



NET4GAS, s.r.o

HP PIPELINE DN1400, NODE KATEŘINSKÝ POTOK – NODE PŘIMDA

Construction Specification

11.03.2019

DVZ

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1 GENERAL

1.1 Scope of the document

The new DN1400 natural gas pipeline, with a total length of approximately 150 km, shall be running from the planned Distribution Node Kateřinský potok near Hora Svaté Kateřiny village to the existing Distribution Node Přimda near Přimda village.

The project goal is interconnection of the existing infrastructure with new EUGAL pipeline being built in Germany and increasing capacity of existing infrastructure. The pipeline is running in general parallel to existing pipeline(s) and passes through two regions, i.e. Ústecký a Plzeňský.

All works described in this document and fulfilling of requirements from all stakeholders are part of the Contractor's scope of work unless stated otherwise. In case of misalignment between this specification / tender documentation and stakeholders statements / issued permits the more strict requirements, statements and permits are binding.

The main design data of the proposed pipeline are following:

- Transported medium natural gas
- Pipe length approx. 150 km
- Pipeline diameter DN 1400 (OD = 1422 mm)
- Pipeline Design Pressure 85.0 bar
- Station Piping Design Press. 100.0 bar
- Maximum Operating Pressure 85.0 bar
- Design temperature -20/50°C
- Pipeline material Steel - L485ME ČSN EN ISO 3183
PSL2
- Line pipe wall thickness Category A: 18.0 mm; B: 21.5 mm

External coating 3L HDPE according to ČSN EN ISO 21809- 1, Class B3 = 4.2 mm. In addition, if mechanical protection is required Cemtex, GRP, Rockshield mesh, Geotextile, FZM-N or FZM-S fibre-reinforced cement mortar according to DVGW GW 340 or an alternative is added to the 3L HDPE coating.

In general, the basic wall thickness category A shall be used. The increased wall thickness of the pipe wall is used in selected steep slopes, at sections with higher pipe cover and within stations.

This specification covers the requirements for the construction of the DN 1400 PN 85 pipeline. All activities leading to pipeline construction, commissioning and handing over to the Employer described in this specification and related documents are part of the Contractor's work and performance, unless expressly provided otherwise in some specific cases. These activities shall be included in the total price offered by the Contractor for the work.

The pipeline has been divided into 2 construction lots:

- Lot 1: DN Kateřinský Potok, km 0.0 - LVS Malměřice (incl.), km 63.5
- Lot 2: LVS Malměřice (excl.) , km 63.5 - DN Přimda, km 150.0

1.2 Basic data

Project:	HP PIPELINE DN 1400, NODE KATEŘINSKÝ POTOK – NODE PŘIMDA
Investor:	NET4GAS
Consultant:	ILF Consulting Engineers
Contractor	To be identified during tender phase of the Project
Start of Construction period (assumed)	06/2019
Start of Trial period	09/2021
Approval period	03/2022

1.3 Definitions

Term	Explanation
Project	HP Pipeline DN1400, Node Kateřinský potok – Node Přimda
Employer	NET4GAS (N4G)
Consultant	ILF Consulting Engineers (ILF)
Contractor	Companies under contract with Employer for the performance of works/services for the Project

Sub-contractor	Companies under contract with the Contractor for the execution of works/services for the Project
Project Stakeholder	An individual, group, institution or organization, who is affected by the Project – landowner, tenant, third party line owner or operator
Authorised Expert	An independent experienced and approved expert / authorized institute, holder of the Authorization (Permit to Practice), e.g. Authorised Surveyor, Construction Supervisor, Pipeline Inspector.
Employer's Supervisor	Performs activities assigned by the Employer or contract in the interest of the Employer (in Czech: TDI)
Authority	All national and local agencies, departments and district offices having jurisdiction

