

GENERAL SPECIFICATION

SAFETY

GS EP SAF 521

**Safety specific requirements for LNG onshore
liquefaction plants and export**

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1. Scope

1.1 Purpose

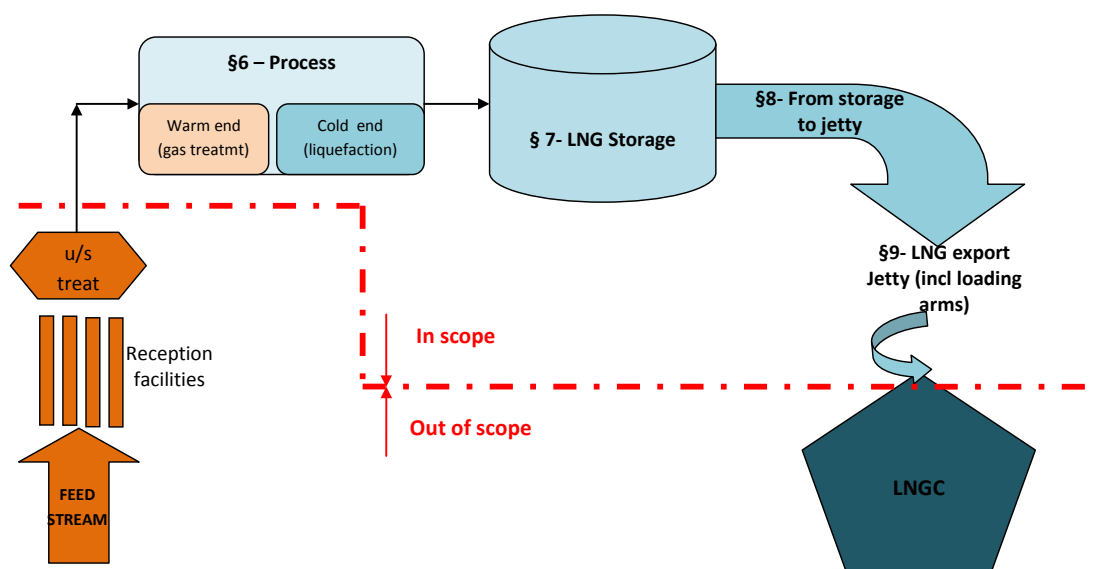
The purpose of this General Specification is to define the specific Safety requirements for onshore natural gas liquefaction plants and associated export terminals.

This specification contains:

- A set of **generic requirements** generally applicable to LNG plants as a whole and handled hazardous substances (§ 4 and 5)
- Sets of **specific requirements** applicable to functional units/parts of LNG facilities (§ 6 to 9)

This specification is written by exception, it addresses primarily the features of LNG processing induced hazards management by either prescriptions or recommendations of adequate design barriers. For other conventional hazards of the oil and gas industry - as well present in a LNG plant (e.g. such as upstream treatment, LPG storage ...) – the other Company General Specifications remain fully applicable unless explicitly amended or superseded by the present GS.

Figure 1: scope of GS EP SAF 521



1.2 Applicability

This specification is not retroactive.

This specification applies to new or major modification on onshore natural gas liquefaction plant and associated LNG export terminal constructed by the Company or affiliates. It can also be applied to other companies of which the Group is a shareholder and which request the application of the E&P Standards on their project. This specification lays down Exploration &

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Production requirements with respect to provision of service, execution of work and supply of equipment and material.

Safety requirements for LNG ships are outside the scope of this specification to the extent they are covered by the IGC code and the other various IMO conventions.

Addressed in this document	Not addressed in this document
Onshore liquefaction plant	Reception facilities, Upstream treatment
LNG storage	LNG carrier
Jetty installation up to the LNG loading arm flange between shore/ship	LNG regasification plant
	LNG peak-shaving plants
	Small scaled LNG plants for supply and distribution
	Pressurized LNG tanks (> 500 mbar)

Requirements for **security** are not covered in this document. ISPS shall be followed from the earliest stage of development.

