

Risk Control

Recommendations for fire safety in the use of lift trucks



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» SCOPE

These recommendations outline fire safety considerations for forklift and other forms of trucks designed for use by personnel inside warehouses and similar commercial and industrial premises and which are powered by battery, diesel fuel or liquefied petroleum gas (LPG). These recommendations also apply to related equipment such as sweepers and motorised lifting equipment such as pallet and platform hoists that are used in the same environment. Automated systems and equipment, such as unmanned trucks operating on rails, are outside the scope of these recommendations.

It is not recommended that petrol-powered equipment is used within buildings and thus this form of mobile plant is outside the scope of this document.

Where the results of an assessment under the Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR) (ref 1) indicate that trucks may have to be designed to be used in hazardous atmospheres, such as those where flammable concentrations of vapours and dusts may accumulate, reference is only made in general terms in this document, as detailed guidance is set out in the HSE publication HS(G)113 (ref 2) to which reference should be made.

These recommendations should be read in conjunction with RISC Authority documents RC56: **Fire safety in the storage, handling and use of highly flammable and flammable liquids - Storage in drums and containers other than external fixed tanks**, (ref 3), RC8: **Recommendations for the storage, use and handling of common industrial gases in cylinders including LPG** (ref 4), RC59: **Fire safety when charging electric vehicles** (ref 5) and RC18: **Recommendations for fire safety in warehouses** (ref 6).

» SYNOPSIS

These recommendations provide advice regarding fire safety in the use of lift trucks powered by batteries, diesel fuel or LPG.

Recommendations concern the trucks themselves and where their use may impact on the fire safety provisions in the premises in which they operate. Of particular concern are issues concerning hazard areas where flammable atmospheres relating to flammable liquids or combustible dusts may occur.

» DEFINITIONS

Hazard zones

This refers to the classification of hazardous areas in accordance with BS EN 60079-10 (ref 7). In respect of flammable liquids, the zones are identified as follows:

Zone 0: An area in which an explosive gas atmosphere is present continuously or for long periods (for example in some chemical process areas).

Zone 1: An area in which an explosive gas atmosphere is likely to occur in normal operation (for example, areas around fuel dispensing pumps).

Zone 2: An area in which an explosive gas atmosphere is not likely to occur in normal operation and, if it does occur, is likely to do so only infrequently and will exist for a short period only (for example areas where there may be accidental breakage of a small container of flammable liquid).

In respect of combustible dusts the zones are defined as follows:

Zone 20: A place in which an explosive atmosphere, in the form of a cloud of combustible dust is present continuously, for long periods or frequently for short periods (for example, a mill or pneumatic conveying system).

Zone 21: A place in which an explosive atmosphere, in the form of a cloud of combustible dust is likely to occur occasionally in normal operation (for example, bagging points and inspection ports that are frequently opened).

Zone 22: A place in which an explosive atmosphere, in the form of a cloud of combustible dust is not likely to occur in normal operation but, if it does occur, will persist for a short period only (for example, leaks from incorrectly fitted lids or spillages).

» INTRODUCTION

The use of 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 associated with the trucks. They may also introduce the potential for increasing fuel availability due to leakage of diesel fuel or LPG.

Careless use of lift trucks may cause damage to passive fire protection measures such as protective coatings on walls and structural building elements. Damage may also occur to active fire protection measures such as sprinkler heads, water supply pipe work and smoke or heat detectors. These hazards should be minimised by rigorous driver training.

Recent developments have seen the introduction of increasingly powerful electric vehicles into the workplace. These, using larger electric batteries employing lithium ion technologies together with associated charging facilities, have also increased the fire risk and highlighted the need for appropriate staff training.

