations. Protective systems supplied after this date should also comply with EPS; ie the supplier has the duty to ensure that the equipment satisfies the relevant essential health and safety requirements and that the appropriate conformity assessment procedure has been carried out.**

Guidance 6

261 One or more of the relevant essential health and safety requirements for a protective system may be covered by a harmonized standard adopted by the European Committee for Standardisation or the European Committee for Electrotechnical Standardisation[65].

262 Where protective systems are supplied as an integral part of plant or equipment, eg storage vessel; bucket elevator, their conformity is assessed during the conformity assessment of the equipment they are integrated with. This should include where relevant, compliance with the technical standard(s) applicable to the protective system(s) integrated into the plant or equipment. [Source, EC ATEX Guidelines (2nd edition) – Section 3.8, p.16, EPS Regs and BS 5908-2].

263 Explosion protection measures for plant and equipment processing dangerous substances include explosion relief venting, explosion suppression equipment, pressure shock resistant plant and pressure resistant plant. The design of the protection measure should mitigate possible explosions by:

(a) relieving the explosion pressures and/or hot gases to a safe place outside of the workroom;

(b) suppressing the explosion before dangerous pressures build-up; and

(c) safely containing the explosion without the plant rupturing.

264 Plant and equipment normally requiring explosion protection or emergency relief venting, include:

(a) ovens and dryers normally operating with concentrations of dangerous substances below 25% of the LEL but without sufficient process control to prevent deviations above 25% LEL;

(b) ovens and dryers operating with concentrations of dangerous substances above 25% of the LEL;

(c) reactors where there is a significant residual risk from the process of a runaway reaction (unless alternative protection measures are provided such as crash cooling, reaction inhibition and quenching);

(d) cyclones, dust filters and other dust handling plant where there is a risk of ignition;

(e) spray dryers producing combustible dusts;

(f) silos storing combustible dusts;

(g) aerosol filling rooms using liquefied flammable gases;

(h) other plant and equipment in which explosive atmospheres may occur and ignition sources cannot be eliminated;

(i) storerooms for highly flammable and extremely flammable liquids; and,

(j) storage of compressed and liquefied flammable gas in buildings.

265 An explosion in a classified area may affect the safety of people in an unclassified area, eg, an explosion in an item of equipment may endanger someone standing nearby, even though there is normally no flammable material outside the equipment.

ACOP 6

Review of control and mitigation measures

266 **Existing control and mitigation measures may need to be improved, extended or replaced, using a system of experience reviews. Measures selected should be appropriate to the work activity, consistent with the risk assessment and sufficient to reduce the risk so far as is reasonably practicable.**

Residual risk

267 **If, after implementing all reasonably practicable precautions in the plant, the process control, mitigation, and safe systems of work a residual risk remains, workers should as a last resort be provided with suitable personal and respiratory protective equipment (PPE/RPE). PPE and RPE must never be viewed as a first line of defence.**

Guidance 6

268 An explosion in a classified area may affect the safety of workers in an unclassified area, eg, an explosion in an item of equipment may endanger someone standing nearby, even though there is normally no flammable material outside the equipment.

ACOP 6 paragraph 6

Transport of dangerous substances on site

269 **An employer should assess, plan and implement arrangements for movement of dangerous substances on any work premises which are under their control.**

Guidance 6

270 This regulation applies to on-site operations only, not to public roads. Such premises would not normally include the public highway unless

it forms an integral part of the work premises when special measures may be required. The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 will apply off-site on the public highway.

271 Under regulation 5(2)(c)(iv), the employer should have already assessed the risks associated with transport, handling and storage of dangerous substances.

ACOP 6

Waste containing dangerous substances

272 **From the risk assessment under regulation 5(2)(c)(iv) employers should decide upon and then implement appropriate control measures to ensure the safety of employees and others during the handling and storage and before or during disposal of waste materials which contain dangerous substances. Where appropriate the management arrangements should include:**

(a) **consideration of the hazardous properties of the waste materials;**

(b) **prevention of waste materials from different sources and of different composition being mixed without appropriate consideration of their compatibility;**

(c) **safe storage in suitable containers, labelled according to their hazardous properties;**

(d) **procedures and precautions for the safe collection and mixing of waste materials;**

(e) **prompt removal from workrooms of empty and nominally empty containers which may still contain residues of dangerous substances. These should then be stored according to the requirements of full containers while awaiting disposal in an appropriate manner.**

Guidance 6

273 Employers should also be aware of, and take account of, other legislation covering the disposal of waste. Guidance on waste handling and disposal can be found on the following web sites:

- The Environment Agency for England;
- Natural Resources Wales for Wales (from 1 April 2013);
- The Scottish Environment Protection Agency for Scotland[19].

Security

274 The level of security for the storage area will depend on the potential consequences of a fire and the general security already provided for the premises. Security measures will need to take into account the possibility of arson and vandalism as well as the general site fire precautions and control measures. Examples of security measures include locks on storeroom doors, welded mesh or chain link fencing, intruder alarms, security patrols and lockable covers to filling and discharge connections.

ACOP 6 paragraph 7

Review of control and mitigation measures

275 **Existing control and mitigation measures may need to be improved, extended or replaced, using a system of experience reviews. Measures selected should be appropriate to the work activity, consistent with the risk assessment and sufficient to reduce the risk so far as is reasonably practicable.**

Guidance 6

276 The employer, having carried out all the required assessment and subsequent implementation work should continue to actively ensure that the conditions they have created are maintained both in terms of hardware - plant etc and software, in terms of people and systems such as management procedures. For example, they should ensure their standard operating procedures are followed.

277 Employers should periodically check and review the measures they have in place (as required by regulation 5(3)) to ensure that the equipment provided is maintained.

Schedule 1 to Regulation 6: General safety measures

Schedule paragraph 8

1 The following measures are those specified for the purposes of regulation 6(8).

Workplace and work processes

2 Ensuring that the workplace is designed, constructed and maintained so as to reduce risk.

3 Designing, constructing, assembling, installing, providing and using suitable work processes so as to reduce risk.

4 Maintaining work processes in an efficient state, in efficient working order and in good repair

5 Ensuring that equipment and protective systems meet the following requirements –

(a) where power failure can give rise to the spread of additional risk, equipment and protective systems must be able to be maintained in a safe state of operation independently of the rest of the plant in the event of power failure

(b) means for manual override must be possible, operated by employees competent to do so, for shutting down equipment and protective systems incorporated within automatic processes which deviate from the intended operating conditions, provided that the provision or use of such means does not compromise safety;

(c) on operation of emergency shutdown, accumulated energy must be dissipated as quickly and as safely as possible or isolated so that it no longer constitutes a hazard; and.

(d) necessary measures must be taken to prevent confusion between connecting devices.

Organisational measures

6 The application of appropriate systems of work including -

(a) the issuing of written instructions for the carrying out of the work; and

(b) a system of permits to work with such permits being issued by a person with responsibility for this function prior to the commencement of the work concerned,

where the work is carried out in hazardous places or involves hazardous activities.

ACOP 6 Schedule 1

Design considerations

278 **The workplace, including the location of equipment, should be designed, constructed and maintained to prevent releases of dangerous substances accumulating in sufficient quantity that ignition could result in a fire and/or explosion or 'other events' that may lead to injury. In particular:**

(a) **except where specially designed for the purpose, liquid spills should be prevented from accumulating in the workplace;**

(b) **workplace ventilation should be sufficient to prevent accumulations of flammable vapours forming an explosive atmosphere; and**

(c) **combustible dusts should be prevented from accumulating to such an extent that, if dispersed and they became airborne, an explosive atmosphere would result.**

279 **The employer should ensure the plant and equipment and storage conditions, including arrangements for heating the workplace will not cause the dangerous substances to ignite, self-heat or thermally decompose.**

Guidance 6 Schedule 1

280 Where it is intended to carry out chemical reactions it will be necessary to carry out a chemical reaction hazard assessment as part of the assessment required by regulation 5. This should provide sufficient information on the reaction kinetics, quantities and rates of heat and any gas generation to allow the plant to be designed safely with the correct process controls and operating conditions. This should include, as necessary:

- materials of construction;
- vessel design pressure;

- agitator configuration and speed;
- reactant feed controls;
- safe operating temperatures and pressures;
- heat transfer and cooling rates;
- process instrumentation and interlocks; and
- process venting
- safe method of reaction quenching

281 Both normal operation and the effects of foreseeable process faults should be considered during the chemical reaction hazard assessment. Further information on the assessment and control of chemical reaction processes is given in *Designing and operating safe chemical reaction processes*[66].

ACOP 6 Schedule 1

Deliberate combustion of dangerous substances

282 **Where plant is designed for the deliberate combustion of dangerous substances, it is necessary to prevent or reduce the risk of an explosion by implementation of appropriate control and mitigation measures. As a minimum, controls are needed to ensure:**

(a) **safe fuel levels before the application of an ignition source;**

(b) **adequate supply of air for safe combustion of fuel and/or cooling of plant;**

(c) **controlled fuel flow to the combustion process ensuring unburnt fuel does not accumulate;**

(d) **unintentional interruption of the process is corrected;**

(e) **plant shutdown does not result in the formation of an explosive atmosphere;**

(f) **plant used for disposal by combustion is suitable for purpose and is operated by adequately trained staff.**

Safe systems of work

283 **Maintenance, repair, modification, extension, restructure, demolition or cleaning activities should be carried out in accordance with the appropriate safe system of work, identified in the risk assessment. Before these activities take place, where it is not reasonably practicable to eliminate stocks, spillages or contamination with dangerous substances, employers should:**

(a) **minimise the presence of and avoid the release of dangerous substances;**

(b) **prevent an explosive atmosphere forming by inerting or adequate ventilation;**

(c) **prevent ignition sources from being introduced into the work area; and**

(d) **provide appropriate emergency arrangements and equipment.**

Guidance 6
Schedule 1

Dangerous substances used as cleaning agents

284 The use of dangerous substances for cleaning purposes should be avoided wherever possible. Where this is necessary the employer should ensure that the substance with the least hazardous properties is selected.

285 For manual cleaning operations use of a dangerous substance should be minimised by applying it to an article or surface in small sections at a time. There must be adequate ventilation of the work area and elimination of ignition sources. Properly designed safety containers should be used to handle and dispense dangerous substances.

286 Where dangerous substances are introduced into plant or equipment for cleaning employers should ensure that any additional hazards, including their compatibility with other dangerous substances present, are identified and appropriate control measures are implemented.

287 Cleaning plant and equipment is a hazardous activity and the employer will also, where necessary, need to create systems to:

(a) isolate plant and equipment from sources of dangerous substances;

(b) control ignition sources in any additional hazardous zones created by the work;

(c) establish acceptable concentrations of dangerous substances for particular work activities;

(d) monitor the concentration of dangerous substances within the plant and in the surrounding area;

(e) maintain concentrations of dangerous substances below predetermined safe limits by ventilation or inerting techniques;

(f) establish action limits and procedures should the predetermined limits be exceeded during cleaning work; and

(g) ensure that the plant or equipment is inspected by a competent person and is declared clean and safe for the intended work.

288 Where entry into tanks or plant is required the employer will also need to take into account the requirements of the Confined Spaces Regulations 1997[9].

289 Industry guidance on tank cleaning is published by the Energy Institute[67]. Inerting means rendering the dangerous substance inactive, which usually means removing air from the tank.

Systems of work

290 Employers should ensure that there is a system of work that ensures that the control measures for a particular activity are properly understood and implemented and that an appropriate level of control is in place. The level of control will depend on the risks associated with the activity and may be based on simple operating procedures, safety method statements or a permit-to-work system.

Operating procedures (low risk activities)

291 For low risk activities adequate control measures should be implemented through adequate supervision or a system of work that may include the use of written operating procedures.

292 Low risk activities are those activities that do not increase the level of risk associated with the work normally carried out in that area. They do not, for example, introduce ignition sources into the work area or create a risk of releasing dangerous materials. They may include:

(a) routine cleaning operations;

(b) dealing with small leaks and spills during normal manufacturing or handling operations; and

(c) routine machine and equipment adjustments.

Safety method statements (medium risk activities)

293 For medium risk activities the employer should ensure that appropriate control measures are implemented through the use of safety method statements.

294 Medium risk activities include maintenance, repair and servicing activities carried out by employees and contractors within or near to hazardous areas or on plant or equipment containing a dangerous substance. They may involve work that releases small quantities of dangerous substances but they should not have the potential to release a significant quantity. A significant quantity is considered to be one that could create explosive atmospheres beyond the hazardous areas already designated for the installation or one that could affect the health and safety of others on or off the site. Medium risk activities are also those which do not introduce ignition sources into hazardous areas.

295 Such activities may include:

(a) leak testing of tanks and lines; or

(b) hot work in areas where there are only small quantities of dangerous substances present that do not give rise to hazardous places, for example laboratories or motor vehicle workshops (but see paragraph 36(a)).

296 A safety method statement is a written procedure to cover a particular non-routine task. As well as specifying the work to be done it will also identify the hazards associated with the work and the measures necessary to control those hazards. For repetitive tasks a generic safety method statement can be used and, where necessary, modified to take into account job specific requirements or deviations. Safety method statements are inappropriate for high risk activities which should be subject to a permit-to-work system (see paragraphs 298 to 304). However, safety method statements may be incorporated into the permit-to-work system.

297 The safety method statement, whether it is prepared in-house or by outside contractors, should be clear, concise and contain the following information:

(a) a description of the task and where it is to be carried out;

(b) the sequence and method of work;

(c) the hazards identified during the risk assessment;

(d) the skills required to deal with the hazards;

(e) the precautions necessary to control the hazards;

(f) references to specific safety procedures covering known hazards;

(g) details of any isolations and any related control procedures;

(h) details of tools and equipment to be used;

(i) method of disposal of waste and debris; and

(j) details of the state or condition in which the plant or equipment will be left at the end of the activity.

