



HALLIDAY STACK & DEWHIRST
LOSS PREVENTION CONSULTANTS

**CONSIDERATION
OF
HSE APPROVED CODE OF PRACTICE AND GUIDANCE
L138 (SECOND EDITION) 2013
DANGEROUS SUBSTANCES AND EXPLOSIVE
ATMOSPHERES REGULATIONS 2002
FOR
NABIM
BY
HALLIDAY, STACK AND DEWHIRST LIMITED**

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AUTHORS NOTE

This report is in response to the request from NABIM, for consideration to be given to the preparation of a document, based on ACOP138 (2013), relevant to the flour industry activities.

Two difficulties have arisen that require consideration by NABIM.

- (i) The document produced by NABIM in 2003 was based on the texts of European Directive 137 and DSEAR. Interpretive comments/guidance were mainly provided by Burgoyne's. Such advice is now provided to NABIM by Halliday Stack and Dewhirst Ltd (HSD).

ACOP138 (2013) contains a large number of detailed HSE requirements relating to the implementation of DSEAR.

It is stated that:

- (a) the HSE statements have "special legal status".
- (b) to secure compliance HSE may refer to this guidance – many requirements are stated to be "must" or "should". This could be interpreted as mandatory. NABIM members will therefore have to be aware, not only of the DSEAR text, but also the ACOP text. This limits the extent to which the ACOP text can be edited.
- (ii) Many of the ACOP requirements are stated to apply when a "dangerous substance" is involved.

In ACOP 2013 "dangerous substance" is defined as follows:

- (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.*

Substances in (a), (b) and (c) differ greatly in terms of the type and degree of risk they present during industrial operations.

In many of the texts in ACOP 2013, the HSE requirements are stated to be for situations in which a "dangerous substance" is present. No distinction is made between the requirements for substances of type (a), (b) and (c). This can lead to over-prescription of measures necessary in flour handling activities.

In certain texts it has been possible to edit out the requirements that are not applicable to flour products. However, in many cases, this has not been possible and the full text is given in this report.

The problems posed by (i) and (ii) above require consideration by NABIM.



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1. INTRODUCTION

The Dangerous Substances & Explosive Atmospheres Regulations (DSEAR) came into force on 9th December 2002. These implement the requirements of the European Directive 1999/92(EC “Minimum Requirements for Improving the Safety and Health of Workers Potentially at Risk from Explosive Atmospheres”. This Directive also called ATEX 137, as its title indicates, lays down minimum requirements for the safety and health protection of workers potentially at risk from explosive atmospheres associated with gases, vapours and dusts. The UK regulations are, in addition, concerned with hazards associated with substances whose chemical properties can result in risk and in doing so incorporate the requirements of European Chemical Agents Directive 98/24/EC.

Plants processing such materials are required to comply with the regulations.

In March 2003, Burgoyne Consultants Ltd produced, at the request of NABIM, the report “Dangerous Substances and Explosive Atmospheres Regulations – 2002 – Guidance for the Flour Industry” (NABIM-A).

In 2003 HSE published an “Approved Code of Practice and Guidance – Dangerous Substances and Explosive Atmospheres L138” (ACOP 2003). A second edition of this ACOP was published in 2013 (ACOP 2013). At the request of NABIM, consideration has been given to ACOP 2013 and its relevance to the flour industry.

ACOP 2013 does not change the DSEAR/ATEX regulations and it is stated that “No significant new duties are placed on businesses that are in compliance with the replaced ACOP’s”. It can be expected, therefore that the guidance given in NABIM-A remains generally valid.

ACOP 2013 differs from ACOP 2003 in

- (a) it provides guidance on the application of DSEAR to a wider range of industrial activities – not all of which are relevant to the flour industry.
- (b) It contains interpretive guidance and examples of the application of DSEAR – again not all are relevant to the flour industry.

The status of ACOP 2013 is presented in Section 2 of this report. The code is stated “to have special legal status” and that “Health and safety inspectors seek to secure compliance with the law and may refer to this guidance”. This suggests that the text of ACOP 2013 must remain as the definitive version with respect to compliance with DSEAR. This limits the degree to which the text of guidance in ACOP 2013 can sensibly be changed or edited.

In this report the following approach has been adopted:

- (a) Text and/or guidance that have no relevance to the flour industry are not included.
- (b) Text and/or guidance that have relevance to different types of substances (e.g. gases, vapours, dusts) have, wherever possible, been edited to separate out the text relevant to flour products.
- (c) Text and/or guidance that are fully relevant to the flour industry are reproduced with appropriate comments.

The format of this report follows the order in ACOP 2013. Text from ACOP 2013 is identified by its paragraph number, e.g. "Pxxx". Edited texts are identified by "PxxxE".

2. STATUS AND ENFORCEMENT OF ACOP 2013

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.

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.

P19E – 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.

P20 – General fire safety requirements in the workplace in England and Wales are applied through the Regulatory Reform (Fire Safety) Order 2005 (SI 2005/1541). The Scottish equivalents are the Fire (Scotland) Act 2005 (2005 (asp 5)) and the Fire Safety (Scotland) Regulations 2006 (SSI 2006/456). The legislation consolidated and revoked legislation that previously covered general fire safety, including the requirement for fire certification. Current legislation requires the employer to carry out a risk assessment to determine the general fire safety requirements for their workplace and implement those requirements, including maintaining a general fire safety management plan.

P21E – General fire safety legislation is normally enforced by the local fire and rescue authority in Scotland, the Scottish Fire and Rescue Service.