» RECOMMENDATIONS

1. Compliance with fire safety legislation

- 1.1 In premises to which the Regulatory Reform (Fire Safety) Order 2005 (or equivalent legislation in Scotland and Northern Ireland) (refs 8-12) applies, a fire risk assessment should be carried out and recorded and be reviewed wherever there is a material change in the number or type of lift trucks employed in the buildings or other areas in which they are used. It should also address any changes in operations such as the charging or changing of batteries. The use of lift trucks should also be considered in the fire risk assessment where deliveries are made with the assistance of a truck carried by a supplier.
- 1.2 All fire risk assessments should consider the possibility of deliberate fire setting.
- 1.3 Because charging of electric trucks will often continue outside of working hours, fire prevention measures to be considered should include:
 - physical segregation of charging points from process and storage areas;

- provision of suitable power supplies, control and isolation systems;
 - suitable fire detection and warning installations in case of fire;
 - provision and siting of appropriate portable fire fighting equipment;
 - development of an emergency action plan to protect life and property and ensure the continuing functioning of the business in case of fire;
 - staff training in the safe charging of trucks and the actions to take in the event of fire, including the safe shut down of the charging process and evacuation of the premises.
- 1.4 Where appropriate, an assessment in compliance with the Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR) (ref 1) should be undertaken to identify hazard zones so as to ensure that charging areas are sufficiently remote from any hazardous materials such as flammable liquids and gases that may be stored or in use on the premises. An assessment should also be used to ensure that suitable, intrinsically safe, electrical equipment is installed in the charging areas.
- 1.5 The response by fire and rescue services to 999/112 calls and signals routed via fire alarm monitoring organisations varies widely throughout the UK, and differs from day to night time. Fire safety managers should refer to the relevant fire and rescue service websites to make themselves aware of the levels of response in the areas in which their premises are located and consider this information when undertaking and reviewing their fire risk assessments.

2. Business continuity

Even a small fire can have a disproportionate effect on a business if it occurs in a critical area. Lift trucks are becoming increasingly sophisticated and expensive and in many cases are becoming relied upon for the efficient functioning of a business.

- 2.1 In commercial premises where the batteries of electric trucks are charged, the fire hazards and thus the threats to the business are increased by the need for the charging process to continue during the night or over weekends when no, or few, staff may be present. It is therefore paramount that careful consideration be given to all fire and safety implications when battery charging areas are being selected and designed.
- 2.2 All organisations should take steps to ensure the continued smooth running of their business by making a suitable emergency plan. Guidance for this is set out in **Business resilience: A guide to protecting your business and its people** (ref 13). The emergency plan should address the implications of a fire, flood or other perceived disaster on all facets of the business model. It should indicate the lines of communication that should be followed and the contact details for specialist assistance, providers of alternative accommodation and suppliers of lift trucks.
- 2.3 When complete, the emergency plan should be rehearsed by means of a tabletop exercise, with the results being assessed and amendments made to the plan as necessary.

- 2.4 Consideration may be given to applying commercially available computer programmes, such as the ROBUST software (Resilient Business Software Toolkit) which is available free of charge (ref 14), or other appropriate product, to develop and check the adequacy of the plan.

3. Fire safety management

- 3.1 All lift trucks should be regularly inspected and subjected to preventive maintenance in strict accordance with the manufacturers' schedules. Lift trucks should be kept free of accumulations of oil, grease and easily ignitable materials such as fluff and dust. Non-combustible agents should be used for cleaning.
- 3.2 The use of lift trucks should be restricted to personnel trained in their operation and the handling of loads. Driving performance should be monitored, for example, by keeping a record of each driver's training, accidents and near misses, with the objective of preventing accidents and damage to the fabric of the building, racking and passive and active fire protection measures arising from careless driving. Drivers should have a licence issued by an HSE accredited training body.
- 3.3 Particular attention should be given by drivers to avoiding impact damage to fire doors, compartment walls, protective coatings on structural steel and other key elements of passive fire protection. A particular hazard is impact damage to composite insulated panels to avoid exposure of combustible insulated core materials. For this and other reasons the driving of unloaded forklift trucks with elevated forks should not be allowed. The provision of suitable impact protection bollards or barriers should be considered where possible.
- 3.4 It is a legal requirement (see Provision and Use of Work Equipment (PUWER) Regulations 1998 (ref. 28)) that work equipment is maintained in an efficient state, in efficient working order and in good repair. A competent person should therefore 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 following charging and that safety devices are operational. All reported defects should be corrected before equipment is used.
- 3.5 Ensure that all protective covers and guards remain in place at all times during operation of the unit to prevent, for example, the build-up of combustible materials on hot exhaust pipes.
- 3.6 Adequate gangways and aisles should be maintained to facilitate safe truck operations. These should be reviewed when new forms of racking or storage or new trucks are introduced into the building.
- 3.7 Where premises are sprinkler protected, a detailed assessment should be 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.
- 3.8 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 forklift trucks limited

