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Contents

1 Subject of specification 3

2 Scope of validity 3

2.1 Deviations 3

3 Documents hierarchy 3

4 Environment requirements: 3

5 Fire and explosion hazards in refinery facilities, terminals and fuel stations 4

5.1 The basic elements of the fire protection system in the LOTOS Group Refinery 4

5.2 Requirements concerning the location of equipment, installations and process facilities 5

5.2.1 Immediate isolation of hydrocarbon supply to dangerous vessels of the process installation in case of fire shall be provided by electrically operated cut-off valves (MOV) installed on supply pipelines to such installations and controlled locally (local cassette should be fireproof) and from the adequate Control Room. 5

5.2.2 The minimum distances between vessels and equipment in process installations in petroleum processing plants : 6

6 Guidelines for the selection of fire extinguishing and protecting equipment 7

6.1 Classification of fire extinguishing and protection equipment 7

6.1.1 Foam extinguishing systems (fixed and semi-fixed) 7

6.1.2 Deluge systems 9

6.1.3 Fixed steam extinguishing systems 11

6.1.4 Fixed gas, aerosol and water mist extinguishing systems 11

6.1.5 Extinguishers 12

6.1.6 Fire alarm and detection systems 12

7 Extinguishing media 13

8 Fire water supply 13

9 Fireproofing 13

10 Fire roads 14
11 Fire and explosion protections of technical, process, utility equipment and installations 15
12 Guidelines for carrying out maintenance, testing and inspection of fire protection equipment 15
13 Technical documentation 16
14 Relevant documents 16
15 Codes and standards 16
16 Record of changes 18

1 Subject of specification

This specification used in conjunction with Standard Technical Specifications of the LOTOS Group establishes the minimum requirements for the design, selection and fabrication of fire-fighting equipment.

2 Scope of validity

This specification applies to the preparation of tender documents, inquiries and contracts concerning new investments and modernisation projects planned by LOTOS Group.

It shall also be a basis for preparing detailed specifications and inquiries for individual or packaged supplies.

2.1 Deviations

Any deviation from this specification and the relevant specifications, standards and related documents including proposals, which the bidders claims to be economically and / or technically superior solutions must be submitted in writing for review and approval by Grupa LOTOS SA. Non-approved exceptions are not acceptable by Grupa LOTOS SA.

The supplier must report in writing any ambiguity in this or any other specifications of Grupa LOTOS SA or non-compliance with the referred documents / standards and obtain a written explanation of Grupa Lotos SA.

3 Documents hierarchy

In case of conflicts existing between this specification and other documents, the following order of precedence shall govern:

- The current Polish legislation,
- Terms of purchase order / contract and other requirements agreed in writing with GLSA,
- Data Sheets approved by GLSA,
- This specification,
- Other specifications,
- Drawings and others documentations,
- Standards.

4 Environment requirements:

- Atmosphere: marine, aggressive industry, chemical, dust,
- Ambient temperature (max/min): +36 °C / -25 °C,
- Relative humidity (max/min): 90 % / 70 %,
- Ground elevation: 1 m above sea level,
- Wind speed: 26 m/s,
- Operating conditions: refinery, seaside,

- Prevailing wind directions: from south and south-west.

5 Fire and explosion hazards in refinery facilities, terminals and fuel stations

The LOTOS Group Refinery processes and stores petroleum products. These substances can cause great fire, explosion and toxic hazards. Spaces where substances that can produce explosive mixtures with air are used, produced or processed are considered to be explosion hazard zones. The explosion hazard assessment of rooms and outdoor spaces includes the indication and determination of explosion hazard zones.