P27 – DSEAR is enforced by HSE or local authority inspectors in accordance with the Health and Safety (Enforcing Authority) Regulations 1998 (SI1998/494) except at commercial premises holding petroleum licences. At these premises the regulations are enforced by petroleum licensing authorities in respect of any activities related to refuelling means of transport such as motor vehicles.

P28 – At most workplaces, fire and rescue authorities will enforce equivalent provisions to DSEAR that relate to general fire safety.

In considering enforcement within a business it is stated:

- (a) “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 INDG370 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 at www.hse.gov.uk/fireandexplosion”.

- (b) P30 – Employers must consult safety representatives appointed by recognised trades unions under the Safety Representatives and Safety Committees Regulations 1977 (SI 1977/500). 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 (SI 1996/1513).

3. DUTIES UNDER THE REGULATIONS

The ATEX 137 Directive, DSEAR, ACOP 2003 and ACOP 2013 are all concerned with the provision of a safe workplace. The documents discuss, in detail, the duties and responsibilities of employers and self-employed.

The text of Regulation 4 on this topic is reproduced below

- (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 related, 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.*

ACOP 2013 includes the following four statements as guidance to employer, self-employed and contractor situations.

P75 – 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, subcontractors 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.

P76 – In addition to their own employees, employers are required under DSEAR (and by section 3 of the HSW Act) 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 anyone who could potentially be at risk including employees working for other employers, visitors to the site, anyone such as members of the public occupying premises or space nearby.

P77 – 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 non-employees to the extent required by the nature and degree of the risk.

P78 – 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 should be agreed between them, but each employer must satisfy themselves that any arrangements adopted are adequate.

P79 – Where an explosive atmosphere may occur, the employer responsible should co-ordinate the implementation of any explosion protection measures. (See regulation 11).

Employer duties and responsibilities are considered in more detail for individual activities in the ACOP 2013 sections concerned with Risk Assessment and Risk Reduction/Elimination. These are considered in the next section of this report.

4. RISK ASSESSMENT

In summary, (a) all employers and the self-employed are required 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. (b) employers should check that measures are in place before beginning any new work activity or processes and re-check arrangements periodically. (c) If five or more people are employed, a written record of the significant findings is required. This can either be a separate record or integrated into the record made of overall assessment under the Management of Health and Safety at Work Regulations 1999 (SI 1999/3242) (the Management Regulations) or the fire safety regulations.

The requirements of Regulation 5 are reproduced below:

- (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 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 then 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, 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.*

4.1 Identification of Safety Risks

P80 – 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, e.g. inexperienced trainees and those under 18;**
- (d) consider others including workers or 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.**

P81 – 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 must do to eliminate or reduce the risks from dangerous substances, so far as reasonably practicable.

P82 – The assessment (including the recording of significant findings) enables employers to demonstrate to themselves and to others who may have an interest, e.g. 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.

P83 – Employers should carry out hazardous area classification (see regulation 7) as an integral part of the risk assessment to identify places where controls over ignition sources are needed and those places where they are not. Schedule 2 of the Regulations (located with regulation 7) sets out definitions of the zones to be used when clarifying hazardous areas.

P84 – 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.

P85 – Many factors influence the risks from a fire involving dangerous substances. In particular, employers should consider:

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

P86 – Further information on how to undertake a suitable and sufficient risk assessment is available on HSE’s risk management web pages at www.hse.gov.uk/risk.

P87 – The risk could, where appropriate, be completed alongside goal-orientated risk assessments, such as the BS EN 61508-1 or BS EHN 61511-2 sector standards used by the process industry, providing that risks from fire, explosion and other events arising from dangerous substances are addressed, including the requirements specified by DSEAR.

P88 – 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 people from a fire at the employer's premises and the practical actions taken to eliminate or reduce the risk.

P89 – 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.

P90 – 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:

- (a) for England and Wales, in *Fire safety in the workplace* <https://www.workplace-fire-safety-your-responsibilities>;
- (b) for Scotland, in *Fire Law – Are you aware of your responsibilities – Fire Safety Risk Assessment* www.scotland.gov.uk/Topics/Justice/public-safety/Fire-Rescure/FireLaw;
- (c) for construction sites, in *Fire safety in construction* HSG168.

P91 – In most workplaces, the local fire and rescue authority enforces the general fire safety legislation which covers general fire safety precautions required in case of fire. In so far as they relate to general fire safety, this includes equivalent provision to regulations 1-6, 8, 9 and 11 of DSEAR. 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.

4.2 Identification of Dangerous Substances

P92 – A suitable and sufficient risk assessment should give consideration to the overall risk presented by dangerous substances as well as assessing each factor individually.

P93 – Employers must identify any dangerous substances that may be present at the workplace and the hazards they present (e.g. 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 (e.g. 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 (e.g. waste, residues, scrap materials etc.);
- (e) naturally occurring in the workplace (e.g. methane may be present in tunnelling and mining operations).

P94 – When considering information on the hazardous properties of dangerous substances, employers should identify any adverse conditions that

should be avoided. These could include excessive heat, sunlight, exposure to air or moisture and contact with other incompatible substances.

P95E – Some substances are obviously hazardous to safety, other substances might be hazardous only under certain conditions. Flour dust can form an explosive atmosphere and present an explosion risk.

P96 – For dusts which are liable to form an explosive atmosphere, information will be needed on particle size and potential concentration in air.

P97 – 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.