accordingly, for example, drums of flammable liquid should only be handled with lift trucks that are adapted for use in hazardous atmospheres.

- 3.9 During idle periods forklift trucks should be kept in a designated location, preferably a detached building, separated from manufacturing or storage areas. Where detached areas or buildings are used they should be kept secure out of working hours and idle trucks be immobilised to prevent unauthorised use.

- 3.10 Keys or fobs to trucks should be kept in the possession of the authorised driver during work time and be stored securely out of working hours.

4. Battery powered trucks

- 4.1 Wherever practicable, the charging of batteries should not take place when the premises are unattended/ outside working hours due to the fire risk involved and the potential impact of a fire on the continuity of the business.

- 4.2 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 batteries need to be removed from units for charging.

- 4.3 Where the recommendation in section 4.2 is impractical, charging should be confined to a designated area of a building. A clearance of at least 2m should be established between the charging unit and the truck and any combustible materials or composite panels containing combustible cores. This area should be defined by barrier rails of adequate strength and/or prominent floor markings.

- 4.4 If a 2m separation is not practical, a partition such as a block or brick wall offering at least 60 minutes fire resistance may be used to separate a small charging area from the combustible materials. This may be appropriate, for example, depending on the findings of the fire risk assessment, for a single-panel charging installation serving one or two trucks where charging is conducted without battery removal. It is not, however, appropriate where highly combustible or high value goods are stored.

- 4.5 Charging areas should be kept clean, tidy and free from rubbish and other combustible materials.

- 4.6 Battery chargers should be supported on a non-combustible stand about 0.5m above a concrete floor or other non-combustible surface, or be securely wall-mounted against a non-combustible structure so as to prevent water damage. Battery chargers should not be mounted on walls constructed with composite panels containing combustible cores or be placed on a combustible surface such as a wooden or plastic pallet. Chargers should not be located within storage racking.

- 4.7 Over-current and over-charge protection should be provided for all battery chargers.

- 4.8 All electrical connecting leads should be kept as short as possible. Leads and connections should be maintained in sound condition and be inspected frequently. Suitable precautions should be taken to prevent mechanical damage to cables when not in use.

- 4.9 The wiring and other elements of electrical installations should be tested periodically by a competent electrician and in accordance with the current edition of BS 7671 (the IET Wiring Regulations) (ref 15). Inspections should be carried out on a risk assessed basis as recommended in the Periodic Inspection Report.

Figure 2: Battery charging area



- 4.10 Where a portable charger is in use (ie one fitted with a 13 amp plug), it should be inspected periodically (PAT tested) at least in accordance with HS(G)107 (ref 16) and the IET **Code of practice for in-service inspection and testing of electrical equipment** (ref 17) and may need to be tested more often as determined by a risk assessment.
- 4.11 Hydrogen is produced during the charging of some forms of battery and may be an explosion hazard. The production of hydrogen increases under boost charge and when overcharging occurs. When charging is carried out in enclosed areas such as in buildings, adequate natural or mechanical ventilation should be provided. Although the production of hydrogen is reduced in sealed batteries in comparison with vented batteries, the hazard should not be ignored and the suitability of any electrical installation within the charging area needs to be considered in accordance with the findings of the DSEAR assessment (see section 1.4).
- 4.12 Ventilation rates should be sufficient to maintain the atmosphere at or below 25% of the Lower Explosive Limit (LEL) of hydrogen. Ventilation rates can be calculated to ensure that the required concentration is achieved. Further information regarding secondary batteries and battery installations is set out in BS EN 50272-1 (ref 18).
- 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.
- 4.13 All personnel authorised to change or charge batteries should be adequately trained.
- 4.14 All tools used in the installation and maintenance of batteries should be suitable for battery work, for example, be electrically insulated and acid resistant.
- 4.15 Metallic items worn by operators (such as bracelets and neck chains) should be removed before working on a battery to prevent short-circuiting.

