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**Vehicles and mechanical handling  
equipment (MHE) in explosives  
facilities**



**UN SaferGuard**  
Securing ammunition, protecting lives

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## Foreword

Ageing, unstable and excess conventional ammunition stockpiles pose the dual risks of **accidental explosions at munition sites** and **diversion to illicit markets**.

The humanitarian impact of ammunition-storage-area explosions, particularly in populated areas, has resulted in death, injury, environmental damage, displacement and disruption of livelihoods in over 100 countries. Accidental ammunition warehouse detonations count among the heaviest explosions ever recorded.

Diversion from ammunition stockpiles has fuelled armed conflict, terrorism, organized crime and violence, and contributes to the manufacture of improvised explosive devices. Much of the ammunition circulating among armed non-State actors has been illicitly diverted from government forces.<sup>1</sup> In recognition of these dual threats of explosion and diversion, the General Assembly requested the United Nations to develop **guidelines for adequate ammunition management**.<sup>2</sup> Finalized in 2011, the International Ammunition Technical Guidelines (IATG) provide voluntary, practical, modular guidance to support national authorities (and other stakeholders) in safely and securely managing conventional ammunition stockpiles. The UN SaferGuard Programme was simultaneously established as the corresponding knowledge-management platform to oversee and disseminate the IATG.

The IATG also ensure that the United Nations entities consistently deliver high-quality advice and support – from mine action to counter-terrorism, from child protection to disarmament, from crime reduction to development.

The IATG consist of 12 volumes that provide practical guidance for ‘through-life management’ approach to ammunition management. The IATG can be applied at the guidelines’ **basic, intermediate, or advanced levels**, making the IATG relevant for all situations by taking into account the diversity in capacities and resources available. Interested States and other stakeholders can **utilize the IATG for the development of national standards and standing operating procedures**.

The IATG are reviewed and updated at a minimum every five years, to reflect evolving ammunition stockpile-management norms and practices, and to incorporate changes due to changing international regulations and requirements. The review is undertaken by the UN SaferGuard Technical Review Board composed of national technical experts with the support of a corresponding Strategic Coordination Group comprised of expert organizations applying the IATG in practice.

The latest version of each IATG module can be found at [www.un.org/disarmament/ammunition](http://www.un.org/disarmament/ammunition).

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<sup>1</sup> S/2008/258.

<sup>2</sup> See also the urgent need to address poorly-maintained stockpiles as formulated by the United Nations Secretary-General in his Agenda for Disarmament, *Securing Our Common Future* (2018).

## Introduction

The use of mechanical handling equipment (MHE), cranes and other vehicles in explosives storage areas, facilities or buildings presents an inherent risk of fire or explosion, which should be minimised. This IATG module provides guidance on the risk reduction measures to be taken when using MHE and other mobile equipment within, or close to, explosives facilities. The IATG also includes guidance to regulate their standards of design and manufacture.

## Vehicles and MHE in explosives facilities

### 1 Scope

This IATG module provides guidance on: 1) the risk reduction measures to be taken when using mechanical handling equipment (MHE) and other mobile equipment within or close to explosives facilities; and 2) the design and manufacture of MHE and vehicles to appropriate standards.

### 2 Normative references

A list of normative references is given in Annex A. These documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

A further list of informative references is given in Annex B in the form of a bibliography, which lists documents that contain additional information related to the contents of this IATG module.

### 3 Terms and definitions

For the purposes of this module the following terms and definitions, as well as the more comprehensive list given in IATG 01.40 *Glossary of terms, definitions and abbreviations*, shall apply.

The term 'national authority' refers to *the government department(s), organisation(s) or institution(s) charged with the regulation, management, co-ordination and operation of conventional ammunition management activities*.

In all modules of the International Ammunition Technical Guidelines, the words 'shall', 'should', 'may' and 'can' are used to express provisions in accordance with their usage in ISO standards.

