

# Recommendations

for the use of  
fork-lift trucks

RC11

**LOSS PREVENTION RECOMMENDATIONS**

These recommendations are part of a series of insurer documents developed under the Insurers’ Fire Research Strategy Funding Scheme (InFiReS) and published by the FPA. InFiReS membership comprises a group of UK insurers that actively support a number of expert working groups developing and promulgating best practice for the protection of property and business from loss due to fire and other risks. The technical expertise for the Recommendations is provided by the Technical Directorate of the FPA and experts from the insurance industry who together form the InFiReS Risk Control Steering Group.

The aim of the FPA Series of Recommendations is to provide loss prevention guidance for industrial and commercial processes and systems. The series continues a long tradition of providing authoritative guidance on loss prevention issues started by the Fire Offices’ Committee (FOC) of the British insurance industry over a hundred years ago and builds upon earlier publications from the LPC and the ABI.

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**SCOPE**

These recommendations outline the fire safety considerations for fork-lift trucks powered by battery, diesel or liquefied petroleum gas (LPG) that are commonly used in industrial and commercial premises. These recommendations will also apply to other motorised lifting equipment such as pallet/platform hoists and motorised equipment generally, such as sweepers.

Petrol-powered units are seldom used and have, therefore, been excluded from this document.

Trucks suitable for use in hazardous atmospheres such as flammable vapours and dusts, although mentioned in this document, fall outside the scope of this publication. Adequate details are, however, included in the HSE publication HS(G)113 (ref. 1).

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## FOREWORD

The use of fork-lift trucks in commercial and industrial concerns introduces a range of fire hazards associated with both the trucks themselves and the environment in which they operate.

Fire hazards include potential ignition sources such as electrical short circuits, sparks from electrical equipment, engine components and exhaust systems. Vehicles may also introduce the potential for increasing fuel availability due to leakage of diesel or LPG.

Careless use of fork-lift trucks may cause damage to passive protection measures such as protective coatings on walls and structural building elements. Damage to active protection measures such as sprinkler heads, water supply piping and hose-reel units are also possibilities.

Over the years many major fires or incidents in commercial or industrial premises have been caused directly or indirectly from fork-lift truck operations.

The HSE publication, Specialist Inspector Reports, Number 60 (ref. 2), indicates that between April 1997 and March 2001 the following were reported or investigated:

- 14 accidents/incidents involving either battery explosions or split rim wheels bursting apart when tyres were changed or wheels removed.
- eight of the incidents investigated involved battery explosions. Four occurred during battery charging, two during jump starting and two involved fires when vehicles were being driven soon after battery charging as a result of sparks igniting hydrogen given off by the batteries.
- 15 harmful releases. Five of these involved freeze burns as a result of disconnecting LPG hoses from cylinders. One incident involved the ignition of transmission oil while a fork-lift truck was in use.

It is imperative therefore, that in all situations where fork-lift trucks are deployed, a thorough fire risk assessment be conducted based on the type of equipment in use and the surroundings to ensure that the hazards and appropriate controls are fully identified.

## RECOMMENDATIONS

### 1. General

The following recommendations apply to all types of equipment addressed in this document.

- 1.1 All fork-lift trucks should be regularly inspected and subjected to preventive maintenance in strict accordance with the manufactures' schedules. (Inspection and certification by a competent person is a statutory duty under the Lifting Operations and Lifting Equipment Regulations 1998.) Fork-lift trucks should be kept free of accumulations of oil, grease or lint. Non-combustible agents should be used for cleaning.
- 1.2 The use of fork-lift trucks should be restricted to personnel trained in their operation. Driving performance should be monitored, for example, by keeping a record of each driver's accidents and near misses, with the objective of preventing accidents and damage arising from careless driving. Drivers should, preferably, have a licence issued by an HSE accredited training body.
- 1.3 A responsible person should make a daily start-up inspection to check for oil, fuel and hydraulic fluid leaks and the integrity of fuel lines. Checks should be made that battery connections and protective covers are correctly in place and that safety devices are operational. All reported defects should be corrected before the equipment is used.
- 1.4 Ensure that all protective covers and guards remain in place at all times during operation of the unit.
- 1.5 Adequate gangways and aisles should be maintained to facilitate safe truck operations.
- 1.6 Particular attention should be given to avoiding impact damage to fire doors, compartment walls, protective coatings on structural steel and other key elements of passive fire protection. Impact damage to composite insulated panels should also be avoided, particularly if exposure to combustible insulated core materials is likely. For the same reason the driving of unloaded fork-lift trucks with elevated forks should not be allowed. The provision of suitable impact protection barriers will often be advisable.
- 1.7 Where premises are sprinkler protected, it is vital that a detailed assessment is undertaken of the potential risk of impact damage to sprinkler heads (particularly those situated within storage racks), range pipes and the main installation control valves. Where necessary, suitable mechanical protection should be provided.
- 1.8 First aid firefighting equipment such as portable extinguishers and hose reels should be protected from impact damage by trucks either by careful selection of location or by mechanical protection such as barriers. Mechanical protection must not restrict access to firefighting equipment.
- 1.9 All fork-lift trucks and similar equipment should carry a suitable fire extinguisher, approved and certificated by an independent, third party certification body, which should be installed and maintained in accordance with BS 5306: Part 3 (ref. 3). Opposition is sometimes encountered regarding the provision of extinguishers on units. Such opposition may be based on training issues, the type and size of extinguisher, space limitations on the unit and the need to protect extinguishers from damage. These should all be resolved accordingly. For example, the provision of a small

extinguisher with a limited extinguishing rating may provide a false sense of security. The size and capability of the unit should be determined by the fire hazard protected. If portable fire extinguishers are provided, fork-lift truck operators should be trained in their safe operation.