Figure 3: LPG-powered lift truck



- 4.16 Suitable 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 terminals or connections.

- 4.17 Hot work and the use of open flames should be prohibited in battery charging areas.

5. Diesel and LPG powered trucks

- 5.1 Diesel fuel for lift trucks should be contained in drums or tanks located in the open, away from buildings and suitably bunded to contain any leaks or spillages. Further information is set out in RISCAuthority recommendations RC56 (ref 3).
- 5.2 Diesel and LPG refuelling operations should be carried out in the open air at a suitable designated location. Diesel fuel should be dispensed from approved dispensing pumps but in the event of emergency refuelling being necessary, approved safety containers may be used. Overfilling of tanks and spillage should be avoided. Engines should be switched off and trucks not manned during filling operations.
- 5.3 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 packaging and other waste material which may be drawn into the engine compartment. Floors should therefore be swept regularly.
- 5.4 Where determined by risk assessment, a spark arrestor should be fitted to the exhaust outlet.
- 5.5 In the case of LPG-powered trucks, the valve on the LPG cylinder should be closed when the truck is not in use.
- 5.6 Where LPG trucks are in use, 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 RISCAuthority recommendations RC8 (ref 4), with spare cylinders being stored securely outside the building.

Figure 4: Battery-powered lift truck



- 5.7 Where the LPG supply is in the form of a bulk tank for the refilling of cylinders, specialist advice concerning the tank installations and filling site should be obtained from the installer. Further information is provided in a series of publications from the UKLPG (refs 19-21).
- 5.8 Cylinder refilling should only be carried out by trained and competent personnel who are fully aware of the fire hazards involved and the precautions to be taken.
- 5.9 LPG fuelled trucks should not be exposed to high temperatures and thus should not be operated near to ovens and furnaces and in similar areas.
- 6. The use of lift trucks in hazardous atmospheres**
- 6.1 Where appropriate, a risk assessment should be undertaken by a competent person in compliance with the Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR) (ref 1). This should identify hazard zones based on the frequency and duration of an explosive atmosphere. Equipment, such as lift trucks, that has to be used in potentially explosive atmospheres must be suitably protected so as not to present a potential ignition source. Detailed information on this subject is set out in HSE guide HS(G)113 (ref 2). Additional information is also given in RISCAuthority publication RC30 (ref 22).
- 6.2 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 a serious problem and is possible if flammable vapours are drawn into the engine through the air inlet system.
- 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 the build-up of static electricity.
- On LPG powered trucks' hot surfaces and exhausts present the most serious potential ignition sources.
- It is therefore imperative that only forklift trucks with suitable protection are used in hazardous areas. Details regarding this type of appliance and suitable recommendations are included in the HSE publication HS(G)113 (ref 2).
- 6.3 As is the case with all lift trucks, those with protection for operating in hazard zones should be regularly inspected, serviced and maintained by properly trained engineers in accordance with the manufacturers' recommendations. In addition, after servicing or repair, certificated trucks should be confirmed, by a competent person, as meeting the certification criteria before being returned to operation.
- 7. Fire protection**
- 7.1 Fire protection measures for battery charging areas should be proportionate to the risk and be based on the findings of the fire risk assessment.
- 7.2 Portable fire extinguishers provided in battery charging areas should comply with BS 5206-8 (ref 23) and be approved and certified by an independent, third party certification body. All lift trucks and similar equipment should carry a suitable fire extinguisher. All extinguishers should be maintained in compliance with BS 5306-3 (ref 24). Lift truck operators should be trained in the safe operation of the extinguishers on their vehicles.
- 7.3 First aid firefighting equipment in premises in which trucks are operating should be protected from impact damage by trucks either by careful selection of location and/or by mechanical protection such as barriers. Mechanical protection must not restrict access to firefighting equipment.
- 7.4 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 the source because of the danger of an explosion if the gas continues to escape. Notices to this effect should be placed on every LPG-powered truck.
- 7.5 Battery charging and lift truck parking areas should be protected by automatic fire detection and alarm (AFD) installations designed, installed, commissioned and maintained by an engineer with accreditation by an independent UKAS accredited third party certification body. The installation should be to a recognised category of installation in accordance with BS 5839-1 (ref 25) as determined by a risk assessment.
- 7.6 The AFD installation should be interfaced so as to isolate the power supply to battery charging circuits in the event of the fire alarm actuating.
- 7.7 The AFD system should be monitored either on-site or by an off-site alarm receiving centre with accreditation by an independent UKAS accredited third party certification body and operating in accordance with BS 5979 (ref 26).
- 7.8 The installation of automatic fixed fire suppression systems is strongly recommended in areas where trucks are parked when not in use and where chargers are to run in unattended premises. Where a risk assessment determines that water sprinklers should be installed, the installation should be designed, installed, commissioned and maintained in accordance with the **LPC Sprinkler Rules incorporating BS EN 12845** (ref 27) by engineers having accreditation by an independent UKAS accredited third party certification body.