- a) **'shall' indicates a requirement:** It is used to indicate requirements strictly to be followed in order to conform to the document and from which no deviation is permitted.
- b) **'should' indicates a recommendation:** It is used to indicate that among several possibilities one is recommended as particularly suitable, without mentioning or excluding others, or that a certain course of action is preferred but not necessarily required, or that (in the negative form, 'should not') a certain possibility or course of action is deprecated but not prohibited.
- c) **'may' indicates permission:** It is used to indicate a course of action permissible within the limits of the document.
- d) **'can' indicates possibility and capability:** It is used for statements of possibility and capability, whether material, physical or casual.

### 4 Categorisation of vehicles and MHE and permissibility in explosives areas (LEVEL 2)

IATG 05.40 *Safety standards for electrical installations* categorises buildings containing explosives according to the nature of explosives stored, handled or processed in the building. It also categorises electrical installations and equipment to be used in the building. A similar system should also be used to categorise vehicles and MHE permitted inside buildings containing explosives. Ancillary items in use with vehicles and powered mobile MHE shall also comply with the equivalent standards of the main equipment with which they are utilised.

This IATG module covers the following categories of equipment:

- a) forklift trucks;

- b) mobile cranes;
- c) fixed pedestal jetty cranes;
- d) travelling portal jetty cranes;
- e) ship and barge mounted cranes; and
- f) overhead travelling cranes.

This IATG module is not intended to cover the following:

- a) lifts;
- b) conveyors; or
- c) lifting gear used to attach the load to the crane hook.

#### 4.1 Vehicles permitted in categorised areas (LEVEL 2)

Table 1 summarises the types of vehicles that may be used in the various electrical category areas and zones:<sup>3</sup>

Category and Zones	Permitted	Design and Manufacture Specifications
Category A Zone 0	<ul style="list-style-type: none"> <li>▪ All vehicles and MHE shall be prohibited.</li> </ul>	
Category A Zone 1	<ul style="list-style-type: none"> <li>▪ Diesel powered vehicles</li> <li>▪ Diesel powered MHE</li> <li>▪ Electrically powered vehicles</li> <li>▪ Electrically powered MHE</li> </ul>	See Annex C
Category A Zone 2		
Category B Zone 20	<ul style="list-style-type: none"> <li>▪ Diesel powered vehicles</li> <li>▪ Diesel powered MHE</li> <li>▪ Electrically powered vehicles</li> <li>▪ Electrically powered MHE</li> </ul>	See Annex D
Category B Zone 21		
Category B Zone 22		
Category C	<ul style="list-style-type: none"> <li>▪ Diesel powered vehicles</li> <li>▪ Diesel powered MHE</li> <li>▪ Electrically powered vehicles</li> <li>▪ Electrically powered MHE</li> </ul>	See Annex E
Category D	<ul style="list-style-type: none"> <li>▪ All vehicles</li> </ul>	

Table 1: Vehicles and MHE permitted in electrical category zones

#### 4.2 Vehicle compatibility and categorised areas (LEVEL 2)

Different categories of military diesel powered vehicles, diesel powered mobile MHE, electrically powered vehicles and electrically powered mobile MHE are, in some cases, compatible, although some are not. Table 2 summarises the compatibility of different Category Type vehicles.

Category Area of Vehicle	Compatibility with other Area Categories							
	Cat A Zone 0	Cat A Zone 1	Cat A Zone 2	Cat B Zone 20	Cat B Zone 21	Cat B Zone 22	Cat C	Cat D
Cat A Zone 0	Yes	Yes	Yes	No	No	No	Yes	Yes
Cat A Zone 1	No	Yes	Yes	No	No	No	Yes	Yes

<sup>3</sup> See Clause 4 of IATG 05.40 *Safety standards for electrical installations* for definitions of category zones.