2. Reference documents

The reference documents listed below form an integral part of this General Specification.

The main reference of this GS is [EN 1473](#). The purpose of this document is hence to amend, complete, change or emphasize on specific requirements.

External Documents

Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published at the effective date of this document.

Reference	Title
IALA-AISM	International Association of Marine Aids to Navigation and Lighthouse Authorities
EN 1160	Installations and Equipment for Liquefied Natural Gas: General Characteristics of Liquefied Natural Gas.
EN 12065	Installations and Equipment for Liquefied Natural Gas - Testing of Foam Concentrates Designed for Generation of Medium and High Expansion Foam and of Extinguishing Powders Used on Liquefied Natural Gas Fires.
EN 14620-1 to 5	Design and manufacture of site built, vertical, cylindrical, flat-bottomed steel tanks for the storage of refrigerated, liquefied gases with operating temperatures between 0 °C and -165 °C -.
EN 1473	Installation and equipment for Liquefied Natural Gas – Design of onshore installations
EN 12308	Installations and equipment for LNG - Suitability testing of gaskets designed for flanged joints used on LNG piping
Eurocode 2	Design of concrete structures
ICS	Tanker Safety Guide: Liquefied Gas, Appendix 8
IMO FSS Code	International Code for Fire Safety Systems, chapter 2.
IP Code, Part 15	Area classification Code 2005- 3rd edition.
ISGOTT	International Safety Guide for Oil tankers and Terminal
SIGTTO	Society of International Gas Tanker and Terminal Operators. Liquefied Gas Handling Principles on ships and in terminals, figure 5.17) - McGuire and White: Guidelines for the alleviation of excessive surge pressures on ESD
Cut LNG Storage Costs	By Hashemi, H.T. & Wesson, H.R. Hydrocarbon Processing Vol. 50 n°8 August 1971 p.117-120
ISO 28460	Petroleum and natural gas industries — Installation and equipment for liquefied natural gas — Ship-to-shore interface and port operations
NFPA 59A	Standard for the Production, Storage, and Handling of Liquefied Natural Gas (LNG)
MTMSA	Marine Terminal Management and Self Assessment (OCIMF)
49 CFR Part 193	Liquefied Natural Gas Facilities ; Federal Safety Standards

Total General Specifications

Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published in the applicable yearly collection.

Reference	Title
GS EP ELE 032	Design of earthing and bonding systems and lightning protection for Onshore installations
GS EP SAF 021	Layout
GS EP SAF 216	Area classification
GS EP SAF 228	Liquid drainage
GS EP SAF 253	Impacted area, restricted area and fire zones
GS EP SAF 261	Emergency Shutdown and Emergency De-Pressurisation (ESD & EDP)
GS EP SAF 311	Rules for the selection of fire-fighting systems
GS EP SAF 312	Fire and gas detection systems
GS EP SAF 321	Fire pump stations and fire water mains
GS EP SAF 322	Fixed fire water systems
GS EP SAF 334	Foam fire extinguishing systems
GS EP SAF 351	Escape, evacuation and rescue from fixed installations

3. Terminology and definitions

There are three types of statements in this specification, the “shall”, “should” and “may”, statements. They are to be understood as follows:

Shall Is to be understood as mandatory. Deviating from a “shall” statement requires derogation approved by Company

Should Is to be understood as strongly recommended to comply with the requirements of the specification. Alternatives shall provide a similar level of protection and this shall be documented

May Is to be understood as permission

Note that “**will**” is not to be understood as a statement. Its use is to be avoided, unless it is necessary to describe a sequence of events.