5.1 The basic elements of the fire protection system in the LOTOS Group Refinery

- LOTOS Fire Brigade Ltd. [LOTOS Straż Sp. z o. o.],
- Alarm Point – LOTOS Fire Brigade headquarters,
- Fire water pumping station, capacity 60 m^3/min at a pressure of 12.5 bar (g); During normal operation only jockey pump is running (Q = 1.3 m^3/min at a pressure 6 bar (g)),
- Fire water reservoir No. 1, capacity 10 000 m^3 from the refinery's own intake on the river Motlawa and from the rainwater pools of the refinery sewage water treatment plant,
- 5 water reservoirs 1 000 m^3 each, located in the refinery area,
- An underground fire water ring network with operating pressure from 6 to 12.5 bar (g), fitted with 2-, 3- and 4-hose connections hydrants, spaced not more than 50 m from one another (DN 110/75),
- Foam and water spray systems (fixed and semi-fixed),
- High capacity water supply point (DN 150),
- Water and foam monitors of a water capacity of 2 400 l/min, with a foaming agent reservoir of a capacity of 1 000 litres, for process installations,
- Fire extinguishers and fire blankets located outdoor within installations and buildings,
- Fireproofing,
- Alarm system consist of manual call point (push buttons) located within the refinery area, with the signal sent to the Control Room and the Alarm Point,
- Smoke detectors and flame detectors located in selected places, with the signal sent to the Control Room and the Alarm Point,
- Hydrocarbon concentration detectors located within installations. Exceeding the threshold concentrations activates the alarm system,
- Hydrogen sulphide concentration detectors located within some installations. Exceeding the threshold concentrations activates the alarm system,
- Alarm and dispatcher telephones enabling direct connection with the Alarm Point or the Control Room,
- Radiotelephones enable constant contact between the Control Room and the plant personnel,
- A loudspeaker system transmitting information from the Control Room,
- Emergency lighting.

5.2 Requirements concerning the location of equipment, installations and process facilities

To adopt an adequate fire protection method for process facilities, a fire scenario should be developed, assuming the occurrence of only one fire at one time in the fire zone under consideration.

Fire risk assessment and analysis must be carried out to reduce the size of fire, casualties, damage to the environment and property, and to define protective measures.

The risk assessment must identify and assess fire and explosion hazard created by the process, equipment and used petroleum products.

The classification of explosion hazard zones can be found in technical specification No. 1020.

Fire and explosion characteristics and classifications shall include the following:

- The substance name,
- Place of storage, processing,
- Quantity (mass, volume),
- Temperature class,
- Flash point,
- Auto ignition temperature,
- Explosive group,
- Lower explosive level,
- Upper explosive level.

The location of vessels and equipment must take into account the following:

- Requirements resulting from safety and fire protection regulations,
- Requirements resulting from the process needs and equipment operation,
- Requirements resulting from the classification of explosion hazard zones,
- Requirements regarding possibilities of carrying out effective rescue operations,
- Requirements regarding access roads and assembly yards used for transport, erection and maintenance purposes,
- Requirements regarding safe access for erection, dismantling and maintenance of equipment.

5.2.1 Immediate isolation of hydrocarbon supply to dangerous vessels of the process installation in case of fire shall be provided by electrically operated cut-off valves (MOV) installed on supply pipelines to such installations and controlled locally (local cassette should be fireproof) and from the adequate Control Room.
Others actuators then MOV may be also considered.

Such cut-off valves should be applied for equipment including:

- Volume of LPG is greater then 8 cubic meters, or,
- Volume of hydrocarbons at temperature higher then flash point is greater then 10 cubic meter, or,
- Volume of heavy hydrocarbons (C5+) is greater then 15 cubic meters.

Valves and actuators should meet hydrocarbon fire resistance minimum EI 30, control and power cables should meet hydrocarbon fire resistance minimum EI 30 (in case when underground routing is

not possible) and additionally equipped with fireproof cover. Fire resistance class should be defined individually, taken into account the required MOV work time during the fire or other hazard.

5.2.2 The minimum distances between vessels and equipment in process installations in petroleum processing plants :

	Group number	1	2	3	4	5	6	7	8	9
Group No.	Equipment name	Minimum distance (meters) between equipment groups								
1	Fired heaters and other equipment for heating liquids and gaseous product with heat of combustion	3	10÷15	10÷15	10÷20	10÷15	10÷15	20	10	15
2	Distillation, rectifying, absorption and gas fractionating columns, regenerators in catalytic processes, scrubbers, oxidisers, water and gas separators, sedimentation tanks, wet scrubbers, air-tight buffer tanks etc.	10÷15	Dmax	20	10	3	2	5	4	2
3	Heating oil tanks in a process installation.	10÷15	20	Dmax	10	5	5	10	10	3
4	Operating rooms, pumping stations of cold and hot products, control and measuring instruments	10÷20	10	10	10	5÷8	5÷8	10÷15	8	10
5	Box-type condensers and coolers	10÷15	3	5	5÷8	1	1	5	4	3
6	Heat exchangers, tube condensers, evaporators functionally connected with process installations	10÷15	2	5	5÷8	1	Dmax	5	4	3
7	Gas compressors connected with process installations	20	5	10	10÷15	5	5	3	5	5
8	Air compressors, water pumping stations within process installations	10	4	10	8	4	4	5	3	5
9	Individual pumps outside pumping stations	15	2	3	10	3	3	5	5	1

6 Guidelines for the selection of fire extinguishing and protecting equipment

The basis for the design of fire extinguishing and protecting equipment shall be a proper evaluation of the fire and explosive hazard. The evaluation shall be the basis for determining the parameters of the fire-fighting system and the type of the extinguishing medium.