Category Area of Vehicle	Compatibility with other Area Categories							
	Cat A Zone 0	Cat A Zone 1	Cat A Zone 2	Cat B Zone 20	Cat B Zone 21	Cat B Zone 22	Cat C	Cat D
Cat A Zone 2	No	No	Yes	No	No	No	Yes	Yes
Cat B Zone 20	No	No	No	Yes	Yes	Yes	Yes	Yes
Cat B Zone 21	No	No	No	No	Yes	Yes	Yes	Yes
Cat B Zone 22	No	No	No	No	No	Yes	Yes	Yes
Cat C	No	No	No	No	No	No	Yes	Yes
Cat D	No	No	No	No	No	No	Yes	Yes

Table 2: Vehicles and MHE permitted in electrical category zones

### 4.3 Vehicles authorised to enter a potential explosion site (PES) (LEVEL 1)

Electrically operated vehicles and MHE shall always be preferable, from a safety viewpoint, to those operated by internal combustion engines. Electrically powered vehicles and powered mobile MHE can be permitted in a potential explosion site (PES) under certain specific conditions.

Petrol engines shall not be permitted in a PES. Diesel powered vehicles and diesel powered mobile MHE can be permitted in PES under certain conditions.

Diesel engines that have petrol starting systems, and vehicles powered by liquid petroleum gas (LPG), butane or propane operate under the same combustion/ignition conditions as petrol engines and shall not be permitted in any PES other than Category D.

Vehicles and powered mobile MHE authorised for use within a PES shall conform, as a minimum, to the conditions set out in Annexes C, D and E.

#### 4.3.1 Standard vehicles in a PES (LEVEL 1)

A standard, unprotected vehicle or powered mobile MHE may be brought into a Category C explosives area, holding yard or marshalling yard, but shall be subject to the restrictions detailed below:

- a) the area shall be authorised only for the storage and handling of qualified<sup>4</sup> explosives;
- b) there shall be no processing permitted;
- c) the unprotected vehicle shall be used only for the receipt or despatch of qualified explosives;
- d) the vehicle engine shall be stopped before loading or unloading commences and it shall not be restarted until the operation is complete and all explosives are secured;
- e) loading and unloading shall be performed by MHE that is of a suitable standard to enter the PES;
- f) the unprotected vehicle shall be inspected by a competent person to ensure that it is without defects before the vehicle is allowed to enter the explosives area. In particular, the inspection will cover the fuel, brakes, electrical and exhaust systems, ensuring that no leaks or hazardous condition exists; and
- g) should the vehicle emit sparks, its engine shall be turned off and the explosive packages offloaded prior to its immediate removal from the explosives area.

<sup>4</sup> See IATG 01.50 UN Explosive hazard classification system and codes.

#### **4.3.2. Standard vehicles in an explosives area but not a PES (LEVEL 1)**

Emergency vehicles shall be allowed access to explosives facilities, including during exercises. However, during an emergency, care must be exercised to ensure crews are not placed in jeopardy or are made aware of the hazards associated with the emergency.

Privately owned vehicles may enter an explosives area in order to move staff. They shall be equipped with a fire extinguisher and shall not present an increased fire risk. Authority for such vehicles is subject to the written permission of the head of the establishment. Privately owned vehicles are not allowed in a PES and shall be parked in designated car parks.

Contractors may be permitted to enter explosives facilities with vehicles and powered mobile MHE. Whenever possible, the requirements of this module shall be met. Should this not be possible, then further control measures shall be implemented.<sup>5</sup>

#### **4.3.3. Identification of mechanical handling equipment (LEVEL 1)**

All mobile MHE, including cranes, shall be clearly identified by a manufacturer's label, sign writing, plating or other suitable means to define the electrical category areas and zones (see Table 1) in an explosives facility in which it is cleared for use.

#### **4.3.4. MHE engines and fuel standards (LEVEL 2)**

Internal combustion engines shall be of the compression ignition (CI) type. Cold starting fluids shall only be used in a permanently installed system that injects fluid into the inlet air manifold downstream of the inlet flame arrestor. The length and bore dimensions of any cold start fluid injection jet shall be proportioned so that the jet is flameproof. Cold starting fluids shall not be used in conjunction with any electrical starting aids.