For the purpose of this specification, the following definitions shall apply:

BLEVE	Boiling Liquid Expanding Vapor Explosion: sudden rupture due to fire impingement of a vessel and/or system containing liquefied gas under pressure; the pressure burst and the flashing of the liquid to vapor creates a blast wave and potential missile damage. In case of flammable gas, immediate ignition of the expanding fuel-air mixture leads to intense combustion creating a fireball. It is caused by the rupture of the vessel metal strength due to heat competing with the increasing pressure of the liquefied gases inside the vessel.
Boil-Off / Boil-off gas / B.O.G	Vaporisation of a liquid due to the heat transfer into a cargo transported or stored near its boiling point. The vapors generated are called boil-off gas or B.O.G.
Brittle fracture	Fracture of a material caused by lack of ductility, usually with very little plastic deformation. One possible cause of brittle fracture can be exposure of the material to low temperatures.
Cargo	Volume of liquid hydrocarbons that has been loaded or to be loaded onboard a ship.
Cargo manifold	The piping, valves and flanges through which LNG ships receive and discharge their cargo. Located close to midship.
Colloidal concrete	Concrete with Low Thermal Transfer Coefficient.
Credible scenario or event	Incident likely to occur within a concerned area. Used for the definition of fire zones. Consequences corresponding to a credible event of a given fire zone shall not impact other fire zones (Company).
Cryogenic	Product at temperature below -150°C
Cold	From -29°C to -150°C
Custody transfer	The process by which ownership or custody of a cargo is transferred between contracting parties, usually before loading or discharging. This includes the measurement of volume, temperature and composition. It may include a quality check in a form of an on-line strainer to make sure that the transferred cargo is debris free.
Determine	Means make an appropriate investigation using scientific methods, reach a decision based on sound engineering judgement, and be able to demonstrate the basis of the decision (49 CFR Part 193).
Dike	A structure used to establish an impounding area or containment. (NFPA 59A)
Drip tray	Container located under flanges, valves or a tank to collect the eventual dripping resulting from a leak.

Dry-break coupling	Device fitted in a hard-arm and installed between two valves to provide a means of quick disconnection with a very small amount of cargo spillage in case of an emergency. The action of the dry-break coupling is usually hydraulically controlled and is interlocked with the actuation of the two valves. In LNG system, is known as well as Powered Emergency Release Coupler (PERC).
EDP Sector	Emergency Depressurisation Sector : Sub-fire zone within LNG train
Emergency depressurisation (EDP)	Control actions undertaken to depressurise equipment or process down to a pre-defined threshold (generally 7 barg or 50% of design pressure) in a given period of time (generally 15 minutes) in response to a hazardous situation (ISO + Company).
Emergency Release System (ERS)	System that provides a positive means of quick release of transfer arms and safe isolation between ship and shore, following a predefined procedure including an emergency shut-down (ESD) (EN 1473) NOTE The operation of the emergency release system can be referred to as an "ESD II" for marine operators (not to be confused with "ESD2" for onshore.
ESD	Emergency Shut-down
ERS	Emergency Release System
Export terminal	The tank farm and the jetty facilities associated with a liquefaction plant.
Fender	Resilient device, usually movable, interposed between a ship's hull and harbour walls or other ships to minimise impact and prevent direct contact, thus reducing risk of structural damage or chafing. Often of rubber compound or pneumatic construction. The fender panels are usually covered with pads having low friction coefficients (typically polyethylene resin pads).
Fire zones	Area within the installation where equipment is grouped by nature and/or homogeneous level of risk attached to them. The partition of an installation into fire zones results in a significant reduction of the level of risk. This implies that consequences of a fire, flammable gas leak or an explosion corresponding to the credible event likely to occur in the concerned fire zone, shall not impact other fire zones to an extent where their integrity could be put at risk (Company)
Foam concentrate ratio	Ratio generally expressed in percentage of the foam concentrate volume over the solution (water + concentrate) volume.
Foam expansion ratio	The ratio between the resulting volume of foam and the volume of solution (water and foam concentrate).

