



Assessing the risks



The author

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The Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR) require employers to control the risks to safety from fire and explosions. **Barrie Church** looks into the crucial aspects that both employers and employees should take into consideration.

In previous articles, we have explained the implications of DSEAR and the need for every employer with natural gas /LPG installations in the commercial and industrial sector to have completed a Risk Assessment (RA). This equally applies to employers having employees working with flammable gas (including LPG blowtorches and oxy-acetylene).

NOTE: This piece of law is retrospective and now applies to every non-domestic gas installation.

Regulation 5

Regulation 5 is the foundation of compliance with DSEAR, and the HSE Guidance explains:

"The assessment is carried out to identify safety risks arising out of, or in connection with, work or the conduct of

an employer's undertaking that relate to dangerous substances. It should identify how those risks arise and how they impact on those affected. An assessment must be undertaken before any new work activity involving dangerous substances begins.

The risk assessment should take into account the effects of measures which have been or will be taken to eliminate or control risks. This includes consideration of general fire precautions such as means of detection and giving warning in case of fire.

The requirement to assess the risks from dangerous substances should not be considered in isolation. It should be carried out as part of the overall risk assessment required by Regulation 3 of the MHSW Regulations 1999 rather than as a separate exercise."

This last point is important to note as MHSW Regulations have always required RAs to be produced yet few employers/contractors have ever done so.

In particular, the RA needs to give consideration to:

- The potential for dangerous substances to be released (either intentionally or unintentionally) from plant/equipment, or during handling.
- The potential for explosive atmospheres to form.
- The likelihood of unintentional ignition sources from equipment, etc.
- The effectiveness of the plant/equipment to mitigate the effects of an incident.

Employers should also consider whether the equipment is designed and installed to appropriate standards, and whether it is regularly inspected and maintained since a leak will



be discovered during a regular inspection before it becomes a major problem.

The RA should also include the likelihood and scale/magnitude of the effects of an event on the workplace – and its effects on any surrounding areas/personnel – in order that measures can be adopted to mitigate the risk and the effects.

While performing the RA, the employer must determine what – if any – hazardous area classification applies. So called ‘safe zones’ do not now exist, but instead a zone referred to as Negligible Extent (NE) is used. Guidance is given in much more detail in IGEM/UP/16.

At the time of publication, IGEM/UP/2 Pipework is being revised and the intention is that systems meeting the standard up to 0.5bar should always meet Zone 2 NE and thus require no further changes to electrical equipment.

However, the risk assessment will specify inspection periods and maintenance schedule requirements, and these are covered in more detail in DSEAR Regulation 6 (*Elimination or reduction of risks from dangerous substances*), Regulation 7 (*Places where explosive atmospheres may occur*) and Regulation 8 (*Arrangements to deal with accidents, incidents and emergencies*).

Regulation 6

Regulation 6 requires every employer to ensure that risk is either eliminated or reduced so far as is reasonably practicable.

» It will be for the Courts to determine if you got it right. If there is an incident, you probably got it wrong. «

Where it is not reasonably practicable to eliminate risk, the employer should – as far as is reasonably practicable – apply measures consistent with the risk assessment and appropriate to the nature of the activity or operation:

- to control risks, and
- to mitigate the detrimental effects of a fire or explosion

The control of risks can be performed by:

- reducing of the quantity of dangerous substances to a minimum (not easy with piped gas).
- avoiding or minimising of the release of a dangerous

substance (vitaly important by regular inspection/visits, use of let-by valve test).

- the control of the release of a dangerous substance to a safe place (e.g. GEA purge or flare stack).
- the prevention of the formation of an explosive atmosphere, including the application of adequate ventilation (leaving ventilation fans running, opening doors/windows).
- the avoidance of ignition sources if a dangerous substance is present (hot work permits, permits to work).

The control of risks has to be performed ‘as far as is reasonably practical’. It will be for the Courts to determine if you got it right. If there is an incident, you probably got it wrong.

The control measures necessary for the safe use of dangerous substances often require – or are dependent upon – employees carrying out the appropriate operating procedures correctly and complying with written or verbal instructions.

Employers, therefore, need to provide employees with sufficient supervision and training to ensure that the systems of work required by Regulation 6 are fully implemented and operating procedures are correctly followed. It is not enough to rely solely on training.

In a recent incident, an employee failed to perform the isolation valve let-by test. The resultant valve leakage caught fire. The employer failed in his claim that the operative was trained and understood the need to do the let-by test. The lack of procedures was the fault of the employer. If he did not have the expertise to write such procedures, it was his responsibility to find somebody who did.

Control measures will also require the adoption of operational methodology to cover all foreseeable events such as ‘isolate and make safe the gas supply to a steam boiler prior to burner maintenance’. Some procedures may require every valve used in the operation to be individually detailed and may look like this:

“Close all valves in compressor room. Open valve 110 to depressurise gas to roof top vent. Attach calibrated gas analyser to valve 111 and open valve 111. Connect controlled pressure nitrogen supply to base valve 112 and open valve to inject nitrogen below 5bar. Test for decrease in NG at test point 111 until NG below 40% LFL.” and so on.

Regulation 7

Regulation 7 requires employers to classify work areas into Zones and, where necessary, to mark

Table 1. A typical RA table.