Diesel fuel shall have a flash point of not less than 55°C. Other fuels may be used in diesel operated internal combustion engines provided that the fuel has a flash point of not less than 38°C and the ambient temperature of the area in which the vehicle is working shall be at least 5°C below the flash point of the fuel. Allowance shall be made for solar heat gain where vehicles are working in strong sunlight. The auto-ignition temperature of either fuel is to be not less than 250°C. These temperatures shall be derived from internationally accepted test methods used by qualified test organisations. When additives are used in fuels, the flash point and auto-ignition temperature will normally be reduced and therefore allowances should be made for this during the test. Fuel and cold starting aid fluid shall only be carried in a fixed tank. No provision shall be made for the carriage of spare fuel or starting fluid.

#### **4.3.5. Tyres and ancillaries (LEVEL 2)**

The tyre of at least one road wheel shall be electrically conducting in accordance with the requirements of the national authority. All wheels on any one axle are to be fitted with tyres of the same type. Ancillary items in use with vehicles and powered mobile MHE are to comply with the equivalent standards as the main equipment with which they are utilised.

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<sup>5</sup> See IATG 06.60 *Works services (construction and repair)*.

#### **4.3.6. Electromagnetic compatibility (EMC) (LEVEL 2)**

All vehicles and powered mobile MHE shall be compliant with the requirements of IATG 05.60 *Hazards of electromagnetic radiation*. Equipment may be marked with the appropriate standards if the manufacturer states that it meets the requirements of a relevant EMC standard without an EMC test having been conducted. Those purchasing equipment shall therefore obtain test results for the equipment from the supplier/manufacturer to demonstrate compliance.

### **5 Lifting equipment not in regular use (LEVEL 2)**

All mobile cranes, ship or other mounted cranes of all kinds, and all cranes not in regular use, shall be subjected to the following tests before use:

- a) all pre-use checks recommended by the manufacturer;
- b) testing of every crane motion for several minutes without load, each motion individually at first then by a combination of two or more motions simultaneously as appropriate, and then repeating the test with an inert load on the crane. The load shall be at least equal to the maximum load to be handled. For mobile cranes the strength and stability of the crane at its location is important. The test shall include simulating the maximum reach the crane would be required to move the load;
- c) on floating cranes, the test lift and its load shall be repeated after any break of one hour or more, or at any time when required by the ship's captain, the nominated representative, the loading supervisor or master stevedore or the crane operator. The test lift shall be witnessed by a representative of both the loading and receiving parties; and
- d) assurance shall also be obtained that cranes not in regular use are adequately maintained and that the probability of failure shall be at least equal to that which the crane would be afforded if it was subject to regular use.

### **6 Safe working load (SWL) (LEVEL 1)**

The SWL shall not be exceeded under any circumstances other than those prescribed in the relevant test procedures. This situation shall only be permitted under the supervision of a competent person.

### **7 Management and control of MHE in explosives areas (LEVEL 2)**

All MHE and other lifting equipment used in explosives areas shall be authorised by the head of the establishment. They shall meet the requirements and restrictions of this IATG.

#### **7.1 Serviceability**

No unserviceable vehicle or powered MHE shall be permitted to enter any explosives facility. Particular attention shall be paid to exhaust systems. If a fault is discovered on any vehicle or MHE during use that affects safety, the vehicle or MHE shall be immediately withdrawn from use and removed from the operating area.

#### **7.2 Maintenance and testing**

Vehicles and powered MHE shall be maintained and subjected to periodic testing in accordance with the manufacturers' approved schedules and national authority approved regulations. Maintenance, tests and inspection are crucial elements involved in the safe operation of MHE. Adequate maintenance, tests and inspections will improve the overall condition of the MHE and lessen the possibility of accidents. This regime should also apply to any rail vehicles and appliances. The vehicle or MHE manufacturer shall provide maintenance schedules, which include the maximum performance limits and test criteria. These shall ensure the continuing effectiveness of any safety

devices or other safety features fitted. These test and maintenance schedules shall be incorporated into the national authority maintenance schedules. Vehicles and MHE for use in above ground and underground explosives facilities shall be properly maintained and periodically tested in accordance with these schedules.