Hazardous Area	A hazardous area is defined as a three dimensional space in which a flammable atmosphere may be expected to be present such frequencies as to require special precautions for the control of potential ignition sources (IP Code, Part 15). All other areas are referred to as non-hazardous areas in this context. In a hazardous area three types of zones (0, 1 and 2) are recognised (IP Code, Part 15). (Company)
HAZID	HAZard IDentification: Set of methods to identify the potential hazards and mitigation measures of an installation.
Impacted area	Area that extends beyond the boundaries of the installation but which is nevertheless affected either permanently by normal operation of the facility (e.g. noise or radiation) or exceptionally by the consequences of an emergency situation caused by a major failure (Company)
Import terminal	The jetty facilities and the tank farm associated with a regasification plant.
Impounding area	An area defined through the use of dikes or the site topography for the purpose of containing any accidental spill of LNG or flammable refrigerants (NFPA 59A).
International Shore Fire Connection	A Firewater connection defined by the ISGOTT (see § 26.5.3) which may be used to supply firewater to the LNG ship from the jetty or from a fire fighting vessel / tug to the firewater network of the jetty trestle or jetty head.
Jetty	In this document this word includes the jetty head, the mooring dolphins, the breathing dolphins and the trestle.
Liquefaction plant	This term is limited to the gas pre-treatment, heavy components removal and liquefaction. It does not include the storage tanks nor the jetty facilities which are defined as "export terminal".
Liquefied gas	A liquid which has a saturated vapor pressure exceeding 2.8 bar absolute at 37.8°C formed by refrigeration, pressurisation or a combination of both and certain other substances of similar characteristics specified in the IMO Gas Code.
Liquefied Natural Gas (LNG)	A colourless fluid in the liquid state composed predominantly of methane and which may contain minor quantities of ethane, propane, nitrogen or other components normally found in natural gas (EN 1160-1).
Liquefied Petroleum Gas (LPG)	Propane or butane or a mixture of both stored at or very near the atmospheric pressure.
LOA	Length OverAll

Loading Control Room	Room from where loading operations are controlled, e.g. cooling, start-up, ramping, shutdown, warm-up.... It handles LNG process matters and general safety matters. It has usually no control on marine matters (mooring tension, mooring hooks release....) but may be informed of the latter via a monitoring display or by radio. Depending on the site, the Loading control room may be located outside the jetty, but in all cases the functionality should remain available in case of fire or explosion.
Lower Flammability Limit (LFL)	Lower concentration of gas (by volume and expressed in percentage) in a gas-air mixture that will form an ignitable mixture. Lower Flammability Limit: 5% vol. In air for pure methane. For any mixture or other product it shall be recalculated as it may vary significantly with the composition.
Marine Control Room	Room from where marine activities are monitored and when applicable controlled, i.e., approaching, berthing, mooring tension monitoring, mooring hooks emergency release.... It handles marine activities and safety matters related to the ship, the jetty and traffic nearby. It has usually no process control functionality but may be informed via a monitoring display or by radio. Depending on the site, the Marine control room may be located outside the jetty, but the functionality should be available.
MAIP	Maximum Allowable Incidental Pressure
MOV	Motorized Operated Valve
Major failure	A conceivable incident that can possibly occur on the facility. Used for the definition of the facility restricted area and impacted area (Company)
MCHE	Main Cryogenic Heat Exchanger. Heat Exchanger inside which the natural gas is mainly liquefied and in some cases subcooled. The exchanger may be of a spiral wound type (SWCHE) or of plate-fin type (PFHE). In practical, MCHE is more referred to SWCHE.
Marine restricted area	Refer to restricted area (marine) below.
Missiles	When a metallic structure, (vessels, piperack...) fails violently due to excessive internal pressure or as a result of an explosion, the metal is often torn into several pieces that are propelled some distance away by the sudden release of the overpressure. These pieces are commonly referred to as missiles or projectiles.
Mounded	Describes a horizontal cylindrical tank covered with a layer of earth or equivalent material.
OBE	An Operating Basis Earthquake is the maximum earthquake event for which no damage is sustained and restart and safe operation can continue. NOTE This higher probability event would result in no commercial loss to the installation and public safety is assured (EN 1473)