The selection of the extinguishing medium shall be determined by:

- the type of process equipment,
- the type, quantity and form of the flammable material,
- the equipment operating temperature and the flash point and auto ignition temperatures of the flammable material,
- the equipment operating pressure.

The selection of the type of the extinguishing equipment shall be determined by:

- the distribution of the flammable material and the way it is stored,
- fire propagation speed,
- the operating potential of LOTOS Fire Brigade,
- the presence of the personnel,
- the type of the extinguishing medium used,
- the type of the process equipment.

A proper evaluation of the fire and explosion hazard allows to determine the necessary scope of the design of fire extinguishing and protection equipment.

Fire fighting equipment and extinguishing medium must have proper certificates allowing usage in Poland and Europe (including CNBOP conformity declaration and certificate). The certificates must be attached to As – built documentation

Moreover, products used in foam installations are subject of a written acceptance by LOTOS Group.

6.1 Classification of fire extinguishing and protection equipment

- Foam extinguishing systems (fixed and semi-fixed),
- Deluge systems,
- Fixed steam extinguishing systems,
- Clean agent systems, aerosols and water mist systems,
- Fire extinguishers,
- Fire alarm and detection systems.

6.1.1 Foam extinguishing systems (fixed and semi-fixed)

Foam extinguishing systems are as follows:

- Fixed foam extinguishing systems,
- Semi-fixed foam extinguishing systems,
- Water-and-foam monitors.

Ground vertical tanks, designed for storage crude petroleum and class I, II and III petroleum products, which are heated above their flash-point shall be equipped in fixed or semi-fixed foam extinguishing systems.

Fixed foam extinguishing systems consist of foam pumping station, a distribution valved post, a piping network connected to the pumping station, distributing the water solution of the foaming agent, the equipment for foam generation and applying it directly to surfaces in the risk of fire. The fixed foam system shall be used for extinguishing fixed roof tanks of capacities exceeding 3 200 m^3 and for floating-roof tanks of capacities exceeding of 10 000 m^3.

Foam pump stations for supplying the water/foam monitors are part of fixed foam extinguishing systems.

Water/foam monitors are used for fire-fighting and cooling of:

- Process installation equipment (e.g.: reactors, columns, or others) which height exceeds 15 m,
- Process installation equipment which are located 15 m above ground level which are not protected by fire water spray system/deluge system.

Inside process installations or in above ground locations, the remotely controlled water/foam monitors shall be used. Monitor locations must be consulted with LOTOS Group during 3D model review (if 3D revive is in scope) or with use of other methods (documentation) which makes monitor range analysis enable. Monitor control station must be located in place which enable observation of monitor and protected area.

To avoid use of piping heat tracing, water/foam monitors shall be designed as dry systems.

Semi-fixed foam extinguishing systems consisting of: equipment for generating and supplying foam directly to the surfaces in risk of fire. Equipment is connected to a feeding line ended with fire couplings/connectors located at a safe distance from the object to be extinguished, in the fire water distribution post. Foam solution is supplied by mobile equipment of LOTOS Fire Brigade to the fire couplings /connectors. The semi-fixed systems shall be used for extinguishing fixed-roof tanks of a capacity less than 3 200m^3 and floating-roof tanks of a capacity less than 10 000 m^3.

The foam pumping station shall be located at least 25 m from the axis of the tank dike, tank shield wall or the protected process installation. The walls of the pumping station building shall be made of materials of minimum 120 minutes fire resistance. In the pumping station there shall be provided space for foam concentrate tanks of a capacity securing at least 60 minutes use of a 3 % or 1 % foam solution.

Pumping units, including one standby, should be driven by electric motors connected to switchgear supplied from two sources. In lack of double power supply, a power generating unit may be used as the additional power source.

The external foam-piping network that distributes foam solution shall be located on the perimeter with allowable branches not longer than 300 m. It shall be supplied from a foam pumping station by two independent pipelines.

The foam system shall be started from the process control room of the respective plant and from the distribution post. The distribution post shall be located at a distance of not less than 20 m from the outer edge of the top of the dike, shield wall or from devices and equipment (containing flammable medium) of the protected process installation. The distribution post shall be made as a protective shelter with roof of non-combustible materials of a fire resistance of 120 minutes and glazing of a fire resistance EI 60.

