DSEAR hazards

Although DSEAR (Dangerous Systems and Explosive Atmospheres Regulations) was enacted back in 2003, its implications for hazardous plant are still misunderstood. Barrie Church explains

Ignorance of the law is no defence, yet eight years after enactment of DSEAR (the Dangerous Systems and Explosive Atmospheres Regulations) in 2003, many plant managers, designers and installers seem unaware of its implications. That is particularly worrying, given that, unusually, these regulations were retrospective for all natural gas and LPG installations in factories, hospitals, shopping centres and shops, as well as central plant for domestic flats. Only pipework in domestic occupation and CE marked gas appliances are exempt – although such equipment still requires a risk assessment.

In brief, each installation needs to be considered for the likelihood of a gas leak occurring and for such a leak leading to an incident that may cause harm or injury. It is also a legal duty on site occupiers to consider the risks and control measures in place to mitigate such leakage. Risk assessments must consider the initial design specification, construction standards, local ventilation provisions, testing procedures and on-going maintenance procedures.

Much of this is covered in the Institution of Gas Engineers and Managers' procedures: IGE/UP/1 Strength and tightness testing and purging of industrial and commercial gas installations; IGE/UP/2 Installation of pipework on industrial and commercial premises; and IGE/UP/10 Installation of flued gas appliances in industrial and commercial premises. However, IGEM UP/16 (Hazardous area classification for natural gas installations downstream of primary meter installations) is new, providing information and guidance on systems with an operating pressure not exceeding 2bar.

Most gas installations operate at low gas pressures (below 100mbar) and it is a simple and not too costly process for a competent person to ensure compliance. Leakages for typical pipework of this type normally generate a Zone 2 classification (see panel).

However, because they are so small and in occupied spaces, they are detected quickly and can be designated Zone 2 NE (negligible extent), meaning that special electrical components are not necessary. Note that, if the same leak is in a space not visited more than twice a year or never maintained, or with poor ventilation, then Zone 2 electrical equipment might be required.

Using appropriate equipment is key to maintaining safety in notified hazardous areas

Natural gas guidelines

Looking at the scope of UP/16, the standard covers all natural gas (and methane-based bio-gas) installations downstream of a primary meter, with an operating pressure not exceeding 2bar and not located in dwellings. It does not cover LPG (liquefied petroleum gas) installations, for which, at this time, there is no similar definitive guidance. Nevertheless, compliance with UP/16 should provide better safety than doing nothing.

The implications are widespread, and require updates to most installation standards and

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particularly UP/2 and UP/10. Ideally, new systems should be designed to take account of DSEAR. However, in existing installations, engineering judgement will be essential. Either way, the requirement is that pipework installations be designed and installed to UP/2, tested to UP/1, sited in ventilated locations, and maintained to prevent corrosion, damage and subsequent leakage that might lead to danger.

Achieving Zone 2 NE

When it comes to UP/16, the initial design of the gas system downstream of the emergency control valve (ECV) will need to achieve Zone 2 NE. Where this is not possible, it will be necessary to use flameproof equipment. To achieve Zone 2 NE, adequate local ventilation around every joint (not welded, soldered or brazed joints), or potential gas leak source, has to be provided.

Incidentally, local equipment congestion will normally restrict the availability of ventilation and may preclude Zone 2 NE, unless other measures are taken – for example, using lower gas pressures, improving local ventilation and/or increasing inspection frequency.

Even though NE zones are similar to designated safe areas, changes should not be made to any pipework or the nearby environment that may adversely affect an assessment as Zone 2 NE. That includes changes to pipework that effectively reduce ventilation, adding equipment or changing the building layout, if the change may impair diluting air flows.

DSEAR itself requires that a risk assessment be completed of the downstream gas installation (examples are given in the appendices to UP/16). That said, from a practical perspective, the primary design issue for gas pipework is that there must never be three surfaces within 1m of the pipe joints. Where this presents difficulties, the options are to all-weld the pipework system or to move it away from any confined space in the boiler area.

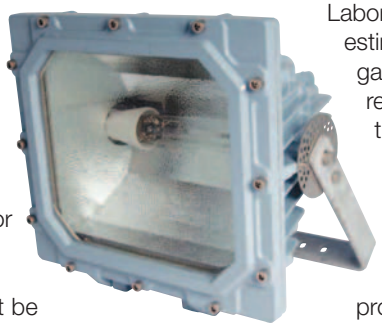
UP/16 also gives more detail on the ventilation requirements for ducts and ceiling spaces. In general, spaces must be ventilated to ensure that leaks are diluted safely. Equally, all appliance compartments must be ventilated, despite what domestic boiler manufacturers might tell you. The best way to get air movement is vents on four outside walls – and as high and low as practicable.

As for pipework in loft spaces, most will, or should, have soffit ventilation, which ought to ensure the requisite air changes. But high-level ventilation will still be required and UP/16 gives advice as to the size of the ventilator opening, which is dependent upon the height between the soffit vents and the high level vent itself. There will also be a restriction on operating pressure.

And there are similar issues with basements. Again, most should have adequate ventilation, but provision will need to be made for high level ventilation back into the building. Where this falls foul of the Building Regulations' fire compartment requirements, additional safety measures will be needed – such as fire dampers in the high level ventilators and/or more frequent inspections.

For mechanical ventilation, the design issues are the same, but inlet ventilation must be ducted, or blown to low level, while extract ventilation is as high as possible. If the extract fans cannot be high, permanent natural ventilation grilles will also be needed at high level.

Barrie Church is director of Global Energy Associates, which has been closely involved with test work at the UK's Health and Safety Laboratories in Buxton on the estimation of danger zones from gas leakages. This work has resulted in the publication of the engineering standard IGEM/SR/25 hazardous area classification of natural gas installations, and, from this detailed standard, IGEM has published UP/16 to provide practical advice PE



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What does zoning mean?

Electrical components and other ignition sources, such as hot surfaces on furnaces and exhausts, all provide a means of igniting a leakage of flammable gas. The bigger the leak, the greater the risk of fire or explosion, so test work in the UK has long since determined reasonable leakage potentials, ventilation required to dilute them to safe levels and the distance ignition sources must be from potential leakages to prevent ignition.

These are among key parameters behind the standard classification of hazardous zones. Any ignition source inside the risk distance (or, more accurately, volume) has to be classified for use in a hazardous area. Zone 2 is the lowest risk, moving up to Zone 1 as a higher risk (for example, in coal mining operations) and Zone 0 as the highest risk area, such as within the proximity of a continuous blowing gas vent.

Equipment for use in zoned hazardous areas may be classified as explosion proof or intrinsically safe. Either way, it is more expensive than standard equivalent electrical equipment. Explosion proof units are badged, for example, as 'EEx n IIB T2' – where the second code (in this case 'n') concerns the protection description (here, n protection), the third defines the gas group hazard (in this case, ethylene) and the fourth, the auto-ignition temperature (in this case, 300ºC) – and carry the Ex hexagonal logo.