ACOP 6 Schedule 1

Permit-to-work systems (high-risk activities)

298 **Where the proposed work is identified as a high-risk activity, employers should ensure that strict controls are in place and that the work is only carried out against previously agreed safety procedures. This should include implementing a permit-to-work system issued by a responsible person. They should be sufficiently knowledgeable about permit systems, the materials, processes, plant and equipment associated with the proposed work, to be able to identify all the potential hazards and precautions.**

Guidance 6 Schedule 1

299 High-risk activities are those where the foreseeable consequences of an error or an omission could result in immediate and serious injuries, for example an explosion or a fire that immediately affects people or traps them. They will normally include:

(a) hot work on or in any plant and equipment (including containers and pipes, eg storage tank, drum, cylinder, silo, pipeline, fuel tank etc) remaining *in situ* that contains or may have contained a dangerous substance;

(b) carrying out hot work or introducing ignition sources in areas that are normally designated as hazardous due to the presence of an explosive atmosphere. (This includes places classified as hazardous under regulation 7(1) of DSEAR)

(c) hot work in the vicinity of plant or equipment containing a dangerous substance where a potential outbreak of fire caused by the work might spread to threaten that plant and equipment;

(d) entry into, and work in, a confined space which contains or has contained a dangerous substance or where the work activity introduces a dangerous substance into the confined space; and

(e) opening or breaking into plant and equipment, or

disconnecting a fixed joint that contains or has contained a dangerous substance (excluding routine activities such as charging, discharging and sampling which are themselves covered by other standard operating procedures).

300 Guidance on permit-to-work systems may be found on HSE's website[68] and also in guidance leaflet Guidance on permit-to-work systems HSG 250[68].

301 In the context of DSEAR, a permit-to-work is a documented system that authorises certain people to carry out specific work within a specified time frame. It sets out the precautions required to complete the work safely and should be based on a risk assessment. It will describe what work will be done and how it will be done; the latter can be detailed in an attached safety method statement (see paragraph 294 above).

302 The permit-to-work requires declarations from the person authorising the work and from the person carrying out the work. Where necessary it will also require a declaration from those involved in shift handover procedures or extensions to the work. Finally, where plant is to be put back into service, it will require a declaration from the originator of the permit that the work is complete and that the plant is ready for normal use.

303 The permit-to-work should be clearly laid out and avoid statements which could be misleading and ambiguous. It should be designed to allow for use in unusual circumstances and detail procedures if the work needs to be suspended for any reason.

304 As well as detailing the precautions that need to be taken to prevent a fire or explosion, the permit-to-work should cover the precautions that are required to control health hazards and where necessary the hazards arising from entry into confined spaces; electric shock; high pressure systems; and contact with moving equipment.

ACOP 6 Schedule 1

Hot work

305 **Hot work and maintenance processes that involve the application of heat or generation of sparks should be eliminated wherever reasonably practicable. Where it is not possible to do so, before work commences, employers should:**

(a) **risk assess and implement appropriate safety procedures for all activities;**

(b) **make safe plant and equipment to eliminate residual dangerous substances by isolation and by adequate cleaning and gas-freeing;**

(c) **ensure that where inerting with nitrogen, carbon dioxide or combustion gas is used, risks from inerting gas are considered under COSHH[6]; and**

(i) **a calibrated oxygen detection meter is used to ensure the oxygen level has been reduced to below that planned;**

(ii) **inerting material is maintained at adequate levels for the duration of the work to ensure the atmosphere in the plant or equipment cannot**

support combustion or that any free volume is sufficiently small that any explosion within this will not pose a danger;

(d) **ensure a competent person inspects and monitors the atmosphere inside plant and equipment.**

306 **In exceptional circumstances hot work can be carried out on operationally active or inactive plant or equipment that has previously contained a dangerous substance without cleaning or inerting. Such techniques are only applicable to plant or equipment containing liquids or gases and are not suitable for plant containing dangerous substances which are solids, dusts or explosives or that contain liquid or gaseous oxygen.**

307 **Where it is intended to carry out hot work on plant or equipment that still contains a dangerous substance the employer must ensure that:**

(a) **there is sufficient liquid or gas within the plant to prevent air or oxygen from entering and forming an explosive atmosphere;**

(b) **flames or heat will only be applied to the outside surface of the plant;**

(c) **the plant cannot fail or leak as a result of the hot work activity and allow liquid or gas to escape and ignite;**

(d) **the gas or liquid composition cannot change to become an explosive atmosphere during the hot work;**

(e) **sufficient control can be exercised over the movement of materials into or out of that plant and any associated plant or equipment;**

(f) **substances or residues present in the plant cannot undergo any reaction or decomposition leading to a dangerous increase in pressure or attack on the metal;**

(g) **these techniques are only carried out under a strict permit-to-work system;**

(h) **all personnel involved in planning and carrying out the work and supervising it are competent and trained in appropriate procedures and fire and explosion hazards; and**

(i) **there are no explosive atmospheres around the work area arising from that plant or other work activities.**

Guidance 6 Schedule 1

308 The specified conditions above should prevent a fire or explosion by ensuring that the contents of the plant are kept above their higher explosion limit and that the hot work is only carried out on the outside of the plant.

309 Eliminating dangerous substances before performing maintenance will include removing stocks of dangerous substances, cleaning and making plant safe, sealing drums and containers, isolating pipework or material handling systems and clearing up any spills or deposits of dangerous

substances.

Preparation and procedures for hot work

310 Wherever reasonably practicable, employers should eliminate the need for hot work by the use of other processes that do not involve the application of heat or the generation of heat or sparks.

311 The use of cold-cutting equipment (including low speed drills, saws and chisels) may not be considered to be 'hot work' but they may still create sparks or hot surfaces with the potential to ignite explosive atmospheres. Their use, therefore, should be assessed and controlled as for any other potential ignition source.

312 Where it is not reasonably practicable to avoid hot work on plant or equipment that has contained a dangerous substance, regulation 6(3) requires the employer to apply appropriate measures, so far as is reasonably practicable, to control the fire and explosion risks.

Cleaning and gas-freeing plant for hot work

313 Before starting work plant and equipment which has contained a dangerous substance should be isolated, cleaned and in the case of volatile liquid and solid dangerous substances, gas-freed and ventilated to remove dangerous substances. These are hazardous operations requiring their own assessments and appropriate safety procedures.

314 Thorough removal of all residues must be ensured. However this may not be reasonably practicable for very large tanks, for example on ships, nor may complete inerting of the enclosed spaces prior to work. In these cases, the areas surrounding the proposed repair site should be cleaned back to an extent assessed as adequate by a competent person. All involved will need to be experienced and trained in this type of work. The competent person will need to ensure that:

(a) surfaces have been cleaned of all residues of dangerous substances

(b) there are no significant amounts trapped or held in any voids, crevices or absorbent components of the plant

(c) by monitoring the atmosphere within the plant or equipment that it is free from all flammable gases and vapours

(d) the concentration of any dangerous substance is less than 1 % of its LEL

(e) flammable gases or vapours do not reocurr during the hot work activity. The need for further continuous or periodic monitoring of the atmosphere throughout the work activity should be considered.

315 Where it is not reasonably practicable to eliminate dangerous substances by adequate cleaning techniques, the employer must implement measures to control and if necessary mitigate against the fire and explosion risks arising from the hot work.

Inerting

316 Gas-freeing and inerting should only be performed by those competent to do so, with appropriate measuring equipment, systems for

work and safety equipment.

317 In some cases, cleaned and emptied plant and equipment may still contain residues of dangerous substance which are difficult or impracticable to remove. Interting may be appropriate where there is a risk that these residues could ignite or form an explosive atmosphere during hot work.

318 Inerting is only applicable to flammable, highly flammable or extremely flammable dangerous substances or to substances that can create an explosive atmosphere on heating. It is not applicable to dangerous substances which are oxidisers or chemically unstable and are able to react without the presence of atmospheric oxygen to give rise to hazardous heat or pressure effects.

319 Inerting techniques may use water, nitrogen foam, nitrogen gas, combustion gas or carbon dioxide to reduce the oxygen content in the plant to below the levels that combustion can occur. Inerting may be hazardous if insufficient inert material is added to plant and equipment to achieve and maintain a non-combustible atmosphere or if people are exposed to dangerous quantities of toxic or asphyxiating gases and vapours.

320 Further information can be found in L101 *Safe work in confined spaces*[69]. Additionally, the resultant displaced dangerous substances may accumulate outside the plant and equipment giving rise to unforeseen health and safety hazards. The atmosphere should be checked at various points, using a recently calibrated oxygen detection meter, to ensure that the oxygen content has been reduced to below the planned level. The employer should also assess any risk to health from inerting techniques under COSHH[6].

ACOP 6 Schedule 1

Using gas welding and cutting equipment

321 **Employers must implement measures to control the risk of fires and explosions arising from gaseous welding mixtures and cutting equipment. These measures will include:**

(a) **providing appropriate equipment designed and constructed to recognised standards, which has been inspected and maintained in accordance with the manufacturer's instructions;**

(b) **preventing fires and explosions inside welding/cutting equipment caused by:**

(i) **blowpipe flashback;**

(ii) **acetylene decomposition;**

(iii) **high-pressure oxygen;**

(c) **where appropriate, monitoring or detecting leaks or the possible build up of oxygen or fuel gases in confined spaces;**

(d) **ensuring work takes place away from heat sources and there is adequate ventilation. If the use of gas cylinders in confined spaces cannot be avoided, supply valves should always be securely closed if cylinders are left unattended and special precautions, such as local**

exhaust ventilation, need to be taken;

(e) **routing hoses or pipes through areas where they are not easily damaged or near to heat sources;**

(f) **where moveable gas hoses or pipes are used or routed through confined spaces they should be removed to a well- ventilated area at the end of each operation. Where this is not possible, they should be disconnected from source at a point outside the confined space and their contents safely vented; and**

(g) **appropriate training, instruction and supervision to ensure correct operating procedures are followed.**

Guidance 6 Schedule 1

322 Industry guidance on storage and use of gases can be found from suppliers and from the British Compressed Gas Association (BCGA)[70].

ACOP 6 Schedule 1

End of life

323 **Before any decommissioning or relocation of fixed or bulk storage, advice should be sought from the supplier of the dangerous substance about making plant safe before it is mothballed, dismantled, transferred to a holding area or removed from site. For any decommissioning or relocation work involving fixed bulk storage such as compressed and liquefied flammable gas and underground petrol tanks, documentary evidence that industry guidance and advice was obtained from the supplier on safe systems should be preserved, together with any permits-to-work.**

324 **Where tanks have been made temporarily safe, to be taken off site for cleaning and disposal, they should be maintained in a safe condition before and during transport and subsequent demolition.**

325 **Portable gas cylinders (transportable pressure receptacles) of any kind for which there is no further use should be returned to the supplier who is normally also the owner for refill or disposal. Employers should keep track of cylinders, drums and other transportable containers on site so that they may be safely disposed of.**

Guidance 6 Schedule 1

Redundant plant and equipment

326 The plant and equipment should first be adequately isolated from sources of dangerous substances (eg by permanent disconnection or by use of blanking plates) and drained or cleaned of residual material. Additional cleaning or inerting may be required depending on the risk assessment and the proposed method of disposal. Normally the plant and equipment should be effectively cleaned of all residues and where necessary gas freed before being mothballed, dismantled, transferred to a holding area or removed from site.

327 Where plant or equipment containing residual product is to be removed from site without cleaning or gas freeing, the employer should

ensure that it can be handled and transported safely and that those receiving it are aware of the hazards and are competent to deal with them. The employer should ensure that the risk assessment identifies the hazards and the necessary control measures for the transfer/transport procedures and that, where available, agreed industry standards are followed.

Disposal of static vessels containing compressed and liquefied flammable gases

328 Guidance on removing redundant bulk LPG vessels from sites is contained in the LPG Association Code of Practice No 26 - *Uplifting of static LPG vessels from sites and their carriage to and from site by road*[71]. The minimum practicable amount of LPG that can remain in a vessel of less than five cubic metres when it is removed from site is 50kg.

Disposal of underground petrol storage tanks

329 Suitable solid materials for filling underground storage tanks in situ include sand/cement slurry, foamed concrete and urea amino plastic foam. Before adding the solid material the tank should be emptied of residual product and then made safe by filling with an inert material such as nitrogen foam, nitrogen gas, water, carbon dioxide or locally generated combustion gas. Alternatively the tank can be made safe before filling by suitable cleaning and degassing methods. Guidance produced by the Petrol Enforcement Liaison Group (PELG), *Managing the Risks of Fire and Explosion* (The Red Guide) is available from the Energy Institute website[72]. The Association for Petroleum and Explosives Administration's (APEA), *Guidance for the Design, Construction ,Modification, Maintenance and Decommissioning of Filling Stations* (The Blue Book) is available from the APEA website[73].

Regulation 7 Places where explosive atmospheres may occur

Summary 7

Regulation 7 contains specific requirements to be applied where an explosive atmosphere may occur (in addition to the requirements in regulations 5 and 6).

The regulation requires competent identification of hazardous and non-hazardous zones before new work starts and verification by a competent person.

Regulation 7

(1) Every employer shall classify places at the workplace where an explosive atmosphere may occur into hazardous or non-hazardous places in accordance with paragraph 1 of Schedule 2 and shall classify those places so classified as hazardous into zones in accordance with paragraph 2 of that Schedule; and that Schedule shall have effect subject to the notes at the end of that Schedule.

(2) The employer shall ensure that the requirements specified in Schedule 3 are applied to equipment and protective systems in the places classified as hazardous pursuant to paragraph (1).

(3) Where necessary, places classified as hazardous pursuant to paragraph (1) shall be marked by the employer with signs at their points of entry in accordance with Schedule 4.

(4) Before a workplace containing places classified as hazardous pursuant to paragraph (1) is used for the first time, the employer shall ensure that its overall explosion safety is verified by a person who is competent in the field of explosion protection as a result of his experience or any professional training or both.

(5) The employer shall ensure that appropriate work clothing which does not give rise to electrostatic discharges is provided for use in places classified as hazardous pursuant to paragraph (1).

(6) This regulation is subject to the transitional provisions in regulation 17(1) to (3).