8 Checklist

		Yes	No	N/A	Action required	Due date	Sign on completion
8.1	Compliance with fire safety legislation (section 1)						
8.1.1	Has a fire risk assessment been carried out and recorded in compliance with the Regulatory Reform (Fire Safety) Order or equivalent fire safety legislation? (1.1)						
8.1.2	Is the assessment reviewed whenever there is a material change in the number or type of lift trucks employed in the buildings or other areas in which they are used? (1.1)						
8.1.3	Does the fire risk assessment consider the possibility of deliberate fire setting? (1.2)						
8.1.4	Because charging of electric trucks will often continue outside of working hours, do fire prevention measures include: <ul style="list-style-type: none"> • physical segregation of charging points from process and storage areas; • provision of suitable power supplies; • suitable fire detection and warning installations; • provision of appropriate portable firefighting equipment; • development of an emergency action plan to protect life and property and ensure the continuation of the business in case of fire; • staff training in the safe charging of trucks and the actions to take in the event of fire? (1.3) 						
8.1.5	Has an assessment been undertaken in compliance with the Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR) to identify hazard zones so as to ensure that charging areas are sufficiently remote from hazardous materials? (1.4)						
8.1.6	Has reference been made to the relevant fire and rescue service websites to ensure awareness of the levels of response in the event of fire? (1.5)						
8.2	Business continuity (section 2)						
8.2.1	Is careful consideration given to all fire and safety implications when battery charging areas are being selected and designed? (2.1)						
8.2.2	Have steps been taken to ensure the continued smooth running of the business by making a suitable emergency plan? (2.2)						
8.2.3	Has the emergency plan been rehearsed by means of a tabletop exercise, with the results being assessed and amendments made to the plan as necessary? (2.3)						
8.2.4	Has consideration been given to applying commercially available computer programmes, such as the ROBUST software (Resilient Business Software Toolkit) or other appropriate product, to develop and check the adequacy of the plan? (2.4)						