1.4 Abbreviations

Term	Explanation
BD	Basic Design
BPCS	Basic Process Control System
BTS	Border Transfer Station
CBR	California Bearing Ratio
CCTV	Closed-Circuit Television
CS	Compressor station
DCS	Distributed Control System
DD	Detailed Design
DP	Design Pressure (acc. to EN 1594)
DN	Diameter Nominal
DT	Design Temperature (acc. to EN 1594)
EIA	Environmental Impact Assessment
EICT	Electrical and ICT (room)
EMCS	Electric Motor Compressor Set (VFD Transformer, VFD, EM, Gearbox, if applicable, Compressor)
ESD	Emergency Shutdown

FOC	Fibre Optic Cable
FSS	Fail Safe System
GIS	Geographic Information System
HP	High Pressure
HDPE	High Density Polyethylene
HSE	Health, Safety and Environment
HSK	Hora Svaté Kateřiny station
HVAC	Heating, Ventilation, Air-Conditioning and Cooling
I&C	Instrumentation and Control
ICT	Instrumentation, Control System, Telecommunications
ITT	Invitation to Tender
JP	Junction point
LAN	Local Area Network
LLI	Long Lead Item
LV	Low Voltage
LVS	Line Valve Station
MCC	Motor Control Centre
MOV	Motor Operated Valve
MUF	Manual Ultrasonic Testing
MV	Medium Voltage
MTTR	Mean Time To Repair
MTBF	Mean Time Between Failure
NDT	Non Destructive Testing
OD	Outer Diameter
ODF	Optical Distribution Frame
OP	Operating Point
OREDA	Offshore Reliability Data
PFD	Process Flow Diagram
PPE	Personal Protective Equipment

P&ID	Piping and Instrumentation Diagram
QA/QC	Quality Assurance / Quality Control
RfG	Rules of Gas Transport
RTU	Remote Terminal Unit
RU KP	Node Kateřinský Potok
RU Přimda	Node Přimda
SCADA	Supervisory Control And Data Acquisition
SIL	Safety Integrity Level
TBC	To Be Confirmed
TBD	To Be Determined
TELCO	N4G Telecommunication Systems
TOFD	Time of Flight Diffraction Technique
UCS	Unit Control System
UPS	Uninterrupted Power Supply
VA	Valve Arrangement
VDU	Video Display Unit
WT	Wall Thickness

1.5 Selected References

No.	Number	Title
1	C4G-HPPL-ILF-UP51X-LIN-VYK-1XX	Alignment Sheets
2	C4G-HPPL-ILF-GENER-GEN-DAT-820	Composition of Process Gas
3	C4G-HPPL-ILF-GENER-STR-DIA-100	System Flow Diagram
4	C4G-HPPL-ILF-RU006-STA-VYK-312	RU Katerinsky Potok – Coordination Layout
5	C4G-HPPL-ILF-TU33S-STA-VYK-312	TU Jirkov – Coordination Layout

6	C4G-HPPL-ILF-TU50S-STA-VYK-312	TU Vrskmaň – Coordination Layout
7	C4G-HPPL-ILF-TU51S-STA-VYK-312	TU Hrusovany – Coordination Layout
8	C4G-HPPL-ILF-TU52S-STA-VYK-312	TU Syrovice – Coordination Layout
9	C4G-HPPL-ILF-TU53S-STA-VYK-312	TU Malmerice – Coordination Layout
10	C4G-HPPL-ILF-TU40S-STA-VYK-312	TU Mladotice – Coordination Layout
11	C4G-HPPL-ILF-TU41S-STA-VYK-312	TU Hubenov – Coordination Layout
12	C4G-HPPL-ILF-TU42S-STA-VYK-312	TU Svinomazy – Coordination Layout
13	C4G-HPPL-ILF-TU48S-STA-VYK-312	TU Bor – Coordination Layout
14	C4G-HPPL-ILF-RU005-STA-VYK-312	TU Přimda – Coordination Layout
15	C4G-HPPL-ILF-GENER-STR-SPC-823	Piping Installation and Fabrication – Specification
16	C4G-HPPL-ILF-GENER-STR-VYP-201	Station Piping - Wall Thickness Calculation
17	C4G-HPPL-ILF-GENER-STR-SPC-800	Piping Classes - Specification
18	C4G-HPPL-ILF-GENER-STA-SPC-801	Welding - Specification
19	C4G-HPPL-ILF-GENER-LIN-SPC-803	Pressure Tests and Stresstests - Specification
20	C4G-HPPL-ILF-GENER-STR-MAN-902	Requirements on Drying, Cleaning and Calibration
21	C4G-HPPL-ILF-GENER-LIN-SPC-804	Cleaning, Calibration and First Run - Specification
22	C4G-HPPL-ILF-GENER-LIN-SPC-802	Painting and Coating - Specification
23	C4G-HPPL-ILF-GENER-LIN-VYK-0XX	Pipeline Typical Drawings