OCIMF	Oil Companies International Marine Forum
Perlite	A very light natural mineral insulation material produced by heat treatment of volcanic stones. It is used as insulation in LNG tanks.
PAGA	Public Address and General Alarm
PERC:	“Powered Emergency Release Coupler” see “dry break coupling” above.
PFHE	Plate-Fin Heat Exchanger.
PMS	arm Position Monitoring System.
Port Authority	The Authority (person or body) empowered to exercise effective control in a port area, which is responsible for port services and facilities and collecting port charges.
Pressurised liquefied gas	Liquefied gas (here generally propane or butane or a mixture of both) stored at ambient temperature under its own vapor pressure (opposite to refrigerated gases).
Property line	Actual or virtual fence inside which the Company controls and is responsible for all activities. It includes the industrial area defined as “restricted area” and other areas under the control of the Company such as administrative buildings, warehouses, parking lots, security house, scrap yard... etc. The “public” is supposed to have free access on the outside of the property line except if prohibited or limited by the local authorities. In case of virtual fence (on sea, river, channel, muddy waters, swamp...), the actual physical barrier may be well inside the property line but other means (e.g. navigational aids, poles) shall inform the public of the location of the actual property line.
Quick Connect /Disconnect Coupler (QC/DC):	A means of connecting the hose or arms to the vessel's cargo manifold without the requirement for bolts. It may be hydraulically or manually operated.
Rapid Phase Transition (RPT)	Over-pressurisation without combustion that can occur under certain circumstances when quantities of LNG have been put in contact with water.
Refrigerated liquefied gas	Liquefied gas stored at or near atmospheric pressure. Its temperature corresponds to its saturated temperature at this pressure (alternative to pressurised liquefied gas).
Roll-over	The situation where the stability of two, inverted, stratified layers of liquid of differing densities is disturbed, resulting in a spontaneous rapid mixing of the layers, accompanied by a violent vapor evolution.
Restricted area (on land / trestle / jetty head)	Area within the boundaries of the installation and hence under the control of Company, affected permanently by normal operation of the facility or exceptionally by the consequences of an emergency situation caused by a major failure (Company)

Restricted area (marine)	Area around the jetty in which no unauthorized traffic is allowed to enter NOTE 1 This may vary according to jetty operations and security levels. NOTE 2 There may also be a land-use planning exclusion zone, in which no public permanent human activity is allowed. (ISO 28460)
Ship's cargo manifold	The flanged pipe assembly mounted on board ship to which the outboard flange of the loading arms is connected.
Sloshing	Movement of liquid in a container due to outside motion such as sea swell or earthquake.
SSE	A safe shutdown earthquake (SSE) is the maximum earthquake event for which the essential fail-safe functions and mechanisms are designed to be preserved. NOTE Permanent damage can be accepted, but without the loss of overall integrity and containment. The tank would not remain in operation without a detailed examination and structural assessment (EN 14620-1 to 5)
Submerged pumps	A type of centrifugal pump commonly installed on LNG ships and at terminals in the bottom of a ship cargo tank or a storage tank. It comprises drive motor, impeller and bearings totally submerged by the cargo when the tank contains bulk liquid of good dielectric characteristics. If the cargo conducts electricity, the electrical motor has to be enclosed and made tight.
Sub-deluge zone	Group of modules (selected according to the location of the fire scenario) that shall be deluged simultaneously in the event of a specified fire scenario
Surface Emissive Power	Fraction of the total available heat energy that is emitted as radiation. It is expressed in kW/m ² . This is the power emitted from a flame as radiation per surface unit.
Surge pressure	A phenomenon generated in a pipeline system when there is a sudden change in the rate of flow of liquid in the line (e.g. due to a valve closure). Surge pressure can be dangerously high if the change of flowrate is too rapid and the resultant shock wave can damage pumping equipment and cause rupture of pipelines and associated equipment.
SWCHE	Spiral Wound Cryogenic Heat Exchanger (see MCHE).
Terminal	Includes jetty head, jetty trestle and related storage.
Thermal bowing effect	Bending of a pipe due to different temperatures on the upper part and the lower part of the pipe. Known under the nickname of "banana effect".
Validated software	A software - whose basic theory is widely accepted by the industry, - whose mathematical problem solving method is widely accepted by the specialists and covers all the application domain of the software, - which has been calibrated and tested with real experiments on an industrial or semi-industrial scale.