4.3 Factors Relevant to Risk Assessment

P103E – When assessing and/or designing activities involving dangerous substances (such as work processes, process and storage plant and then workplace itself) all relevant factors must be taken into account, including:

- (b) quantities and storage methods, e.g. in bulk tanks or 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.**

P104E – The risk assessment should include consideration of whether work processes may give rise to flammable 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.

4.4 Release of Dangerous Substances

P105 – When considering risks from releases of dangerous substances the following should be included:

- (a) unavoidable releases;**
- (b) intentional releases, such as from drying ovens etc; and**
- (c) foreseeable releases, for example leaks from process equipment or storage containers or spills during dispensing.**

P106 – 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. Guidance on safe storage is readily available (including some 'off-the-shelf' industry codes), whereas the wide variation possible in different production processes means that identifying potential failures during a process may need to be considered from first principles.

P107 – 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.

P108 – In taking account of the work activities involving dangerous substances when assessing risk, employers should 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.

4.5 Risks From Non-Routine Activities

P111 – 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 substances.**

P112 – Employers must 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.**

P113 – In addition to 'normal' (i.e. routine) 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 that expose 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.

P114 – Non-routine activities should 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 risk associated with the activity should be assessed before work starts.

P115E – 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:
 - (iii) combustible dusts which may be dispersed to give rise to an explosive atmosphere or cause latent smouldering hazards (e.g. 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 (e.g. 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.
- (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.

4.6 Risk From Cleaning Activity

P116 – 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 the use of dangerous substances so far as reasonably practicable.

P117 – If a dangerous substance needs to be used for cleaning, then the risk of it generating a hazardous area and the present of potential ignition sources needs to be considered.

P118 – 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.

4.7 Impact of Safety Measures on Employees and Others

P119 – 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 an 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 an incident, including the procedures to deal with accidents, incidents and emergencies.**

P120 – When considering what measures are reasonably practical to address hazards arising from the presence of dangerous substances, and when 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 inter-connected 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 explosive atmospheres;****
- (h) provision of safe access to the emergency services for fire fighting 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.**

4.8 Extent and Frequency of Flammable Atmospheres

P121 – 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.

P122E – 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. When considering area classification, employers should consider the likelihood of releases of an explosive atmosphere as well as the quantity of such releases.

P123 – 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;
- (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, e.g. ventilation.

P124 – When special precautions are required, e.g. 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.

P125E – Some potential sources of release may be so small that it is not necessary to specify a zoned area. This will be the case if the consequence of an ignition following a released 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 the pipe has been properly installed and maintained, it is extremely unlikely that the substance will be released – so an explosive atmosphere would not be expected to occur from this source and the area surrounding the pipe would not be considered as hazardous.

4.9 Identification of Ignition Sources

P131 – 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 should 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.

P132 – As a minimum, the following forms of energy should be included when considering potential ignition sources but there may be others:

- (a) heat;**
- (b) electrical;**
- (c) mechanical;**
- (d) chemical.**

P133 – Employers should:

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

P134 – 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.

P135 – 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.

P136 – When identifying potential ignition sources, employers must 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.

P137 – Many sources of ignition are easy to identify. Examples of potential ignition sources include:

- (a) heat energy, e.g.**
 - 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, e.g.
- 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 electric supply;
- (c) mechanical energy, e.g.:
- friction (e.g. overheating);
 - ultrasonic;
 - impact;
 - grinding;
 - compression (including adiabatic compression and shock waves);
- (d) chemical energy (refer to SDS/technical information sheets or data), e.g.:
- self-heating;
 - impact- and heat-sensitive materials (e.g. pyrophoric substances);
 - reactions between dissimilar metals (e.g. thermite reaction sparks);
 - runaway exothermic reaction.

P138 – In considering whether controls on ignition sources are required, employers may take into account other control measures or the likely size of a fire.

4.10 **Scale and Consequences of Fires/Explosions**

P139 – Employers must consider the likely scale of a 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.

P140 – 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.

P141 – 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 to justify the level of precautions to be taken.

P142 – The employer should consider the possible consequences of a potentially explosive atmosphere, or the resultant effects of any explosion, spreading through inter-connected plant or entering a room, building or other enclosure where the plant is located via any openings.

P143 – 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.

4.11 Effect of Safety of Novel Activities/Emerging Technologies

P144 – 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.

P145 – 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.

P146 – If the dangerous substances present are also a risk to the health of employees and others (i.e. they are acutely toxic, carcinogenic etc), employers should also assess health risks as required by COSHH.

4.12 Regular Review of Risk Assessments

P147 – 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 or the employer concludes it is no longer valid and following an accident or dangerous occurrence.

P148 – When reviewing their risk assessment employers should take the opportunity to re-examine their control and 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 means it is no longer valid. Records, where required, of significant findings should also be updated.

P149 – Employers may find it useful to note the next planned review date each time the risk assessment has been reviewed.

P150 – 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 most significant changes, it will be obvious that there are consequences for safety and that a re-assessment 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 re-assessment. 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.

P151 – 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/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.

P152 – Adverse events such as accidents, dangerous occurrences or near misses should be a trigger for reviewing the original risk assessment.

4.13 Recording of Risk Assessments

P153 – 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.

P154 – The recorded risk assessment should follow regulation 5(4) and:

- (a) describe the relevant workplace activity;**
- (b) identify the dangerous substances in the workplace 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 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).**

P155 – Where the DSEAR risk assessment is integrated into an overall assessment, it can be recorded as part of that assessment.

P156 – 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.

P157 – 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.

P158 – 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. 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. A chemical works would be expected to carry out, for example, detailed hazard and operability studies, whereas a small retail outlet selling a few aerosol cans would be expected to record much less information.