#### **7.2.1. Exhaust system maintenance**

Particular care is to be taken when carrying out maintenance of exhaust systems on vehicles and MHE. Following any maintenance to the exhaust system, it should be reassembled with new gaskets and shall be tested for leaks before the equipment is allowed to be used. Exhaust system flame emission tests are not required during routine maintenance.

#### **7.2.2. Exhaust system modifications**

A spark arrester is any device which prevents the emission of flammable debris from combustion sources, such as internal combustion engines. Spark arresters play a critical role in the prevention of vegetation fire and the ignition of explosive atmospheres. Vehicles may be fitted with spark arresters as a precaution but fitment of such devices does not change the classification of vehicles permitted in categorised areas as captured in Table 1 above.

#### **7.2.3. Modifications (LEVEL 1)**

Modifications to vehicles and MHE shall not be carried out unless specifically authorised by the national technical authority.

#### **7.2.4. Firefighting equipment (LEVEL 1)**

Vehicles and powered MHE shall carry sufficient fire extinguishers of a type suitable for the fuel used, and which will also deal with electrical fires. Additional means of firefighting shall be available at garages, refuelling points and battery charging facilities.

### **7.3 Equipment breakdown**

If a breakdown, including failure to start readily, occurs near to a PES, the vehicle or MHE shall be off-loaded of any explosives before any repairs begin. Only minor repairs, sufficient to allow the vehicle or MHE to be moved, shall be permitted. If major repair *in situ* is required, the head of the establishment shall approve this after ensuring all precautions are taken to minimise the risk involved. However, the preferred option should be to have the vehicle or MHE towed or recovered to outside the explosives area.

### **7.4 Speed limits (LEVEL 1)**

The maximum speed limit within an above ground explosives area for each type of vehicle and MHE shall be designated by the head of the establishment, taking heed of the equipment manufacturers' guidelines. As a guideline, it is recommended that the maximum speed limit in an underground storage should be 8 kph and in above ground storage 16 kph. Speed limits should be clearly indicated by signs or notices and highlighted within local orders.

### **7.5 Loading and unloading operations**

During loading and unloading operations, the engines of all load carrying road vehicles shall be switched off unless the engine is required to facilitate the loading or unloading of the vehicle, e.g. a forklift truck, lorry mounted crane etc.

## **7.6 Parking and garaging**

### **7.6.1. Parked vehicles and parked vehicles loaded with ammunition**

Vehicles and powered mobile MHE should not be left unattended in a PES or in an explosives area. Parked vehicles loaded with explosives shall be treated as a PES as required by IATG 02.20 *Quantity and separation distances*.

### **7.6.2. Garaging**

Garaging in an above-ground explosives facility should not be within the inter-magazine distance (IMD) of any PES.

Vehicles and MHE used in underground sites should be garaged at a selected area above ground. Should this not be possible then the head of the establishment should authorise a selected area underground that is sited as far as possible from the explosives.

## **7.7 Refuelling of vehicles and MHE (LEVEL 1)**

Vehicles and MHE shall only be refuelled at authorised above-ground refuelling points and fuel tanks shall not be filled beyond the specified capacity. No spare fuel shall be carried.

Where refuelling points are authorised in underground sites, the fuel shall be taken underground in approved containers in sufficient quantities for one day's work only. The refuelling point should have a floor of concrete which is impervious to fuel and have a suitable method of spillage containment sufficient to ensure that 100% of a spillage can be contained, and that any surge resulting from the sudden release of fuel is also contained. It should also have an adequate ventilation system.

## **7.8 Ventilation**

Should vehicles and MHE be permitted in an explosives building, adequate ventilation shall be provided to ensure 100% removal of exhaust fumes. This is a critical personnel safety issue. See also Clauses 7.7 and 7.9.

## **7.9 Battery charging and battery maintenance (LEVEL 1)**

The batteries of electrically powered vehicles and electrically powered mobile MHE shall be maintained and charged only at authorised locations. The maintenance and charging of some types of batteries can produce hydrogen gas, which is explosive, and therefore the process shall be viewed as dangerous. After battery charging, the MHE should stand for a minimum period of 1 hour before entering an explosives area.

