



Exploration & Production

GENERAL SPECIFICATION

SAFETY

GS EP SAF 341

Location and protection of onshore hydrocarbon storage

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01	10/03	Change of Group name and logo
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1. Scope

1.1 Purpose of the specification

The purpose of this specification is to define the requirements for the location and the protection of onshore hydrocarbon storage atmospheric tanks and pressure vessels. Hydrocarbon storage systems can be sorted out in three categories:

- Tanks for the storage of liquid hydrocarbons
 - Fixed roof tanks
 - Floating roofs tanks
 - Internal floating roof tanks.
- Pressure vessels for storage of liquefied hydrocarbons (LPG storage)
 - Above-ground
 - Underground or under-embankment.
- Refrigerated vessels at atmospheric pressure for storage of liquefied hydrocarbons (LNG, LPG, ethane, ethylene), **not covered by this specification**.

Storage tank safety requirements depend on various elements impacted safety and detailed below. It shall be verified at the various project stages that all these inputs have been adequately addressed and that none of their possible consequences on the safety of the tank farm itself, the installation to which it pertains and public beyond the boundaries of the facility have been overlooked.

- Fluid category (or class) of hydrocarbons stored (French classification is used in the development that follows)
- Associated transfer operations
- True vapour pressure at storage temperature
- Type of storage tanks or vessels (above or underground, fixed or floating roofs)
- Capacity of the storage tanks or vessels (individual, in a bund, overall in the installation)
- Impact on inhabited or public places and traffic (roads and railways)
- Vicinity of other storage installations, process facilities, public and fire-fighting facilities.

The present specification is not a design code and must not be used as such; its scope is restricted to safety related issues as follows:

- Layout (refer to **chapter 4**)
 - Maximum capacity of storage
 - Safety distances.
- Containment (refer to **chapter 5**)
 - Containment control
 - Gas detection
 - Bunding.

- Fire control (refer to **chapter 6**)
 - Passive fire protection and active fire-fighting means (in agreement with the fire scenarios mentioned in the SAFETY CONCEPT and **GS EP SAF 253**)
 - Fire-fighting application rates and times.

1.2 Applicability

This specification applies to onshore installations only. As a general rule, it shall apply to new installations and to major modifications or extensions of existing installations. Some countries impose retroactive application for LPG storage.

This specification does **not** cover:

- Storage of liquefied hydrocarbons refrigerated at atmospheric pressure
- Storage of miscellaneous liquid hydrocarbons commonly required for the processing or utilities, such as jet fuel, diesel oil, methanol, glycol, treatment chemicals, etc.
- Storage tank passive fire protection (refer to **GS EP SAF 337**)
- Under-water storage of hydrocarbons
- Mobile storage facilities
- Transfer operations.

2. Reference documents

The reference documents listed below form an integral part of this General Specification. Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published at the EFFECTIVE DATE of the CONTRACT.

There is no international regulation covering storage tank safety related matters. Local regulations shall be referred to where existing and as applicable.

In the absence of any local regulation, practice is to follow this general specification **GS EP SAF 341**. Where local regulations are less stringent than the present specification, this latter shall apply, unless a derogation dossier has been submitted to, and approved, by COMPANY.

Standards

Reference	Title
BS 5146	Inspection and test of valves
BS 6755	Testing of valves

Professional Documents

Reference	Title
API Publ 2510A	Fire Protection Considerations for the Design and Operation of LPG Storage Facilities

API RP 2001	Fire Protection in Refineries
API RP 2003	Protection against ignitions arising out of static, lightning and stray currents
API RP 2021	Fighting Fires in and Around Flammable and Combustible Liquid Atmospheric Storage Tanks
API Std 620	Design and construction of Large, Welded, Low-pressure Storage Tanks
API Std 650	Welded Steel Tanks for Oil Storage
API Std 2000	Venting Atmospheric and Low Pressure Storage Tanks
API Std 2510	Design and Construction of LPG Installations
GESIP 91/01	Commentaires sur le projet de règles d'aménagement et d'exploitation des dépôts d'hydrocarbures liquides
GESIP 93/04	Incendie des grandes cuvettes, prévention et stratégies d'intervention
GESIP 93/10	Recommandations pour systèmes de fermeture de canalisation en pied de bac