Vapor barrier	A thin watertight lining placed on top of insulation to prevent the ingress of water / sea mist vapor.
Vapor displacement	Release of vapors that had previously occupied space above liquid fuels stored in tanks. These releases occur when tanks are emptied and filled.
VCE	Vapor Cloud Explosion

4. General requirements for layout

The general layout principles are defined in [GS EP SAF 021](#).

4.1 General arrangement

Facilities shall be arranged into the following fire zones:

- Liquefaction train(s) (one fire zone per process train which includes warm end, cold end and refrigeration loops)
- LNG Storage tanks (one fire zone for each set of tanks built at the same time)
- Jetty head berth (one fire zone per berth, if multiple berths)
- Utilities
- Flare(s)

Depending on the project, the following facilities could be part of the scope. In that case, they shall be arranged in dedicated fire zones:

- Refrigerant make up storage tanks
- Reception Facilities
- Upstream Treatment (e.g. condensate extraction)
- Power Generation
- LPG facilities (to be split in adequate fire zones)
- Condensate facilities (to be split in adequate fire zones).

Support facilities (admin, workshop, warehouse, central control room, fire station and fire water pumping and storage facilities, etc) are located in the general service area. The general service area shall be located outside the plant restricted area (defined in [GS EP SAF 253](#)).

Specific layout requirements for process areas, storage tanks and export terminals are given in **Sections 6, 7, 8 and 9**, respectively.

Security requirements shall be followed and layouts shall be reviewed by Company Security department.

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4.2 Safety distances on LNG plants and export terminal

During screening or conceptual phase default safety distance values may be used, following **GS EP SAF 021** and the Appendices listed below:

1. Around jetty head (Refer to **Appendix 1**)
2. Jetty head and loading lines (Refer to **Appendix 2**)
3. LNG storage tanks (Refer to **Appendix 3**)
4. Liquefaction plant (Refer to **Appendix 4**)
5. Minimum spacing for LNG facilities (Refer to **Appendix 5**)

These safety distance values shall be confirmed / cross checked by calculation when data specific to the project is available. Those safety distances and associated hazardous effects threshold values shall be calculated based on **GS EP SAF 253** considering the LNG specific properties (Refer to [EN 1160-1](#)).

5. General mitigations and cautions

5.1 Mitigation measures in case of LNG spillage

5.1.1 LNG spillage detection

The potential consequences of losing containment and subsequently releasing the cryogenic hazard present in LNG plants imposes to provide dedicated means of cryogenic spills detection on top and over the conventional F&G detectors. Low temperature detection shall be provided where such spills can occur, in particular in impounding basins. Gas detectors can also contribute to detect LNG spills and must be located taking account of the buoyancy of cold LNG vapors.

5.1.2 Reduction of the vaporization rate

It is recommended that areas likely to be exposed to LNG spillage be covered by a low thermal transfer coefficient material such as colloidal concrete

Impounding basin shall be provided with high expansion foam (500:1) triggered by low temperature detection.

5.1.3 Reduction of distance to LFL

Potential means to reduce distance to LFL are:

- High expansion foam
- Water curtains: may as well reduce the distance to the LFL by creating turbulence, hence increasing the mixing with warmer air and the dilution of the vapor cloud. The water flow rate should be the one recommended as a minimum by [EN 1473](#).

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5.1.4 LNG Spillage on ground / ditches / containment on land

Refer to **GS EP SAF 228** for high volatility hydrocarbon liquids open drain principles and to subsections dedicated to spillage containment.

Wherever there is a risk of liquid LNG spillage, gravel, sand, raw earth and the like are not accepted as ground cover as they increase the vaporization rate (high specific heat transfer and large surface of thermal exchange). Only concrete is acceptable with a preference to colloidal concrete (this excludes interconnecting piping between fire zones, assumed to be fully welded).