Hazard	Who might be affected	Existing controls	L	S	R	Additional measure	L	S	R
General failure of gas pipework system due to: <ul style="list-style-type: none"> • corrosion/erosion or mechanical damage; • corrosion/wear at supports; • inadequate inspection and/or monitoring 	<ul style="list-style-type: none"> • Staff • Contractors • Members of the public 	<ul style="list-style-type: none"> • Pipework specification suitable for design pressure and gas and installed to recognised Standards • All pipework and components installed by competent persons. • Materials installed appropriate to design operating pressure • NDT carried out where appropriate • Pipework pressure tested to recognised standards prior to commissioning • In service visual checks, where accessible 	2	2	4	<ul style="list-style-type: none"> • Pipework to be protected from corrosion and mechanical damage in vulnerable locations. • Accessible pipework to be visually inspected not less than every six months • Pipework inspection where accessible to be carried out using leak detection fluid and/or portable gas detection device annually. • Records to be kept of results of gas inspection surveys 	1	2	2
Corrosion and mechanical failure in wall and floor entries	<ul style="list-style-type: none"> • Staff • Contractors • Members of the public 	<ul style="list-style-type: none"> • Not all wall entries are sleeved. The pipe is wrapped against corrosion. • Where fitted, the sleeve and pipe are sealed to prevent the transfer of smoke and gas leakage 	2	2	4	<ul style="list-style-type: none"> • If wall/floor contains a cavity, seal cavity space around pipe to prevent gas ingress then fill space at one end with fire resistant mastic sealant. 	1	2	2

L = Likelihood of event occurring
 S = Severity of event should it occur
 R = Risk evaluation

L and S are based on numerical values of 1 to 5 on Likelihood and Severity, where 1 is low and 5 high. By multiplying the L and S, we get R and, for that, 1 to 6 is low, 8 to 15 is medium and 16 to 25 is high. This indicates that issues ranked as ‘high’ will be attended to before those ranked as ‘low’, but all issues must be considered for remedial work.



those Zones with signs at the point of entry into them. Where the Zone is not classified as NE, the ATEX sign must be displayed. The classification must be verified by a competent person. This does not mean that work cannot take place in a Zone 2, 1 or 0 area - it does, however, mean that it is necessary to ensure that the area is gas free and safe for work to take place.



Figure 1. ATEX safety sign on components and at points of entry into a location classified as a Hazardous area such as Zone 2 or Zone 1.

If the area is checked to be gas free and there are no uncontrolled releases of gas, spark-proof tools and anti-static clothing are not normally required. Controlled releases **must** be very small and safely ventilated.

Although there is a British Standard - BS EN 60079 - on Zone classification, in the UK we normally refer to IGEN/UP/16 and IGEN/SR/25 for any methane-based gas. Currently, there is no definitive information for LPG or for some hydrogen/carbon monoxide bio-gases.

The conclusions of an area classification study usually take the

form of 3D drawings identifying the hazardous areas and types of zones. However, where Zone 2 NE areas exist this can be by a simple line diagram with the gas pipework highlighted in a chosen colour. This is may 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.

Whenever such drawings and documents have been produced, they should be retained as part of the site technical file alongside the formal RA. These documents must be considered before any new equipment is introduced, pipe system changes are made, or changes to the building or ventilation effectiveness are made.

Where an area has been classified as, for example, Zone 1 or 2, any electrical equipment or ignition source must be fit for use in that application. Electrical components will be marked 'Ex' followed by 'd' for a flame-proof motor, 'IIA' for natural gas and 'T1' for natural gas ignition - resulting in a code of **Ex d IIA T1**.

Before this may be something such as

CE 1180  II 2 G

where:

- **1180** is the test house number,
- **II** is for surface industry,
- **2** is for Zone 2 and
- **G** is for gas.

Regulation 8

Regulation 8 is a little bit more straightforward. Amongst other things, the employer must have

information on emergency arrangements and specific hazards that may cause an incident, accident or emergency. To do this, it will be necessary to implement suitable warning alarm systems, evacuation procedures and rescue procedures.

In the event of something happening, steps will need to be taken to reduce the effects

of the event (turn off the gas or depressurise a high pressure system to a safe location). Having made everything safe, effect a proper repair before returning to normal. After the event, it should be investigated to make sure it cannot occur again. This will also mean re-assessing the risk assessment. ■

TO SUM UP

- › DSEAR is a retrospective piece of legislation that applies to all industrial and commercial installations and to employers operating at each site and to those working in those sites.
- › A number of companies are now finding themselves in court defending the position that they have not completed the risk assessment required by Regulation 5 in a professional manner. It is vital to remember that the risk assessment (RA) must be reviewed prior to any site change and at last every five years.
- › Regulation 6 follows on from the RA performed in Regulation 5, requiring employers to recognise risks, control them and mitigate their effects should they occur. Formalised operating procedures need to be prepared for the work being performed in a hazardous area. Using a trained and competent engineer is in itself not adequate.
- › The assessment of the required safety zone for each site using flammable gases is a requirement of Regulation 7. UP/16 from IGEN is an invaluable tool for employers in this respect. ATEX safety signs must be displayed at points of entry, and visitors to site will need to be advised of the safety issues in the site induction.
- › Regulation 8 sets down requirements for handling emergencies and incidents just in case Regulations 5, 6 and 7 failed to stop the dangerous occurrence.



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