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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 fittings has been developed with the aim to ensure the purchase of fittings 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;
* fittings 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 fittings 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 fittings

**3.1. Supply volumes of fittings**

Supplied pipe fittings must be manufactured in accordance with the standards:

* LVS EN 14870-1:2011 - “Petroleum and natural gas industries. Induction bends, fittings and flanges for pipeline transportation systems. Part 1: Induction bends (ISO 15590-1: 2009 modified)”;
* LVS EN 14870-2:2005 - “Petroleum and natural gas industries - Induction bends, fittings and flanges for pipeline transportation systems - Part 2: Fittings”.
* LVS EN 10253-2:2008 – “Butt-welding pipe fittings. Part 2: Non-alloy and ferritic alloy steels with specific inspection requirements”. Fittings of "B" type.

The supply of fittings includes product volumes for new pipeline sections.

The values of the bend angles of the pipelines are shown in Table 3.1, taking into account the installation rules of the new gas pipeline sections.

**Table 3.1. Fitting specification**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **No.** | **Name, part type** | **Diameter of the pipe to be connected and pipe wall thickness D х t, mm** | **Operating pressure, MPa** | **Temperature of the transported medium, °С** | **Quantity, pcs.** |
| **1** | **2** | **3** | **4** | **5** | **6** |
| ***Fittings for overground placement without insulation*** | | | | | |
|  | Bend 90°,  r=1,5D | 219,1х12,5 | 10,5 | -10 ÷+45 | 2+1 |
|  | Bend 90°,  r=1,5D | 168,3х11 | 10,5 | -10 ÷+45 | 34 |
|  | Bend 90°,  r=1,5D | 114,3х8,8 | 10,5 | -10 ÷+45 | 2+1 |
|  | Bend 90° r=1,5D | 88,9x8 | 10,5 | +5 ÷ +22,6 | 1+1 |
|  | Bend 90° r=1,5D | 60,3x5,6 | 6,7 | +5 ÷ +22,6 | 2+1 |
|  | Tee | 88,9x8 | 6,7 | +5 ÷ +22,6 | 1 |
|  | Tee | 60,3x5,6 | 6,7 | +5 ÷ +22,6 | 1 |
|  | Concentric reducer | 88,9x8 –60,3x5,6 | 6,7 | +5 ÷+22,6 | 1+1 |
| ***Fittings for underground placement without insulation*** | | | | | |
|  | Bend 90°,  r=1,5D | 114,3х8,8 | 10,5 | -10 ÷+45 | 10+1 |
|  | Bend 45°,  r=1,5D | 114,3х8,8 | 10,5 | -10 ÷+45 | 2+1 |
|  | Bend 90°,  r=1,5D | 60,3x5,6 | 6,7 | +5 ÷+22,6 | 6+1 |
|  | Bend 60°,  r=1,5D | 60,3x5,6 | 6,7 | +5 ÷+22,6 | 2+1 |
|  | Bend 45°,  r=1,5D | 60,3x5,6 | 6,7 | +5 ÷+22,6 | 8+1 |
|  | Bend 30°,  r=1,5D | 60,3x5,6 | 6,7 | +5 ÷+22,6 | 3+1 |
|  | Spherical end cap | 530x17,5 (12) | 10,5 | -10 ÷+45 | 2+1 |
|  | Spherical end cap | 508x17,5 | 10,5 | -10 ÷+45 | 2 |
|  | Spherical end cap | 219,1х12,5 | 10,5 | -10 ÷+45 | 3 |
|  | Spherical end cap | 168,3х11 | 10,5 | -10 ÷+45 | 3 |
|  | Spherical end cap | 114,3х8,8 | 10,5 | -10 ÷+45 | 4 |
|  | Spherical end cap | 88,9x8 | 10,5 | +5 ÷+22,6 | 1 |
|  | Spherical end cap | 60,3х5,6 | 10,5 | +5 ÷+22,6 | 1 |
| ***Fittings for underground placement with factory insulation*** | | | | | |
|  | Bend 55°,  r=1,5D | 508х17,5 | 10,5 | -10 ÷+45 | 1 |
|  | Bend 45°,  r=5D | 508х17,5 | 10,5 | -10 ÷+45 | 1 |
|  | Bend 35°,  r=5D | 508х17,5 | 10,5 | -10 ÷+45 | 1 |
|  | Bend 4°,  r=5D | 508х17,5 | 10,5 | -10 ÷+45 | 1 |
|  | Bend 90°,  r=1,5D | 219,1х12,5 | 10,5 | -10 ÷+45 | 8+1 |
|  | Bend 45°,  r=1,5D | 219,1х12,5 | 10,5 | -10 ÷+45 | 2+1 |
|  | Bend 13°,  r=5D | 219,1х12,5 | 10,5 | -10 ÷+45 | 2+1 |
|  | Bend 90°,  r=1,5D | 168,3х11 | 10,5 | -10 ÷+45 | 43 |
