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# General information

**NB! Unofficial translation. In case of discrepancies between the texts of the Technical specification in Latvian and English, the text in Latvian shall prevail.**

The technical specification for the supply of pipes has been developed with the aim to ensure the purchase of pipes necessary for the enhancement of the operation of gas collection point No. 3 (hereinafter - GCP-3) of the Incukalns underground gas storage (hereinafter - Incukalns UGS).

The technical specification is an integral part of the procurement documentation and the contract and includes the following sections:

* initial data;
* pipe technical requirements and delivery volumes;
* documentation to be submitted.

The project is co-financed within Contract No. INEA/CEF/ENER/M2018/1752017, project No. 8.2.4-0031-LV-W-M-18, project title “Enhancement of Incukalns underground gas storage”.

# Initial data

# Location of the object

The existing Incukalns UGS GCP-3 is located in the Republic of Latvia, approximately forty kilometres from Riga, in Krimulda Parish, Krimulda District, near the settlement Ragana.

# Gas composition and thermodynamic properties

The hydrocarbon composition and thermodynamic properties of the natural gas pumped into the gas storage are given in the Tables 2.2.1 and 2.2.2.

The composition of the natural gas is provided at standard conditions: T=20°C and P=1,013246 bar (average value). The pipes must also be suitable for the transmission of natural gas blend with hydrogen.

* + 1. **Table.** **Composition of the natural gas**

|  |  |
| --- | --- |
| **Component** | **Content, % (of the volume)** |
| Methane | 96,529 |
| Ethane | 2,010 |
| Propane | 0,429 |
| N-Butane | 0,067 |
| I- Butane | 0,069 |
| I-Pentane | 0,011 |
| N-Pentane | 0,008 |
| Hexane | 0,008 |
| Nitrogen | 0,740 |
| Carbon dioxide | 0,129 |
| Neopentane | 0,001 |

* + 1. **Table**. **Thermodynamic properties of the natural gas. Quality indicators of the natural gas.**

| **No** | **Quality indicators\*** | **Unit of measurement** | **Average value** |
| --- | --- | --- | --- |
| 1. | Highest calorific value | kWh (kcal/m3 ) | 10,478 (9009) |
| 2. | Highest VOBBE index | kWh (kcal/m3 ) | 13,811 (11875) |
| 3. | Mass concentration of hydrogen sulphide | g/m3 | 0,00010 |
| 4. | Mass concentration of mercaptan sulphur | g/m3 | 0,00040 |
| 5. | Absolute density | kg/m3 | 0,6933 |
| 6. | Relative density | kg/m3 | 0,5756 |

\* Data for the last 3 years. Data may change in accordance with the standard LVS 459: 2017 “Natural gas. Gas properties, parameters, quality assessment”.

#  Parameters for calculations

Operating medium temperature from -10°C to +45°C.

Ambient temperature from -40°C to +50°C.

Operating pressure - from 25 bar to 105 bar.

# Climatic conditions in the construction area

In accordance with the Latvian construction standard LBN 003-19 "Construction climatology":

* Absolute minimum air temperature: -39°C;
* Absolute maximum air temperature: +34°C;
* Average air temperature of the five coldest days: -26,7°C;
* Maximum daily average relative air humidity (%): 90%;
* Average maximum air temperature of the hottest month: +22,6°C;
* Altitude above the sea level: 70 m;
* Normative freezing depth of clay soil, which is possible every 10 years: 120 cm.

In accordance with LVS EN 1991-1-3:2003/NA:2019 “Eurocode 1. Actions on structures. Part 1-3: General actions. Snow loads. National Annex”, characteristic value of snow loads on the ground surface with probability 0.02 sk = 1.75 kN / m2 (III snow load region).

According to LVS EN 1991-1-4 “Eurocode 1. Actions on structures. Part 1-4: General actions. Wind actions. National Annex” fundamental basic wind velocity vb,0=24 m/s.

# Technical requirements and delivery volumes of pipes

**3.1. Pipe** **supply volumes**

The pipes must be manufactured in accordance with LVS EN ISO 3183: 2020 “Petroleum and natural gas industries. Steel pipe for pipeline transportation systems" (ISO 3183: 2019), requirements of Annex A.

For 3 years after the purchase of the product from the manufacturer, the manufacturer must keep and, at the request of the Customer, issue records of control types and tests in accordance with the said clause of the standard:

* rolling and product analysis;
* tensile test results;
* guided bend tests results;
* V-notch impact test results (CVN) of specimens;
* results of drop weight tear tests (DWT);
* results of hydrostatic tests;
* radiographic inspection of tubes (X-rays radiograph);
* results of certification of non-destructive testing personnel;
* control protocols of welded seam repairs;
* any other test protocols specified in the API Spec.5L, 46th edition (2018) appendix and delivery order, including all welding procedures (WPS) and welding procedure certification protocols (WPQT/PQR).

The supply of pipes must meet the following technical requirements.

Pipe delivery volumes are shown in Table 3.1.