Schedule 2 to Regulation 7(1): Classification of places where explosive atmospheres may occur

(which substantially reproduces the provisions of Annex I of Council Directive 99/92/EC)

1 Places where explosive atmospheres may occur

- *A place in which an explosive atmosphere may occur in such quantities as to require special precautions to protect the health and safety of the workers concerned is deemed to be hazardous within the meaning of these Regulations.*

- *A place in which an explosive atmosphere is not expected to occur in such quantities as to require special precautions is deemed to be non-hazardous within the meaning of these Regulations.*

2 Classification of hazardous places

- *Hazardous places are classified in terms of zones on the basis of the frequency and duration of the occurrence of an explosive atmosphere.*

Zone 0

- *A place in which an explosive atmosphere consisting of a mixture with air of dangerous substances in the form of gas, vapour or mist is present continuously or for long periods or frequently*

Zone 1

- *A place in which an explosive atmosphere consisting of a mixture with air of dangerous substances in the form of gas, vapour or mist is likely to occur in normal operation occasionally*

Zone 2

- *A place in which an explosive atmosphere consisting of a mixture with air of dangerous substances in the form of gas, vapour or mist is not likely to occur in normal operation but, if it does occur, will persist for a short period only*

Zone 20

- *A place in which an explosive atmosphere in the form of a cloud of combustible dust in air is present continuously, or for long periods or frequently*

Zone 21

- *A place in which an explosive atmosphere in the form of a cloud of combustible dust in air is likely to occur in normal operation occasionally*

Zone 22

- *A place in which an explosive atmosphere in the form of a cloud of combustible dust in air is not likely to occur in normal operation but, if it does occur, will persist for a short period only*

Notes:

1. Layers, deposits and heaps of combustible dust must be considered as any other source which can form an explosive atmosphere.

2. "Normal operation" means the situation when installations are used within their design parameters.

Schedule 3 to Regulation 7(2): Criteria for the selection of equipment and protective systems

1. Equipment and protective systems for all places in which explosive atmospheres may occur must be selected on the basis of the requirements set out in the Equipment and Protective Systems

Intended for Use in Potentially Explosive Atmospheres Regulations 1996 unless the risk assessment finds otherwise.

2. In particular, the following categories of equipment must be used in the zones indicated, provided they are suitable for gases, vapours, mists, dusts or mists and dusts, as appropriate:

- *in zone 0 or zone 20, category 1 equipment,*
- *in zone 1 or zone 21, category 1 or 2 equipment,*
- *in zone 2 or zone 22, category 1, 2 or 3 equipment.*

3. For the purposes of this Schedule and regulations 7(2) and 17(1) -

(a) "equipment" means machines, apparatus, fixed or mobile devices, control components and instrumentation thereof and detection or prevention systems which, separately or jointly, are intended for the generation, transfer, storage, measurement, control and conversion of energy and the processing of material, as the case may be, and which are capable of causing an explosion through their own potential sources of ignition;

(b) "protective systems" means devices other than components of equipment which are intended to halt incipient explosions immediately or limit the effective range of an explosion or both, as the case may be, and which systems are separately placed on the market for use as autonomous systems;

(c) "devices" means safety devices, controlling devices and regulating devices intended for use outside potentially explosive atmospheres but required for or contributing to the safe functioning of equipment and protective systems with respect to the risks of explosion;

(d) "component" means any item essential to the safe functioning of equipment and protective systems but with no autonomous function; and

(e) "potentially explosive atmosphere" means an atmosphere which could become explosive due to local and operational conditions.

Schedule 4 to Regulation 7(3): Warning sign for places where explosive atmospheres may occur

(which substantially reproduces the provisions of Annex III of Council Directive 99/92/EC)

- *Distinctive features:*

(a) triangular shape;

(b) black letters on a yellow background with black edging (the yellow part to take up at least 50% of the area of the sign).

Guidance 7 paragraph 1

330 The particular requirements of regulation 7 are in addition to the requirements in regulation 6 and are limited to explosive atmospheres as defined in regulation 2, ie those that may occur in air under normal ambient conditions (for the purposes of standardisation defined as: -20 to 40°C, and 0.8 to 1.1 bar). For atmospheric conditions outside these ranges, regulations 7 and 11 do not apply. However, the rest of the Regulations do apply in such circumstances and the employer is required to assess such atmospheres to ensure that the risks from fire or explosion are either eliminated or reduced so far as is reasonably practicable.

ACOP 7 paragraph 1

Hazardous area classification

331 **Where a hazardous area classification study has been carried out under regulation 7, this should be recorded in the form of a drawing which:**

(a) **identifies the hazardous areas and types of zones;**

(b) **shows the extent of the zones in both plan and elevation (ie illustrates the 3-dimensional nature of the hazardous zone);**

(c) **is supplemented by text giving information about;**

(i) **the dangerous substances that will be present;**

(ii) **the work activities that have been considered;**

(iii) **other assumptions made by the study;**

(d) **is retained as part of the documentation in support of regulation 5;**

(e) **is considered whenever new equipment is to be introduced into a zoned area.**

Guidance 7 paragraph 1

332 Schedule 2 defines a place as hazardous where an explosive atmosphere may occur in such quantities as to require special precautions to protect the health and safety of workers. A place where an explosive atmosphere is not expected to occur in such quantities as to require such special precautions is deemed to be non-hazardous.

333 In deciding when hazardous area classification is not necessary for a small quantity of dangerous substance the actual circumstances of use and any specific industry guidance should be taken into account.

334 A spillage from a small bottle of solvent would release so little flammable material that no special precautions for the selection of equipment are needed and therefore the area would not be classified as hazardous. An assessment would still be required to identify the normal control measures necessary to protect the health and safety of those using the solvent. For example, measures to prevent spillage; measures to reduce exposure to fumes or vapours; controls over naked flames and similar large and continuous ignition sources when the solvent is being used. After such a spillage it would be necessary to control obvious ignition sources (eg smoking) during clean up and disposal of the liquid.

335 The expression 'special precautions' used in Schedule 2 means precautions to control potential ignition sources within a hazardous area, in particular in relation to the construction, installation and use of equipment. The term 'not expected to occur in such quantities' means that employers should consider the likelihood of occurrences of explosive atmospheres as well as the potential quantity of such dangerous substances when considering area classification. So if a release is extremely unlikely to occur and/or if the quantities released are small, it is unlikely to be necessary to classify the area as hazardous.

336 Hazardous area classification should be carried out as an integral part of the risk assessment process. Its purpose is to define the extent, frequency and duration of any occurrence of an explosive atmosphere (the zone). The zone in turn defines the requirements for the selection and installation of equipment and protective systems to prevent sources of ignition.

337 The conclusions of an area classification study usually take the form of drawings identifying the hazardous areas and types of zones. This is normally supplemented by text giving information about the dangerous substances that will be present, the work activities that have been considered, and other assumptions made by the study. Whenever such drawings and documents have been produced, they should be retained as part of the documentation in support of regulation 5. The information in these documents should be considered whenever new equipment is to be introduced into a zoned area.

338 If a maintenance process increases the risk of a release of dangerous substance, then the scope of the hazardous area may need to be enlarged. It is normally unnecessary to produce a new hazardous area classification drawing for the duration of the maintenance work. The risk assessment may find that new temporary controls and procedures are necessary for maintenance activities.

339 If during periods of maintenance, dangerous substances can be adequately and reliably excluded from an area which is normally classified, it is likely to be possible to treat the area as non-hazardous (depending on the risk assessment in the particular circumstances).

340 Trade associations are often the best source of advice on classifying areas into hazardous zones where flammable liquids and gases are present. Typical hazardous area classifications for a number of different circumstances may be found in HSE and industry publications on flammable substances.

341 Additional guidance on hazardous area classification and controlling ignition sources is contained in the following publications:

- Model Code of Safe Practice Part 15: Area Classification Code for Installations Handling Flammable Fluids[74]. 4th edition
- Electrostatics. Code of Practice for the avoidance of hazards due to static electricity[75]
- Safe use and handling of flammable liquids[42]
- The storage of flammable liquids in tanks[42]
- Solvents Industry Association guidance and visual training aids[76]
- Safe handling of combustible dusts. Precautions against explosions[64]

342 An international standard, *Explosive atmospheres. Classification of Areas. Explosive Gas Atmospheres*[77], explains the basic principles of area classification for gases and vapours. Its counterpart for dusts, Explosive atmospheres. Classification of areas. Combustible dust atmospheres[78]. Taken together, these form a suitable basis for assessing the extent and type of zone, and can be used as a guide to complying with regulation 7 and Schedule 2. However, they cannot give the extent and type of zone in any particular case, as site-specific factors should always be taken into account.

343 In addition to HSE guidance documents, industry specific codes containing examples have also been published by various organisations. Applied appropriately, are valuable in encouraging consistent interpretation of the requirements. Such guidance and codes include: Energy Institute - Area classification code for installations handling flammable fluids. Part 15 of the IP model code of safe practice in the petroleum industry, Energy Institute and APEA Guidance for the design, construction, modification and maintenance of petrol filling stations[72,73], UKLPG Code of practice 1: Part 1 2009 edition Bulk LPG storage at fixed installations[40], UKLPG Code of practice 7[39]: Storage of full and empty LPG cylinders and cartridges[39].

344 Some repeated activities such as refuelling cars, or loading and unloading tankers intended for use on the public roads, involve the introduction of potential sources of ignition into an area where a spill is possible, which would meet the description of a hazardous area. In these circumstances, safety can be achieved by isolating power sources (eg turning off engines, etc) while a transfer is taking place, and making suitable checks before and after a transfer, and before moving a vehicle into or out of a hazardous area. The risk assessment made under regulation 5 should consider the controls necessary.

ACOP 7 paragraph 2

Selection of equipment for use in hazardous areas

345 **The employer should only use 'products' (equipment, protective systems, safety devices, components and their combinations) in potentially explosive atmospheres that comply with the specific Essential health and safety requirements (EHSRs) of EPS[17], unless the risk assessment states otherwise (see also paragraph 357). Note: the suitability of a 'product' includes its potential as an ignition source by any mechanism, including: heat, mechanical, chemical and electrical energy). This means that only 'products' which do not present an ignition risk should be used.**

Guidance 7 paragraph 2

346 In addition to the term 'hazardous area', the term 'safe area' is commonly used by suppliers of equipment that is not ATEX protected and which is used in non-hazardous areas.

347 Where the 'product' is supplied from within the EU territory, confirmation of this should be available from the supplier/manufacturer, who in compliance with EPS should provide information and mark the 'product' to confirm the nature of potentially explosive atmosphere it is designed for. An employer may need to obtain expert advice when sourcing equipment to ensure it is suitable for the specific hazard circumstances for example organic dusts or a chemical with particular ignition characteristics. This also applies to mobile equipment.

348 Where the employer manufactures the 'product' for their own use, or

imports it directly from outside the EU territory they are deemed to be the 'responsible person' under EPS[17] and take on the full responsibility for complying with those Regulations when putting the 'product' into service for the first time in the EU territory.

ACOP 7 paragraph 2

349 **The employer should ensure that the 'product' is installed, operated and maintained in accordance with the supplier's instructions. The employer should ensure that any modification or change of a device or component maintains compliance with the EHSRs for the 'product'.**

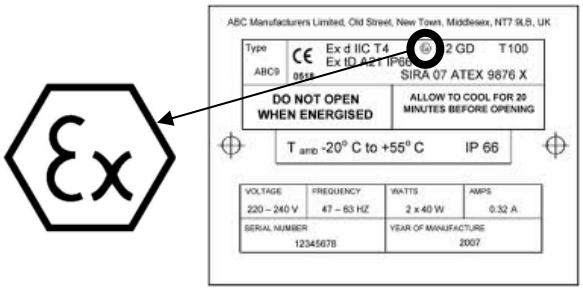
350 **'Products' that were already in use within EU territory before July 2003 are not subject to the requirements of Schedule 3. These can continue in use providing the employer has assessed them and is able to demonstrate that they can assure the risks from fire or explosion are either eliminated or reduced so far as is reasonably practicable. Equipment that is 'second-hand' ie it has already been used in the EU before July 2003 is not subject to the requirements of Schedule 3 but must meet the relevant requirements set out in regulation 6.**

351 **Where an employer intends to use the flexibility provided by the phrase in Schedule 3(1) 'unless the risk assessment finds otherwise', this decision must be adequately justified and recorded by their risk assessment which should confirm that the approach taken provides an equivalent level of safety to DSEAR. The derogation cannot be used to avoid the requirements placed on 'responsible persons' under EPS**[17]Error! Bookmark not defined. **concerning the supply, importation and/or putting into use of 'products'.**

Guidance 7 paragraph 2

352 The effect of regulation 7, Schedule 2 and Schedule 3, taken together, is to require new equipment and protective systems provided for use at work, in places classified as hazardous, to comply with EPS. In most cases this can be achieved following an area classification study by selecting EPS equipment of an appropriate category according to the criteria set out in Schedule 3.

353 A standardised marking scheme is widely used to help identify equipment suitable for a specific location. Equipment built to the requirements of EPS[17] will carry the explosion protection symbol 'εx' in a hexagon, the equipment category number (1, 2, or 3), the letter G and/or D depending on whether it is intended for use in gas or dust atmospheres, and other essential safety information. In many cases this will include a temperature rating expressed as a 'T' marking, and sometimes a gas group. These indicate limitations to safe use. Employers and those installing equipment should consider the marking and documentation provided with 'Ex' equipment when it is being installed.



354 Further guidance may be found in:

(a) Non-electrical equipment for use in potentially explosive atmospheres. Basic method and requirements BS EN 13463-1:2009[79];

(b) Electrical apparatus for explosive gas atmospheres - Electrical installations in hazardous areas BS EN 60079-0[80]; and

(c) Explosive atmospheres. Equipment. General Requirements[81].

355 Flame arresters[50], pressure valves and ROSOVs must be ATEX certified and properly installed and suitably maintained.

356 The controls apply particularly to the selection of fixed equipment that can create an ignition risk; but the same principles may be extended to control the use of mobile equipment; other sources of ignition that may be introduced into the workplace, eg matches and lighters; and the risks from electrostatic discharges. Advice on electrostatic discharges is contained in a technical report: Electrostatics. *Code of Practice for the avoidance of hazards due to static electricity*[62].

357 The derogation referred to in paragraph 351 is intended to allow equipment of a higher or lower category than that normally required for the zone in question to be used where:

(a) equipment is temporarily taken into a zoned area and alternative effective precautions are provided to control the risk. An example might be arrangements to isolate or shut down equipment to prevent the release of a dangerous substance;

(b) workers can be excluded from the hazardous area, and will not be at risk from any ignition of an explosive atmosphere;

(c) equipment of the required category is simply not available, but a lower category can be used in combination with other protective measures to achieve the purposes of these Regulations.

