FIRE SAFETY GUIDE FOR FORKLIFT TRUCK OPERATIONS

This document is designed to assist NFU Mutual customers in managing the fire risks associated with forklift trucks

NFU Mutual
RISK MANAGEMENT SERVICES

INTRODUCTION

Many fires are attributed to forklift trucks. Their use creates a range of fire hazards associated with the trucks, associated chargers, batteries, and the environment in which they operate with significant potential ignition sources including:

1. Electrical short circuiting
2. Sparks from electrical equipment
3. Exhaust systems
4. Heat emissions from engine components
5. Vehicles powered by flammable fuels which introduce the risk of leakage of diesel or LPG

Forklift trucks and chargers are often stored in warehouse environments with heavy fire loads that can aid rapid fire growth.

Careless use of forklift trucks may cause impact damage to passive fire protection measures such as fire doors/shutters, or the metal skins of composite panels which may contain a combustible insulation core. Impact damage may also be caused to active fire protection measures such as fire alarm systems, or sprinkler heads which could lead to escape of water and associated damage.

The following guidance covers some of the main fire safety considerations for fork-lift trucks and is also relevant to other mobile plant such as powered pallet trucks, sweepers, mobile elevated work platforms, and other specialist lifting equipment used in business premises. Automated systems and equipment are outside the scope of this guidance.

FIRE RISK ASSESSMENT

A fire risk assessment to be undertaken to identify and evaluate the potential for a serious fire at your premises. Responsibility for the fire risk assessment rests with occupiers and owners of business premises and should include the construction of the premises, working practices within, fire inception hazards, likely fire spread potential and the suitability and standard of fire protections including your fire alarm, fire doors, emergency lighting, escape signage and fire extinguishing appliances. The risk assessment to be carried out by a suitably competent person and any necessary control measures carried out to reduce the risk and effects of fire.

The selection of the correct type of forklift truck for the environment is essential to ensure the fire risk is mitigated as far as possible.

We recommend the local Fire & Rescue Service are invited to visit the premises to assess the water sources and familiarise themselves with the layout and the location of the premises.

ELECTRICAL INSTALLATION

Electrical testing of the fixed installation to be undertaken in accordance with the current edition of **BS7671 Requirements for Electrical Installations. IET Wiring Regulations** by a member of National Inspection Council for Electrical Installation Contractors (NIC EIC), who is regulated for commercial installations. The frequency of electrical inspection of the premises to be every 3 years in accordance with the recommendations of BS 7671 or Electricity at Work Regulations, or more frequently if advised by your electrician and any remedial action to be corrected without delay.

All fixed wiring systems to machines to be connected to an independent isolator or junction box fitted with an independent Residual Circuit Device (RCD) of suitable fuse rating.

Consider annual thermographic inspections, by a competent person, of the machinery and fixed wiring systems with any remedial action identified to be rectified without delay.

Further guidance can be found in the Fire Safety Guide for Electrical Installations

AUTOMATIC FIRE SUPPRESSION SYSTEMS

Consider fitting a direct, low pressure application, fixed fire suppression system to the machinery and electrical switch cabinets. Any such system to comply with **LPS1666: Requirements and test procedures for the LPCB approval of direct low pressure (DLP) application fixed fire suppression systems** and upon activation isolate the power supply and activate the fire alarm system via a relay switch. If lithium-ion batteries are present, it should be ensured that the extinguishment medium is appropriate.

Further guidance can be found at https://www.redbooklive.com/download/pdf/LPS1666-Issue-Direct-Low-Pressure-Application-Fire-Suppression-System-Standard.pdf

FIRE DETECTION

Consider installation of, or upgrading existing system, to an automatic fire alarm system conforming to **BS5839: Fire Detection and Alarm Systems for Buildings: Part 1: Code of Practice for Design installation, commissioning and maintenance of systems in non-domestic premises**, specifically designed to provide early warning fire detection. The fire alarm system should also give a warning remotely to nominated staff via an approved alarm receiving centre. A programme of testing, servicing, checking and maintenance in accordance with the installer's recommendations to be in place and documented.

Early smoke detection and monitoring for explosive and/or toxic gases produced by battery chargers to be considered, via the use of aspirating smoke detectors (ASD), in close proximity to the charger units. Activation of the ASD to isolate the power supply to the chargers and raise an alarm through the main fire alarm system.

PORTABLE FIRE EXTINGUISHERS

Suitable portable fire extinguishing appliances to be located throughout the premises, with at least one dry powder appliance located within the vicinity of any charging equipment. Regular inspection and maintenance to be undertaken and recorded by an approved supplier. Staff should be provided with instruction and training in the correct use of extinguishers.

BUSINESS CONTINUITY

Even a small fire can have a disproportionate effect on a business if it occurs in a critical piece of equipment/machinery. All businesses to therefore take steps to ensure the continued smooth running of the business by making a suitable emergency plan and carrying out a business impact analysis which can form the basis of a continuity plan to be put into place in the event of a loss.