- 1.10 In the event of a fire involving an LPG-powered unit, no attempt should be made to extinguish the fire before isolating the LPG supply at source. A notice to this effect should be placed on every LPG-powered fork-lift truck.
- 1.11 Full recognition should be given to the inherent fire hazards of the materials conveyed by the truck and special care taken or the use of fork-lift trucks limited accordingly. For example, flammable liquid drums should not be handled with fork-lift trucks that are not approved for hazardous atmospheres.
- 1.12 During idle periods fork-lift trucks should be kept in a designated location, preferably a detached building, separated from the manufacturing or storage areas. Where separate areas or buildings are used they should be kept secure when not in use and idle trucks immobilised to prevent unauthorised use.

**2. Battery-powered appliances**

- 2.1 All charging of batteries should be carried out in a separate building of non-combustible construction reserved for this purpose or in a specially designed charging area. The charging area should, preferably, be separated from other areas by fire-resisting construction, including doors, offering at least 60 minutes fire resistance.

This is particularly important where multiple-panel battery charging installations serving more than two trucks is involved or where batteries need to be removed from units for charging.

- 2.2 If the recommendation in 2.1 is for any reason impractical, charging should be confined to a designated area of a building which should be kept totally clear of combustible material. A clearance of at least 2m should be established between the charging unit and truck and any adjacent combustible materials or composite panels containing combustible cores. This should be defined by barrier rails of adequate strength.

If a 2m separation is not practical a partition offering at least 30 minutes fire resistance may be used to separate the charging area from the combustible materials.

This would be appropriate for a single-panel charging installation serving one or two trucks where charging is conducted without battery removal.

It is, however, not appropriate where highly combustible or high value goods are stored.

- 2.3 Battery chargers should be installed on a concrete floor or securely wall-mounted against a non-combustible structure. Battery chargers should not be mounted on walls constructed with composite panels containing combustible cores.
- 2.4 Over-current and over-charge protection should be provided for all battery chargers.
- 2.5 All electrical connecting leads should be kept as short as possible. Leads and connections should be maintained in sound condition and inspected frequently. Suitable precautions should be taken to prevent mechanical damage to cables when not in use.
- 2.6 Charging areas should be kept clean, tidy and free from rubbish and other combustibles.
- 2.7 Hydrogen is produced during charging and may be an explosion hazard. The production of hydrogen increases under boost charge and when over-charging occurs. When charging is carried out in enclosed areas such as in buildings, adequate natural or mechanical ventilation should be provided. Mechanical ventilation is likely to be required. Although the production of hydrogen is reduced in sealed batteries in comparison to vented batteries, the hazard should not be ignored.  
  
Ventilation rates should be sufficient to maintain the atmosphere at or below 25% of the Lower Explosive Limit (LEL). Ventilation rates can be calculated to ensure that the required concentration is achieved. Further relevant information regarding ventilation is provided in BS 6133: 1995 (ref. 4).  
  
Hydrogen gas monitoring equipment may need to be installed, together with suitable interlocks to isolate the charging devices automatically in the event of gas accumulation beyond the safe limits. Advice should be obtained from a specialist ventilation contractor.
- 2.8 All personnel authorised to change or charge batteries should be adequately trained.
- 2.9 All tools used in the installation and maintenance of batteries should be suitable for battery work, for example, electrically insulated and acid resistant.
- 2.10 Metallic items worn by operators (such as bracelets and neck chains) should be removed before working on a battery to prevent short-circuiting.
- 2.11 Suitable material handling equipment, such as an overhead hoist, should be provided where required for the handling of batteries. Uncovered batteries should be covered with a suitable non-conducting material to prevent the hoist chain from shorting on terminals or connections.
- 2.12 Smoking and use of open flames should be prohibited in battery charging areas.

2.13 All electrical installations should be installed, inspected and tested in accordance with BS 7671: 2001 (ref. 5).

2.14 Battery charging areas should be included in the fire and explosion assessment conducted in accordance with the Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR).

### 3. Diesel-powered appliances

3.1 Diesel fuel should be contained in drums or tanks located in the open, away from buildings and suitably banded to contain any leaks or spillages. Provide portable fire extinguishers of a type approved by the Loss Prevention Certification Board or equivalent certification body.

3.2 All refuelling operations should be carried out in the open air at a suitably designated location.

Refuelling should be from approved dispensing pumps. In the event of emergency refuelling being necessary, approved safety containers should be used. Irrespective of the method of refuelling, overfilling and spillage should be avoided.