P159 – 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, COSHH, and the written health and safety policy statement required by section 2(3) of the HSW Act. 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 for visiting inspectors. You may find it helpful to have a system of document version control in place.

P160 – 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, it may only be necessary for employers 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.

P161 –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 the Provision and Use of Work Equipment Regulations 1998 (SI 1998/2303) (PUWER).

P162 – 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.

P163E – For work equipment, the record should show that equipment is suitable for work with the dangerous substance(s) involved. Paragraphs 164 to 167 detail the information to be recorded for equipment located in or controlling equipment within a potentially explosive atmosphere.

Examples of Assessment Report Formats appropriate to the flour industry are detailed in the NABIM-A report.

4.14 Multi-employer Sites

P168 – 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.

P169 – Regulation 5(4)(c)(iv) requires that the record should explain the purpose of the co-ordination measures required by regulation 11. For example, the aim could be to alert employees or another employer to the presence of hazardous substances or places, or to facilitate emergency arrangements in the event of an accident.

P170 – 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.

P171 – 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.

4.15 New Work Activity

P172 – 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.

P173 – 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.

P174 – 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.

5. CONTROL OF RISKS FROM DANGEROUS SUBSTANCES

Employers are required to eliminate or reduce risk to people's safety by removing or controlling risks, and by providing measures to limit or mitigate the consequences for people should an incident occur.

The regulatory requirements are given in Regulation 6 and Schedule 1. ACOP 2013 provides guidance in how to meet the regulating requirements.

Regulation 6 requires:

- (1) *Every employer shall ensure that risk is either eliminated or reduced so far as is reasonably practicable.*
- (2) *In complying with this 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.*

5.1 Employer Responsibilities

P175 – Where it is necessary to work with dangerous substances, employers are not expected to eliminate all risk but to reduce risks 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 foreseeably arise so far as reasonably practicable.

P176 – 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 risk balanced against all the overall risks, not just its flammability or explosion properties.

P177 – A substance that's 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.

P178 – Having considered whether risk can be eliminated, e.g. 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 then 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.

P179 – 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 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.

5.2 Control of Product Release

P200 – Plant and equipment used to handle, store or produce dangerous substances should be designed to an appropriate domestic national or international standard (where available) 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 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 from 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 compatible materials.**

P201 – Employers must also ensure that new pressure systems comply with the Pressure Equipment Regulations 1999 (SI 1999/2001) and existing pressure systems comply with the requirements of the Pressure Systems Safety Regulations 2000 (SI 2000/128) (PSSR).

P202 – Where any plant or equipment operates at a pressure greater than 0.5 bar above atmospheric pressure there are duties on the supplier and user under 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.

P203 – Detailed guidance and ACOP requirements for PSSR are available in the publication *Safety of pressure systems* L122.

P204 – Dangerous substances that give rise to a significant risk of fire during handling or processing include those classified under CHIP as explosive, oxidising, extremely flammable, highly flammable and flammable.

P205 – 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 publication *Guidance for the location and design of occupied buildings on chemical manufacturing sites*.

P206E – 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 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.

P207 – 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 inter-connected plant equipment processing flammable gases and vapours include flame arresters (see BS EN ISO 16852), fast-acting valves and suppression barriers.

P208 – Where plant contains openings such as inlets and outlets, these have the potential to release dangerous substance and employers must ensure:

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

5.3 Ventilation Requirements

Authors Note: In principle this will be applicable to dusts but, except for P216, it is directed primarily at gases/vapours.

P209 – 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.

P210 – 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, provided and positioned to prevent or minimise releases of potentially unsafe concentrations, into the work area or room;
- (e) adequate mechanical general ventilation 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.

P211 – The following steps should also be taken where appropriate:

- (a) prevent the formation of explosive atmospheres in enclosed spaces forming part of plant, equipment or ductwork;
- (b) dryers, ovens, cabinets, connecting ducts, trunks and their associated ventilation casings should be fire-resisting structures;
- (c) safely disperse vapourising liquid leaks from fixed liquefied gas vessels away from vulnerable populations and locations.

P212 – Locating 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 of any releases of dangerous substances, e.g. buildings, pits and structures providing weather protection. Employers should, as appropriate, ensure these features are:

- (a) sufficient distance away; or
- (b) of suitable design to prevent the accumulation of dangerous substances; and where necessary:
- (c) the ground should be graded to direct vapours away from occupied buildings and vulnerable populations, e.g. to provide safe dispersal of vapourising liquid leaks from fixed liquefied gas vessels.

P213 – 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:

- (a) 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
- (b) prevent the formation of such atmospheres in any other parts of the building.

P214 – 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:

- (a) 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
- (b) 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.

P215 – 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.

P216 – 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.

P217 – Adequate ventilation can sometimes prevent the formation of an explosive atmosphere. The variations associated with work activities mean, however, that typical effectiveness is likely to be limited to a reduction in the likelihood (chances) of a hazardous explosive atmosphere forming and/or reduction in the extent of the hazardous area (zones). There 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 of a sufficiently small volume of explosive atmosphere would have insignificant over-pressure or thermal effects if it is ignited. See regulation 7 and Schedule 2 for classification.

P218 – Where necessary, check that the ventilation is adequate e.g. congestion or obstructions may affect the airflow. 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.

P219 – Adequate ventilation is typically 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.

P220 – 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.

P221 – Further guidance on assessing and designing for natural ventilation is available in BS 5925, *Natural ventilation in non-domestic buildings*, and *Environmental design*.