GENERAL GUIDANCE

1. Lift trucks to be inspected regularly and subjected to preventive maintenance in strict accordance with the manufacturers' schedules. Lift trucks to be kept free of accumulations of oil, grease & easily ignitable materials such as fluff and dust. Non-combustible agents to be used for cleaning.
2. A competent person to make a daily start-up inspection to check for oil, fuel and hydraulic fluid leaks and the integrity of fuel lines. Checks to also be made to ensure battery connections and protective covers are in place following charging, and safety devices are operational. A visual inspection of the charging leads to be completed to ensure the connections and cable insulation are undamaged. All reported defects to be corrected before the equipment is used and records of the inspections to be retained.
3. The use of lift trucks to be restricted to personnel trained in their operation by an HSE accredited training body in accordance with the HSE Approved Code of Practice & Guidance "Rider Operated Lift Trucks – Operator Training & Safe Use" (L117) and HSG6 Safety in working with lift trucks.
4. Driving performance to be monitored and a record of each driver's training, refresher training, accidents and near incidents maintained, with the objective of preventing accidents and damage arising from careless driving
5. Protective covers and guards on the equipment to remain in place at all times during the operation of the unit, for example to prevent the build-up of hot material on exhaust pipes.
6. Adequate gangways and aisles to be maintained to facilitate safe truck operations.
7. Particular attention to be given to avoiding impact with fire doors, compartment walls, racking, protective coatings on structural steel, and other key elements of passive fire protection. Impact with composite insulated panels to be avoided, particularly if exposure to combustible insulated core materials is likely. The driving of unloaded forklift trucks with elevated forks to be prevented and impact protection, such as bollards or barriers, may be required near vulnerable access openings, plant or equipment.
8. The potential fire hazards of the materials being transported to be considered. For example, drums of flammable liquid to only be handled by lift trucks that are adapted for use in hazardous atmospheres.
9. When not in use forklift trucks to be kept in a designated area, preferably a detached building separated from any manufacturing or storage areas.
10. Keys to the vehicles to be removed when not in use to prevent unauthorised use.

LEAD–ACID BATTERY POWERED TRUCKS

1. To minimise the risk of fire, battery charging to be undertaken in a separate building of non-combustible construction, and only used for this purpose. Alternatively, an enclosed charging area separated by fire-resisting construction, including doors, and providing at least 60 minutes fire resistance to be installed. Care to be taken to ensure that piped services, ducts and cables passing through the walls, floors and ceilings of the compartment are suitably fire stopped to the same standard as the fire rating of the charging area walls and ceiling.
2. Where the above is impractical, charging to be confined to a designated area (or areas) which are kept entirely clear of combustible materials. A clearance of at least 1.5m to be maintained between the charging unit and truck and any proximate adjacent combustible materials/stock. This area is to be defined by barrier rails of adequate strength and/or by prominent floor markings.
3. Battery chargers to be supported on a non-combustible stand approximately 0.5m above a concrete floor or other non-combustible surface in order to prevent water damage. Alternatively, they could be securely wall-mounted against a non-combustible structure.
4. Battery chargers are not to be mounted on walls constructed with combustible insulated composite panels, and vehicle battery charging is not be undertaken within 3 metres of such panels unless:
5. Charger units are mounted on metal stands or brackets, at least 250 mm from the panels, which are not fixed directly to the panels; and
6. The panels behind the charger units are protected by non-combustible material such as metal checker plate extending at least 1m around the chargers.
7. Over-current and over-charge protection to be provided for all battery chargers and electrical connecting leads to be kept as short as possible to reduce the risk of accidental damage and unnecessary wear. Leads and connections to be maintained in good condition and inspected frequently.
8. Portable chargers (i.e. those with a 13-amp plug) are more susceptible to damage and are to be subject to regular visual inspection and formally inspected periodically, Portable Appliance Test (PAT), at least annually.
9. Hydrogen can be produced during charging, particularly under boost charging and where overcharging occurs, and this can present an explosion hazard. Manufacturer's guidance to be consulted to determine the appropriate ventilation requirements for the batteries being used. Battery charging areas are to be included in the fire and explosion assessment conducted in accordance with the Dangerous Substances and Explosive Atmospheres Regulations (DSEAR).
10. When charging is undertaken in enclosed areas, such as in buildings, adequate natural or mechanical ventilation to be provided: ATEX rated motors are likely to be required for mechanical ventilators. Where this cannot be achieved, hydrogen gas monitoring equipment to be installed, together with suitable interlocks to isolate the charging devices automatically in the event of gas accumulation beyond safe limits. Advice to be obtained from a specialist ventilation contractor.
11. All personnel authorised to change or charge batteries to be adequately trained and equipped and all tools used in the installation and maintenance of batteries to be suitable for the purpose, e.g. electrically insulated and acid resistant.