Equipment of distribution post is specified in section 6.1.2.

In process plants, where large quantities of hydrocarbons are present, the manual or remote water-and-foam monitors shall be used.

The low expansion foam shall be used as extinguishing medium used in foam extinguishing systems for protecting storage tanks with petroleum products of the 1st and 2nd fire hazard classes (class I, II petroleum products). For calculation purposes a 3 % foam solution shall be assumed. The type of foam extinguishing agent must be approved by LOTOS Group.

To avoid use of heating system, foam extinguishing agent storage tanks should be covered by soil or located in proper storage rooms. Information about foam extinguishing agent type should be placed near storage tank.

The following instructions shall be used to determine the intensity of foam solution supply:

- 10 dm^3/min x m^2 for extinguishing a fixed-roof tank of a diameter of up to 20 m. For tanks of bigger diameters – 0.2 dm^3/min x m^2 for each additional meter,
- 10 dm^3/min x m^2 for extinguishing a floating-roof tank, considering the area between the shell and the protecting rim on the roof pontoon,
- 4.5 dm^3/min x m^2 for extinguishing the space between the tank and the shield wall (double wall) that surrounds it,
- 3 dm^3/min x m^2 for extinguishing the dike surface without considering the area of the tank,
- 6.6 dm^3/min x m^2 for extinguishing the dike surface of aboveground tanks with a horizontal principal axis,
- 6.5 dm^3/min x m^2 for extinguishing the surface of filling stations by means of a water/foam monitor or a fixed foam system according to NFPA 11 the latest edition.

Moreover, products used as elements of the foam system are subject of a written acceptance by LOTOS Group.

Materials:

- For underground piping (wet) – seamless steel pipes with PE or ZO3 insulation, or PE pressure pipes. Design pressure 16 bar,
- For distributing aboveground piping (dry) – galvanised seamless steel pipes connected with steel flanges. The length of the pipe -approximately 6 m.

6.1.2 Deluge systems

Deluge systems are divided into:

- Water deluge systems,
- Water/foam deluge systems.

Deluge systems automatically or manually started are used for extinguishing or protecting purposes against the effects of heat radiation and fire propagation. The deluge system is permanently fixed to the protected facility. The characteristic feature of these devices is that the water-distributing pipes are empty in normal conditions.

The following facilities shall be fitted with deluge systems:

- Aboveground tanks with fixed roofs and floating roofs, for storing crude oil and class I and II petroleum products,
- Horizontal and spherical tanks for storing gas, petroleum and class I and II petroleum products.

Basing on designed fire scenario an application of the water deluge system must be provided for following process equipment:

Pump groups, in which at least two of them contain light hydrocarbons (C4 or lighter).

- Compressors in which hydrogen or light hydrocarbons are present,
- Storage tanks class I and II class of petroleum products, used in process,
- Non-return flow devices (e.g. exchangers) which contain liquid hydrocarbons (C4 or lighter) and which capacity exceeds 8 m^3,
- Vertical vessels and columns up to 15 m height, above potential source of fire (including column skirt, if it is not made as fire resistant),
- Air coolers which contains flammable liquids with temperature above their auto ignition temperature or big groups of air coolers which contain flammable liquids.

Each time there must be checked necessity for use water/ foam deluge system for protection:

- Groups of pump and heat exchangers which contain class I, II petroleum products and III petroleum products heated above their flash point (but not more then 100 °C) located in places where conduct a rescue operations is difficulty by fire brigade.

The distribution post shall be located not less than 20 m from the edge of the external top of the dike, the edge of the shield wall or the outline of process installation. It shall be made as a protective shelter with the roof of non-combustible materials of a fire resistance of 120 minutes and glazing of a fire resistance EI 60.

The distribution post shall be fitted with the following:

- Information for which facility it is dedicated,
- Electrically operated main valve,
- Electrically operated directional valves,
- Strainers,
- Accessories for pressure measurement,
- Electrically operated valve on the draining pipeline,
- Fire couplings/connectors (DN 75) providing easy connection to fire engines of LOTOS Fire Brigade,
- Deluge system start button with functions: spraying and end of spraying,
- A board with the distribution post diagram with detailed indication of fire couplings/connectors valves and information about minimum pressure supply from fire engine,
- Telephone,
- Lighting.

Activation of the deluge system shall cause a simultaneous closure of the drain valve. Closure of the main valve shall cause opening of the drain valve.