358 In addition, the derogation cannot be used to circumvent the requirements placed on 'responsible persons' under EPS[17], and in particular:

(a) to allow equipment imported from outside the EU, built to other standards, to be used without complying with the EPS Regulations before it is placed on the market or put into service in the European Economic Area (EEA);

(b) to justify equipment built to lower standards than that specified by EPS.

359 The leeway provided by the Schedule 3 derogation does not affect the duties placed on manufacturers, suppliers, importers and other 'responsible persons' under EPS. Users who manufacture equipment for their own use, or who import directly from outside the EEA are considered to be a 'responsible person' under EPS and take on the full responsibility for complying with those Regulations when putting that equipment into service for the first time in the EEA.

360 A European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR) equipment certificate of approval. provided by the Department for Transport (DfT) must be obtained for pumps that use the vehicle's engine to drive tanker offloading activities. Earthing links/clamps do not contain their own potential source of ignition and so according to the ATEX Guidelines[82] at paragraph 3. 7.2 are not subject to ATEX. Nevertheless the potential for ignition must be considered including from misuse.

ACOP 7 paragraph 3

Marking areas containing explosive atmospheres

361 **Employers should either:**

(a) **erect a sign complying with Schedule 4 at the points of entry to alert people to the locations where an explosive atmosphere may occur and the need to take special precautions or,**

(b) **if this is impractical, employers should be able to demonstrate that they have taken equally effective means to alert people to locations where an explosive atmospheres may occur and that special precautions are required for entry.**

Guidance 7 paragraph 3

362 The requirement in regulation 7(3) applies in addition and without prejudice to similar requirements in other legislation, such as the Dangerous Substances (Notification and Marking of Sites) Regulations 1990[83] and the Health and Safety (Safety Signs and Signals) Regulations 1996[84]. If signs have already been provided under those Regulations, and they are sufficient to warn of an explosive atmosphere, then the addition of the sign specified in Schedule 4 may not be necessary. However, if the employer considers the existing signs are not sufficient the sign in Schedule 4 may need to be applied in addition. Marking is not required for individual zones.

363 Signs are useful to identify where:

(a) special workplace or site rules apply eg designated smoking areas, antistatic footwear to be worn, or access restricted to authorised people;

(b) portable or mobile equipment must be of an explosion protected design eg hand torches, vehicles or cleaning machines;

(c) fixed equipment should be of an explosion-protected design.

This can also be useful for the purposes of audit or later plant modifications.

364 If the risk assessment indicates that, after appropriate measures have been taken to eliminate or control risks, there is still a significant risk then signs should be used to reduce the risk further. The sign should:

(a) be visible to the public and outward-facing on the boundary and fire service entry points.

(b) be positioned at the points of entry to the place where the explosive atmosphere may exist within a clearly defined area.

(c) supplement, if necessary, other means used to identify less clearly defined hazardous zones, for example painted lines on the ground around large open-air plant.

365 Where signage is considered necessary, in addition to other risk reduction measures, it may sometimes be more appropriate just to mark points of entry to the workplace as a whole, rather than the numerous individual locations within the site, if all the special precautions apply throughout the entire site.

366 Signs should be of sufficient size to fulfil their warning function, and they should be maintained so that they are clearly visible. The arrangements made by employers under regulation 9 should ensure that employees receive sufficient information, instruction and training on the meaning of the sign and the measures to be taken in connection with it.

ACOP 7 paragraph 4

Verification of places containing explosive atmospheres

367 **Verification of explosion safety should be carried out by someone not directly involved in the design, construction and operation of the workplace. If sufficient verification expertise exists in-house then it may be performed by that person(s) but the appointed person(s) should be impartial. Otherwise external competent verification should be obtained. The procedure should confirm that the plant, equipment, protective systems, safety devices, components and their combinations, and the building/structure housing these are suitable for use with the dangerous substances that are to be used in the workplace and the classification(s) of potentially explosive atmosphere that may exist within this.**

Guidance 7 paragraph 4

368 The employer must ensure that someone who is competent to consider the risks at that workplace and decide on the adequacy of the control and other measures to ensure explosion safety carries out the verification. The verification can be in-house as long as the competent person is independent of the selection, installation and production. On larger installations more than one person may need to be involved.

369 The verifier must have obtained sufficient practical and theoretical knowledge from actual experience and/or professional training relevant to the particular workplace and work activity they intend to verify. For example, someone who is competent to verify the explosion safety of a petrol station may not be competent to verify the adequacy of measures to deal with

combustible dust in a textile factory.

370 The purpose of verifying overall explosion safety is to confirm the workplace can operate in accordance with these Regulations. The workplace should not be brought into use if verification shows that explosion risks are such that it is not safe to do so. Verification should include consideration of the following:

(a) the dangerous substances that will be present at the workplace, including their hazardous properties and quantity;

(b) the suitability of the plant, equipment and protective systems for work in explosive atmospheres;

(c) the work processes, operating procedures and systems of work;

(d) the effectiveness of measures to:

(i) prevent explosive atmospheres forming;

(ii) control risks from explosive atmospheres;

(iii) mitigate the effects of an explosion;

(iv) the effectiveness of emergency arrangements where these are required.

371 Verification can be carried out through a variety of means, for example by an examination of documents, visual inspection, or physical checks and measurements. Much of the work may be a normal part of the commissioning process. Examples of the work involved include:

(a) checks that mechanical ventilation systems produce the air flows intended;

(b) inspection of records showing that process equipment is leak-tight before dangerous substances are introduced for the first time;

(c) ensuring that a hazardous area classification drawing has been prepared, and a visual inspection that electrical equipment is of the correct type or category for the zone where it has been installed and has been installed correctly;

(d) ensuring that appropriate information is available about the dangerous properties of materials to be handled in the plant.

372 Verification may be used to demonstrate that recommendations of the risk assessment required have been put into effect. Where a workplace is subject to legislation on major hazards, such as COMAH[10], the verification may be used as part of the ALARP argument required by those regulations.

373 Although there is no requirement to keep a record of the verification, it is recommended that the verifiers name, and the date on which verification was completed be recorded. If a record is kept it should be in an easily accessible format. Any documentation produced may be useful for the risk assessment, especially where verification indicates that specific conditions need to be maintained to ensure explosion safety. These conditions should be included in the risk assessment record.

374 Regulation 5(3) requires any risk assessment to be kept under review, for example when new processes are started, or new work equipment is brought into use. Part of that review might involve verification of a significant new plant or process, but it is not intended that verification be applied to every change in a work activity or equipment.

ACOP 7 paragraph 5

Provision of antistatic clothing and footwear

375 **Where the risk assessment under regulation 5 of these Regulations indicates that an electrostatic discharge could ignite any potential explosive atmosphere that may exist, the employer should:**

(a) **provide employees working in hazardous places with antistatic work clothing, including footwear;**

(b) **where the risk assessment shows this to be necessary, also provide employees with other antistatic work clothing, including any personal protective equipment provided for other purposes.**

Guidance 7 paragraph 5

376 Some clothing, including footwear, contains materials that can generate electrostatic discharges during use. Such discharges can ignite certain types of explosive atmospheres. Employees should also consider the electrostatic properties of their own clothing which may be worn under the protective clothing provided by their employer. Antistatic or ordinary clothing should not be fastened up or removed in places where an explosive atmosphere may occur and a safe area should be established where workers are able to remove or change clothing, etc in safety.

377 The risk from electrostatic discharges from clothing can be reduced if the wearer is earthed by means of suitable footwear and flooring, such as concrete or steel grids. This is likely to be sufficient for places classified into zone 0, 1 or 2 as specified in Schedule 2. In a small number of cases special footwear may also be necessary for zones 20, 21 and 22. Antistatic footwear and flooring should be tested routinely and replaced if it is found that its antistatic properties have deteriorated.

378 Employers should also have a policy in place to manage employee or visitor possessions having the potential to give rise to electrostatic discharges being brought into a hazardous area, eg car keys and electronic fobs, mobile telephones, cameras and other portable equipment.

379 General advice on electrostatic hazards is contained in BS 5958-1[85], part 1 and part 2[86] includes a range of measures applicable to various industrial situations such as petrochemical installations and flammable powder handling. Further information can also be found in the BSI report CLC/TR 50404:2003 Electrostatics - Code of Practice for the avoidance of hazards due to static electricity[87]. See also guidance on control and avoidance of ignition sources on page 57.

Guidance 7 paragraph 6

380 This regulation is subject to the transitional provisions in regulation 17(1) to (3). This period has now expired, however regulation 17(1) still applies to exempt equipment and protective systems that were in operation

in workplaces before 30 June 2003 as per regulation 7(3), Schedule 3.

Regulation 8 Arrangements to deal with accidents, incidents and emergencies

Summary 8

This regulation requires employers to protect the safety of employees by forward planning to have in place arrangements to deal with accidents, incidents and emergencies, including the evacuation, escape or rescue of people. The arrangements include first aid, safety drills and testing, information on hazards, warning and response systems and means of escape, These are required unless such measures would be disproportionate to the risk.

Regulation 8

(1) Subject to paragraph (4), in order to protect the safety of his employees from an accident, incident or emergency related to the presence of a dangerous substance at the workplace, the employer shall ensure that--

(a) procedures, including the provision of appropriate first-aid facilities and relevant safety drills (which shall be tested at regular intervals), have been prepared which can be put into effect when such an event occurs;

(b) information on emergency arrangements, including--

(i) details of relevant work hazards and hazard identification arrangements, and

(ii) specific hazards likely to arise at the time of an accident, incident or emergency,

is available;

(c) suitable warning and other communication systems are established to enable an appropriate response, including remedial actions and rescue operations, to be made immediately when such an event occurs;

(d) where necessary, before any explosion conditions are reached, visual, or audible, warnings are given and employees withdrawn; and

(e) where the risk assessment indicates it is necessary, escape facilities are provided and maintained to ensure that, in the event of danger, employees can leave endangered places promptly and safely.

(2) Subject to paragraph (4), the employer shall ensure that information on the matters referred to in paragraph (1)(a), (c) to (e) and the information required by paragraph 1(b) is--

(a) made available to relevant accident and emergency services to enable those services, whether internal or external to the workplace, to prepare their own response procedures and precautionary measures; and

(b) displayed at the workplace, unless the results of the risk assessment make this unnecessary.

(3) Subject to paragraph (4), in the event of an accident, incident or emergency related to the presence of a dangerous substance at the workplace, the employer shall ensure that--

(a) immediate steps are taken to--

(i) mitigate the effects of the event,

(ii) restore the situation to normal, and

(iii) inform those of his employees who may be affected; and

(b) only those persons who are essential for the carrying out of repairs and other necessary work are permitted in the affected area and they are provided with--

(i) appropriate personal protective equipment and protective clothing; and

(ii) any necessary specialised safety equipment and plant,

which shall be used until the situation is restored to normal.

(4) Paragraphs (1) to (3) shall not apply where--

(a) the results of the risk assessment show that, because of the quantity of each dangerous substance at the workplace, there is only a slight risk to employees; and

(b) the measures taken by the employer to comply with his duty under regulation 6(1) are sufficient to control that risk.

Guidance 8

381 In respect of the dangers arising from an accident, incident or emergency involving the dangerous substance, compliance with regulation 8 of DSEAR fulfils most of the requirements of regulation 8 of the Management Regulations. However, the Management Regulations contain additional requirements to nominate competent persons to initiate procedures, for example.

382 Other health and safety at work legislation also include requirements on planning for and responding to emergencies. These include COMAH[10], The Offshore Installations (Prevention of Fire and Explosion, and Emergency Response) Regulations 1995[88], and The Radiation (Emergency Preparedness and Public Information) Regulations 2001[89] (REPPIR). The emergency measures under DSEAR deal with safety risks. Employers will need to consider whether such arrangements are also required to address health risks under COSHH[6].

383 The assessment of accidents, incidents and emergencies related to the presence of a dangerous substance and the determination of emergency arrangements to be taken, should be performed at the same time as the requirements of the other regulations above, plus those of any other relevant health, safety and fire legislation. In practice meeting the requirements in this other legislation (with regard to flammable properties, etc) may mean that an employer is largely meeting the requirements in DSEAR.

ACOP 8 paragraph 1

384 **The employer should consider the conclusions of their risk assessment about the likelihood and scale or magnitude of the predicted effects on people of any foreseeable unplanned event involving dangerous substances on their premises. The resulting emergency arrangements put in place should aim to minimise the impact.**

385 **These measures should be taken in addition to the measures already required by regulation 6 to eliminate or reduce risk (by design, and safe operation, instruction and training.**

Guidance 8 paragraph 1

386 Depending on the findings of the risk assessment and measures already taken, employers will need to consider:

(a) what additional first aid facilities may need to be provided taking into account the likely effects of any incident.

(b) what additional safety drills may need to be developed (and tested). The frequency of practising any such drills will depend on a number of factors including;

- the quantity of dangerous substances on site and the level of risk they present;
- the size of the workplace and workforce; and
- the success, or otherwise of previous tests.

387 It is important for employers to consult with employees and their representatives during the risk assessment process. The emergency arrangements will need to be reviewed and, if necessary, revised if circumstances change at the workplace. For example, if there is a significant increase in the use of a dangerous substance or if new work processes lead to the introduction of new substances into the workplace.

ACOP 8 paragraph 1

388 **The warning and other communication systems should be appropriate to the level of risk presented by foreseeable accidents, incidents or emergencies and provide sufficient time and information to allow the necessary emergency actions to be carried out. A warning or communication system should:**

(a) **not require people to remain in the affected area to continue to sound or give the alarm during an emergency;**

(b) **be rapid, easy and reliable to initiate;**

(c) **be appropriate to the level of foreseeable risk from an event;**

(d) **allow enough time and information to take necessary actions;**

(e) **be seen or heard in all areas of the workplace likely to be affected by the incident.**

Guidance 8 paragraph 1

389 Employers should also have procedures in place to keep employees informed of situations as they develop and any actions that may be needed as a consequence.