5.4 Contamination of Workplace by Loss of Containment

P236E – To avoid contaminating other parts of the workplace in the event of a loss of containment, employers should take measures so far as reasonably practicable to:

- (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.**

5.5 Control of Ignition Sources

P238 – 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 must consider under hazardous area classification.

P239 – If an employer decides to create a designated smoking area for employees and visitors, this should not be sited in or near a hazardous zone.

P240 – 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.

P241 – In areas where the ignition of dangerous substances could affect safety, measures must be taken 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;**
- (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 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 the ACOP text between paragraphs 306-352 (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 (see NABIM-A);**

- (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.

P242 – 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.

5.6 Mechanical Exhaust Ventilation (MEV)

P245 – Where mechanical exhaust ventilation (MEV) is provided and after having eliminated or minimised any releases to reduce the hazardous area of any potentially explosive atmosphere, employers should then eliminate or establish controls on ignition sources by considering all relevant factors in relation to the MEV systems. This includes:

- (a) for a potentially explosive atmosphere, selection and installation of equipment and protective systems designed to be safe for the zone of the hazardous area. Such equipment and systems supplied after June 2003 should meet the essential safety requirements detailed in the EPS;
- (b) not siting electric motors of fans within ducts that may contain dangerous substances, where build-up of residues may lead to overheating;
- (c) designing (protecting) and installing only fan impellers, bearings, pulleys etc suitable for such use if they are in a hazardous area/zone, for example inside ductwork;
- (d) providing equipment, inspection testing, cleaning and maintenance schemes to minimise overheating or fault conditions with the potential to lead to ignition of the dangerous substance;
- (e) equipotential bonding MEV, to prevent electrostatic build-up;
- (f) making provision to prevent the accumulation of flammable/combustible waste deposits and enabling safe access for safe cleaning and maintenance.

P246 – Guidance on preventing ignition from non-electrical equipment, e.g. by use of sensors, is contained in BS EN 13463-6.

5.7 Fan Impellers

P252 – 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. Such electric fan motors should be sited outside exhaust ducting in a position where they can be readily inspected, cleaned and maintained to avoid ignition or build-up of residues leading to overheating.

P253 – Fans, Impellers and couplings/casings within the ducting must be properly designed and installed to avoid ignition from static discharge, frictional sparking or rubbing. Where a fan and motor are located in a classified zone of a hazardous place the fan motor design should be ATEX certified as suitable for use in that zone. Where an integral MEV fan assembly is installed in a wall leading directly to outside, it will need to be ATEX-compliant for the zone. A relevant design standard for fans on MEV systems in relation to hazardous explosive atmospheres is BS EN 14986.

5.8 Ignition Sources – Temporary

P254 – 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.

5.9 Guidance on Plant Layout and Equipment Installation

P260 – Regulation 6(5) details the measures that 6(3)(b) requires to 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 the 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 construction 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 compressed flammable gases and liquefied flammable gases such as LPG are stored underground, they are in suitable underground reservoirs and caverns which are not sited beneath any building or similar structure where a dangerous accumulation of gas could occur;
- (l) cupboards, bins, tanks, vessels and containers (where normally 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.

P261 – 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.

P262 – Structures required to serve as a physical barrier of fire-resisting construction where 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 266-280.

P263 – 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* HSG103.

P264E – For most dangerous substances, advice on adequate separation is detailed in HSE or industry codes of practice and guidance.

P265 – 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.

5.10 Fire Resistance of Structures

P266 – The periods of fire resistance should be determined by assessment of the fire hazard, taking account of its anticipated duration and severity.

P267 – 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.

P271 – Storerooms and workrooms required to be of fire-resisting construction (i.e. 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 of 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 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 5). (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;
 - (ii) where they are for any 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.

5.11 Fire Resistance – Ducts, Trunks, Casings

P274 – 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' in respect of their reaction to fire, so far as 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).

P275 – Cabinets, ovens, cupboards, bins, ducts, trunks and casings 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.

P276 – 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 over-pressure when the risk assessment identifies an explosion as a likely event.

P277 – 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 foreseeable occur in the event of an accident.

P278 – 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.

P279 – 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 fire resistance or capacity to resist the spread of flames.

5.12 Protective Systems

P281 – 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 and/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.

P283 – 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 include pressure, flame, projectiles and the operation of the mitigation measure.

P284 – Steps should be taken to prevent any measures provided to counteract propagation through inter-connected plant failing in a manner that might expose people to the harmful effects of the explosion.

P285 – 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; i.e. 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.

P286 – One or more of the relevant essential health and safety requirements for a protective system may be covered by a harmonised standard adopted by the European Committee for Standardisation or the European Committee for Electrotechnical Standardisation.

P287 – Where Protective systems are supplied as an integral part of plant or equipment (e.g. 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 (EC ATEX Guidelines (Third Edition) Section 3.8, the EPS Regulations and BS 5908-2).

P288 – 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.

P289E – 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;
- (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;
- (h) other plant and equipment in which explosive atmospheres may occur and ignition sources cannot be eliminated.

P290 – An explosion in a classified area may affect the safety of people in an unclassified area, e.g. an explosion in an item of equipment may endanger someone standing nearby, even though there is normally no flammable material outside the equipment.

5.13 Movement/Waste Disposal of Product

P291 – An employer should assess, plan and implement arrangements for movement of dangerous substances on any work premises which are under their control.

P292 – 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.

P293 – Under regulation 5(2)(c)(iv), the employer should have already assessed the risks associated with transport, handling and storage of dangerous substances.