Technical requirements for deluge system:

- The lowest pressure at inlet to the spray nozzle that has the most adverse location shall not be less than 1.5 bar,

- Spray nozzle shall have the opening diameter minimum 6 mm,
- For spraying the shells of vertical tanks – angular spray nozzles,
- For spraying the horizontal surfaces of compressors, pumps, structures – conical spray nozzles,
- Aboveground piping shall be made as flanged pipe shapes of seamless carbon steel, and shall be galvanised after a trial assembly,
- Underground piping shall be made from carbon steel pipes with outside insulation of PE or ZO2, or from PE pressured pipes. Design pressure 16 bar,
- Fire water supply pipes shall be designed in such a way to allow water free run-off from each place.

Water consumption rates for water used by deluge systems protecting aboveground tanks shall be applied in accordance with Journal of Law No. 243 of 2005, item 2063, Regulation by the Minister of Economy of 21 November 2005 on the technical conditions to be met by liquid fuel tank farms and petrol stations, long-distance pipelines conveying crude oil and petroleum products and their location, as later amended.

Following water application rates shall be applied (according to NFPA 15):

- 4.1 l/min/m^2 for spraying horizontal surfaces of steel structures,
- 10.2 l/min/m^2 for spraying uninsulated and insulated surfaces of vessels, columns, reactors, tanks, transformers and vertical steel structures,
- 20.4 l/min/m^2 for spraying the surfaces of pumps, compressors and related equipment,
- 10.2 l/min/m^2 for spraying stations for loading and unloading of petroleum products to/from railway or road tankers.

6.1.3 Fixed steam extinguishing systems

Steam extinguishing devices are used for fighting gas, liquid and solid body fires on small areas or in closed spaces where air exchange is limited (fired heaters, pumping stations, flange connections, where there is a possibility of outflow of hydrocarbons of a temperature higher than the temperature of auto ignition).

Valves activating the steam system shall be in easily accessible places, away from extinguishing steam hazard, at least 15 m from the protected facility. It is not acceptable activation of steam rings which protect more than one process device by one valve. Information about the purpose and the way of activating the system shall be posted in the distribution post. Distribution post shall be fitted with: pressure measurement on the supply pipeline, draining unit, marking and illumination, and shall have a paved access for personnel.

In places, where leakage may result in auto ignition of hot hydrocarbons, steam lance with insulated handles shall be used.

Saturated steam of a pressure of 3.5÷6 bar shall be used to supply the extinguishing installation.

Steam pipelines shall be made from seamless carbon steel pipes.

6.1.4 Fixed gas, aerosol and water mist extinguishing systems

Use of fixed extinguishing systems for closed spaces and rooms, such as control rooms, server rooms, electrical switch stations, combustible liquids pump stations, combustible liquids and gases loading stations, shall be each time designed and consulted with LOTOS Group specialists.

- Fixed gas extinguishing systems, based on NOVEC 1230 agent shall be used to protect rooms and objects with valuable and important for installation work electrical and electronic equipment which can resist only small fluctuation of temperature (e.g. server rooms, TIR rooms),
- Fixed aerosol extinguishing system shall be used for rooms and objects i.e.: electrical substations, raised floors. Aerosol as a extinguishing medium stops combustion process by combine free radicals during burning process. Additionally, it does not reduce oxygen level in the air but it reduces visibility. Aerosols are stored in non-pressure reservoir,
- High-pressure water mist fixed extinguishing system shall be used for rooms and objects which are hardly to seal, in which personnel, gas turbines, cable tracing, transformer stations can be present. Demineralised water for extinguishing purpose shall be stored in pressurized cylinders. As ejection source nitrogen can be use. AFFF foaming agent can be added to the water. High-pressure water mist cools down the fire area, extinguish fire, and cause locally displacement of oxygen from fire zone by its volume incensement during vaporizing,
- Air inertization systems shall be used for rooms and objects which are seal and not designed for continuous service (e.g. archives). Working principle of the system is decreasing oxygen concentration in the air up to 15%. It leads to eliminate condition necessary to start a fire. Agent that makes oxygen concentration decrease is nitrogen from local nitrogen generator.

Consumption rates and detailed guidelines for design and installation of fixed extinguishing using inert gases, aerosols and water mist shall be applied according to: NFPA 2001, NFPA 2010, NFPA 750, other standards or manufacturer specification.