12. Suitable handling equipment, such as an overhead hoist, to be provided for the handling of batteries. Uncovered batteries to be covered with a suitable non-conducting material to prevent the hoist chain from shorting terminals or connections. Metallic items worn by operators (such as bracelets and neck chains) to be removed before working on a battery to prevent short-circuiting.
13. Hot work and the use of open flames to be prohibited in battery charging areas.

LITHIUM-ION BATTERY POWERED TRUCKS

1. If a lithium-ion cell reaches high temperatures or is subject to over-charging, the structure of the metal oxides can be damaged. This damage is highly exothermic, resulting in high energy release, producing oxygen and causing the electrolyte fluid to boil. This produces highly flammable gas. If the temperature increases to the flash point, thermal runaway (the process by which each cell bursts on ignition to ignite the next cell) starts. Extinguishing the fire is difficult because lithium-ion cells produce oxygen by themselves.
2. Owing to the risks associated with such batteries additional consideration to be addressed within the fire risk assessment. Consequently, the following control measures to be adopted in connection with lithium-ion batteries:

   Low level fire detection to be provided in the vicinity of any charging stations, as recommended by the fire alarm design company.
3. Purpose designed fire extinguishers for use on lithium-ion battery fires to be provided and fire wardens and staff to be trained in their safe use e.g. F500 EA approved extinguishers.
4. No charging to be undertaken when the premises are unattended.
5. The equipment to be subject to a full maintenance contract with competent contractors.
6. Only batteries approved by the equipment manufacturer to be used.
7. Ensure the equipment is suitable for cold/damp environments where applicable e.g. within cold or freezer stores.
8. Batteries to be checked and maintained regularly in accordance with manufacturers' instructions.
9. Excessive vibration of the batteries could increase the risk of fire. Ensure batteries are appropriately secured and vibration is kept to a minimum.
10. Any spare batteries to be kept in a purpose-built cabinet providing at least 60 minutes fire resistance.
11. Any damaged batteries to be immediately taken out of the building and removed to a distance of at least 10m from any buildings or plant.
12. During charging, and as much as possible when they are not in use, lift trucks to be contained in a fire rated container or cabinet with at least 90 minutes fire resistance, and sited as recommended by the supplier.

DIESEL

Diesel fuel to be contained in drums or proprietary oil tanks located in the open, away from buildings, and suitably bunded to contain leaks or spillages. Spill kits to be retained for emergency events. Re-fuelling to be undertaken in the open and in a suitably designated location. Diesel fuel to be dispensed from approved dispensing pumps but if emergency re-fuelling is necessary, approved safety containers may be used. Overfilling and spillage to be avoided. Fork-lift trucks to be switched off and the operator not to be on or in the vehicle during filling operations. Smoking and open flames to be prohibited in re-fuelling areas. Consideration to be given to how any fuel spillage would be able to be contained and cleared.

Particular care to be taken to ensure that the exhaust system, engine bay and other potentially hot surfaces to be kept entirely free from combustible items including loose waste material which may be drawn into the engine bay. Floors to, therefore, be kept as clean as possible. Where possible, spark arresters to be fitted to exhaust outlets.

LPG POWERED TRUCKS

1. LPG cylinder refilling to only be undertaken by trained personnel who are aware of the fire hazards.
2. The valve on the LPG cylinder to be closed when the truck is not in use.
3. The total quantity of LPG on the premises is to be kept to a minimum.
4. Where the LPG supply is in the form of a bulk tank for the refilling of cylinders, specialist advice concerning its installation, location and safe operation to be obtained from the installer.
5. Cylinders to be stored in a way and location outside the building that does not compromise fire safety. If storage of LPG cylinders in the open is not possible, a separate, designated, appropriately ventilated building to be used and LPG to be stored away from other highly flammable or oxidising agents. Prominent warning signs should be displayed at LPG storage areas.

Further guidance can be found in the document 'RC8 Storage, Use and Handling Of Common Industrial Gases in Cylinders' available on the RISCAuthority website, or from Liquid Gas UK – see https://www.liquidgasuk.org/.

For further information refer to Risk management programme for the safe use and storage of LPG Cylinders

FORKLIFT TRUCKS IN HAZARDOUS ENVIRONMENTS

In accordance with The Dangerous Substances and Explosive Atmospheres Regulations (DSEAR), the hazardous areas in all workplaces to 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 used in potentially explosive atmospheres, such as fork-lift trucks, to comply with the recommendations of HS(G)113 - Lift Trucks in Potentially Flammable Atmospheres. Only explosion proof fork-lift trucks may be used in such hazardous areas.

IMPORTANT NOTE:

The information contained herein is designed for guidance only and NFU Mutual cannot accept responsibility for any errors or omissions arising from its use. Should further guidance be required please contact our local NFU Mutual Regional or Branch office, or telephone Risk Management Services on 01789 202425.

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