P294E – 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.

P295 – 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 websites:

- the Environment Agency in England
www.environmentagency.gov.uk/business/sectors/wastemanagement.aspx
- the Scottish Environment Protection Agency www.sepa.org.uk/waste.aspx
- Natural Resources Wales Cyfoeth Naturiol Cymru
<http://naturalresources.gov.uk>
- Industry guidance is also available.

P296 – 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.

5.14 Review of Control/Mitigation Measures

P297 – 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 reasonably practicable.

P298 – If a residual risk remains after implementing all reasonably practicable precautions in the plant, process control, mitigation and safe systems of work, 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.

P299 – 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, and in terms of people and systems such as management procedures. For example, they should ensure their standard operating procedures are followed.

P300 – Employers should periodically check and review the measures they have in place (as required by regulation 5(3)) to ensure that the equipment is maintained.

6. GENERAL SAFETY MEASURES

General safety measures are prescribed in Schedule 1 of the regulations to supplement the requirements of Regulation 6 discussed in Section 5 of this report.

The requirements of Schedule 1 are reproduced below:

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

The following texts are published in ACOP 2013 as a reaction to the above requirements.

P301E – 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:

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

P302E – 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.

6.1 Maintenance/Repair/Cleaning Activities

P306 – 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.**

P307 – 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.

P308 – 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 so far as reasonably practicable, elimination of ignition sources. Properly designed safety containers should be used to handle and dispense dangerous substances.

P309 – 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.

P310 – 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.

P311 – 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 (SI 1997/1713).

P312 – Industry guidance on tank cleaning is published by the Energy institute in the *Tank cleaning safety code*. Inerting means rendering the dangerous substance inactive, which usually means removing air from the tank.

P313 – 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.

P314 – For low-risk activities adequate control measures should be implemented through supervision or a system of work that may include the use of written operating procedures.

P315 – 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.

P316 – For medium-risk activities the employer should ensure that appropriate control measures are implemented through the use of safety method statements.

P317 – 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.

P318 – Such activities may include:

- (a) leak testing 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, e.g. laboratories or motor vehicle workshops.

P319 – 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 321-327). However, safety method statements may be incorporated into the permit-to-work system.

P320 – 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.

6.2 High Risk Activity/Permit To Work

P321 – 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 to systems and the materials, processes, plant and equipment associated with the proposed work to be able to identify all the potential hazards and precautions.

P322 – High-risk activities are those where the foreseeable consequences of an error or an omission could result in immediate and serious injuries, e.g. 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, e.g. 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);
- (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).

P323 – Guidance on permit-to-work systems may be found on HSE’s website at www.hse.gov.uk/safemaintenance/permits.htm and in *Guidance on permit-to-work systems* HSG250.

P324 – 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 314).

P325 – 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.

P326 – 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.

P327 – 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.

6.3 Work Involving Heat/Spark Sources

P328 – 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 plant and equipment safe 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; and**
 - (i) 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.**
 - (ii) A calibrated oxygen detection meter is used to ensure the oxygen concentration is adequately low and does not rise above the determined safe level;**
- (d) ensure a competent person inspects and monitors the atmosphere inside plant and equipment.**

P329E – 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 not suitable for plant containing dangerous substances which are solids or dusts.

P332 – 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.

P333 – 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.

P334 – 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.

P335 – 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 reasonably practicable, to control the fire and explosion risks.

P336 – 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.

P337E – Thorough removal of all residues must be ensured. However, this may not be reasonably practicable for very large tanks. 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;
 - (e) flammable gases or vapours do not reoccur during the hot work activity.
- The need for further continuous or periodic monitoring of the atmosphere throughout the work activity should be considered.

P338 – 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.

6.4 Welding/Cutting Operations

P344 – 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) protecting welding/cutting equipment, pipework and any associated fuel gas or oxygen compressed gas cylinder by the use of a suitable device which will arrest the progression of a flame flashback or acetylene decomposition;
- (c) where appropriate, monitoring or detecting leaks or the possible build-up of oxygen or fuel gases in confined space;
- (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 and not 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.

P345 – Industry guidance on storage and use of gases can be found from suppliers and from the British Compressed Gas Association. Guidance on acetylene and on the fire and explosion risks associated with hot work is available on the HSE website www.hse.gov.uk/fireandexplosion/acetylene.htm, and in UKLPG Code of Practice 7 *Storage of Full and Empty LPG Cylinders and Cartridges*.

6.5 Decommissioning/Relocation of Plant

P346 – Before any decommissioning or relocation of fixed and 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.

P347 – 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.

P348 – Portable gas cylinders (transportable pressure receptacles) of any kind for which there is no further use should be returned to the supplier, which 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.

7. AREA CLASSIFICATION/SELECTION AND CONTROL OF EQUIPMENT

Requirements for identification of hazardous areas (Area Classification) and the selection and control of equipment used in such areas are specified in Regulation 7, Schedule 2.

The specific requirements, in Schedule 7, to be applied where an explosive atmosphere may occur are reproduced below:

- (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).*

The requirements for Area Classification in Schedule 2 are reproduced below:

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.

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.

- 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.*

Regulations in Schedule 3 for the selection and control of equipment for use in hazardous areas are reproduced below:

(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 for the safe functioning of equipment and protective systems but with no autonomous function; and
- (e) “potentially explosive atmospheres” means an atmosphere which could become explosive due to local and operational conditions.