24	C4G-HPPL-ILF-UP5XX-LIN-VYK-1XX	Pipeline Detail Drawings
25	C4G-HPPL-ILF-GENER-LIN-TZP-910	Technical Report - Road Crossings
26	C4G-HPPL-ILF-GENER-LIN-TZP-920	Technical Report - River Crossings
27	C4G-HPPL-ILF-GENER-LIN-TZP-930	Technical Report - Railway Crossings
28	C4G-HPPL-ILF-GENER-LIN-TZP-940	Technical Report - UG and OH Lines Crossings
29	C4G-HPPL-ILF-GENER-LIN-TZP-955	Technical Report - Drainage Reparations
30	C4G-HPPL-ILF-GENER-GEN-SPC-000	Survey Works
31	C4G-HPPL-ILF-GENER-LIN-VYP-200	Wall Thickness Calculation
32	C4G-HPPL-ILF-GENER-LIN-VYP-201	Pipeline Static Calculation
33	C4G-HPPL-ILF-GENER-LIN-VYP-202	Thrust Boring Pits Static Calculation
34	C4G-HPPL-ILF-GENER-KAO-SPC-801	Cathodic Protection - Specification
35	C4G-HPPL-ILF-GENER-TEL-SPC-801	Fibre Optic Cable - Specification
36	C4G-HPPL-ILF-GENER-BOZ-MAN-900	Spill and Flood Protection Plan
37	C4G-HPPL-ILF-GENER-BOZ-MAN-901	Emergency Plan
38	C4G-HPPL-ILF-GENER-BOZ-TZP-902	HSE Plan for Construction Phase

1.6 Codes and standards

No.	Number	Title
1	C4G-HPPL-ILF-GENER- GEN-SEZ-840	List of Regulation and Standards

During construction period all applicable laws, regulations, standards, technical regulations and instructions valid in the Czech Republic must be abided, including the statements of the relevant Authorities and Stakeholders. Outcome requirements from all permits, notifications to Authorities and Project Stakeholders must be met.

1.7 Conflict requirements, exceptions

During the tender phase, the Contractor shall notify in writing the Employer or Authorized Expert designated by the Employer of any conflict between this specification, related documents, codes, standards, and technical regulations as outlined above, and any other specification that is part of the tender. In such a case, the Employer or the Authorized Expert designated by the Employer shall provide a written precedent and/or interpretation during the tender. Compliance with the requirements in the chapters of this specification does not exempt the Contractor from his liability or other contractual obligation to perform his activities.

Any exceptions or concessions to the requirements of this specification shall be requested by the Contractor in writing.

1.8 Contact between the relevant parties and the Contractor

Prior to commencement of the work, the Contractor shall provide a detailed schedule of construction, taking into account the statements of the Authorities, Project Stakeholders, EIA requirements, construction conditions, etc. It shall also include, but is not limited to, construction documentation, fabrication documentation, supplier documentation, inspection and test plans, etc.

Prior to start of the construction activities (or upon request); the Contractor shall notify all Project Stakeholders and Authorities about the commencement of the works. Notifications must be delivered in a provable manner (e-mail, letter, etc.) at least one week in advance. The notification shall also include planned time schedule relevant for the Project Stakeholder.