**Table 3.1. Pipe specification according to LVS EN ISO 3183:2020 PSL 2 L360NE**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **No.** | **Pipe diameter and wall thickness, D х t, mm** | **Operating pressure, MPa** | **Temperature of the transported medium, °С** | **Unit of measurement** | **Quantity** |
| 1 | 2 | 3 | 4 | 5 | 6 |
| ***Pipes for overground placement without insulation*** |
|  | 219,1x11,0 | 10,5 | -10 ÷ +45 | m | 20 |
|  | 168,3х8,8 | 10,5 | -10 ÷ +45 | m | 140 |
|  | 114,3х7,1 | 10,5 | -10 ÷ +45 | m | 30 |
|  | 60,3x5,6 | 6,7 | +5 ÷ +22,6 | m | 40 |
|  | 88,9x8,0 | 6,7 | +5 ÷ +22,6 | m | 10 |
| ***Pipes for underground placement with factory insulation*** |
|  | 508x17,5 | 10,5 | -10 ÷ +45 | m | 120 |
|  | 219,1x11,0 | 10,5 | -10 ÷ +45 | m | 230 |
|  | 168,3х8,8 | 10,5 | -10 ÷ +45 | m | 4680 |
|  | 114,3х7,1 | 10,5 | -10 ÷ +45 | m | 240 |
|  | 60,3x5,6 | 6,7 | +5 ÷ +22,6 | m | 910 |

**3.2. Information for pipe delivery:**

* the pipes are manufactured and tested in accordance with LVS EN ISO 3183:2020, Annex A;
* pipe strength group (determines the strength level of pipes and related to the chemical composition of steel) – PSL 2 (LVS EN ISO 3183:2020, Annex A, p. A.4.1.2);
* steel grade - L360NE (LVS EN ISO 3183:2020, Annex A, Table A.4.1.2);
* pipe type (for all order items except pipelines DN500) – SMLS pipes (LVS EN ISO 3183:2020, Annex A, p. A.3.3.1); seamless pipe;
* DN500 pipe type – welded pipes SAWL (LVS EN ISO 3183:2020, Annex A, p. A.3.3.2); SAWL – welded pipe with one longitudinal seam (electro-welding under slag);
* for pipes with wall thickness t ≤ 25.0 mm with steel grade L360NE (Х52 NE) - chemical composition for steel grade L360NE (LVS EN ISO 3183:2020, Annex A, Table A.1);
* quantity, total length of pipes - according to Table 3.1 in this document;
* outer diameter and pipe wall thickness – according to Table 3.1 in this document;
* length and length type - L = 10m, approximate length of pipes;
* type of pipe end surfaces - at the pipe ends, if the wall thickness t> 3.2 mm, an edge for weld joint must be created. Angle of inclination of the pipe end in relation to the axis of the pipe in a direction perpendicular to 30**°** (+ 5°), width of the edge deflection 1,6 (± 0,8) mm;
* temporary external coating of pipes - Pipes for overground use in gas pipelines sections must be supplied with a temporary external corrosion protection coating for the storage and transportation period. This type of coating must be dense and smooth, with no visible drains;
* special exterior (anti-corrosion) coating for underground pipes - exterior insulation coating in accordance with Paragraph 3.2.4 of this document.

**3.2.1. Pipe tests:**

3.2.1.1. Tube test for impact strength (Charpy impact test) and for welded tubes D≥508 mm sample test with drop weight (DWT).

For requirements for impact testing of pipes, see p.A.4.4.1, p.A.7.4.3, p.A.7.3.3, p.A.7.4.2 and Table A.8 LVS EN ISO 3183:2020.

Impact strength test temperature for V-notch (CVN) samples T = - 40°С. Minimum impact energy 40 J.

Pipe welds and thermal influence zones (HAZ), the minimum average impact energy (three test samples), based on full specimen tests at a temperature of - 40°C, shall be 40 J (LVS EN ISO 3183: 2020 p.A.4.4.1.)

The samples are tested with drop weight (DWT) at temperature T= - 40°С.

In tests on welded tubes on impact bending (CVN) and with drop weight (DWT) at a temperature T = - 40 ° С, the mean stiff deformation component in the sample shall be not less than 85%.

3.2.1.2. Pipe tensile test.

Tensile tests shall be performed in accordance with p.A.7.3.1, A.7.3.2, p.А.7.4.1 and Table A.8 LVS EN ISO 3183: 2020.

During the pipe test, the strength limit, the yield strength and the relative elongation after destruction of the sample must be determined.

3.2.1.3. Guided-bend test.

Guided bend tests of a welded pipe seam shall be performed in accordance with ISO 5173 (see p.A.7.3.1, p.A.7.3.4, p.A.7.4.4 and Table A.8 in LVS EN ISO 3183: 2020). The opening of the seam and the formation of cracks at any point in the test piece are not permitted.