Mentioned systems can be supplemented or replaced by Very Easy Smoke Detection Apparatus (VESDA), designed in accordance with PN-EN 54-20 standard after previously agreement with LOTOS S.A. specialists

6.1.5 Extinguishers

Extinguishers shall be provided for all buildings, installations and process units.

The selection of extinguishing equipment in respect of its size shall depend on the size of the fire zone, fire propagation speed and the size of possible fires.

Extinguishers shall be located regardless of the installed fire-fighting equipment and in places with fire hazard, for example:

- Flammable gas and liquid pumping stations,
- Flammable gas compressors,
- Flammable gas bottling stations,
- Control rooms,
- Process equipment.

Fire extinguishers with at least 12 kg of extinguishing medium shall be located in process installation and tank farm. If possible, portable fire equipment shall be grouped and placed inside fire extinguishers shelters.

6.1.6 Fire alarm and detection systems

Hazard detection system shall ensure:

- Early detection of the hazard,
- Warning of personnel,

- Alerting of LOTOS Fire Brigade,
- A possibility of activating fire-fighting equipment.

Detailed guidelines for the fire detection and signalling system according to Specification No. 3810 as later amended. For process plant, fire detection should be applied according to GLSA requirements.

7 Extinguishing media

For fire extinguishing, depending on the type of the flammable material and the place of fire the following media shall be used:

- Water,
- Water mist,
- Steam,
- Extinguishing foam,
- Carbon dioxide (CO_2),
- Inert gases (argon, nitrogen, etc.),
- Extinguishing powders.

8 Fire water supply

Fire water supply will be based on the ring-shaped fire water network in LOTOS Group Refinery, of a normal pressure of 6 bar(g) (jockey pump) and 12.5 bar(g) after high-pressure pumps are started (fire situation). The network is fitted with aboveground hydrants DN150 equipped with DN150 coupling/connectors and supplied from fire water pumping station of a capacity of 60 m^3/min at a pressure of 12.5 bar(g).

In case of fire detection, high-pressure pumps are remotely activated from sewage treatment control station by service or from process control station or from LOTOS Fire Brigade alarm station.

Taking into consideration that activation of the fire extinguishing systems which are supplied by fire water is done by decision of operator, it is assumed that during fire hazard conditions system activation will take place after remote activation of high-pressure fire water pumps. In regards to above, there is no specified minimal operating pressure for whole fire water network.

Minimal operating pressure for proper operating of each individual fire extinguishing system located in process installation is defined by designer. Information about minimal operating pressure will be placed on board located near designed system.

The calculation of the demand for fire water shall be made in accordance with the adopted fire scenario and fire water consumption rates.

9 Fireproofing

Within fire hazard zones the self-supporting structures of the below listed equipment shall have fire-proofing:

- Bridges (trestles) and steel structures,
- Air coolers,
- Steel structures supporting equipment and tanks,
- Heaters and boilers,

- Skirts and support of vertical vessels,
- Saddler supports of tanks.

Detailed guidelines for use fire-proofing are according to Specification No. 1181 and API 2218 Fireproofing Practices in Petroleum and Petrochemical Processing Plants.

10 Fire roads

Refinery internal roads should form closed communication system. Fire roads should leads to process buildings and process objects. Additionally near fire water reservoirs and water intake stations the manoeuvre yards for fire engine should be located. The yards must be designed to be used in all weather conditions.

It is no acceptable to locate fire roads inside Explosion Hazard Zones calculated from process units.

Buildings:

Fire roads with hardened pavement, which enable access for fire engine at each time/season of year, should be lead to:

- Building containing production or storage/warehouse fire zone, fire zones located outside of the building (containing process unit equipment, storage yard or shelter) if density of fire load of mentioned zones exceed 500 MJ/m^2, zone surface exceed 1 000 m^2 and/or explosion hazard room is present,
- Fire water intake stations.

Fire road should be routes along longer side of the building on full it's length. In the situation when length of shorter side of the building exceeds 60 m, fire road should be routed on both sides of the building.

Closer edge of fire road must be located at least 5÷15 m from the building wall for objects classified as ZL (hazardous for people) and at least 5÷25 m from the building wall for other objects.

Exact distance between fire road and building is specified by: building function, building construction and building classification. Decision about fire road location must be each time consulted with Health and Fire Protection Authority Expert and accepted by LOTOS Group Health and Fire Protection Specialist.

Space between building and fire road must be free of all land development objects or trees and bushes (which height exceed 3 m), and must enable easy access to the façade of building for basket crane and mechanical ladders.