## **8 MHE operator instructions**

Formal instructions should be developed for MHE operators to cover the following:

A) ammunition and explosives shall be handled in a manner so as to prevent shock or friction that may cause a fire, explosion or damage to the material. These materials shall not be thrown, dropped, dragged, or tumbled over floors or over other containers;

B) containers of bulk ammunition and explosives shall be handled carefully to avoid rupture of the containers or the container seams and to prevent undue friction between the containers;

C) MHE shall be kept clean at all times;

D) the load shall be checked before fully lifting the forks or moving the MHE. Only stable or safely arranged and secured loads shall be handled;

E) more than one pallet or container should never be lifted unless it is strapped together as a unit load and is within the rated capacity of the MHE; and

F) it is the responsibility of all personnel operating MHE to be aware of unsafe conditions. All unsafe conditions or materials shall be reported.

## **Annex A** **(normative)** **References**

The following normative documents contain provisions, which, through reference in this text, constitute provisions of this part of the guideline. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of the guideline are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO maintain registers of currently valid ISO or EN:

- a) IATG 01.40 *Glossary of terms, definitions and abbreviations*. UNODA;
- b) IATG 01.50 *UN Explosive hazard classification system and codes*. UNODA;
- c) IATG 02.20 *Quantity and separation distances*. UNODA;
- d) IATG 05.40 *Safety standards for electrical installations*. UNODA;
- e) IATG 05.60 *Hazards of electromagnetic radiation*. UNODA; and
- f) IATG 06.60 *Works services (construction and repair)*. UNODA.

The latest version/edition of these references should be used. The UN Office for Disarmament Affairs (UNODA) holds copies of all references<sup>6</sup> used in this guideline and these can be found at: [www.un.org/disarmament/un-safeguard/references](http://www.un.org/disarmament/un-safeguard/references). A register of the latest version/edition of the International Ammunition Technical Guidelines is maintained by UNODA, and can be read on the IATG website: [www.un.org/disarmament/ammunition](http://www.un.org/disarmament/ammunition). National authorities, employers and other interested bodies and organisations should obtain copies before commencing conventional ammunition management programmes.

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<sup>6</sup> Where copyright permits.

## **Annex B**

### **(informative)**

## **References**

The following informative documents contain provisions, which should also be consulted to provide further background information to the contents of this guideline:

- a) AASTP-1, Edition B, Version 1. *NATO Guidelines for the Storage of Military Ammunition and Explosives*. NATO Standardization Organization (NSO). December 2015.  
<http://nso.nato.int/nso/nsdd/listpromulg.html>;
- b) DSA03.OME part 2 provides for the safe storage and processing of Ordnance, Munitions and Explosives (OME). UK MOD. November 2020; and
- c) NFPA 505. *Fire Safety Standard for Powered Industrial Trucks Including Type Designations, Areas of Use, Conversions, Maintenance, and Operation*. National Fire Protection Association. USA. (Also see Tables C.1 and D.1 for CEN Standards).

The latest version/edition of these references should be used. The UN Office for Disarmament Affairs (UNODA) holds copies of all references<sup>7</sup> used in this guideline and these can be found at: [www.un.org/disarmament/un-safeguard/references](http://www.un.org/disarmament/un-safeguard/references). A register of the latest version/edition of the International Ammunition Technical Guidelines is maintained by UNODA, and can be read on the IATG website: [www.un.org/disarmament/ammunition](http://www.un.org/disarmament/ammunition). National authorities, employers and other interested bodies and organisations should obtain copies before commencing conventional ammunition management programmes.

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<sup>7</sup> Where copyright permits.

## Annex C (informative) Special requirements for Category A area MHE

### C.1 Authorised vehicles in a Category A PES

Diesel powered vehicles, diesel powered mobile MHE, electrically powered vehicles and electrically powered mobile MHE are authorised to enter a Category A Zone 1 PES (for Category 2G vehicles) and Category A Zone 2 PES (for Category 2G and 3G vehicles). However, they shall comply with the minimum applicable national technical authority standards. Recommended European (EN) standards are listed below in Table C.1.