5.1.5 LNG Spillage on structure

Cold splash protection shall be applied on critical structural steel members where there is potential risk of brittleness of the steel due to the cooling effect of the released product. The geometrical extent of the cold splash protection shall be determined by simulation of the liquid leak jet using the credible leak scenario.

The cold splash protection shall give a protection to the effects of the cold splash, for a duration evaluated in the risk analysis.

The cold splash protection system shall be able to withstand the atmospheric boiling temperature of the product while maintaining the temperature of the steel structure above the structure's brittle fracture temperature.

Supports shall not be in thermal contact with LNG lines. Supports shall be specifically designed so that the insulation material around the pipes acts as well as an insulator of the support from the cold temperature.

Structural beams in the plant which could be exposed to LNG spillage / splash (flange leak, small bore piping failure...) shall be adequately protected. If fireproofing is also required, the same product may be used if tests have demonstrated satisfactory results when the product has been subjected to thermal shocks (ambient to cryogenic temperatures followed by exposure to fire).

In addition, safety mobile equipment (fire extinguishers, powder mobile containers, resuscitators, etc.), most of them being made from carbon steel, shall be stored / located in areas which are not likely to be splashed by liquid LNG or other cryogenic products.

5.2 ESD / EDP considerations

5.2.1 Emergency Shut-Down

ESD activation shall put the fire zone(s) at risk in a safe state. Actions such as electrical and equipment shut-down, ESD valves operation to their fail safe position in order to contain inventories have to be taken.

ESD activation in the plant or at the jetty head can be summarized as follows:

Emergency shutdown (ESD) – plant	Control actions undertaken to shutdown equipment or process in response to a hazardous situation. (ISO) System that safely and effectively stops the whole plant or individual units to minimise incident escalation (EN 1473)
Emergency shutdown (ESD) – jetty head	Closes the arm Motor Operated Valve, the PERC valves, opens the vent and stops cargo and vapor transfer. This is possible through the ESD ship/shore link.

All ESD shall be activated by the ESD system upon confirmed loss of containment. ESD triggering shall be automatic on confirmed detection of fire, gas leak **or LNG spillage**. A voting logic shall be implemented to avoid spurious trips.

ESD shall comply with [EN 1473](#) and [GS EP SAF 261](#).

5.2.2 Emergency depressurisation

The rules stated in [GS EP SAF 261](#) for liquefied gases shall apply. The EDP actuation should be manual from the Central Control Room and interlocked with a permissive to EDP instruction from the ESD system.

Temperature decrease due to depressurization should be considered for equipment design.

5.3 Mitigation measures in case of gas leak or fire

As a rule, the design of the active protection systems shall promote and enable activation of the systems from a safe area, preferably from the control room. This supposes that all necessary elements allowing doing a remote precise diagnostic of the situation (e.g. presence and spread of liquid cryogenic spill, presence and location of fire) and making an informed decision are put at board operators' disposal with an adequate design of the Fire and Gas (and spill) detection system including with CCTV visual aids.

5.3.1 Cooling of adjacent equipment (deluge, spray, artificial fog, monitors, water curtains)

Water shall never be in contact with LNG, therefore the deluge actuation or the actuation of firewater monitors should **not** be automatic in LNG area. Operation team has to assess the need to actuate the deluge or firewater monitor.

The surface emissive power of burning LNG vapors is far higher than the surface emissive power of other hydrocarbons. When calculating the deluge water flow, this characteristic shall be taken into account so that the protected equipment is always covered by a water layer. Standard flow for deluge system for standard hydrocarbons is given in [GS EP SAF 322](#).

For small units, man-actuated firewater monitors can be used. For those small units, monitors at ground level are preferred to monitors located on platforms.

5.3.2 Fire suppression and reduction of heat radiation

Large LNG fire should not be preferably extinguished as soon as the LNG leak has not been stopped and dispersion of flammable gas is not under control. Initial extinction may create a