Tank farm:

Fire road shall be routed to aboveground storage tanks with petroleum and class I and II petroleum products:

- From one side of the tank and with two traffic lanes if capacity of tank do not exceed 10 000 m^3,
- From two sides of the tank and with two traffic lanes if capacity of tank exceed 10 000 m^3.

The fire road shall be routed from one side of the aboveground storage tank with Class III petroleum products and with two traffic lanes.

Distance between outer edge of fire road and groups of petroleum and class I and II petroleum products aboveground storage tanks (measured from bund wall axis) shall be at least:

- **20 m** – if fire distribution post is located between fire road and bund wall or shield wall/double wall,
- **10 m** – other situations.

Distance between outer edge of fire road and group of aboveground storage tanks with class III petroleum products and petroleum products with flashpoint above 373.15 K (100° C) measured from bund wall axis or shield wall) should be **at least 5m.**

Fire roads for storage tanks protected by shield wall/double wall should be located at least 0.3 m higher than elevation of tank foundation.

Distance between LPG Storage Tanks and buildings, fences and public roads shall be at least:

- **30 m** for aboveground tanks,
- **15 m** for underground tanks.

Other objects:

Fire roads for objects/units which are not specified in this standard should be designed with accordance to local law requirements:

- Regulation by the Minister of Internal Affairs and Administration of 24 June 2009 on fire water supply and fire access roads (Journal of Law No. 124 Item 1030),
- Regulation by the Minister of Infrastructure of 12 April 2002 on the technical conditions to be met by buildings and their location (Journal of Law No 75, item 690 as amended),
- Regulation by the minister of Economy of 21 November 2005 on the technical conditions to be met by liquid fuel tank farms and petrol stations, long-distance pipelines for conveying petroleum and petroleum products and their location (Journal of Law No 243 Item 2063 as amended),
- Technical specification No. 5300 – Yards and roads, as later amended.

11 Fire and explosion protections of technical, process, utility equipment and installations

- Lightning protection, earthing, anti-electrostatic systems – Spec. No. 4500,
- Classification of Explosion Hazard Zones. Ex Equipment Selection – Spec. No. 1020,
- Sewage and drainage systems – spec. No. 1150,
- Fireproofing of process and tank installations – Spec. No. 1181.

12 Guidelines for carrying out maintenance, testing and inspection of fire protection equipment

Commissioning of new fire protection equipment shall be conducted by Contractor with cooperation of LOTOS Fire Brigade and attendance of LOTOS Group representatives. Commissioning report shall be prepared. Report templates are included in technical specification No. 1500 Commissioning or check report and handover protocols. Those templates will be used for specific installations according to needs.

Technical inspections and maintenance, functional tests shall be conducted in compliance with the Regulation No. Nr GLS/ZA/014/07/TD by the General Director of LOTOS Group of 4 June 2007, Appendix No. 5 as later amended.

13 Technical documentation

The Building Project about which, according to the provisions of the building law, the State Fire Authority may give its opinion before the commissioning of the object requires agreement with respect to fire protection. When Building Project is required, the fire protection requirements shall be prepared on basis fire scenario designed earlier as a separate document.

Scope, requirements and the way of conducting agreements of a Building Project can be found in the Regulation by the Minister of Internal Affairs and Administration of 16 June 2003. Agreement of a building design with respect to fire protection – see Journal of Law No. 121, item 1137, as amended.

14 Relevant documents

- Any "Technical Specification" issued by GRUPA LOTOS S.A. listed in Contract Files,
- Regulation No. Nr GLS/ZA/014/07/TD the General Director of LOTOS Group, Attachment No. 4 and No. 5 – Guidelines for conducting technical inspections and maintenance works, functional tests, pressure tests of fire protection equipment located on LOTOS Group site,
- GLSA procedure. GKL.48.03.00 "Procedure in case of failure in LOTOS Group plant",
- GLSA Procedure GKL.48.02.02.00 "The rules of fire protection".