390 Examples of warning systems include:

(a) a continuous or intermittent ringing bell;

(b) a klaxon or hooter;

(c) warning lights;

(d) an intercom or tannoy system

391 When considering what warning and communication systems will be appropriate, employers should take into account:

(a) the size of their workplace and workforce;

(b) who needs to be alerted and why;

(c) quantities of substances involved and the level and type of risk those substances present; and

(d) the emergency actions to be taken in the event of an incident and the required response times for these.

392 Warning systems are not necessarily restricted to signalling the need for withdrawal or evacuation of people who might be affected by the incident. They can also be to alert employees of an incident or emergency, so that they can take appropriate emergency action to contain or mitigate the incident. Where there are multiple alarm systems in a workplace, employers should ensure that these are clearly discernible and that their employees have the necessary training and equipment to be able to safely carry out the correct actions required.

ACOP 8 paragraph 1

393 **Early detection and warning measures should be in place if there is the potential for a release of dangerous substance of sufficient quantity so as to create a significant explosion hazard. Where appropriate, immediate measures should be in place to detect such a release before it reaches its LEL.**

394 **The employer is responsible for selecting a suitable place or places of safety where people can gather and be accounted for after vacating their workplaces.**

Guidance 8 paragraph 1

395 Employers should already have considered mitigation measures against fire and explosions by the provision of adequate escape facilities in parallel with the requirement contained in general fire safety legislation (see page 10). The installation and type of warning system is dependent on the nature of the operation, for example, an early detection system would be required in an aerosol filling shed, but not in a small storage site.

396 However, the presence of a dangerous substance can accelerate the spread of fire and production of smoke and other toxic fumes. Particular attention should be given in choosing the escape route and place of safety to ensure that it will not be affected by the event should it escalate. Employers

will also need to take account of situations where toxic substances may be released as a result of an incident. When considering escape facilities employers should consider the potential for explosions, rapid fire development and ingress of dangerous substances into escape routes which may compromise escape.

ACOP 8 paragraph 2

397 **The employer should ensure sufficient information on the nature of any foreseeable emergencies involving dangerous substances is made available to the relevant accident and emergency services who are likely to be asked to deal with such incidents. As a minimum, employers should contact the external emergency services, inform them that this information is available and offer to send this information to them. Employers should also make this information available to any on-site emergency services.**

Guidance 8 paragraph 2

398 Achievement of full mitigation of foreseeable accidents, incidents and emergencies will typically be by a combination of workplace emergency arrangements and those provided by the emergency services, overall, to ensure the safety of employees, emergency service personnel and other people. Employers will need to consider if some or all of the external emergency services need to be aware of their emergency arrangements. In the case of offshore installations, the coastguard may also need to be included. The fire service will in any case assume responsibility for tackling any fire upon their arrival, but they may also be able to assist in dealing with other non-fire emergencies such as released or spilled dangerous substances.

399 If requested by the emergency services, employers should be prepared to send the information to them and/or meet with their representatives to discuss the emergency procedures. The information made available will help the emergency services to prepare their own response procedures and should include:

(a) the identity, location and approximate quantities of dangerous substances;

(b) the foreseeable types of accident, incident or emergency that could occur and the hazards that may result;

(c) where on site such events could occur, what effects they could have, other areas that may be affected should the event escalate and the possible repercussion that may cause; and

(d) the emergency arrangements drawn up by the employer to deal with accidents, incidents and emergencies, the procedures prepared by the employer to deal with any such event, the warnings and other communication systems, and escape facilities.

(e) details of the employer's designated contact who will advise the emergency services of the situation on their arrival at an emergency.

400 Information, training and instruction on emergency arrangements should be made available to employees and their representatives. For

example, this may be by the periodic circulation of copies of the arrangements, or providing individual copies. The adequacy of emergency procedures should be regularly tested and any deficiencies found as a consequence addressed. Unless the risk assessment indicates otherwise, employers should display the emergency procedures in a prominent position at key locations in the workplace. Appropriate information on emergency arrangements should also be communicated to non-employees who may be affected.

401 Employers should keep the emergency services updated on significant changes, such as the quantities and nature of dangerous substances present.

ACOP 8 paragraph 3

402 **Employers should implement those measures necessary to achieve control or containment of an accident, incident or emergency in order to allow sufficient time for people to escape or be evacuated to a place of safety. Following an event, employers must assess whether any danger remains and carry out the necessary measures to make the situation safe. If there are any doubts about safety, expert assistance should be sought, eg from accident and emergency services. Implementation of the necessary measures should be achieved without exposing employees or others to unnecessary risk, giving precedence to remote control measures over those requiring entry into the affected area.**

Guidance 8 paragraph 3

403 Employers should adopt a systematic approach for identifying potential accidents, incidents, emergencies or other events and consider how they can be detected when they have occurred, or are occurring. They also need to determine, for the various stages of the accident, incident or emergency, the appropriate type and degree of intervention to both mitigate the consequences of the event and prevent its further escalation. The impact of an accident, incident or emergency can often be greatly reduced if prompt and correct action is taken as soon as the event occurs.

404 Factors to be taken into account by employers when assessing the requirements for emergency arrangements include:

(a) the properties of the dangerous substances present, and their quantities and the way they are used or stored;

(b) the foreseeable types of accidents, incidents, emergencies or other events that may occur, and the level of risk that may be presented (for example, the response required to deal with a major fire in a bulk storage facility will be different from that required for a small spill of a few litres of flammable liquid);

(c) precursors to the end emergency (fire or explosion) involving the dangerous substance (eg unignited leaks, spills and releases of the dangerous substance; or the potential for these, arising for example, from mechanical damage to plant containing dangerous substances);

(d) means of detecting events - for example the selection and effectiveness of the means of detecting a leak, spill or release of a dangerous substance and hence the speed and

nature of the emergency response will depend on such matters as location, size of release and potential escalating events;

(e) the trigger events for alarms and warnings - for example where mechanical exhaust ventilation is provided to ensure a safe atmosphere, it might well be considered reasonable that critical diminution in its flow should cause an alarm or suitable warning to be given, so that emergency actions can be taken to isolate the release of the dangerous substance and take other remedial action as necessary;

(f) the role of the non-employees in emergency arrangements - for example a spill outdoors during a driver controlled tanker unloading operation. In this case it would be reasonable for the driver (who may not be an employee) to detect the spill and initiate appropriate emergency action which might include warning other people in the locality, using spill control equipment and calling the emergency services;

(g) specific procedures that employees and others should follow if an accident, incident or emergency occurs (eg clearing up spills of flammable liquids or, for more serious incidents, moving to a safe area or complete evacuation of the workplace);

(h) the role, responsibilities and authority of employees who may be allocated specific duties (eg persons responsible for shutting down equipment, checking that specific areas have been successfully evacuated, contacting the emergency services, etc);

(i) the provision, where necessary, of suitable safety equipment or personal protective equipment; and

(j) procedures for assisting particular groups of people, such as members of the public or other visitors on site (who may be unfamiliar with the workplace and the risks presented by dangerous substances that are present) or disabled employees.

405 Steps to mitigate the effects of an incident may, where it is safe to do so, include:

(a) evacuating people who may be affected, taking into account possible escalation of the incident, to a place of safety;

(b) isolating plant or equipment from where uncontrolled releases of a dangerous substance are occurring;

(c) removing to a safe place the dangerous substance under threat;

(d) preventing the further spread of a spilt or leaking dangerous substance by the use of barriers, booms or absorbent materials;

(e) limiting the extent of any flammable vapour cloud arising from a release of the dangerous substance by, for example, the use of water sprays and curtains, or applying fire fighting

foam over the surface of the spilt or leaking liquid materials;

(f) increasing natural or mechanical ventilation to dilute hazardous concentrations of dangerous substances arising from an incident;

(g) controlling potential ignition sources in non-hazardous areas that are now affected by an uncontrolled release of dangerous substance;

(h) protecting the vessels or plant containing the dangerous substance against the effects of fire by such means as water deluge systems, water monitors and passive fire protection coatings; and

(i) applying appropriate fire-fighting materials to a fire involving a dangerous substance.

406 Under regulation 8, measures to restore the situation to normal following an event are limited to those measures needed to achieve the normal level of safety for the premises. They do not include measures to rebuild a plant or restore it to normal production or operation but could include:

(a) repair or decommissioning leaking or unsafe plant;

(b) safe recovery and clean up of spilt or leaked dangerous substances;

(c) making safe damaged or unstable buildings;

(d) repair or replacement of any equipment, monitoring devices or alarms necessary for the safety of employers or others present on the premises;

(e) neutralising or disposing of any unstable or dangerous substances resulting from an incident.

407 Measures taken to deal with accidents, incidents and emergencies will need to be adaptable to deal with the specific situation. This is also the case with the remedial action following the accident, incident or emergency. It is therefore imperative for employers to ensure that those of their employees expected to respond in the event of an accident, incident or emergency involving a dangerous substance have the necessary skills, expertise and training to carry out the functions expected of them; and that suitable plant and equipment necessary to carry out these functions is available and properly maintained for immediate use.

408 Equipment to be provided should include appropriate personal protective equipment (PPE) (including appropriate protective clothing and footwear) that is determined to be necessary to enable employees to safely carry out the emergency actions required. However, employees should not be exposed to unnecessary risk in carrying these out. When selecting equipment to be used in emergencies, employers will need to ensure it is appropriate for the circumstances in which it may be used. For example the need to avoid ignition sources when dealing with the releases of flammable vapours, gases, etc.

409 Before carrying out any remedial work the employer should carry out a risk assessment to determine the control measures that need to be put in place to ensure the health and safety of employees. As part of this

assessment the employer should determine the appropriate systems of work, including possible permit-to-work systems that need to be implemented before employees or contractors enter any areas affected by the incident or emergency.

ACOP 8 paragraph 4

410 **Employers are not required to implement additional emergency arrangements if they have determined through the risk assessment carried out under regulation 5(1) that the risk is slight because of:**

- **the quantity of each substance present;**
- **the effectiveness of existing emergency arrangements;**
- **control measures in place that fulfil the requirements of regulation 6 and other fire safety legislation.**

Guidance 8 paragraph 4

411 In respect of fire, the normal emergency procedures, including escape routes and means of giving warning already provided in the workplace may be assessed to be sufficient. Appropriate guidance on fire precautions in such circumstances is available on HSE's webpages[90]. Employers must be satisfied, however, that those control measures will continue to be effective if an accident, incident or emergency occurs. For example, where an accompanying event such as an explosion is possible that might compromise an escape route, regard would need to be given to the alternative measures needed to ensure safe evacuation. For example, this might include a specially strengthened escape route and/or refuge. The route of escape from a non-hazardous area must not be through a hazardous area.

Regulation 9 Information, Instruction And Training

Summary 9

Appropriate information, training and instruction should be given to contractors and employees on the dangerous substances present together with information on the hazards, risks, precautions and actions necessary for them to remain safe.

Regulation 9

(1) Where a dangerous substance is present at the workplace, the employer shall provide his employees with--

(a) suitable and sufficient information, instruction and training on the appropriate precautions and actions to be taken by the employee in order to safeguard himself and other employees at the workplace;

(b) the details of any such substance including--

(i) the name of the substance and the risk which it presents;

(ii) access to any relevant safety data sheet; and

(iii) legislative provisions which concern the hazardous properties of the substance;

and

(c) the significant findings of the risk assessment.

(2) The information, instruction and training required by paragraph (1) shall be--

(a) adapted to take account of significant changes in the type of work carried out or methods of work used by the employer; and

(b) provided in a manner appropriate to the risk assessment.

ACOP 9 paragraphs 1 & 2

412 **The information provided to employees as required under regulation 4(1)(b) and, to the extent that it is required by the nature and degree of the risk, to other people who may be present at a workplace, should include the following:**

(a) **how and where the dangerous substance is used in the specific site activities in addition to the general information in the SDS;**

(b) **the precautions and actions mentioned in regulation 9(1) as part of the information for employees includes the control and mitigation measures adopted, including methods of work, the reasons behind them, and how to use them properly;**

(c) **training and instruction which should include the**

reasoning (theory behind the practice). Training in the use and application of control measures and equipment should be carried out taking into account recommendations and instructions supplied by the manufacturer;

(d) **any procedures for dealing with accidents, emergencies and incidents prepared in accordance with regulation 8. This ranges from smaller unplanned incidents including dealing with faults, clearing blockages to larger emergencies and should prepare staff for how to react if and when foreseeable events happen;**

(e) **any further relevant information resulting from a review of the risk assessment: why it has been done and how any changes will affect the way employees do the work in the future.**

413 **The information, instruction and training provided should be appropriate to the level of understanding and experience of employees. It should be provided in a form which takes account of any language difficulties or disabilities. Information can be provided in whatever form is most suitable in the circumstances, as long as it can be understood by everyone.**

414 **Should change to any work processes occur, then the employer has a duty to ensure extra information, instruction and training is given if necessary.**

Guidance 9 paragraphs 1 & 2

415 The control measures necessary for the safe handling and use of dangerous substances often require or are dependent on employees carrying out the appropriate operating procedures correctly and complying with written or verbal instructions. Employers, therefore, should provide employees with sufficient supervision and training to ensure that the systems of work required by regulation 6 and Schedule 1 are fully implemented and operating procedures are correctly followed.

416 The objective of providing information, instruction and training is to ensure that employees can work with dangerous substances without putting themselves or others at risk. The extent of the information, instruction and training required will be proportionate to the degree of complexity of the hazards, risks, processes and controls.

417 The significant findings of the risk assessment will help to explain to employees what the risks are and how the control/mitigation measures are designed to protect their safety. It will also help employees to understand and use the safeguards that employers introduce.

418 The employer should consider all the various ways of providing information, instruction and training and select those most appropriate to their own circumstances. Options include:

(a) class or group tuition;

(b) individual tuition;

(c) written instructions including leaflets, courses etc;

(d) refresher training, toolbox talks etc.

419 Employers also need to take account of the needs of people other than employees, such as contractors who may be present on site, members of the public, etc. While it may not always be practical to provide formal training in these circumstances, employers should consider what other information or instruction may be needed to reduce risks. For example, pictorial signs for infrequent visitors to the site or those for whom English is not their first language,(which might be the case for delivery drivers and other staff/visitors), notices explaining hazards (eg warning notices, no smoking signs, etc), and copies of emergency and evacuation procedures.

