

Chemopetrol, a.s.	Guide values of the highest appropriate velocities when transporting inflammable substances in pipeline	N 13 012

The standard is binding for all departments of the company and for external organizations which determine guide values of inflammable substance flow. It does not apply to the Litvínov and Kralupy refinery unit.

Departments of the company are obliged to present the standard to all external organizations the perform these activities and for which the standard becomes binding as well.

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1. General provisions

1.1 Scope of validity

This standard applies to determination of guide values of inflammable substance flow velocity listed in table 1, for their transport in pipeline, that is completely filled with the flowing substance and the hazard of spark discharge with explosive mixture of transported inflammable substance as a result of static electricity effect is eliminated.

1.2 Guide velocity of inflammable liquid flow (petrol, diesel, mineral oils, etc.) is dependent on the pipeline diameter and electric resistivity of transported inflammable liquid. The bigger diameter the lower admissible velocity, however with higher electric resistivity of the inflammable liquid there is increased number of static discharges.

1.3 When pumping the fuels (petrol, kerosene, etc.) the velocity of 4 m/s is considered as safe, in some cases even 6 m/s and more may be allowed. However, in no case may the velocity exceed the value of 8 m/s. In velocities exceeding 4 m/s it is necessary to verify the value of electric resistivity of the transported inflammable liquid and to opt for optimum flow velocity as per ascertained facts.

2. Recommended inflammable substance flow velocity

2.1 To restrict formation of static discharges in existing pipe main, when designing new pipeline and erecting new equipment, it is recommended to adhere to the guide values of the highest admissible flow velocity as per table 1 below when transporting inflammable liquids.

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Table No. 1

Inflammable substance	Pipeline diameter in mm	Guide velocity in m/s
Petrol, diesel, mineral oils, alcohols, ketones and esters	10	*8,0
Petrol, diesel, mineral oils, alcohols, ketones and esters	25	*4,9
	50	3,5
	100	2,5
	200	1,8
	400	1,3
	600	1,0
Ether, carbon disulphide	Up to 24	Less than 1,0

*. To select flow velocity with respect to the value of electric resistivity of the transported inflammable liquid.

2.2 Guide velocities as per table No.1 are determined regardless of the operating overpressure of transported inflammable liquid, as the pressure has practically no effect on the degree of static discharge occurrence hazard when the inflammable liquid flows through the pipeline.

3. Necessary protective measures to eliminate formation of static discharges and their harmful effects

3.1 When transporting inflammable liquids there are static electricity discharges mainly in the case when the explosive mixture of inflammable liquid vapour with access of air is created above the surface in the tank or other space and in case there is concurrent discharge by a spark as a result of energy accumulated in this area.

3.2 The spark discharge occurs:

- a) In the tank from the surface of filled liquid by some metallic grounded part of the tank
- b) Between electrostatically insulated part of the equipment (that is charged by flowing liquid) and grounded object in the vicinity

3.3 Inside pipeline, that is fully filled with flowing liquid, there is no need to be worried about the static discharge hazard.

3.4 Static charge formation hazard occurs mainly during spraying the discharged liquids, i.e. when re-pumped from pipeline to the tank.

3.4.1 With respect to this possibility it is necessary in the interest of safety that all intake pipes touched the bottom of the tank to achieve conductive connection between the end of the intake pipe and the filled tank.

3.4.2 In case the tank is empty, it is necessary to adhere to the following protective measures while filling this tank:

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- a) when filling the empty tank, it is necessary to limit the flow velocity to maximum 1 m/s until a nozzle of the intake pipe is fully under the surface and this one rises at least to 0,6 – 1 m above the bottom. This measure is necessary mainly in the case when the re-pumped fuel is contaminated with water, mechanical impurities or mixed with air, or in case the re-pumped fuel has resistivity above $10^{12} \Omega \text{ m}$ and in case the pipeline serves for re-pumping of different inflammable liquids.
- b) When selecting the higher initial velocity, these must not exceed half the value determined in the table No.1 and it is necessary to use relaxation vessels before the inflammable liquid enters the tank.
- c) What concerns tanks made of non-conducting material or in case the inside walls are fitted with non-conducting coating, it is recommended to use static arrester (conductive bars assembled in the vessel horizontally and grounded).

3.5 Metallic pipeline must be conductively connected at appropriate places, mainly at the discharge or at the filling equipment and before entering the object also electrostatically grounded.

3.5.1 Electrostatic grounding is conforming when the electrostatic leakage at all places does not exceed $1 \text{ M}\Omega$. Such a grounded object cannot accumulate static charges. Pipeline connected by flanges must be conductively connected at all places with risk of improper connection.

3.5.2 Insulation separator with resistance exceeding $1 \text{ M}\Omega$ the connection must be bridged or the insulated part of the pipeline must be grounded.

3.5.3 Ground connection of pipeline grounding before entering the object must be located so that the first one is maximum 50 m from the building and the second one maximum 150 m from the building.

3.6 What concerns pipeline from insulating materials (glass) extraordinary attention must be paid to metallic coupling flanges.

3.6.1 Glass pipeline must be fitted with additional electrostatic leakage e.g. electrostatic coating applied lengthwise onto the pipe, by firm winding with a coil from a conductive strip or with a wire around the pipe, etc.

3.6.2 Metal links and additional leakage must be interconnected and electrostatically grounded.

3.6.3 It is necessary to make hoses from electrostatically conductive rubber or other conductive material.

3.7 Other protective measures to eliminate effect of static electricity when transporting inflammable liquid by pipeline, see ČSN 34 1390 art. 197 - 211 and ČSN 33 2030.

4. Lightning protection

4.1 Metal aboveground pipeline with inflammable substance flow (liquid, gas and vapours) is protected against lightning pursuant to ČSN 34 1390 art. 202.

4.2 Underground pipeline – long-distance pipeline with inflammable liquid or gases and vapours is protected against lightning pursuant to ČSN 34 1390 art. 209 – 211.

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ČSN 34 1390	Electro-technical regulations ČSN. Rules for lightning protection and lightning conductors.
ČSN 33 2030	Safety of machinery - Guidance and recommendations for the avoidance of hazards due to static electricity

Note:

Amendments to the previous versions

Rewrite of the standard from 22.12.1997. The amended issue of the standard was supplemented in chapter 4 – Lightning protection. The amended standard reflects only changes of the techn. organizational character based upon organizational changes in the company.

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