Employer will provide list of all affected land plots before commencing of construction activities (or upon request). Contractor shall notify Employer in case the information in this list is outdated or if additional space will be necessary to acquire to execute the construction works.

Every day of the construction period, not later than 15:00 (3 pm), the Contractor shall inform the Employer and the Employer's supervisor, about all planned construction related activities for the next day. All works not identified in the daily look ahead plans may be stopped by Employer without prior notice.

Every morning, during the construction period, 30 minutes before the mobilization of his workforce at the construction site, the Contractor shall confirm these planned work activities.

On a daily basis the Contractor shall also provide to the Employer a list of locations and all planned work activities. The Contractor shall perform only at these locations in line with the approved time schedule. It is the Contractor's responsibility to maintain the project schedule in relation to the notification of the construction activity to all the parties concerned.

In addition, the Contractor shall inform the Employer and the Employer's supervisor about the weekly plan of the anticipated work activities on the site always one week in advance.

1.9 Working strip

The Employer will provide a working strip as well as the sites for planned permanent facilities ready for the start of the Contractor's work according to the documentation and a mutually agreed schedule of construction. This also includes permits for entering areas affected by construction activities.

1.10 Land owners requirements

There are some specific requirements coming from negotiation with land owners. Fulfilling of these requirements is solely in the Contractor's scope of work. These requirements are specified in the statement number *C4G-HPPL-AUT-ILF-0771-L-USP N4G-N_Zam požadavky vlastníků*, which is part of contractual documentation.

These requirements might go beyond requirements specified in the project documentation and must be followed unless agreed otherwise with the Employer. Fulfilling of these requirements shall be document in written in official hand over protocols.

2 SURVEY WORKS

2.1 Contractor's survey works

The Contractor is encouraged to execute verification topographical survey of the working strip or terrain above the pipeline axis.

The surveys, data processing and as-built documentation shall be carried out in accordance with the Survey Specification.

Survey works included in the Contractor's scope of works include in particular:

- Stake out of working strip
- Stake out of the pipeline centreline
- Stake out of structures
- Stake out of existing infrastructure within working strip
- Any other survey activities that will be related to survey works during the construction of the pipeline, stations and its related parts
- Geodetic survey, processing and preparation of as-built documentation

All surveying works shall be carried out in accordance with valid applicable legislation:

- Act No. 200/1994 Sb.
- ČÚZK (State Administration of Land Surveying and Cadastre) Regulation No. 31/1995 to Act No. 200/1994 Sb.
- Act No. 186/2001 Sb.
- Act No. 183/2006 Sb.
- Regulation No. 499/2006 Sb. to Act No.183/2006 Sb.

For all survey data and documentation a spatial links to the existing GIS NET4GAS and Telco GIS data must be ensured. For this reason, the Contractor is responsible to:

- request all available data about the area where the construction surveys will be performed from the relevant department responsible for data management in NET4GAS GIS system;
- follow the Survey Specification when processing the geodetic documentation, so that all acquired data can be inserted into NET4GAS GIS system.

During the preparation of documentation for the newly constructed facilities is mandatory to proceed with the survey of all the gas and non-gas facilities including the pipeline route itself. All underground facilities shall be measured before backfilling. Failure to meet this requirement is a serious defect preventing the takeover of the site by Employer.

In the case of specific *plant basic map* (in Czech: “ZMZ - Základní Mapa Závodu”) for an aboveground object, the geodetic survey shall be carried out in accordance with ČSN 01 3410 and the appearance of the single point symbols of the processed map shall be based on the symbol legend according to ČSN 01 3411.

Underground cable lines laid separately shall be surveyed along their entire length. In addition to the characteristic points (e.g. bends, connections, couplings), the cable line shall be surveyed every 30m in straight sections, in curves in sections of length of $r/3$ [m], where “r” is the radius of the curve. Detailed requirements for the processing of geodetic documentation of fibre optic cables are specified in the “Technical Requirements for the Construction, Repair and Renovation of NET4GAS Cable Routes”.