420 For employees with little or no understanding of English, or those who cannot read English, employers may need to make special arrangements. These could include providing translation, using interpreters, or replacing written notes with clearly understood symbols or diagrams.

421 Where employees from one employer work on the premises of another, the employer occupying the premises must provide the other employer with sufficient information about any dangerous substances that may be present at the premises as part of the day-to-day activity. This information should be sufficiently detailed to allow the other employer to provide his own employees with information and any appropriate instruction on complying with the occupying employer's measures.

422 The employer occupying the premises will also need to know about any dangerous substances that are likely to be used or produced by the work the other employer will be doing. This information is important as it allows the occupying employer to:

(a) be satisfied that the measures put in place by the employer doing the work will not only protect their own employees from risks presented by the substances concerned, but also the occupier's own employees;

(b) provide their own employees with information and instruction about any dangerous substances that the other employer will be using or the work will produce;

(c) reassure their employees that any risks to their safety are being properly controlled; and

(d) take steps to ensure that emergency services personnel attending in the event of an incident are made aware of dangerous substances on the premises posing significant risk to their safety.

423 If changes to workplace activities necessitate a revised risk assessment, then it may be necessary for employers to provide updated information, instruction or training to employees (see also paragraph 127).

424 Information, instruction and training in relation to risks from dangerous substances need only be provided to non-employees where it is required to ensure their safety. For example, it would not be required in situations where the number and type of visitors to a workplace, or the short duration of the visit, combined with a negligible risk, make the provision of such information inappropriate (such as customers in a shop). However, where it is provided, it should be in proportion to the level and type of risk.

Regulation 10 Identification of Hazardous Contents of Containers and Pipes

Summary 10

This regulation applies to containers and pipes that contain dangerous substances that are not subject to or are exempt from any marking requirements in the legislation listed in Schedule 5. The employer should note that this list is out of date in the original printed 2002 version and has been updated here.

Regulation 10

Where containers and pipes used at work for dangerous substances are not marked in accordance with relevant requirements of the legislation listed in Schedule 5, the employer shall, subject to any derogations provided for in that legislation, ensure that the contents of those containers and pipes, together with the nature of those contents and any associated hazards, are clearly identifiable.

Schedule 5 to Regulation 10: Legislation concerned with the marking of containers and pipes

The Health and Safety (Safety Signs and Signals) Regulations 1996 (S.I. 1996/341);

The Good Laboratory Practice Regulations 1999 (S.I. 1999/3106); (add note as amended if JD says so)

The Chemicals (Hazard Information and Packaging for Supply) Regulations 2009 (S.I. 2009/716);

The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2007 (S.I. 2007/1573).

ACOP 10

425 **In many cases the marking of the majority of plant and equipment in which dangerous substances are conveyed and stored, including their location is already covered by other legislation. Regulation 10 does not require everything to be marked or labelled, but the employer should decide, through their risk assessment if and how contents of containers and pipes containing dangerous substances should be identified, whether appropriate identification of this is required and if so, the form it should take.**

Guidance 10

426 Identification is not necessary where the substance is a bulk solid product, such as flour, which is not itself a dangerous substance and is only hazardous if released from containment and dispersed in the air.

427 Identification of pipes and containers:

(a) alerts people to the presence of a dangerous substance so

that they can take the necessary precautions;

(b) can also help to avoid confusion over contents and thereby avoid incorrect mixing of contents.

428 A container includes any fixed or portable, open or enclosed, means to contain dangerous substances such as tanks, silos, reaction vessels, and waste receptacles together with any associated pipe runs or piping system.

429 The regulation allows a common sense approach to selection of the means of identification which will depend on the work activity and take into account security implications. Suitable means could include labelling, the use of appropriate colour coding, or instructions and training.

430 In situations where the contents may change regularly eg chemical process vessels and pipes which are not dedicated to one substance, test tubes in laboratories etc, labelling may not be practicable. In these cases employers will need other arrangements to highlight to employees the hazards associated with the substances involved - employers could provide suitable process instruction sheets, record sheets or training for employees to alert people to the risk and need for caution.

Regulation 11 Duty of co-ordination

Summary 11

Regulation 11 addresses the need to co-ordinate explosion protection measures where employers share the same workplace.

Regulation 11

Where two or more employers share the same workplace (whether on a temporary or a permanent basis) where an explosive atmosphere may occur, the employer responsible for the workplace shall co-ordinate the implementation of all the measures required by these Regulations to be taken to protect employees from any risk from the explosive atmosphere.

ACOP 11

431 **The employer responsible for the workplace should record as required by regulation 5(4) the 'aim of co-ordination' in the risk assessment as well as the measures and procedures for implementing it.**

Guidance 11

432 The aim of co-ordination is to safeguard people by:

(a) alerting other employers, employees and others at the workplace to the potential presence of hazardous places;

(b) ensuring that suitable control and mitigation measures are in place;

(c) ensuring employees and others have sufficient training, etc (see regulation 9); and

(d) facilitating emergency arrangements in the event of an incident.

433 In shared premises, it may be the employer responsible for the workplace or one of the other employers who shares the premises whose work activity creates the explosive atmosphere. Effective co-ordination will require the responsible employer for the workplace to obtain sufficient information from all employers at the workplace about the nature of their work activity, whether any dangerous substances are likely to be present, and the likelihood of an explosive atmosphere occurring. All employers at the workplace should provide the responsible employer with the information required and assist in assessing the shared risks and implementing any necessary safety measures.

434 In multi-occupancy premises, it is not expected that an explosive atmosphere would extend into shared common areas. However the occupier/employer should still take account of an incident involving dangerous substances on the rest of the premises and liaise with the other occupants to ensure adequate emergency procedures are in place (please see Section 3 of HSWA[7]).

Regulation 12 Extension outside Great Britain

Summary 12

Regulations 12-16 deal with the application of the Regulations outside Great Britain, exemptions from the Regulations, and amendments to and removal of other legislation.

Regulation 12

These Regulations shall apply outside Great Britain as sections 1 to 59 and 80 to 82 of the 1974 Act apply by virtue of the Health and Safety at Work etc. Act 1974 (Application outside Great Britain) Order 2013.

Regulation 13 Exemption certificates

Regulation 13

(1) Subject to paragraph (2), the Health and Safety Executive may, by a certificate in writing, exempt any person or class of persons or any dangerous substance or class of dangerous substances from all or any of the requirements or prohibitions imposed by or under 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 certificate in writing.

(2) The Health and Safety Executive 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 it proposes to attach to the exemption; and

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

it 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 exemption will be compatible with the requirements of the Directives.

(3) For the purposes of paragraph (2), "the Directives" means Council Directive 98/24/EC on the protection of the health and safety of workers from the risks related to chemical agents at work and Council Directive 99/92/EC on minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres.

Regulation 14 Exemptions for Ministry of Defence etc

Regulation 14

(1) In this regulation--

(a) "Her Majesty's Forces" means any of the naval, military or air forces of the Crown, whether raised inside or outside the United Kingdom and whether any such force is a regular, auxiliary or reserve force, and includes any civilian employed by those forces;

(b) "visiting force" has the same meaning as it does for the purposes of any provision of Part 1 of the Visiting Forces Act 1952; and

(c) "headquarters" means a headquarters for the time being specified in Schedule 2 to the Visiting Forces and International Headquarters (Application of Law) Order 1999.

(2) The Secretary of State for Defence may, in the interests of national security, by a certificate in writing, exempt--

(a) any of Her Majesty's Forces,

(b) any visiting force,

(c) any member of a visiting force working in or attached to a headquarters, or

(d) any person engaged in work involving dangerous substances, if that person is under the direct supervision of a representative of the Secretary of State for Defence,

from all or any of the requirements or prohibitions imposed by 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 certificate in writing, except that, where any such exemption is granted, suitable arrangements shall be made for the assessment of the risk to safety created by the work involving dangerous substances and for adequately controlling the risk to persons to whom the exemption relates.

Regulation 15 Amendments

Regulation 15

(1) The Acts and instruments referred to in Part 1 of Schedule 6 shall be amended in accordance with that Part.

(2) The instruments referred to in Part 2 of Schedule 6 shall be amended in accordance with that Part.

Schedule 6 to Regulation 15: Amendments

Part 1

1

In section 2 of the Celluloid and Cinematograph Film Act 1922 (purposes to which Act applies), after para-graph (iii) of the proviso insert

"and

(iv) the provisions of this Act shall not apply to a workplace within the meaning of the Fire Precautions (Workplace) Regulations 1997.".

2

(1) The Petroleum (Consolidation) Act 1928 is amended as follows.

(2) In section 2 (provisions as to licences), omit the proviso to subsection (1) (special provision for harbours).

(3) Omit section 9 (byelaws as to loading, conveyance and landing of petroleum-spirit in and upon canals) and section 17 (powers of officers as to testing petroleum-spirit).

(4) In section 18 (warrants to search for and seize petroleum-spirit), for subsection (4) substitute--

"(4) This section does not apply to--

(a) a workplace within the meaning of the Dangerous Substances and Explosive Atmospheres Regulations 2002 used, or intended for use, for the dispensing of petroleum-spirit, or

(b) carriage to which the Carriage of Dangerous Goods by Road Regulations 1996 apply.".

(5) In section 23 (interpretation)--

(a) after the definition of "Contravention" insert--

""the Directive" means Commission Directive 92/69 EEC adapting to technical progress for the seventeenth time Council Directive 67/548/EEC on the approximation of laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances:

"Dispensing" means manual or electrical pumping of petroleum-spirit from a storage tank into the fuel tank for an internal combustion engine, whether for the purposes of sale or not:"; and

(b) for the definition of "Petroleum-spirit" substitute--

""Petroleum-spirit" means petroleum which, when tested in accordance with Part A.9. of the Annex to the Directive, has a flash point (as defined in that Part) of less than 21°C:".

(6) Re-number section 25A (places to which Act does not apply) as subsection (1) and insert at the end

"or

(c) any workplace within the meaning of the Dangerous Substances and Explosive Atmospheres Regulations 2002, apart from a workplace used, or intended for use, for dispensing petroleum-spirit.

(2) For the purposes of subsection (1)(c), any part of a workplace where petroleum-spirit is kept other than for dispensing is not to be regarded as used, or intended for use, for dispensing petroleum-spirit.".

3

(1) The Petroleum-Spirit (Motor Vehicles etc) Regulations 1929 are amended as follows.

(2) For regulation 2 (keeping of petroleum-spirit), substitute--

"2

(1) Subject to paragraph (2), the petroleum-spirit shall not be kept otherwise than in metal vessels so constructed and maintained in such a condition as--

(a) to be reasonably secure against breakage; and

(b) to prevent the leakage of any liquid or vapour therefrom.

(2) Where the vessel in which the petroleum-spirit is to be kept is a fuel tank for an internal combustion engine, the requirement in paragraph (1) that the vessel be made of metal shall not apply.".

(3) In regulation 7, insert at the beginning of paragraph (1) "Subject to paragraph (3) below," and after paragraph (2) insert--

"(3) The disapplication from the requirements of paragraph (1) above in respect of a fuel tank for an internal combustion engine shall only apply to a fuel tank which remains connected to the fuel system of the internal combustion engine it is serving in the way it would ordinarily be so connected when that engine is running.".

(4) In regulation 15A (disapplication), omit "and" at the end of paragraph (a) and insert after paragraph (b)--

"or

(c) any workplace within the meaning of the Dangerous Substances and Explosive Atmospheres Regulations 2002.".

4

The Petroleum (Liquid Methane) Order 1957 is amended by the insertion at the end of the Schedule (pro-visions of the Petroleum (Consolidation) Act 1928 not applied to liquid methane), of "Section 25A(1)(c) and (2)".

5

(1) The Petroleum (Consolidation) Act 1928 (Enforcement) Regulations 1979 are amended as follows.

(2) In regulation 1(2) (citation, commencement and interpretation), after the definition of "the 1974 Act" insert--

""the Directive" means Commission Directive 92/69 EEC adapting to technical progress for the seventeenth time Council Directive 67/548/EEC on the approximation of laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances;

"dispensing" means manual or electrical pumping of petroleum-spirit from a storage tank into the fuel tank for an internal combustion engine, whether for the purposes of sale or not, and "dispenser" shall be construed accordingly;

"Her Majesty's Forces" means any of the naval, military or air forces of the Crown, whether raised in-side or outside the United Kingdom and whether any such force is a regular, auxiliary or reserve force, and includes any civilian employed by those forces;

"non-retail petroleum filling station" means premises used, or intended for use, for dispensing petroleum-spirit for use in motor vehicles, ships or aircraft, but it does not include any retail petroleum filling station;

"petroleum-spirit" means petroleum which, when tested in accordance with Part A.9. of the Annex to the Directive has a flash point (as defined in that Part) of less than 21°C;

"retail petroleum filling station" means premises used, or intended for use, for dispensing petroleum-spirit to the public for use in motor vehicles, ships or aircraft by ways of sale;

"ship" includes every description of vessel used in navigation propelled by means of an internal combustion engine and any reference to "ship" in these Regulations includes a reference to hovercraft; and

"vehicle fuel" means petroleum-spirit or any other substance which provides the power in an internal-combustion engine in a motor vehicle, ship or aircraft.".

(3) In regulation 2(1) (enforcing authorities)--

(a) for "Subject to paragraphs (2) and (3)" substitute "Subject to paragraphs (2) to (4)";

(b) omit subparagraph (a)(i), (iii) and (iv);

(c) insert after subparagraph (c)--

"(d) the Dangerous Substances and Explosive Atmospheres Regulations 2002--

(i) in so far as they apply to any activity relating to fuelling motor vehicles and ships with vehicle fuel, and fuelling aircraft with petroleum-spirit, at a retail petroleum filling station, including any vehicle fuel dispenser, other apparatus or storage tank for storing vehicle fuel used thereat in connection with the fuelling concerned of those respective kinds of fuelling; and

(ii) in so far as they apply to any activity relating to fuelling motor vehicles, ships and aircraft with petroleum-spirit at a non-retail petroleum filling station, including any petroleum-spirit dispenser, other apparatus or storage tank for storing petroleum-spirit used thereat in connection with that fuel-ling."; and

(d) after paragraph (3), insert--

"(4) Nothing in paragraph (1)(d) shall apply to--

(a) Her Majesty's Forces;

(b) any establishment to which the Control of Major Accident Hazards Regulations 1999 apply by virtue of regulation 3 of those Regulations;

(c) *any site in respect of which notification of an activity is required pursuant to regulation 3 of the Notification of Installations Handling Hazardous Substances Regulations 1982; and*

(d) *any activity at a retail or a non-retail petroleum filling station connected with repairing motor vehicles, ships or aircraft or retailing goods other than, in relation to a retail petroleum filling station, vehicle fuel and, in relation to a non-retail petroleum filling station, petroleum-spirit.".*

6

(1) The Petroleum-Spirit (Plastic Containers) Regulations 1982 are amended as follows.

