

Norwich Union Risk Services

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## Storage of Flammable Liquids and Gases

Flammable liquids are defined as those with a flashpoint (temperature at which a substance gives off sufficient vapour for it to form an ignitable mixture with air) below 55°C. There are two main dangers present:

- (a) Explosion - which would result when flammable vapours and air mixtures fall within explosive limits;
- (b) Fire - which may involve the flow of burning liquid over a wide area or the rupture of unvented containers.

Remember that although a flammable liquid may have a higher flashpoint it will, nonetheless, when involved in a fire, greatly contribute to the severity and spread of the fire.

### Legislation

The Dangerous Substances and Explosive Atmospheres Regulations 2002 DSEAR apply to:

- Extremely flammable liquids and gases (Flashpoint (FP) <0°C and BP <35°C)
- Highly flammable liquids FP <21°C
- Flammable liquids FP 21°C - 55°C.

DSEAR also applies to explosives, oxidising agents, flammable dusts and other substances which create similar risks.

This Hardfacts has been prepared with highly flammable liquids liquefied petroleum and gases (LPG) in mind.

### Risk Assessment

Factors to be taken into account when assessing flammable liquid storage installations and LPG include:

- Properties of the substances being stored
- Information provided by the supplier
- The quantities being stored
- Storage method in bulk tanks or containers
- Temperature and pressure of the storage
- Location in relation to site boundaries occupied buildings, means of escape, process areas, heat sources, fixed sources of ignition, other dangerous substances and vehicle thoroughfares
- Design standards for the installation
- Possibility of corrosion
- Activities on adjacent premises
- Training and supervision of employees
- Frequency of deliveries
- Loading and unloading operations
- Inspection and maintenance
- Incidents and emergencies
- Security

### Control Measures

If possible consider elimination of risks by substitution with non flammable liquids or gases. If this is not possible the following control measures should be applied:

- Dangerous substances that are gases, liquids or liquefied gases should be stored in closed tanks, cylinders or containers constructed to an appropriate national or international standard
- Liquids stored above ground should have a means to contain leaks and prevent any spillages. Underground storage tanks should be provided with secondary containment or a leak detection system
- Liquid leaks from fixed LPG storage vessels should be directed away from the vessel and other vulnerable locations to an area where the vapours evaporating from the leak can readily and safely disperse.

**Separation** Storage areas should be adequately separated from site boundaries, occupied buildings, process areas, fixed sources of ignition and other dangerous substances. The separation should be sufficient to allow people to escape from a fire at the store and should also be sufficient to protect the store from fires that may occur elsewhere including on the boundary. The separation should prevent or delay the spread of fire allowing sufficient time for emergency procedures to be mobilised.

Outdoors, adequate separation can be achieved by an appropriate distance or by using a fire-resisting wall.

Where liquids or gases are stored inside buildings, the storeroom should be a dedicated building or a separate room within a building. The store should be adequately separated from buildings, workrooms and potential hazards or be fire-resisting.

Details on separation distance and fire-resisting structures are contained in the DSEAR ACOP, *Control and mitigation measures*.

**Segregation** Incompatible dangerous substances should be segregated or adequately separated to minimise the risk of interaction.

**Ventilation** Good ventilation should be provided in areas where flammable liquids or gases are stored to ensure that any gases or vapours given off from a spill, leak or release are rapidly dispersed. Storage areas should preferably be located in well-ventilated positions, in the open air. If within a building, adequate natural or mechanical ventilation should be provided.

**Identification of storerooms, tanks, vessels and containers** Contents of tanks, vessels and containers, should be clearly identified so that employees or others are aware of their contents and hazards. Similar considerations apply to cupboards, compounds and storerooms.

**Material Transfer** Flammable liquids and gases should be carried in closed vessels or conveyed in a totally closed system incorporating pipelines and pumps or similar. The contents of pipes, fill points and discharge points should be identified. Where a totally enclosed system cannot be used substances should be carried or conveyed in closed containers or vessels that minimise the risk of spills or releases.

Process activities, including dispensing or decanting should not be carried out in a storage area where this would create a risk of fire involving the stored materials.

Loading and unloading facilities should be designed, located and operated to avoid or minimise the risks of fire and explosions at either the transfer facility or the storage installation. The facility should include measures to minimise the risks of leaks, spills and overfilling plant and equipment.

**Control of ignition sources** Areas where potentially explosive atmospheres could be formed should be designated as hazardous zones according to the principles of Hazardous Area Classification. Definition of hazardous zones are set out in Schedule 2 of DSEAR. Employers should implement measures to prevent the ignition of flammable atmospheres in the hazardous zones.

**Storage in process areas and workrooms** The quantity of any dangerous substance present within process vessels, pipelines, pumps, plant and other associated equipment should be as small as is reasonably practicable.

Small quantities of flammable liquids (FL) in closed containers can be stored within the workroom in a suitably placed cupboard or bin which is of fire-resisting structure and is designed to retain spills.

For FL that have a FP above 32°C, this quantity is considered to be up to 250 litres. For extremely and highly FL and those FL with a FP below 32°C the quantity is up to 50 litres.

At retail premises, where products are present in closed or sealed containers, the quantity of dangerous substance at the point of sale should be kept to a minimum consistent with the needs of the business.

Containers that are nominally empty but may still contain residues of dangerous substances should be removed from the workroom and stored in the same manner as full containers.

All openings in cupboards, bins, tanks, vessels and containers whether containing a dangerous substance or nominally empty, should be kept closed except at necessary for their use, operation or maintenance.

**Security** Employers should ensure that adequate security arrangements are provided to prevent unauthorised access to dangerous substances and associated storage equipment.

**Maintenance** Storage facilities must be maintained in a safe condition. They should be subject to an appropriate inspection programme to establish that

they remain fit for purpose. This should be carried out by a competent person.

### Key Action Steps

- Define which flammable liquids and gases on site come under DSEAR
- Carry out a risk assessment review
- All storage must be in a "safe position" - generally in the open air - or in a "fire resisting structure" in suitable closed vessels.
- A maximum of 50 litres of extremely and highly FL and FL with FP <32°C may be kept in a fire resistant cupboard or bin in a workroom.
- Keep openings in storage vessels and tanks closed when not in use so that vapours do not escape and there is no contamination of the enclosed liquid.
- FL and gases storage vessels and containers should be suitably marked.
- Storerooms should be secured with limited access to authorised personnel only.

### Reference Documents

- HSE 138 DSEAR Acop and guidance HSE Books 2003
- HSE L135 – Storage of Dangerous Substances ACOP and Guidance - HSE Books 2003
- HSE L136 – Control and Mitigation Measures - HSE Books 2003
- BS EN 14470 :1:2004 Safety Storage cabinets for Flammable Liquids
- HSE - HS(G) 140: The safe use and handling of flammable liquids - HSE Books 1996.
- HSE - HS(G) 176: The storage of flammable liquids in tanks - HSE Books 1998.
- HSE - HS(G)51: The storage of flammable liquids in containers - HSE Books 1998.
- Guidance on LPG Storage can be obtained from the LPG Association.

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