7.1 **Area Classification**

Area Classification is discussed in NABIM-A and in particular HSE guidance is given on extent of Zones around specific flour handling operations. This is not included in ACOP 2013 and is therefore reproduced below:

Description	Comments	Suggested Zone
Inside dry blender, conveying system, cyclone, grinding plant	Providing the dust is fine enough	Zone 20
Inside silos, hoppers, other equipment filled intermittently	Filling lasts more than 6 hours/day Filling takes less than 6 hours/day	Zone 20 Zone 21
Dirty side of filters, heavy dust burden on inlet stream.	Dust clouds will be present during each regeneration cycle	Zone 20 if filter regenerates frequently Zone 21 if filter regenerates infrequently
Dirty side of filter with light dust burden, e.g. downstream of a cyclone		Zone 21
Clean side of filter	Allows for the case of displaced/torn filter element	Zone 22
Around places where dust is regularly released	Local exhaust ventilation will normally be needed. Visual inspection of operation needed	Small area of Zone 21 if dense dust clouds visible, should rarely extend more than 1m from the source. Otherwise Zone 22
Conveying plant running at pressures below atmospheric	No leaks likely	No need to classify unless there are other sources of release
Conveying plant running above atmospheric pressure	Small leaks are common, unless maintenance standards are very high	Likely to create dust layers and an area of Zone 22
Work rooms	Visual inspection needed, look at high level	Any regular deposits, Zone 22 whole room

Description	Comments	Suggested Zone
Offices, control rooms and other rooms adjacent to classified rooms, containing no source of dust release	Internal self-closing doors should reduce the spread of dust	Unclassified if permanently clean and door is kept closed. Zone 22 otherwise
Locations close to hot surfaces	e.g. space heater or water boiler	Need to ensure tight controls prevent dust releases

The requirements in ACOP 2013 are given below:

P354 – 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 (i.e. illustrates the three-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.**

P355 – Schedule 2 defines a place as hazardous when 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, but the rest of DSEAR still needs to be considered.

P356 – 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. Guidance is available on HSE's website at www.hse.gov.uk/electricity/atex/classification.htm.

P357 – 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 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 (e.g. smoking) during clean up and disposal of the liquid.

P358 – 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.

P359 – 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 so far as reasonably practicable.

P360 – The hazardous area classification drawing could be in the form of two separate drawings showing a simplified approach to the configuration of the plant. Such drawings should be 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. The drawings and documents 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.

P361 – If a maintenance process increases the risk of a release of a 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.

P362 – 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).

P364E – Additional guidance on hazardous area classification and controlling ignition sources is contained in the following publication:

(f) *Safe handling of combustible dusts. Precautions against explosions HSG103.*

P365E – An international standard, *Explosive atmospheres. Classification of areas. Explosive gas atmospheres*, explains the basis principles of area classification for gases and vapours. Its counterpart for dusts is *Explosive atmospheres. Classification of areas. Combustible dust atmospheres* (BS EN 60079-10-2:2009). Taken together, these form a 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.

7.2 Selection and Control of Equipment

P368 – 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, unless the risk assessment states otherwise.

P370 – Where the product is supplied from 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 the potentially explosive atmosphere it is designed for.

P371 – An employer may need to obtain expert advice when sourcing equipment to ensure it is suitable for the specific hazard circumstances, e.g. organic dusts or a chemical with particular ignition characteristics. This also applies to mobile equipment.

P372 – 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.

P373 – 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 the risks from fire or explosion are either ‘second-hand’, i.e. 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.

P374 – 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 concerning the supply, importation and/or putting into use of products.

P375 – 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.

P376 – A standardised marking scheme is widely used to help identify equipment suitable for a specific location. Equipment built to the requirements of EPSD will carry the explosion protection symbol ‘Ex’ 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 or both, 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.

P380E – Controls apply particularly to the selection of fixed equipment that can create an ignition risk. However, the same principles may be extended to control the use of mobile equipment, other sources of ignition that may be introduced into the workplace (e.g. matches and lighters, car key electronic fobs, mobile phones etc).

P381 – The derogation referred to in paragraph 374 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 the Regulations.

P382 – In addition, the derogation cannot be used to circumvent the requirements placed on ‘responsible persons’ under EPS, 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.

P383 – 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.

7.3 **Signage**

P385 – 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 atmosphere may occur and that special precautions are required for entry.**

P386 – 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 (SI 1990/304) and the Health and Safety (Safety Signs and Signals) Regulations 1996 (SI 1996/341). 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.

P387E – Signs are useful to identify where:

- (a) special workplace or site rules apply, e.g. designated smoking areas or access restricted to authorised people;
- (b) portable or mobile equipment must be of an explosion-protected design, e.g. 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.

P388 – 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, e.g. painted lines on the ground around large open-air plant.

P389 – 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.

P390 – 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.

7.4 Verification of Explosion Safety

P391 – Verification of explosion safety should be carried out by someone with sufficient training and experience in explosion protection. If sufficient verification expertise exists in-house then it may be performed by that person(s) but the appointed person(s) should be impartial and sufficiently independent to carry out the assessment/verification effectively. 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 them, 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.

P392 – The employer must ensure that verification is carried out by 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. The verification can be in-house as long as the competent person is sufficiently independent of the installation and operation of the work area involved. On larger installations more than one person may need to be involved.

P393 – 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.

P394 – 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;
- (e) the effectiveness of emergency arrangements, where these are required.

P395 – Verification can be carried out through a variety of means, e.g. by 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.

P396 – Verification may be used to demonstrate that recommendations of the risk assessment have been put into effect. Where a workplace is subject to legislation on major hazards, such as COMAH, the verification may be used as part of the ALARP argument required by those Regulations.