(2) In regulation 8 (disapplication), omit "and" at the end of paragraph (a) and insert at the end of paragraph (b)

"or

(c) *any workplace within the meaning of the Dangerous Substances and Explosive Atmospheres Regulations 2002.".*

7

The Dangerous Substances in Harbour Areas Regulations 1987 are amended by the omission of "the Petroleum (Carbide of Calcium) Order 1929" in regulation 29 (application of Part VIII--storage of dangerous substances).

8

The Fire Precautions (Workplace) Regulations 1997 are amended by the insertion of "and regulations 1 to 6, 8, 9 and 11 of the Dangerous Substances and Explosive Atmospheres Regulations 2002," after "the 1999 Management Regulations" in paragraph (2)(b) of regulation 9 (disapplication).

Part 2

9

(1) The Fire Certificates (Special Premises) Regulations 1976 are amended as follows.

(2) In paragraph 25 of Part III of Schedule 1 (premises for which a fire certificate is required), for the definition of "highly flammable liquid" substitute--

""highly flammable liquid" means any liquid, liquid solution, emulsion or suspension, other than aqueous ammonia, liquefied flammable gas, and liquefied petroleum gas, which--

(a) *when tested in accordance with Part A.9. of the Annex to the Directive has a flash point (as de-fined in that Part) of less than 32°C except that, if the flash point determined by using one of the non-equilibrium methods referred to in that Part falls within the range 30°C to 34°C, that flash point shall be confirmed by the use of like apparatus using the appropriate equilibrium method referred to in that Part; and*

(b) *when tested at 50°C (within an accuracy of -0 +5°C) using the procedure referred to in Appendix B to the "Approved Requirements and test methods for the classification and packaging of dangerous goods for carriage" with a heating time of 60 seconds supports combustion,*

and for these purposes--

(i) *"aqueous ammonia" means ammonia gas dissolved in water;*

(ii) *"the Directive" means Commission Directive 92/69 EEC adapting to technical progress for the seventeenth time Council Directive 67/548/EEC on the*

approximation of laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances; and

(iii) "liquefied flammable gas" means any substance which at a temperature of 20°C and a pres-sure of 760 millimetres of mercury would be a flammable gas, but which is in liquid form as a result of the application of pressure refrigeration or both.".

10

The Carriage of Dangerous Goods by Road Regulations 1996 are amended by the substitution for regulation 20 (unloading of petrol at petroleum filling stations and certain other premises licensed for the keeping of petrol) of--

"Direct filling of fuel tanks with petrol from road tankers

11

(1) Neither the fuel tank for an internal combustion engine nor a portable container shall be filled or replenished with petrol direct from a road tanker conveying petrol in such circumstances that these Regulations apply to that conveyance.

(2) Except in relation to Her Majesty's Forces, the enforcing authority for these Regulations and for sections 2 to 4 and section 7 and 8 of the Health and Safety at Work etc Act 1974 in respect of such filling or replenishing with petrol as is referred to in paragraph (1) at any premises for which a petroleum-spirit licence authorising the keeping of petrol is required under the 1928 Act, shall be the petroleum licensing authority, even if the relevant tanker is on a road at the time of that filling or replenishing.

(3) In this regulation--

(a) "the 1928 Act" means the Petroleum (Consolidation) Act 1928;

(b) "the Directive" means Commission Directive 92/69 EEC adapting to technical progress for the seventeenth time Council Directive 67/548/EEC on the approximation of laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances;

(c) "Her Majesty's Forces" means any of the naval, military or air forces of the Crown, whether raised inside or outside the United Kingdom and whether any such force is a regular, auxiliary or reserve force, and includes any civilian employed by those forces;

(d) "petrol" means petroleum-spirit intended for use as a fuel for an internal combustion engine;

(e) "the petroleum licensing authority" means the local authority empowered to grant petroleum-spirit licences under the 1928 Act for the premises concerned;

(f) "petroleum-spirit" means petroleum which, when tested in accordance with Part A.9. of the Annex to the Directive has a flash point (as defined in that Part) of less than 21°C; and

(g) "petroleum-spirit licence" means a licence authorising the keeping of petroleum-spirit granted by a local authority empowered under the 1928 Act to grant such a licence or by the Secretary of State or by the Health and Safety Executive.".

Guidance 15 Schedule 6

435 This regulation brings Schedule 6 into force. This contains amendments to legislation (mainly concerning petrol). At the time of publication of this ACOP, various pieces of legislation relating to petrol were

under review which may result in changes to that legislation.

Regulation 16 Repeals and revocations

Regulation 16

(1) The Act and instruments referred to in column 1 of Part 1 of Schedule 7 shall be repealed or revoked to the extent specified in the corresponding entry in column 3 of that Part.

(2) The Act and instruments referred to in column 1 of Part 2 of Schedule 7 shall be repealed or revoked to the extent specified in the corresponding entry in column 3 of that Part.

Schedule 7 to Regulation 16: Repeals and revocations

Part 1

Repeal and Revocation

Column 1 Title	***Column 2 Reference***	***Column 3 Extent of repeal or revocation***
The Petroleum (Consolidation) Act 1928	*c 32*	*The proviso to section 2(1)* *Section 9* *Section 17* *In section 25A, the word "and" at the end of paragraph (a)*
The Celluloid, etc Factories, and Workshops Regulations 1921	*SR & O 1921/1825*	*The whole Regulations*
The Manufacture of Cinematograph Film Regulations 1928	*SR & O 1928/82*	*The whole Regulations*
The Petroleum (Carbide of Calcium) Order 1929	*SR & O 1929/992*	*The whole Order*
The Petroleum (Compressed Gases) Order 1930	*SR & O 1930/34*	*The whole Order*
The Cinematograph Film Stripping Regulations 1939	*SR & O 1939/571*	*The whole Regulations*
The Petroleum (Carbide of Calcium) Order 1947	*SR & O 1947/1442*	*The whole Order*

Part 2

Repeal and Revocation

Column 1 *Title*	*Column 2* *Reference*	*Column 3* *Extent of repeal or revocation*
The Factories Act 1961	*c 34*	*Section 31*
The Magnesium (Grinding of Castings and other Articles) Special Regulations 1946	*SR & O 1946/2197*	*The whole Regulations*
The Dry Cleaning Special Regulations 1949	*SI 1949/2224*	*The whole Regulations*
The Factories (Testing of Aircraft Engines and Accessories) Special Regulations 1952	*SI 1952/1689*	*The whole Regulations*
The Shipbuilding and Ship repairing Regulations 1960	*SI 1960/1932*	*Regulations 48 to 52, 54 and 55 to 66*
The Highly Flammable Liquids and Liquefied Petroleum Gases Regulations 1972	*SI 1972/917*	*The whole Regulations*
The Abstract of Special Regulations (Highly Flammable Liquids and Liquefied Petroleum Gases) Order 1974	*SI 1974/1587*	*The whole Order*
The Dry Cleaning (Metrication) Regulations 1983	*SI 1983/977*	*The whole Regulations*
The Factories (Testing of Aircraft Engines and Accessories) (Metrication) Regulations 1983	*SI 1983/979*	*The whole Regulations*
The Dangerous Substances in Harbour Area Regulations 1987	*SI 1987/37*	*Regulation 29(a)*
The Workplace (Health, Safety and Welfare) Regulations 1992	*SI 1992/3004*	*Regulation 6(3)(b)*
The Carriage of Dangerous Goods (Classification, Packaging and Labelling) and Use of Transportable Pressure Receptacles Regulations 1996	*SI 1996/2092*	*Regulation 22(b)*
The Carriage of Dangerous Goods by Road Regulations 1996	*SI 1996/2095*	*Schedule 12*

Regulation 17 Transitional Provisions

Summary 17

Regulation 17 sets out the transitional arrangements for workplaces and work equipment where explosive atmospheres may occur. The period of transition has now elapsed, the text of this regulation has therefore not been reproduced in this publication. Historical information on ensuring compliance in the workplace may be found in Appendix 7.

Appendices

Appendix 1 Notice of Approval

This code has been approved by the Health and Safety Executive, with the consent of the Secretary of State.

Appendix 2 Other relevant legislation

Relationship with other health and safety legislation

The duties in DSEAR apply alongside the HSW Act, other regulations made under the Act, and legislation on fire precautions and within a wider legislative context. Because of their close relationship with DSEAR, an introduction to general fire safety legislation[14] and the EPS[17] regulations is included earlier on in the body of this document (see page 10).

The Management of Health and Safety at Work Regulations 1999[91]

The Management of Health and Safety at Work Regulations (the Management Regulations) also require employers and the self-employed, among other things, to assess the general risks to health and safety arising from their work activity and identify the preventive and protective measures that need to be taken to control the identified risks.

The more specific provisions of DSEAR will only apply where dangerous substances are present or used. For example, an assessment of the risks from dangerous substances and arrangements for emergencies carried out under DSEAR will not need to be repeated for the Management Regulations, and in many cases may be incorporated into the more general 'management' assessment as a sub set. There are legal requirements, in other regulations, to consult employees. Employers are advised to involve employees or their representatives when carrying out risk assessments.

The Control of Substances Hazardous to Health Regulations 2002[6]

Most substances that may be dangerous (to safety) in terms of DSEAR will also present a health risk for which COSHH will apply. Employers will have duties to control the risks from those substances under both sets of regulations but the solutions for both are likely to be common.

Classification, labelling and packaging of dangerous substances

In 2013 the area of classification packaging and labelling was in transition. These developments were driven by the European Regulation (EC) No 1272/2008 on Classification, Labelling and Packaging of Substances and Mixtures (known as the CLP Regulation or CLP)[92] CLP is a direct acting regulation.

By 2015 CLP will replace the existing European system on the classification, labelling and packaging of chemicals - the Dangerous Substances Directive (67/548/EEC) and the Dangerous Preparations Directive (99/45/EC). Both these earlier Directives are implemented in Great Britain by the Chemicals (Hazard Information and Packaging for Supply) Regulations 2009 (CHIP)[93]. For these purposes CHIP will lapse in 2015.There are transitional periods in CLP but by 1 June 2015, chemical suppliers must comply only with the CLP Regulation.

There are implications for DSEAR because regulation 2 refers to the approved classification and labelling guide and CHIP which will both lapse. The CLP Regulation now contains the list of harmonised classifications in Table 3.2 in part 3 of Annex VI of CLP. These harmonised classifications and accompanying labelling requirements are legally binding on all chemical suppliers. As a consequence, the Approved Supply List is discontinued and should no longer be used. Appendix 4 of this document contains more information.

Registration, Evaluation, Authorisation and Restriction of Chemicals. EC no 1907/2006. (REACH)[94]

REACH is a direct acting European regulation. It regulates the placing of substances and articles into the marketplace and affects chemicals supply, packaging and labelling. The legal provisions relating to safety data sheets (SDS) now appear in Article 31 and Annex II of REACH.

The Provision and Use of Work Equipment Regulations 1998[95]

The Provision and Use of Work Equipment Regulations 1998 (PUWER) require employers, and people in control to provide safe work equipment, to use it safely, and to maintain it.

The Personal Protective Equipment Regulations 1992[96]

Under the Personal Protective Equipment Regulations 1992 (PPE) Regulations employers must select, provide and maintain (at no charge) appropriate protective equipment for employees whenever risks are not adequately protected against by other means. Employers should also provide information, training and instruction for employees on its use and maintenance.

The Petroleum (Consolidation) Act 1928 and associated Regulations[97]

DSEAR amended the workplace application of petrol safety legislation. Site operators that store petrol for dispensing into vehicles, ships, boats and planes must be licensed under petrol safety law, which is currently under review (see paragraph 435), but DSEAR also applies to activities at these sites. Where petrol is stored for different (non dispensing) purposes, such as factories etc, a petrol licence is not required, but compliance with DSEAR is necessary.

DSEAR does not apply to activities on sites that are not workplaces; therefore the current legislation concerning the storage of petrol in domestic premises remains in place.

Appendix 3 DSEAR and the self-employed

Changes to health and safety law applying to the self-employed are currently under consideration. Most work with dangerous substances is likely to put others potentially at risk and therefore we expect no practical impact on the steps most self-employed people need to take in relation to DSEAR.

Appendix 4 Revocation of the Chemicals (Hazard Information and Packaging for Supply) Regulations 2009 and the application of the European Classification, Labelling and Packaging of Substances and Mixtures Regulations

From 1 June 2015, European Regulation (EC) No 1272/2008 on Classification, Labelling and Packaging of Substances and Mixtures (known as the CLP Regulation or CLP) will repeal both the Dangerous Substances Directive (67/548/EEC) and the Dangerous Preparations Directive (99/45/EC) and will become the primary legislation in this area. As a consequence the Chemicals (Hazard Information and Packaging for Supply) Regulations 2009, which implement both these directives, will be revoked. One provision of CHIP relating to data retention and dangerous preparations will remain until June 2018, after which CHIP is fully revoked.

The CLP Regulation adopts across the European Union (EU) the United Nations' Globally Harmonised System on chemical classification and labelling (GHS). The CLP Regulation is directly acting on all European Union (EU) Member States. This means that, unlike with directives, no national transposition is necessary and the need for the CHIP Regulations falls away.

The CLP Regulation applies to substances placed on the market from 1 December 2010. It will apply to mixtures (formerly preparations) from 1 June 2015. Chemical suppliers can apply CLP to mixtures placed on the market ahead of the mandatory compliance date if they choose to do so (see below).

