



Department of the Air Force
HQ AEDC (AFMC)
Arnold AFB, TN 37389

Safety, Health, and Environmental Standard

Title: PYROPHORIC FUELS

Standard No.: E4

Effective Date: 11/30/2010

The provisions and requirements of this standard are mandatory for use by all personnel engaged in work tasks necessary to fulfill the AEDC mission. Please contact your safety, industrial health and/or environmental representative for clarification or questions regarding this standard.

Approved:

Contractor/ATA Director
Safety and Health Group

Air Force Functional Chief



Safety, Health, and Environmental Standard

PYROPHORIC FUELS

1.0 INTRODUCTION/SCOPE/APPLICATION

- 1.1 Introduction – This standard discusses basic hazards, storage, and transfer.
- 1.2 Scope – Explosive safety principles in this standard apply to pyrophorics only when they are mixed with Department of Transportation (DoT) Hazard Class (HC) 1 explosives such as rocket propellants or munitions items and/or explosives. Otherwise DoT regulations and manufacture handling instructions apply. When there are any conflicts noted between this standard and industry or national codes, standards or regulatory requirements, the operating contractor shall notify the government.
- 1.3 Application – This standard applies to pyrophoric fuels (i.e., TEA (Triethylaluminum), TEB (Triethylboron), TMA (Trimethylaluminum) and Silane.

2.0 BASIC HAZARDS/HUMAN FACTORS

The hazardous properties of TEB, TEA, TMA, and Silane are similar, but there are some minor differences. Additional information on pyrophorics is available from the AEDC Operation, Maintenance, Information Management, and Support Contractor Safety and Health Group or Environmental Management Group or via the Sentinel MSDS manager maintained by Environmental Management and accessible from the AEDC internal web.

Pyrophorics are classified as DoT HC 2 through 4. Silane is designated HC 2, flammable gas; TEA and TEB are designated HC 3, flammable liquid; and TMA is designated HC 4, flammable solids. Pyrophoric fuels, by themselves, are not considered to be explosive products. When mixed with HC 1 explosive materials, they do not contribute to the net explosive weight of the HC 1 material. QD requirements only apply for pyrophorics when they are mixed with HC 1 explosives and then the predominant hazard takes precedence i.e. HC 1. Pyrophorics are given the compatibility group (CG) designation L similar to the CG-L given to some HC 1 materials. This CG-L designation allows pyrophorics to be stored with HC 1 materials which are also designated CG-L.

2.1 Fire Hazards

- 2.1.1 Pyrophorics ignite immediately on contact with air or water. In case of spills, fire can be temporarily controlled by Dry Chemical, Carbon Dioxide (CO₂), extinguishing agents or Dry sand. Water or halogenated fire-extinguishing agents **MUST NOT** be used.
- 2.1.2 Persons fighting fires or entering spill areas must wear standard turnout suits with a self-contained breathing apparatus.

2.2 Health Hazards

- 2.2.1 Acute poisoning by inhalation of pyrophorics is unlikely to occur since the vapor may ignite spontaneously at lower concentrations than those required to cause toxic reactions.
- 2.2.2 Exposure to pyrophorics may result in thermal burns. Even small amounts released or escaping into the air can produce skin, eye, and respiratory tract irritation and adverse effects to the central nervous system, such as dizziness, headaches, and drowsiness. Liquid pyrophorics cause severe burns on contact with the skin.
- 2.2.3 If fire results from a spill of large quantities of pyrophoric fuel in an enclosed area, oxygen deficiency of the atmosphere may occur, and harmful products of combustion will contaminate the air. Persons entering this area must wear air-supplied respirators equipped with escape bottles or self-contained breathing apparatus until the area is thoroughly ventilated. Use area oxygen meters to check for oxygen deficiencies. Industrial Hygiene should determine potential toxic problems.

3.0 DEFINITIONS/TERMS

Pyrophoric – A Substance, chemical or chemical compound that will spontaneously ignite when exposed to an oxidizing agent or air.

Turnout Suit – An Ensemble which affords adequate protection to personnel engaged in fire fighting operations.

4.0 REQUIREMENTS/RESPONSIBILITIES

4.1 Requirements

4.1.1 First Aid

- 4.1.1.1 If pyrophoric material is splashed on the skin, immediately remove all contaminated clothing including shoes while flushing the skin with large amounts of water. If pyrophorics are splashed in the eyes, begin immediate eye irrigation for at least 20 minutes. Report burns immediately to the Dispensary on first shift or the Fire Hall on second and third shifts for follow-up treatment.
- 4.1.1.2 High volume safety showers and eye fountains must be conveniently located for operating personnel. See AEDC Safety Standard B8, Safety Showers and Eye Fountains.
- 4.1.1.3 Safety [MSDS] information must be posted at sites where pyrophorics are used. Information about pyrophorics can be obtained on the AEDC Environmental website.

4.1.2 Storage

- 4.1.2.1 Pyrophorics may be stored in the same locations as HC 1 explosive materials designated CG-L. CG- L materials **MUST NOT** be stored with any other HC 1 compatibility group explosives.
- 4.1.2.2 Pyrophorics must be stored in the shipping container in which they are received. They must be kept under an inert atmosphere such as dry nitrogen or argon. Carbon dioxide must not be used as a blanket or purge gas because of its electrostatic properties. Keep pyrophoric fuels and oxidizers separated in accordance with NFPA 30.
- 4.1.2.3 Storage buildings must be of noncombustible construction, be well ventilated and kept dry.

4.1.3 Handling and Transfer

- 4.1.3.1 Persons transferring pyrophorics and who manually operate valves, etc., or perform work on systems containing small quantities of pyrophorics must wear fire retardant coveralls, fire retardant apron, gloves, safety glasses, face shield, and a hard hat. Leather shoes or rubber boots may be worn if the tops are high enough to be covered by trouser legs.
- 4.1.3.2 For transferring larger quantities of pyrophorics, full-coverage fuel handler's suits must be worn. Suits must be designed to permit quick removal.
- 4.1.3.3 Use explosion proof equipment, natural or explosion proof ventilation adequate to ensure concentrations are kept below exposure limits.
- 4.1.3.4 An eye wash station suitable for the materials being handled must be readily available. All employees who work with pyrophorics must know the location of and how to operate eye wash stations.
- 4.1.3.5 Ensure all metal parts are grounded during handling and transfer operations to avoid ignition by static electricity.

4.2 Responsibilities

4.2.1 Functional Manager and/or Project Engineer - Ensures operations involving pyrophorics comply with manufacturer's requirements for storage, handling, transport and disposition. In addition, ensures MSDS is available and that all employees involved in pyrophorics operations understand the hazards.

4.2.2 Supervisor - Ensures personnel are trained and briefed on the hazards and operations involving pyrophoric material. In addition, ensures operations involving pyrophoric material comply with manufacturer's instructions and requirements.

4.2.3 Operating Contractor Safety Office -- Provides assistance in the development and implementation of projects/operations involving pyrophoric materials.

5.0 Training - Personnel working with pyrophoric material must be trained.

6.0 Inspection/Audits

Contractor Safety will conduct periodic required inspections of test facilities involved in pyrophoric testing

7.0 REFERENCES

- 7.1 AEDC Safety, Health and Environmental Standards
- 7.2 AFMAN 91-201, Explosives Safety Standard