15 Codes and standards

1. The Speaker of the Republic of Poland official announcement of 15 October 2009 on the uniform text of fire protection law (Journal of Law 2009 No. 178 item 1380).
2. The Speaker of the Republic of Poland official announcement of 12 November 2010 on the uniform text of Polish Building Act (Journal of Law 2010 No. 121 item 0809).
3. Regulation by the Minister of Internal Affairs and Administration of 16 June 2003 on the agreement of a building design with respect to fire protection (Journal of Law No. 121 Item 1137).
4. Regulation by the Minister of Internal Affairs and Administration of 07 June 2010 on the fire protection of buildings, other building objects and areas (Journal of Law Journal of Law No. 109 Item 719).
5. Regulation by the Minister of Internal Affairs and Administration of 24 June 2009 on fire water supply and fire access roads (Journal of Law No. 124 Item 1030).
6. Regulation by the Minister of Infrastructure of 11 July 2004 on for declares certificate conformity and use of building products (Journal of Law No 198, item 2041 as amended).
7. Regulation by the Minister of Internal Affairs and Administration of 20 June 2007 on list of products to ensure public safety, health care, property protection and rules for admitted its to use (Journal of Law No 143, item 1002 as amended).
8. Regulation by the Minister of Infrastructure of 12 April 2002 on the technical conditions to be met by buildings and their location (Journal of Law No 75, item 690 as amended).
9. Regulation by the minister of Economy of 21 November 2005 on the technical conditions to be met by liquid fuel tank farms and petrol stations, long-distance pipelines for conveying petroleum and petroleum products and their location (Journal of Law No 243 Item 2063 as amended).
10. PN-EN 2:1998/A1 Classification of fires.

11. PN-ISO 8421- 1 Fire protection. Vocabulary. General terms and phenomena of fire.
12. PN-ISO 8421- 2 Fire protection. Vocabulary. Structural fire protection.
13. PN-ISO 8421-3 Fire protection. Vocabulary. Fire detection and alarm.
14. PN-ISO 8421- 4 Fire protection. Vocabulary. Fire extinction equipment.
15. PN-ISO 8421- 5 Fire protection. Vocabulary. Smoke control.
16. PN-ISO 8421- 6 Fire protection. Vocabulary. Evacuation and means of escape.
17. PN-ISO 8421-7 Fire protection. Vocabulary. Explosion detection and suppression means.
18. PN-ISO 8421-8 Fire protection. Vocabulary. Terms specific to fire-fighting, rescue services and handling hazardous materials.
19. PN-M-51250-01Fixed firefighting system. Carbon dioxide systems. Designing and installation principles.
20. PN-EN 12845+A2 Fixed firefighting systems. Automatic sprinkler systems. Design, installation and maintenance.
21. PN-B-02863 Fire protection of buildings. Fire water supply. Fire water network .
22. PN-B-02864 Fire protection of buildings. Fire water supply. Rules of calculation of fire water demand for external extinguishing of fire
23. PN-B-02865:1997/Ap1Fire protection of buildings. Fire water supply. Fire water system.
24. API 2001 – Fire Protection in Refineries 9 Edition, April 2012.
25. API 2218 – Fireproofing Practices in Petroleum and Petrochemical Processing Plants- August 1999.
26. API-750 – Management of Process Hazards.
27. NFPA 11 – Standard for Low-, Medium-, and High-Expansion Foam – 2010 as amended.
28. NFPA 13 – Standard for the Installation of Sprinkler Systems – 2013.
29. NFPA 15 – Standard for Water spray Fixed Systems for Fire Protection – 2012.
30. NFPA 16 – Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems – 2011.
31. NFPA 17 – Standard for Dry Chemical Extinguishing Systems Edition 2013.
32. NFPA 17A – Standard for Wet Chemical Extinguishing Systems Edition 2013.
33. NFPA 20 – Standard for the Installation of Stationary Pumps for Fire Protection – 2013.

16 Record of changes

No.	Date	Description	Introduced by
0	04.10.2005	This specification substitutes in whole the previous LOTOS Group's standard No. PR 07 140 identically titled.	Przemysław Kołodziejski
1	27.11.2006	Updated the Regulations in the points: 4.1.2 and 12.	J. Tyborowski
2	16.03.2007 (rev. 2)	Corrections of point 3.1, 4.1.1, 4.1.6 and added point 3.2.1	Przemysław Kołodziejski
3	27.03.2007 (rev.3)	Corrections in point 3.2	Przemysław Kołodziejski
4	17.07.2008 (rev. 4)	Update and correction in point: 3.1, 4.1.1, 4.1.2, 4.1.4, 6 Updated the Regulations: 9, 10, 11 and 12.	Przemysław Kołodziejski
5	18-03-2013	Extension in paragraph 9: Functional tests and protocols requiremets added	MP T.Wróbel
6	30.11.2013 (rev. 6)	Review, update, standardize and changes to the Standard within scope of order No. OK/990/2012	Editorial board coordinated by T. Wróbel
-	31-08-2015	Page layout corrections, no contents changes.	T. Wróbel