Regulations

Reference	Title
NFPA 11	Low-Expansion Foam
NFPA 11A	Medium- and High-Expansion Foam Systems
NFPA 11C	Mobile Foam Apparatus
NFPA 15	Fixed Water Spraying Systems
NFPA 16	Installation of Deluge Foam - Water Sprinkler and Foam - Water Spray Systems
NFPA 20	Fire-water Pumps
NFPA 30	Flammable and Combustible Liquids Code
NFPA 31	Oil Burning Equipment
NFPA 58	Standard for the Storage and Handling of LPG
NFPA 59	Standard for the Storage and Handling of LPG at Utility Gas Plants
Arrêté du 4/9/1967	Règles d'aménagement et d'exploitation des usines de traitement de pétrole brut, de ses dérivés et résidus
Arrêtés du 9/11/1972 et du 19/11/75	Règles d'aménagement des dépôts d'hydrocarbures liquides et liquéfiés
Arrêté du 10/5/1993 (fluid category A2)	Stockage de gaz inflammables liquéfiés sous pression

Instructions Ministérielles PRME 89/61.679 C and 680 C du 9/11/1989 and subsequent clarifications by GESIP	Dépôts anciens de liquides inflammables Dépôts de gaz combustibles liquéfiés.
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Codes

Reference	Title
IP Code Part 3	Refining Safety Code
IP Code Part 9	Liquefied Petroleum Gas
IP Code P9	Large Pressure Storage and Refrigerated LPG

Other documents

Reference	Title
	Safety Concept Statement Of Requirements (SOR)

Total General Specifications

Reference	Title
GS EP SAF 021	Layout of installations
GS EP SAF 228	Safety rules for drainage systems
GS EP SAF 253	Impacted, restricted areas and fire zones
GS EP SAF 312	Guidelines for selecting and installing fire and gas detection systems
GS EP SAF 321	Fire pump stations and fire-water mains
GS EP SAF 334	Foam fire extinguishing systems
GS EP SAF 337	Passive fire protection

3. Terminology and definitions

Atmospheric storage	Storage of hydrocarbons such as the True Vapour Pressure @ storage temperature is less than 1.6 bara (French regulation).
Atmospheric tank	Storage tank designed to operate at pressures ranging from atmospheric to 3500 Pa g (0.5 psig), measured at the top of the tank (NFPA).
Bund	Area that is surrounded by embankments and/or walls, in order to confine the spillage of hydrocarbons from the storage tanks or vessels. "Bund" has the same meaning as the American wording "dike".

Equivalent storage capacity

The equivalent storage capacity is defined as the sum of all the fixed and mobile capacities, multiplied by the following factors:

- Fluids categories B, C1 and D1: 1
- Fluids category C2: 1/3
- Heavy fuel-oils: 1/15
- Fluids category D2: 0

Fluid category

As per **French** regulation, hydrocarbons fluids are sorted as follows:

- **Fluid category A:** liquefied hydrocarbons with True Vapour Pressure (TVP) > 1 bara. at 15°C
 - A1: Liquefied at $t < 0^{\circ}\text{C}$
 - A2: Liquefied in other conditions.
- **Fluid category B:** liquid hydrocarbons with flash point < 55°C
- **Fluid category C:** liquid hydrocarbons with: $55^{\circ}\text{C} \leq \text{flash point} < 100^{\circ}\text{C}$
 - C1: Storage temperature above flash point
 - C2: Storage temperature below flash point.
- **Fluid category D:** liquid hydrocarbons with: $100^{\circ}\text{C} \leq \text{flash point}$:
 - D1: Storage temperature above flash point
 - D2: Storage temperature below flash point.

As per **American** regulation (**NFPA**), hydrocarbons fluids are classified as follows:

- **Fluid class IA:** liquid having a flash point below 22.8°C:
 - IA: Atmospheric boiling point below 37.8°C
 - IB: Atmospheric boiling point above 37.8°C.
- **Fluid class IC:** Liquid having a flash point at or above 22.8°C and below 37.8°C.
- **Fluid class II:** Liquid having a flash point at or above 37.8°C and below 60°C.
- **Fluid class IIIA:** Liquid having a flash point at or above 60°C and below 93°C.
- **Fluid class IIIB:** Liquid having a flash point at or above 93°C.

As per **British** regulation, hydrocarbons fluids are classified as follows:

- **Fluid class 0:** Liquefied Petroleum Gases (LPG).
- **Fluid class I:** liquid hydrocarbon with a flash point below 21°C.
- **Fluid class II:** liquid hydrocarbon with a flash point above 21°C but below 55°C
 - II(1): Stored below flash point