After 1 June 2015, chemical suppliers must comply only with the CLP Regulation.

Implications for DSEAR

The migration to the CLP Regulation means that DSEAR employers will need to become familiar with the new classification hazard terminology and accompanying hazard pictograms relevant to explosive atmospheres. The new CLP pictograms and wording will increasingly be seen on SDS and product labels and this will need to be taken into account for employee information, training and instruction.

What does this mean for chemical users?

- Chemical users will see new designs, wording and symbols on product hazard labels. The CLP hazard pictograms are very similar to the CHIP hazard symbols but they have a new shape, design and colour.
- New hazard statements will replace the CHIP risk phrases (R phrases).
- New precautionary statements will replace the CHIP safety phrases (S phrases).
- Guidance on complying with CLP is developed and agreed at EU rather than national level and a detailed suite of guidance is available on the web pages of the European Chemicals Agency (ECHA).
- The legal provisions relating to SDS now appear in Article 31 and Annex II of REACH.

Chemical suppliers must classify, label and package their preparations according to CHIP until 1 June 2015 (Regulations 4 and 6 -11 refer). As an alternative, chemical suppliers can classify, label and package mixtures (preparations) according to the CLP criteria ahead of this date if they choose to do so. In this case, suppliers must, in addition, continue to classify the mixture under regulation 4 of CHIP, although this information should only be included in an SDS (the requirements on labelling and packaging in regulations 6 to 11 of CHIP will no longer apply).

During this transitional period, product hazard labels *must only* show the details of one regime or the other – 'mixed' labels are not permitted. If a mixture is classified according to CHIP, it must only be labelled and packaged according to CHIP. Conversely, if a mixture is classified according to CLP, it must only be labelled and packaged according to CLP.

Withdrawal of the HSE Approved Supply List (ASL)

The ASL was published in Great Britain and reproduced the list of dangerous substances that had been assigned harmonised classifications and accompanying labelling requirements agreed by all EU Member States and which appeared in Annex I to the Dangerous Substances Directive (DSD) (67/548/EEC).

However, the CLP Regulation repealed Annex I in full. As a consequence, the ASL was discontinued and **should no longer be used**. It is out of date and has no legal effect.

It was important, however, that the 40 years of scientific development and technical understanding of the most dangerous chemicals should not be lost. The CLP Regulation immediately re-enacted the list of harmonised classifications which now appears in Part 3 of Annex VI of CLP. The list is represented in two Tables:

- **Table 3.1** provides the classification and labelling information using CLP criteria and terminology.
- **Table 3.2** provides the same information but uses DSD (CHIP) criteria and terminology. (Table 3.2 will be repealed from 1 June 2015 when CLP applies in full and the 'old' list is no longer needed).

Harmonised classifications and the accompanying labelling requirements are legally binding where they are used.

Annex VI of CLP is the official list of harmonised classifications and should be the only source for those seeking this information. The Annex is easily searchable by a number of different fields at this link: http://esis.jrc.ec.europa.eu/index.php?PGM=cla

Regulation 14 of CHIP currently sets out the enforcement arrangements for both CHIP and the CLP Regulation. This will continue to be the case until 1 June 2015. The enforcement arrangements for the CLP Regulation will then appear in a new set of regulations which are being developed at the time of publication. In addition to the enforcement of CLP, these regulations will also include the enforcement arrangements for the biocides regime, 'prior informed consent' (PIC – export of dangerous chemicals) and the appointment of the UK Competent Authorities for CLP, biocides and PIC.

Guidance on the CLP Regulation

Employers subject to DSEAR who need advice need on the CLP Regulation should look to the suite of detailed guidance supporting the Regulation provided by the European Chemicals Agency (ECHA): http://echa.europa.eu/support

Alternatively, employers can contact the UK CLP Helpdesk: ukreachca@hse.gsi.gov.uk

Another source of helpful information is ECHA's Classification and Labelling Inventory which provides information on all substances placed on the EU market and notified to ECHA: http://echa.europa.eu/en/regulations/clp/cl-inventory

Appendix 5 Fire resistance

1. The fire resistance of a physical barrier of fire resisting construction is a measure of its ability to withstand the effects of fire in one or more of the following ways:

- *Integrity*: resistance to fire penetration, ie the prevention of the passage of flame and smoke;
- *Insulation*: resistance to the transfer of excessive heat; and
- *Load-bearing capacity*: resistance to collapse, ie to maintain support of the design load of other parts of the building, plant or structure, where the barrier also provides this.

2. The level of fire resistance is specified as the duration that the barrier is able to withstand the effects of fire in respect of one or more of these properties. This is determined through standard test procedures, where the periods of fire resistance are conventionally reported as: short (or 30 minutes); medium (or 60 minutes); or long (or 120 minutes).

3. The standard test procedures are those described in:

- BS 476 Parts 20-24[98]
- BS EN 1363[99] in conjunction with
- BS EN 1364[100]
- BS EN 1365 Parts 1-4[101]
- BS EN 1366 Parts 1-2[102]
- BS EN 1634 Parts 1-2[103]

Appendix 6 Fire reaction

1. The reaction to fire of a physical barrier of fire-resisting construction is a measure of the contribution the materials used in its construction have on the development and spread of the fire. This contribution is categorised as minimal, low, medium, high, and very high risk. The categories are determined in accordance with standard test procedures, though some materials are deemed to be of minimal risk and do not require to be tested. These are:

- concrete;
- fired clay (ie bricks);
- ceramics;
- steel;
- plaster and masonry containing not more than 1 per cent by weight or volume of organic material; and
- concrete bricks or blocks.

2. The categories of materials that may be used in the construction of a physical barrier of fire-resisting construction is limited to: minimal, low, or medium. The minimum category that may be used depends on the type of barrier, this is discussed in paragraphs 241 to 254 of this document.

3. The test procedures and performance required by either the British Standards or the comparable European Harmonised Standards for the three categories are as follows:

	British Standards	**European Harmonised Standards**
Minimal	The material is certified non- combustible according to the test specified in BS 476-4[104] throughout, or the material does not flame or cause any rise in temperature on either the centre (specimen) or furnace thermocouples according to the test specified in BS 476-11[104]	The material has achieved a classification of A 1 when tested in accordance with BS EN ISO 1182[105] and BS EN ISO 1716[106], or the material has achieved a classification of A2 when tested in accordance with BS EN 13823[107] and BS EN ISO 1182[105] or BS EN ISO 1716[106].
Low	The surface of the material (or) where it is bonded throughout to a substrate, the surface material combined with the substrate) has a surface spread of flame of Class 1 when tested in accordance with BS 476-7[104] and, when tested in accordance with BS 476-6[104] has an index of performance (I) not exceeding 12 and a sub-index (i1) not exceeding 6.	The material has achieved a classification of B or better when tested in accordance with BS EN 13823[107] and BS EN ISO 11925-1[108].
Medium	The material has a surface spread of flame of Class 1 when tested in accordance with BS 476-7[104]	The material has achieved a classification of C or better when tested in accordance with BS EN 13823[47] and BS EN ISO 11925-1[50].

Appendix 7 Workplace and work equipment transitional provisions under regulation 17

Arrangements for workplaces in use on or before 30 June 2003

	When	**Action**
Equipment and protective systems already in use/ available at the workplace	Immediately	Review equipment/protective systems against risk assessment requirements in regulation 5 of DSEAR. Equipment/ protective systems at the workplace can continue to be used provided that the assessment indicates it is safe to do so.
Equipment and protective systems available for first time use after 30 June 2003	After 30 June 2003	Select equipment/protective systems that are new or available for the first time after this date in accordance with regulation 7(2)/Schedule 3 of DSEAR and the essential health and safety requirements of EPS. The place in which the equipment is to be located or used must be classified and zoned in accordance with regulation 7(1) of DSEAR if this has not yet been done during the transitional period for workplaces provided for in regulation 17(2)(a) of DSEAR.
Classification and zoning of hazardous areas	By 30 June 2006	Classify places into hazardous and non- hazardous places and zone hazardous places in accordance with regulation 7(1) of DSEAR. However, places may need to be classified before this date if equipment available for the first time after 30 June 2003 is to be used there.

	When	Action
Modifications etc to workplaces	After 30 June 2003	Ensure that any modification etc made to areas of the workplace that may contain an explosive atmosphere meets the requirements of regulations 7 and 11 of DSEAR from the date of the modification
Marking hazardous places	By 30 June 2006	Provide any signs required by regulation 7(3)/Schedule 4 of DSEAR. If the part of the workplace to be marked is modified, etc after 30 June 2003, but before 30 June 2006, regulation 17(3) of DSEAR requires that signs are provided from the date of the modification.
Provision of work clothing	By 30 June 2006	Provide antistatic work clothing as required by regulation 7(5) of DSEAR. However, if the part of the workplace in which it is to be worn is modified, etc before this date it should be provided from the date of the modification.
Co-ordination of explosion protection measures	By 30 June 2006	Co-ordinate any measures required by regulation 11 of DSEAR and, as required by regulation 5(4) of DSEAR, record the aim of the co-ordination in the risk assessment. However, if part of the workplace is modified etc before 30 June 2006, the co-ordination requirements in respect of that part apply from the date of the modification.

Arrangements for workplaces used for the first time after 30 June 2003

	When	Action
Equipment and protective systems	Immediately	Select equipment or protective systems etc in accordance with regulation 7(2)/ Schedule 3 of DSEAR and Schedule 4 of EPS.
Classification and zoning of hazardous areas.	Immediately	Classify places into hazardous and non- hazardous places and zone hazardous places in accordance with regulation 7(1) of DSEAR.
Modifications etc to workplaces	When modification is made	Ensure that any modifications etc made to areas of the workplace that may contain an explosive atmosphere meet the requirements of regulations 7(1), 7(3), 7(5) and 11 of DSEAR from the date of the modification.
Marking hazardous places	Immediately	Provide any signs required by regulation 7(3)/Schedule 4 of DSEAR
Verification of explosion safety	Before workplace is used for the first time.	Ensure that the overall explosion safety of the workplace is verified by someone who is competent to do so as required by regulation 7(4) of DSEAR.
Provision of work clothing	Immediately	Provide antistatic work clothing as required by regulation 7(5) of DSEAR.
Co-ordination of explosion protection measures	Immediately	Co-ordinate any measures required by regulation 11 of DSEAR

References and further reading

References

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24 European Chemicals Agency http://echa.europa.eu

25 Test methods to assist in the determination of the risk and the precautionary measures required are provided by the following European Standards:

- BS EN 14034-1: Determination of the maximum explosion pressure (pmax);
- BS EN 14034-2: Determination of maximum rate of explosion pressure rise (dP/dt); (Note Parts 1 and 2 are to be merged)
- BS EN 13821: Determination of minimum ignition energy;
- BS EN 14034-3: Determination of lower explosion limit;
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49 *Guidance for the location and design of occupied building on chemical manufacturing sites*, Chemical Industries Association 3rd edition

50 Flame arresters. Performance requirements, test methods and limits for use, BS EN ISO 16852:2010

51 Further guidance on assessing and designing for natural ventilation is provided in:

- BS5925:1991 'Code of practice for ventilation principles and designing for natural ventilation' British Standards Institution London
- CIBSE Applications Manual AM10 'Natural ventilation in non-domestic buildings' (2005)
- CIBSE Guide A 'Environmental design' (2006)

52 Generic advice on the ventilation requirements for the following dangerous substances is available as follows (DN: THIS LIST NEEDS REVISITING AND CROSS REF/ING AS THESE HAVE PROBABLY BEEN CITED ELSEWHERE):

- Flammable Liquids – HSE Guidance Note HSG51 'The storage of flammable liquids in containers'
- Compressed Gas Cylinders - BCGA GN 2 'Guidance for the storage of gas cylinders in the workplace' www.bcga.co.uk
- LPG Cylinders and Cartridges – UKLPG CoP 7 'Storage of Full and Empty LPG Cylinders and Cartridges' http://www.uklpg.org/

53 *Clearing the air. A simple guide to buying and using local exhaust ventilation (LEV)*.INDG 408 http://www.hse.gov.uk/pubns/indg408.pdf

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55 Controlling airborne contaminants at work: A guide to local exhaust ventilation (LEV) HSG258 HSE Books 2008 ISBN 978 0 7176 6415 3 Second Edition 2011

56 Local exhaust ventilation (LEV) workplace dust and fume extraction http://www.hse.gov.uk/lev/index.htm

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- Code of Practice 1: Part 1 Bulk LPG Storage at Fixed Installations
- Code of practice 7: Storage of full and empty LPG cylinders and cartridges
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65 Available technical standards for autonomous protective systems include the following:

- Dust explosion venting systems (BS EN 14797 and BS EN 14491);
- Gas explosion venting systems (BS EN 14994);
- Explosion suppression systems (BS EN 14373);
- Pressure shock resistant equipment (BS EN 14460);
- Dust explosion isolation systems (BS EN 15089);
- Flameless venting systems (BS EN 16009);
- Explosion diverter systems (BS EN 16020);
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66 *Designing and operating safe chemical processes* HSG 143 2000 ISBN: 9780717610518 http://www.hse.gov.uk/pubns/priced/hsg143.pdf

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69 *Safe work in confined spaces. Confined Spaces Regulations 1997* 2009 edition L101 ISBN: 9780717662333 http://www.hse.gov.uk/pubns/priced/l101.pdf

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- BCGA CP 7 - The safe use of oxy-fuel gas equipment (individual portable or mobile cylinder supply)
- BCGA CP 36 - Cryogenic liquid storage at users' premises
- BCGA GN 2 - Guidance for the storage of gas cylinders in the workplace
- BCGA GN 13 - DSEAR Risk Assessment
- BCGA L 2 - The safe handling of gas cylinders at waste facilities

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This book is about XXXXXXX.

It is for XXXXX (eg employers, technical specialists, supervisors, occupational hygienists, consultants etc).

XXXX has changed/been updated since the previous edition.

Health and Safety Executive

Consultation on Dangerous Substances and Explosive Atmospheres Regulations 2002

The full text of this and other Consultative Documents can be viewed and downloaded from the Health and Safety Executive web site on the internet: www.hse.gov.uk/consult/index.htm

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