EN Standard #	Title
EN 1127-1:1998	Explosive atmospheres – Explosion prevention and protection – Basic concepts and methodology.
EN 1175: 1998	Safety of industrial trucks – Electrical requirements.
EN 1755: 2000	Safety of industrial trucks – Operation in potentially explosive atmospheres – Use in flammable gas, vapour, mist and dust.
EN 1834-1: 2000	Reciprocating internal combustion engines - Safety requirements for design and construction of engines for use in potentially explosive atmospheres - Part 1: Group II engines for use in flammable gas and vapour atmospheres.
EN 1834-2:2000	Reciprocating internal combustion engines - Safety requirements for design and construction of engines for use in potentially explosive atmospheres - Part 2.
EN 60079-10:1996	Classification of hazardous areas.
EN 60079-14:1997	Electrical installations in hazardous areas (other than mines).
EN 60079-17:1997	Inspection and maintenance of electrical installations in hazardous areas (other than mines).
EN 12895:2000	EMC.

**Table C.1: Technical design and construction standards for Category A vehicles and MHE**

### C.2 Temperature restrictions

The maximum surface temperature of any part of the vehicle or powered mobile MHE shall be specified for the potentially explosive atmosphere that is anticipated but shall not exceed T4 (135°C).

## Annex D (informative) Special requirements for Category B (dust) area MHE

### D.1 Authorised vehicles in a Category B PES

Diesel powered vehicles, diesel powered mobile MHE, electrically powered vehicles and electrically powered mobile MHE are authorised to enter a Category B Zone 11 PES (for Category 2D vehicles) and Category B Zone 22 PES (for Category 2D and 3D vehicles). However, they shall comply with the minimum applicable national technical authority standards. Recommended European (EN) standards are listed below in Table D.1.

EN Standard #	Title
EN 1127-1:1998	Explosive atmospheres – Explosion prevention and protection – Basic concepts and methodology.
EN 1175: 1998	Safety of industrial trucks – Electrical requirements.
EN 1755: 2000	Safety of industrial trucks – Operation in potentially explosive atmospheres – Use in flammable gas, vapour, mist and dust.
BS EN 50281:1999	Electrical apparatus for use in the presence of combustible dust. 1-1 Electrical apparatus protected by enclosures – Construction and testing. 1-2 Electrical apparatus protected by enclosures – Selection, installation and maintenance. 2-1 Test methods for determining minimum ignition temperatures.
EN 12895:2000	EMC.

**Table D.1: Technical design and construction standards for Category B vehicles and MHE**

### D.2 Temperature restrictions

The maximum surface temperature of any part of the vehicle or powered mobile MHE shall be specified for the potentially explosive atmosphere that is anticipated but shall not exceed T4 (135°C).

## **Annex E** (informative) **Special requirements for Category C area MHE**

### **E.1 Authorised vehicles in a Category C PES**

Diesel powered vehicles, diesel powered mobile MHE, electrically powered vehicles and electrically powered mobile MHE may be authorised to enter a Category C PES subject to the restrictions detailed within this Annex. They shall also comply with the minimum applicable national technical authority standards. Recommended requirements are:

- a) the maximum surface temperature of any part of the vehicle or powered mobile MHE shall not exceed T4 (135°C). This requirement may be met by shielding which is designed to prevent explosives coming into contact with any surface whose temperature exceeds 135°C;
- b) the surface temperatures of components under the covers of the powered mobile MHE in its normal operating condition shall be as low as is reasonably practicable but shall not exceed T3 (200°C);
- c) an approved spark arrestor shall be fitted to the exhaust system;
- d) the air intake system shall be fitted with a dry air cleaner;
- e) a cold starting aid, which ignites fuel in the air intake manifold, if fitted, shall have an approved flame trap between the air cleaner and the cold start device;
- f) the engine shall be fitted with oil pressure loss and high coolant temperature warning devices, or an automatic shut down device;
- g) the EMC performance shall be to national authority specifications with a recommendation of EN12895:2000; and
- h) vehicles shall be clearly marked clearly 'Category C – All Areas'.