Objects and features to be in minimum surveyed – as-built:

- Pipeline axis (top of pipe)
- All welds
- Bends by 3 points (start, centre and end), in case of multiple bends every pipe segment shall be also surveyed at start, centre and end.
- Interconnection of pipelines (T-pieces, assembly joints)
- Pipeline protection and all structures/ elements within the pipeline trench
- Branch pipe connection
- Every change in pipeline diameter
- Every change of material and wall thickness
- Every change of coating or start and end of additional coating
- Casing pipes
- Protective measures
- Leak detector pipes
- Valve stations
- Test outlets of signal wires
- Insulating joints, insulating flanges
- Pipeline, FOC and CP markers
- Drainages
- Cathodic protection elements (anode earthing, cathodic protection stations, interconnecting and connecting objects of cathodic protection elements, cable)
- Within the stations – in addition to the above stated items, all equipment (line valves, fittings, venting valves, flanges, welded-on pieces, ...), and buildings, fencing, roads, cable ducts and other locations shall be surveyed

- Fibre optic cable route and related equipment
- Metallic cable route (if applicable)
- Crossings or parallel lines – utility lines (aboveground and underground) prior backfill. If the surveyor is not sure about the line identification, he shall determine the utility line type at least indicative. The utility line shall be designated by a description in a coordinate list).
- All other structures newly installed within the working strip (e.g. surface erosion protection)

2.2 Survey works inspection

The Employer reserves the right to inspect all survey works and surveying activities at any time, as well as works and results performed by the Contractor, through the Employer's Authorised Surveyor during the entire project period.

The Contractor shall inform the Employer or Employer's Supervisor (in written, by e-mail or by phone) prior to execution any of the following activities:

- Setting out of the working strip
- Setting out of the temporary and permanent claims
- Setting out of the pipeline centreline
- Setting out of existing structures
- Setting out construction (ownership) land plots boundaries. For the pipeline on demand
- After excavation works
- After lowering-in the pipeline
- Before backfilling
- Any other activity that will be related to survey works for the pipeline and its related parts

2.3 Activities of the Employer's Authorised Surveyor

Specification of survey and inspection activities:

- Review of geodetic inputs from the latest versions of project documentation and the land and building permits
- Survey check of the actual execution of the construction. Survey check of the crossing with existing underground utility lines and survey check of the related parallel underground lines.

- Continuous survey check of the as-built survey provided by the Contractor's authorised surveyor.
- Evaluation of the actual longitudinal profile of the pipeline based on results of the as-built survey and inspection of the approved pipe cover.
- Cooperation with the Contractor's authorised surveyor and participation in official handover of individual construction sites.
- Cooperation with the authorised engineering supervisor in terms of resolving possible design changes.
- Checking compliance with the project.
- Providing expertise, consultancy and advisory service to the Employer.
- Participation on the Employer's meetings requiring survey expertise.
- All other activities defined by Employer.

3 PREPARATION OF WORKING STRIP

3.1 General

The pipeline route is shown on map layouts, alignment sheets including longitudinal profiles, detailed drawings and typical drawings. This project documentation package contain data of the location of the pipeline and adjacent facilities, third party installations, topographical information and all the necessary engineering data (e.g. minimum pipeline cover, horizontal chainage, wall thickness distribution) for the construction of the pipeline.

The Contractor to identify, locate and mark all underground utility lines / facilities in the working strip prior to commencement of the works. If necessary, the Contractor shall adjust the vertical alignment of the pipeline according to the actual position of the crossed infrastructure. The Contractor must ensure safety and integrity of the existing third-party lines / facilities and adjacent installations during the whole construction period.

The excavation and site shall be protected by the Contractor in accordance with the HSE principles (see reference documents).

3.2 Locating of existing underground third party lines and facilities

The Contractor shall verify the location of existing parallel and crossed underground lines/facilities by means of excavation pits.

These pits shall be executed in case of:

- The parallel line is closer than 5 m to the proposed pipeline.