		Yes	No	N/A	Action required	Due date	Sign on completion
8.3	Fire safety management (section 3)						
8.3.1	Are all lift trucks regularly inspected and subjected to preventive maintenance in strict accordance with the manufacturers' schedules? (3.1)						
8.3.2	Is the use of lift trucks restricted to personnel trained in their operation and the handling of loads? (3.2)						
8.3.3	Is particular attention given by drivers to avoiding impact damage to fire doors, compartment walls, protective coatings on structural steel and other key elements of passive fire protection? (3.3)						
8.3.4	Does a competent person make a daily start-up inspection to check for oil, fuel and hydraulic fluid leaks and the integrity of fuel lines? Are checks also made that battery connections and protective covers are correctly in place and that safety devices are operational? (3.4)						
8.3.5	Is it ensured that all protective covers and guards remain in place at all times during operation of the unit? (3.5)						
8.3.6	Are adequate gangways and aisles maintained to facilitate safe truck operations? (3.6)						
8.3.7	Where premises are sprinkler protected, has a detailed assessment been undertaken of the potential risk of impact damage to sprinkler heads, range pipes and the main installation control valves? (3.7)						
8.3.8	Has full recognition been given to the inherent fire hazards of the materials being conveyed by the trucks? (3.8)						
8.3.9	During idle periods, are forklift trucks kept in a designated location, preferably a detached building, separated from manufacturing or storage areas? (Where detached areas or buildings are used, are they kept secure out of working hours and idle trucks be immobilised to prevent unauthorised use?) (3.9)						
8.3.10	Are keys or fobs to trucks kept in the possession of the authorised driver during working time and stored securely out of working hours? (3.10)						
8.4	Battery powered trucks (section 4)						
8.4.1	Wherever practicable, is the charging of batteries avoided when the premises are unattended or outside working hours? (4.1)						
8.4.2	Is charging of batteries carried out in a separate building of non-combustible construction reserved for this purpose or in a specially designed charging area? (4.2)						

		Yes	No	N/A	Action required	Due date	Sign on completion
8.4.3	Where the recommendation in section 4.2 is impractical, is charging confined to a designated area of a building with a clearance of at least 2m established between the charging unit and the truck and any combustible materials or composite panels containing combustible cores? (4.3)						
8.4.4	If a 2m separation is not practical, is a partition such as a block or brick wall offering at least 60-minutes' fire resistance used to separate a small charging area from the combustible materials? (4.4)						
8.4.5	Are charging areas kept clean, tidy and free from rubbish and other combustible materials? (4.5)						
8.4.6	Are battery chargers installed on non-combustible supports about 0.5m above a concrete floor or other non-combustible surface, or securely wall-mounted against a non-combustible structure? (4.6)						
8.4.7	Is over-current and over-charge protection provided for all battery chargers? (4.7)						
8.4.8	Are all electrical connecting leads kept as short as possible, maintained in sound condition and inspected frequently? (4.8)						
8.4.9	Is the wiring and other elements of electrical installations tested periodically by a competent electrician and in accordance with the current edition of BS 7671 (the IET Wiring Regulations)? (4.9)						
8.4.10	Where a portable charger is in use (ie one fitted with a 13 amp plug), is it inspected periodically (PAT tested) at least in accordance with HS(G)107 and the IET Code of practice for in-service inspection and testing of electrical equipment? (4.10)						
8.4.11	When charging is carried out in enclosed areas such as in buildings, is adequate natural or mechanical ventilation provided? (4.11)						
8.4.12	Are ventilation rates sufficient to maintain the atmosphere at or below 25% of the Lower Explosive Limit (LEL) of hydrogen? (4.12)						
8.4.13	Has hydrogen gas monitoring equipment been installed, together with suitable interlocks to isolate the charging devices automatically in the event of gas accumulation beyond the safe limits? (4.12)						
8.4.14	Have all personnel authorised to charge or charge batteries been adequately trained? (4.13)						
8.4.15	Are all tools used in the installation and maintenance of batteries suitable for battery work? (4.14)						
8.4.16	Are metallic items worn by operators (such as bracelets and neck chains) removed before working on a battery to prevent short-circuiting? (4.15)						