| 1. 1. | Bend 45°,  r=1,5D | 168,3х11 | 10,5 | -10 ÷+45 | 9+1 |
|  | Bend 69°,  r=5D | 168,3х8,8 | 10,5 | -10 ÷+45 | 1+1 |
|  | Bend 60°,  r=5D | 168,3х8,8 | 10,5 | -10 ÷+45 | 8+1 |
|  | Bend 56°,  r=5D | 168,3х8,8 | 10,5 | -10 ÷+45 | 1+1 |
|  | Bend 55°,  r=5D | 168,3х8,8 | 10,5 | -10 ÷+45 | 1+1 |
|  | Bend 54°,  r=5D | 168,3х8,8 | 10,5 | -10 ÷+45 | 3+1 |
|  | Bend 53°,  r=5D | 168,3х8,8 | 10,5 | -10 ÷+45 | 4+1 |
|  | Bend 52°,  r=5D | 168,3х8,8 | 10,5 | -10 ÷+45 | 1 |
|  | Bend 50°,  r=5D | 168,3х8,8 | 10,5 | -10 ÷+45 | 1+1 |
|  | Bend 48°,  r=5D | 168,3х8,8 | 10,5 | -10 ÷+45 | 1+1 |
|  | Bend 45°,  r=5D | 168,3х8,8 | 10,5 | -10 ÷+45 | 7 |
|  | Bend 44°,  r=5D | 168,3х8,8 | 10,5 | -10 ÷+45 | 1 |
|  | Bend 42°,  r=5D | 168,3х8,8 | 10,5 | -10 ÷+45 | 3 |
|  | Bend 40°,  r=5D | 168,3х8,8 | 10,5 | -10 ÷+45 | 1 |
|  | Bend 39°,  r=5D | 168,3х8,8 | 10,5 | -10 ÷+45 | 1 |
|  | Bend 38°,  r=5D | 168,3х8,8 | 10,5 | -10 ÷+45 | 1+1 |
|  | Bend 37°,  r=5D | 168,3х8,8 | 10,5 | -10 ÷+45 | 2+1 |
|  | Bend 35°,  r=5D | 168,3х8,8 | 10,5 | -10 ÷+45 | 2+1 |
|  | Bend 34°,  r=5D | 168,3х8,8 | 10,5 | -10 ÷+45 | 5 |
|  | Bend 33°,  r=5D | 168,3х8,8 | 10,5 | -10 ÷+45 | 1+1 |
|  | Bend 32°,  r=5D | 168,3х8,8 | 10,5 | -10 ÷+45 | 1+1 |
|  | Bend 31°,  r=5D | 168,3х8,8 | 10,5 | -10 ÷+45 | 2 |
|  | Bend 29°,  r=5D | 168,3х8,8 | 10,5 | -10 ÷+45 | 4+1 |
|  | Bend 28°,  r=5D | 168,3х8,8 | 10,5 | -10 ÷+45 | 8+1 |
|  | Bend 27°,  r=5D | 168,3х8,8 | 10,5 | -10 ÷+45 | 7 |
|  | Bend 26°,  r=5D | 168,3х8,8 | 10,5 | -10 ÷+45 | 3+1 |
|  | Bend 25°,  r=5D | 168,3х8,8 | 10,5 | -10 ÷+45 | 2+1 |
|  | Bend 24°,  r=5D | 168,3х8,8 | 10,5 | -10 ÷+45 | 2+1 |
|  | Bend 23°,  r=5D | 168,3х8,8 | 10,5 | -10 ÷+45 | 2 |
|  | Bend 22°,  r=5D | 168,3х8,8 | 10,5 | -10 ÷+45 | 1+1 |
|  | Bend 21°,  r=5D | 168,3х8,8 | 10,5 | -10 ÷+45 | 1+1 |
|  | Bend 20°,  r=5D | 168,3х8,8 | 10,5 | -10 ÷+45 | 1+1 |
|  | Bend 17°,  r=5D | 168,3х8,8 | 10,5 | -10 ÷+45 | 1+1 |
|  | Bend 16°,  r=5D | 168,3х8,8 | 10,5 | -10 ÷+45 | 1+1 |
|  | Bend 14°,  r=5D | 168,3х8,8 | 10,5 | -10 ÷+45 | 3 |
|  | Bend 13°,  r=5D | 168,3х8,8 | 10,5 | -10 ÷+45 | 2 |
|  | Bend 12°,  r=5D | 168,3х8,8 | 10,5 | -10 ÷+45 | 2+1 |
|  | Bend 11°,  r=5D | 168,3х8,8 | 10,5 | -10 ÷+45 | 1+1 |
|  | Bend 10°,  r=5D | 168,3х8,8 | 10,5 | -10 ÷+45 | 2+1 |
|  | Bend 9°,  r=5D | 168,3х8,8 | 10,5 | -10 ÷+45 | 3 |
|  | Bend 8°,  r=5D | 168,3х8,8 | 10,5 | -10 ÷+45 | 2+1 |
|  | Bend 7°,  r=5D | 168,3х8,8 | 10,5 | -10 ÷+45 | 5+1 |
|  | Bend 6°,  r=5D | 168,3х8,8 | 10,5 | -10 ÷+45 | 14+1 |
|  | Bend 5°,  r=5D | 168,3х8,8 | 10,5 | -10 ÷+45 | 8+1 |
|  | Bend 4°,  r=5D | 168,3х8,8 | 10,5 | -10 ÷+45 | 3+1 |
|  | Bend 3°,  r=5D | 168,3х8,8 | 10,5 | -10 ÷+45 | 6+1 |
|  | Bend 2°,  r=5D | 168,3х8,8 | 10,5 | -10 ÷+45 | 11+2 |
|  | Bend 13°,  r=5D | 114,3х8,8 | 10,5 | -10 ÷+45 | 3+1 |
|  | Bend 25°,  r=5D | 60,3х5,6 | 6,7 | +5 ÷+30 | 3+1 |
|  | Bend 20°,  r=5D | 60,3х5,6 | 6,7 | +5 ÷+30 | 2+1 |
|  | Bend 15°,  r=5D | 60,3х5,6 | 6,7 | +5 ÷+30 | 4+1 |
|  | Bend 10°,  r=5D | 60,3х5,6 | 6,7 | +5 ÷+30 | 4+1 |
|  | Bend 5°,  r=5D | 60,3х5,6 | 6,7 | +5 ÷+30 | 4+1 |
|  | Tee | 508х17,5 | 10,5 | -10 ÷+45 | 1 |
|  | Tee | 168,3х11 | 10,5 | -10 ÷+45 | 1+1 |
|  | Concentric reducer | 711х25 – 508х17,5 | 10,5 | -10 ÷+45 | 1 |
|  | Concentric reducer | 530x17,5(12)– 508х17,5 | 10,5 | -10 ÷+45 | 3+1 |
|  | Concentric reducer | 168,3х8,8 – 159х7 | 10,5 | -10 ÷+45 | 44+10 |
|  | Spherical end cap | 219,1x12,5 | 10,5 | -10 ÷+45 | 1 |
|  | Spherical end cap | 168,3х11 | 10,5 | -10 ÷+45 | 1 |