- Bend or change of direction of existing line. If the bend or change of direction is necessary to locate more precisely, at least 3 pits shall be excavated
- The new pipeline crosses an existing line / facility.

All excavation pits must be made by hand tools. The use of mechanical excavations shall be notified to and approved by the Employer or the Employer's Supervisor in advance.

All works shall be executed only after agreement with the utility line owner or operator.

The existing lines must be marked by wooden pegs with a maximum spacing of 25 m for straight section and 5 m for bends or change of direction. The depth of cover of each line must be measured and recorded in the documentation and displayed on the wooden pegs.

The Contractor shall protect all underground and aboveground lines and facilities in the working strip according to the requirements of the relevant owner or operator, for example when passing over the line or storing the excavated material above the lines (if allowed), etc.

The Employer made the utmost to identify all possible underground facilities within the working strip. Identified depth is based on various sources and must be always doubted and verified. In case of newly discovered lines crossing design and execution is part of the Contractor's scope of work at no additional cost.

3.3 Working strip

The standard working strip width is 36 m, with the separation of topsoil stripping and excavated soil. In the forest areas the width of the working strip is reduced to 30m without topsoil removal. Environmental protected areas, vineyards and according to the permit requirements, the width of the working strip is reduced to 23 m without or without topsoil removal. In case of forest soil removal this shall be stored as required by the relevant Project Stakeholder.

The dimensions of the working strip are shown in the relevant typical drawings, alignment sheets and detailed drawings. The Contractor must ensure that all activities e.g. personnel, equipment, vehicles and construction machinery traffic as well as material transportation and storage are executed only within the working strip and do not exceed at any time the limits of the working strip.

The construction activities shall be performed in a way allowing use of agricultural areas outside the working strip (for cultivation, harvesting, etc.) by the Project Stakeholders without hindrance.

If additional space is required for the construction activities, the Contractor shall obtain all applicable permits for the use of such additional spaces after agreement with the

Employer. All costs for the acquisition and use of the additional space shall be borne by the Contractor.

Also any additional expenses incurred in connection with the additional land acquisition, easements or change of the working strip width shall be at the cost of the Contractor.

3.4 Access roads and construction areas

All material and pipe transport and distribution shall be done by using existing public roads, access roads and within the working strip along the pipeline route.

All access roads available to Contractor shall be inspected by the Contractor prior to use in order to assess the risks associated with use of these roads, e.g. low overhead power lines, capacity of bridges, bicycle paths, utility poles near the travelled surface, narrowing strip passages, schools and presence of children at a specific time during the day etc. Documentation of outcome from these assessments must be available at the Contractor's office on site to all drivers and all drivers and relevant personnel shall be aware of these risks. Access roads might have also various limitations based on stakeholders statement, capacities, obstacles, parameters, road signs, etc. These limitations must be strictly abided by the Contractor unless agreed otherwise in written with responsible stakeholders.

In case that the Contractor will have to use other land plots or roads than those approved for access to the working strip, the Contractor shall obtain the all applicable permits from the relevant Project Stakeholders before using such land plots or roads. Any costs associated with these permits shall be borne by the Contractor.

Two months before commencing the work, the Contractor shall coordinate with the relevant road Authority or Project Stakeholders documentation of all roads which will be used during construction period. This documentation shall include photographs and videos of the current condition of the roads, in particular, damaged spots and sections, cracks, condition of bridges, passages through municipalities, paved areas, access roads, damaged trees, etc.

After completion of the construction, all the access roads and areas used shall be restored to the original or better condition. All damages caused by the construction of the pipeline or stations shall be repaired by the Contractor in shortest terms and at the Contractor's expense.

The Contractor shall ensure that all access roads to the construction site are maintained and made passable throughout the construction period. Vehicles shall be properly cleaned prior to leaving the construction site to the road. Bulky loads and dusty materials shall be secured on trucks in such a way (by tarp or similar) that they do not contaminate the environment or spoil the roads. See document C4G-HPPL-ILF-GENER-GEN-TZP-030 Access to Working Strip - Technical Report. Particular roads used by the Contractor

should be improved to meet required load and transport purposes (surface, width, compaction, etc.).