		Yes	No	N/A	Action required	Due date	Sign on completion
8.4.17	Is suitable handling equipment, such as an overhead hoist, provided where required for the handling of batteries? (4.16)						
8.4.18	Is hot work and the use of flames prohibited in charging areas? (4.7)						
8.5	Diesel and LPG powered trucks (section 5)						
8.5.1	Is diesel fuel for lift trucks contained in drums or tanks located in the open, away from buildings and suitably banded to contain any leaks or spillages? (5.1)						
8.5.2	Are diesel and LPG refuelling operations carried out in the open air at a suitable designated location? (5.2)						
8.5.3	Is particular care taken to ensure that the exhaust system, engine bay and other potentially hot surfaces are kept free from combustible materials? (5.3)						
8.5.4	Where determined by risk assessment, is a spark arrestor fitted to the exhaust outlet? (5.4)						
8.5.5	In the case of LPG powered trucks, is the valve on the LPG cylinder closed when the truck is not in use? (5.5)						
8.5.6	Where LPG trucks are in use, is particular care taken over the storage and use of cylinders to ensure that fire safety is not compromised? (5.6)						
8.5.7	Where the LPG supply is in the form of a bulk tank for the refilling of cylinders, has specialist advice concerning the tank installations and filling site been obtained from the installer? (5.7)						
8.5.8	Is cylinder refilling only carried out by trained and competent personnel who are fully aware of the fire hazards involved and the precautions to be taken? (5.8)						
8.5.9	Is care taken not to expose LPG fuelled trucks to high temperatures? (5.9)						
8.6	The use of lift trucks in hazardous atmospheres (section 6)						
8.6.1	Where appropriate, has a risk assessment been undertaken by a competent person in compliance with the Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR) to identify hazard zones based on the frequency and duration of an explosive atmosphere? (6.1)						
8.6.2	Are only forklift trucks with suitable protection used in hazardous areas? (6.2)						
8.6.3	Are all lift trucks with protection for operating in hazard zones regularly inspected, serviced and maintained by properly trained engineers in accordance with the manufacturers' recommendations? (6.3)						

		Yes	No	N/A	Action required	Due date	Sign on completion
8.7	Fire protection (section 7)						
8.7.1	Are the fire protection measures for battery charging areas proportionate to the risk and based on the findings of the fire risk assessment? (7.1)						
8.7.2	Are portable fire extinguishers provided in battery charging areas in compliance with BS 5206-8 and are they approved and certified by an independent, third party certification body? (7.2)						
8.7.3	Do all lift trucks and similar equipment carry a suitable and maintained fire extinguisher? (7.2)						
8.7.4	Are lift truck operators trained in their safe operation of the extinguishers on their vehicles? (7.2)						
8.7.5	Is first aid firefighting equipment in premises in which trucks are operating protected from impact damage by trucks either by careful selection of location or by mechanical protection such as barriers? (7.3)						
8.7.6	In the event of a fire involving an LPG-powered unit, are drivers aware that no attempt should be made to extinguish the fire before isolating the LPG supply at source? (7.4)						
8.7.7	Are battery charging and lift truck parking areas protected by automatic fire detection and alarm (AFD) installations designed, installed, commissioned and maintained by an engineer with accreditation by an independent UKAS accredited third party certification body? (7.5)						
8.7.8	Is the AFD installation interfaced so as to isolate the power supply to battery charging circuits in the event of the fire alarm actuating? (7.6)						
8.7.9	Is the automatic fire detection and alarm system monitored either on-site or by an off-site alarm receiving centre with accreditation by an independent UKAS accredited third party certification body? (7.7)						
8.7.10	Has the installation of automatic fixed fire suppression systems been considered in areas where trucks are parked when not in use and where chargers are to run in unattended premises? (7.8)						