Fork-lift trucks should be switched off and the operator not on or inside the vehicle during filling operations.

3.3 Smoking and the use of open flames should be prohibited in refuelling areas.

3.4 Particular care should be taken to ensure that the exhaust system, engine bay and other potentially hot surfaces are kept free from combustible materials. This includes loose waste material which may be drawn into the engine compartment.

3.5 Where the risk requires, a spark arrestor should be fitted to the exhaust outlet.

### 4. LPG-powered appliances

4.1 The valve on the LPG cylinder should be closed when the appliance is not in use.

4.2 Where LPG trucks are employed, particular care should be taken over the storage and use of cylinders to ensure that fire safety is not compromised. Cylinders should be stored and used in accordance with FPA recommendations (see reference 6). Further information and guidance on the storage and use of LPG in cylinders is published by the LP Gas Association. More details are available from their web site at [www.lpga.co.uk](http://www.lpga.co.uk).

4.3 Where the LPG supply is in the form of a bulk tank for the refilling of cylinders, special advice concerning the tank installations and filling site should be obtained. This type of installation is covered in references 7, 8, 9 and 10.

Note: Reference 8 replaces HS(G)34 (ref. 7) (except guidance related to buried/mounded vessels and testing and inspection). Reference 9 replaces the guidance on testing and inspection in HS(G)34. Reference 10 replaces guidance on buried/mounded vessels in HS(G)34.

4.4 Cylinder refilling should only be carried out by trained personnel who are fully aware of the fire hazards involved and the precautions to be taken.

4.5 LPG-powered appliances should not be exposed to high temperatures such as areas near ovens and furnaces.

4.6 Recommendations 3.3, 3.4 and 3.5 apply equally to LPG-powered appliances.

### 5. Fork-lift trucks in hazardous atmospheres

5.1 The Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR) came into force on 1 July 2003. From that date, the hazardous areas in all new workplaces must be classified into zones based on the frequency and duration of an explosive atmosphere and the zones checked by a competent person and properly marked. Equipment for use in potentially explosive atmospheres, such as fork-lift trucks, must comply with the health and safety requirements of ATEX 94/9/EC (the Product 100a Directive). More information is given in RC30 (ref. 11).

5.2 The potential ignition sources on battery-powered appliances include arcing and sparking of unprotected electrical components, hot surfaces such as brakes and sparks from friction or static build-up.

On diesel-powered appliances ignition sources include sparks from exhaust systems, hot engine components such as exhausts, other hot components such as brakes and friction sparks. Over speeding of diesel engines is also possible if flammable vapours are drawn into the engine through the air inlet system.

Flameproof vehicles are specially modified to ensure that all potential ignition sources have been adequately contained.

5.3 It is therefore, imperative that only explosion-proof fork-lift trucks are used in hazardous areas. Details regarding this type of appliance and suitable recommendations are included in the HSE publication HS(G)113 (ref. 1).

5.4 Explosion-proof fork-lift trucks should be regularly inspected, serviced and maintained by properly trained engineers in accordance with the manufacturers' recommendations. In particular, after servicing or repair, certificated trucks should be confirmed, by a competent person, as meeting the certification criteria before being returned to operation.

## REFERENCES

1. *Lift trucks in potentially flammable atmospheres*, HS(G)113, Health and Safety Executive, 1996.
2. *Safety of industrial lift trucks. A survey of investigated accidents and incidents (April 1997 to March 2001)*, SIR60, Health and Safety Executive, 2003.
3. BS 5306: Part 3: 2003, *Code of practice for selection, installation and maintenance of portable fire extinguishers*, British Standards Institution.
4. BS 6133: 1995, *Code of practice for safe operation of lead-acid stationary batteries*, British Standards Institution.
5. BS 7671: 2001, *Requirements for electrical installations*. IEE Wiring Regulations. Sixteenth edition, British Standards Institution.
6. *Recommendations for the storage, use and handling of common industrial gases in cylinders, including LPG*, RC8, Fire Protection Association 2004.
7. *The storage of LPG at fixed installations*, HS(G)34, Health and Safety Executive, 1987.
8. Code of Practice 1. *Bulk LPG storage at fixed installations. Part 1: Design, installation and operation of vehicles located above ground*, LP Gas Association, 2004.
9. Code of Practice 1. *Bulk LPG storage at fixed installations. Part 3: Examination and inspection*, LP Gas Association, 2000.
10. Code of Practice 1. *Bulk LPG storage at fixed installations. Part 4: Buried/mounded LPG storage vessels*, LP Gas Association, 1999 as amended 2001.
11. *Recommendations for the selection of electrical and non-electrical equipment for use in atmospheres containing flammable and explosive gases and vapours*, RC30, Fire Protection Association, 2004.

## FURTHER INFORMATION

1. *Safety in working with lift trucks*, HS(G)6, Health and Safety Executive, 2000.
2. *Fire safety standard for powered industrial trucks including type designations, areas of use, conversions, maintenance and operation*, NFPA 505, 2002 edition, National Fire Protection Association.
3. *Industrial trucks*, Loss Prevention Data Sheet 7-39, Factory Mutual, 2000.



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Recommendations



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