3.1.1. Information for the delivery of fittings:

* Supplied pipe fittings must be manufactured in accordance with the standards: LVS EN 14870-1:2011, LVS EN 14870-2:2005;
* quantity of products to be delivered in accordance with Table 3.1 of this document;
* name of each product - Table 3.1 of this document;
* nominal outside diameter - Table 3.1 of this document;
* minimum wall thickness at the ends for welding - Table 3.1 of this document;
* radius and its type (for bends) - Table 3.1 of this document;
* angle (for bends) - Table 3.1 of this document;
* steel grade – L360NE, level PSL2;
* preparation of product ends for welding - in accordance with the applicable manufacturing standard;
* lengths of straight sections of pipe bends (r = 5D) bent by inductive heating - L≥650мм (according to the standard LVS EN 14870-1:2011);
* pipes for bend manufacturing are supplied by the manufacturer, steel grade - L360NE, level PSL2 (according to the standard LVS EN 14870-1:2011);
* temperature of the impact strength test (Charpy impact test): Т = - 40°С;
* strength tests - hydraulic test with pressure calculated according to the product manufacturing standard;

3.1.2. The manufacturer shall submit to the Customer a certificate on the performance of technical control - 3.1 Form 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».

**3.2. Fitting insulation coating**

3.2.1. Underground fittings must 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 from -20C to + 60C) in accordance with LVS EN 10290: 2003 “Steel tubes and fittings for onshore and offshore pipelines. External liquid applied polyurethane and polyurethane-modified coatings" (or equivalent).

3.2.2. Before applying the coating, clean the surface of the fittings to a degree not less than Sa 2½ according to LVS EN ISO 8501-1:2007.

3.2.3. 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. Permissible ambient temperature range of pipe fittings with external anti-corrosion coating after application:

* 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.

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

3.2.6. The ends of the fittings must be free of insulation to 100 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 fittings 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 fittings;
* information about the fitting manufacturer, as well as about the insulation manufacturer and applicator;
* storage conditions for fittings (instructions);
* delivery time schedule;
* documents to be submitted must be in Latvian or English.
  1. **With the delivered goods:**
* certificates of quality and conformity of delivered fittings, 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.