REFERENCES

1. Dangerous Substances and Explosive Atmospheres Regulations (DSEAR), 2002, SI 2002 No 2776, The Stationery Office.
2. HS(G) 113: **Lift trucks in potentially flammable atmospheres**, 1996, Health and Safety Executive.
3. RC56: **Fire safety in the storage, handling and use of highly flammable and flammable liquids - Storage in drums and containers other than external fixed tanks**, 2014, Fire Protection Association.
4. RC8: **Recommendations for the storage, use and handling of common industrial gases in cylinders, including LPG**, 2012, Fire Protection Association.
5. RC59: **Fire safety when charging electric vehicles**, 2012, Fire Protection Association.
6. RC18: **Recommendations for fire safety in warehouses**, 2013, Fire Protection Association.
7. BS EN 60079-10-1: 2009, **Explosive atmospheres, Classification of areas, Explosive gas atmospheres**, British Standards Institution.
8. Regulatory Reform (Fire Safety) Order 2005, SI 2005 No 1541, The Stationery Office.
9. The Fire (Scotland) Act 2005, asp 5, The Stationery Office.
10. Fire Safety (Scotland) Regulations 2006, Scottish SI 2006 No 456, The Stationery Office.
11. Fire and Rescue Services (Northern Ireland) Order 2006, SI 2006 No 1254 (NI9), The Stationery Office.
12. Fire Safety Regulations (Northern Ireland) 2010, SI 2010 No 325 (NI), The Stationery Office.
13. **Business resilience: A guide to protecting your business and its people**, 2005, Fire protection Association.
14. The ROBUST software (Resilient Business Software Toolkit) may be found at <https://robust.riscauthority.co.uk>
15. BS 7671: 2008: **Requirements for electrical installations: IET Wiring Regulations, 17th edition**, incorporating amendment No 1: 2011, British Standards Institution.
16. HS(G)107: **Maintaining portable and transportable electrical equipment**, 2013, Health and Safety Executive.
17. **Code of Practice for In-service Inspection and Testing of Electrical Equipment**, 2012, IET.
18. BS EN 50272-1: **Safety requirements for secondary batteries and battery installations. General safety information**, 2010 British Standards Institution.
19. **Code of Practice 1. Bulk LPG storage at fixed installations. Part 1: Design, installation and operation of vessels located above ground**, 2009 (+ amendments 2012 and 2013), UKLPG.
20. **Code of Practice 1. Bulk LPG storage at fixed installations. Part 3: Examination and inspection**, 2012, UKLPG.
21. **Code of Practice 1. Bulk LPG storage at fixed installations. Part 4: Buried/mounded LPG storage vessels, 2008 + amendment 1**, 2013, UKLPG.
22. RC30: **Recommendations for the selection of electrical and non-electrical equipment for use in atmospheres containing flammable and explosive gases and vapours**, 2004, Fire Protection Association.
23. BS 5306-8: **Fire extinguishing installations and equipment on premises. Selection and positioning of portable fire extinguishers. Code of practice**, 2012, British Standards Institution.
24. BS 5306-3: **Fire extinguishing installations and equipment on premises. Commissioning and maintenance of portable fire extinguishers. Code of practice**, 2009, British Standards Institution.
25. BS 5839-1: **Fire detection and fire alarm systems for buildings. Code of practice for design, installation, commissioning and maintenance of systems in non-domestic premises**, 2013, British Standards Institution.
26. BS 5979: **Remote centres receiving signals from fire and security systems. Code of practice**, 2007, British Standards Institution.
27. **LPG Rules for automatic sprinkler installations (incorporating BS EN 12845: Fixed firefighting systems. Automatic sprinkler systems. Design, installation and maintenance, British Standards Institution)**, 2009, Fire Protection Association.
28. **Provision and Use of Work Equipment Regulations** 1998, SI 1998 No 2306, The Stationery Office.

FURTHER INFORMATION

1. L117: **Rider-operated lift trucks, operator training and safe use**, 2013, HSE.
2. INDG457: **Use lift trucks safely, advice for operators**, 2013, HSE.
3. FM 7-39: **Lift trucks, property loss prevention data sheet**, FM Global.
4. NFPA 505: **Fire safety standard for powered industrial trucks including type designations, areas of use, conversions, maintenance, and operations**, 2013, National Fire Protection Association.

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