P397 – Although there is no requirement to keep a record of the verification, it is recommended that the verifier's 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 used 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.

P398 – 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.

8. ACCIDENTS, INCIDENTS, EMERGENCIES

Employers are required 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.

The requirements in Regulation 8 are reproduced below:

(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.

HSE requirements are as follows:

P405 – 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.

P406 – Other health and safety at work legislation also include requirements on planning for and responding to emergencies. These include COMAH, the Offshore Installations (Prevention of Fire and Explosion, and Emergency Response) Regulations 1995 (SI 1995/743), and the Radiation (Emergency Preparedness and Public Information) Regulations 2001 (SI 2001/2975). 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.

P407 – 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.

P408 – 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.

P409 – 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).

P410 – 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:
- (i) the quantity of dangerous substances on site and the level of risk they present;
 - (ii) the size of the workplace and workforce; and
 - (iii) the success or otherwise of previous tests.

P411 – It can be helpful for employers to involve employees and their representatives during the risk assessment process, as they can be a useful source of information. 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.

P412 – Following the risk assessment, there is a legal requirement, under the Safety Representatives and Safety Committees Regulations 1977 and the Health and Safety (Consultation with Employees) Regulations 1996, to consult employees or their representatives on the introduction of any measures which may substantially affect their health and safety.

P413 – 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; and**
- (e) be seen or heard in all areas of the workplace likely to be affected by the incident.**

P414 – 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.

P415 – 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.

P416 – 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.

P417 – 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.

P418 – Early detection and warning measures should be in place if there is the potential for a release of dangerous substance of sufficient quantity to create a significant explosion hazard. Where appropriate, immediate measures should be in place to detect such a release before it reaches its LEL.

P419 – 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.

P420 – Employers should already have considered mitigation measures against fire and explosion by the provision of adequate escape facilities in parallel with the requirement contained in general fire safety legislation. The installation and type of warning system is dependent on the nature of the operation, e.g. an early detection system would be required in an aerosol filling shed but not in a small storage site.

P421 – 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 assess the potential for explosions, rapid fire development and ingress of dangerous substances into escape routes which may compromise escape.

P422 – 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 it to them. Employers should also make this information available to any on-site emergency services.

P423 – Full mitigation of foreseeable accidents, incidents and emergencies will typically be achieved 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.

P424 – 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;
- (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; and
- (e) details of the employer's designated contact who will advise the emergency services of the situation on their arrival at an emergency.

P425 – 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 should be 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.

P426 – Employers should keep the emergency services updated on significant changes, such as the quantities and nature of dangerous substances present.

P427 – Employers should implement those measures necessary to achieve control or containment of an accident, incident or emergency 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, e.g. 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.

P428 – 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.

P429 – Factors to be taken into account by employers when assessing the requirements for emergency arrangements include:

- (a) the properties of the dangerous substances present, 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 (e.g. 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 (e.g. un-ignited 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, e.g. 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, e.g. where mechanical exhaust ventilation is provided to ensure a safe atmosphere, it might well be considered reasonable that critical reduction 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 non-employees in emergency arrangements, e.g. 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 (e.g. 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 (e.g. people responsible 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 from dangerous substances that are present) or disabled employees.

P430 – 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 the dangerous substance under threat to a safe place;
- (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.

P431 – 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) repairing 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.

P432 – Measures to be 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. Employers must therefore 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.

P433 – Equipment to be provided should include any PPE (including appropriate protective clothing and footwear) that is necessary for 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 should 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.

P434 – Before carrying out any remedial work with 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.

P435 – 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:

- (a) the quantity of each substance present;**
- (b) the effectiveness of existing emergency arrangements;**
- (c) control measures in place that fulfil the requirements of regulation 6 and other fire safety legislation.**

P436 – 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. General guidance on fire precautions is available on HSE's website at www.hse.gov.uk/toolbox/fire.htm (also see paragraph 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, alternative measures may need to be considered to ensure safe evacuation. For example, this might include a specially strengthened escape route and/or refuge. The escape route from a non-hazardous area must not be through a hazardous area.

9. INFORMATION, INSTRUCTION AND TRAINING

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.

The requirements of Regulation 9 are reproduced below:

- (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.*

HSE interpretations are as follows:

P437 – 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 include 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.**

P438 – 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.

P439 – Should change to any work processes occur, then the employer has a duty to ensure extra information, instruction and training is given if necessary.

P440 – 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.

P441 – 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.

P442 – 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.

P443 – The employer should consider all 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.

P444 – Employers also need to take account of the needs of people other than employees who may be present on site, such as contractors, 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 (e.g. warning notices, no smoking signs etc), and copies of emergency and evacuation procedures.

P445 – 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.

P446 – 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 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.

P447 – 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.

P448 – 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 147).

P449 – 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.

10. CO-ORDINATION AND OUTSIDE UK.

Regulation 11 is the duty of co-ordination and Regulation 12 the extension beyond the UK.

In relation to co-ordination (Regulation 11) example contexts are:

- Contractors such as for maintenance, facilities expansion, modification or closure
- Services operated by other businesses (CHP plant, effluent plants etc)
- Points of hazardous material transfer (tanker loading / discharge).

456 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.

The intent of Regulation 12 is to ensure employees working abroad, i.e. the people exposed to potential harm, are subject to a thorough risk assessment. Regulation 12 applies DSEAR Regulations 1, 2 and 3 with the requirement to make a Risk Assessment (P80 to P82) as discussed in Section 4.1.