The dimensions of the frame must comply with the values specified in Table A.9 of standard LVS EN ISO 3183: 2020. Both specimens shall be bent to an angle of 180°, one on the root of the weld, the other with the end of the weld, just below the frame.

* + - 1. Hydrostatic test

Perform a hydrostatic test for each pipe as per p.А.7.4.3; LVS EN ISO 3183: 2020.

The hydrostatic test pressure of the pipes shall be calculated in accordance with API Spec 5L, 46th edition (2018), Paragraph 10.2.6.7, provided that a tangential stress of 95% of the standard minimum yield point is reached in the pipe wall.

The pipe must withstand hydrostatic pressure without leaks from the seam or pipe material.

The operating pressure of the technological medium (natural gas) during the operation of the pipelines is 10.5 MPa.

**3.2.2. Non-destructive testing of pipes.**

The sequence of non-destructive testing operations for seamless pipes throughout the pipe body shall be performed in accordance with p.А.7.5. and Table А.10 of LVS EN ISO 3183: 2020. The qualifications of personnel performing non-destructive testing must meet p. А.7.5.2. of LVS EN ISO 3183:2020.

**3.2.3. Pipe acceptance control**

The periodicity of PSL2 level pipe inspection shall comply with the requirements of Table А.7 of LVS EN ISO 3183: 2020.

3.2.3.1. Acceptance documents.

The manufacturer shall submit to the Customer a certificate on the performance of technical control - 3.1 B in accordance with ISO 10474-2013 «Steel and steel products - Inspection documents» or 3.1 in accordance with LVS EN 10204: 2006 L «Metallic products - Types of inspection documents».

The inspection certificate shall contain the following codes and information in accordance with p.A.7.1.2 LVS EN ISO 3183: 2020:

|  |  |
| --- | --- |
| А | Commercial transactions and parties involved |
| В | Description of products to which the inspection certificate applies |
| С01 – С02 | Location of sample, direction of the test piece and testing temperature |
| С10 – С29 | Tensile test |
| С40 – С43 | Impact test and drop weight tests (DWT) |
| С50 – С69 | Bend or flattening test |
| С71 – С92 | Cast analysis and product analysis |
| D01 | Marking and dimensional checking and verification of the surface appearance |
| D02 – D99 | Non-destructive testing and hydrostatic test |
| Z | Validation |

**3.2.4. Insulation coating of the pipes**

3.2.4.1.Pipes, except for pipes with DN50, for underground placement shall be supplied with the following polyurethane exterior anti-corrosion coating: LVS EN 10 290, PUR, class B, type 2, thickness 1500 µм (transportable medium temperature range -20°C to + 60°C) according to LVS EN 10290: 2003 “Steel tubes and fittings for onshore and offshore pipelines. External liquid applied polyurethane and polyurethane-modified coatings” (or equivalent).

3.2.4.2.Pipes DN50, for underground placement must be supplied with the following PE external anti-corrosion coating: LVS EN 10 288, class 3, type 1, category C, thickness 2.5 mm, (storage temperature - from -40°С to + 40°С) according to with LVS EN 10 288: 2003 “Steel tubes and fittings for onshore and offshore pipelines. External two layer extruded polyethylene based coatings”.

3.2.4.3. Before applying the coating, clean the surface of the pipes to a degree not less than Sa 2½ as per LVS EN ISO 8501-1:2007.

3.2.4.4. The certificate of insulation must contain technical data and test results in accordance with the relevant standards, as well as data on:

* infrared scanning;
* processing of the ends for joints;
* test for delamination - with the pull-off method;
* cathodic bond disturbances;
* specific electrical resistance;
* test for delamination after immersion in tap water;
* penetration resistance;
* thermal aging;
* flexibility;
* extension;
* resistance to ultraviolet radiation.

3.2.4.5. Permissible application ambient temperature range for pipes with external anti-corrosion coating:

* during loading and unloading works and transportation of products – from - 40°С to + 50°С;
* when performing construction and assembly works with products – from - 30°С to + 30°С;
* when storing products – from - 40°С to + 40°С.

3.2.4.6 Provide protection (temporary external surface coating) for non-insulated pipes against corrosion during transportation and storage in an open area for 3 years.

3.2.4.7. The ends of the pipes must be free of insulation - 150 ± 20 mm. The open ends must be treated with corrosion protection for the storage and transportation period.

# Documentation to be submitted

* 1. **With the offer:**
* samples or copies of certificates of quality and conformity of pipes to be supplied in accordance with the requirements of this technical specification.
* samples or copies of insulation material certificates;
* term and conditions of the quality guarantee for the supplied pipes;
* information about the pipe manufacturer, as well as about the insulation manufacturer and applicator;
* pipe storage regulations (instructions);
* delivery time schedule;
* the documents to be submitted must be in Latvian or English.
	1. **With the delivered goods:**
* certificates of quality and conformity of delivered pipes, insulation certificates in accordance with the requirements of this technical specification;
* information on the materials used in manufacturing;
* the documents to be submitted must be in Latvian or English.