The Contractor shall proceed with all protection mitigation measures that may be required to prevent complaints from Project Stakeholders and Authorities.

The material and pipes shall be preferably transported to the construction site as close as practicable by railway and then by trucks directly to the working strip.

Pipes, fittings and other pipeline accessories shall be preferably stored in designated pipe yards and construction facilities. The storage locations and arrangements, including access roads, are shown through the project documentation. These storages are located always nearby planned construction activities (station, pipeline, etc.).

From the storage areas shall be the pipes, fittings and other pipeline accessories transported by trucks directly to the working strip or station construction area.

3.5 Reconstruction of specific existing roads

The following roads incl. eventual proper erosion protection measures shall be reconstructed at least to original or better state by the Contractor as part of his scope of work. Scope of works is incl. securing of approvals and permits from their owners / administrators and other stakeholders.

Type of reconstructed road: Road plane to be compacted to min. 45 MPa, road layer thickness of min. 15 cm, road layer shall be composed of well compactable material with linear sieve curve compacted to min. 98 % Proctor Density and with CBR > 6.5%.

- Reconstruction of a local and field road at Prečáply village, which starts at a road slip from No. 00728 in the centre of the village (land plot 974/3) and continues towards the north-east and ends nearby land plot 419/4). The total length of the reconstruction is approx. 355 m. Particular road parameters and reconstruction length shall be confirmed by the Employer.
- Reconstruction of a purpose built road (mainly land plots 518 and 227) from Straná u Nechanice village direction to Přívklady village, which starts at land plot 541 and ends approx. 180 m after the second exit from this road. The total length of the reconstruction is approx. 1000 m. Particular road parameters and reconstruction length shall be confirmed by the Employer.
- Reconstruction of a field road nearby Otvice village and just a local airport, which starts at a road slip from No. 00251 and continues towards the north-east on land plot 776 and ends at end of this land plot The total length of the reconstruction is approx. 350 m. Particular road alignment, parameters and reconstruction length shall be confirmed by the Employer.

3.6 Notifications

Prior to commencement of work the Contractor must confirm in writing, that he is fully aware about the scope of work and has fully understood all requirements from Authorities and Project Stakeholders. The Contractor shall fulfil all these requirements.

All notifications about starting of the construction activities shall be provided as defined in the Chapter “1.8 Contact between the relevant parties and the Contractor“ of this specification.

The Contractor shall be also responsible on a required basis for contact with all Project Stakeholders. The Contractor shall designate relevant staff for these activities.

The seasonal use (usually till 31 July) of the agricultural land (e.g. sowing, cultivation, harvesting, etc.) shall be considered during planning and preparation of construction activities and these shall be agreed with the affected landowners and tenants.

3.7 Hazardous areas

3.7.1 Geohazard areas

Geohazard areas identified along the route may be landslides, karst and undermined areas, steep slopes, light erodible soils and areas with the higher inflow of groundwater into the trench.

In these areas the Contractor shall proceed with technical measures ensuring safe execution of the construction works and safe operation of constructed facilities during their lifetime. Crossings of sections with a potential risk of landslides shall be systematically observed by the Contractor using geotechnical monitoring and if required proceed with technical measures to mitigate these risks, which shall consist use of drainages, or possibly ground anchoring systems, installation of a concrete pilling wall or using sheet piling.

In sections with steep slopes with an angle $\geq 25\%$ where the backfill material could be washed out of the trench, ditch breakers (sands sack or foam barriers if approved by Employer) shall be installed inside the pipeline trench. For surface erosion protection wooden fascines, geotextile mats or equivalent shall be used. Technical solutions for steep slope sections are addressed in the relevant pipeline drawings – alignment sheets, detail and typical drawings.

Pipeline sections with the higher groundwater table and risk of buoyancy shall be protected by using of concrete weights.

3.7.2 UXO areas

As the pipeline construction passes through the potential UXO (unexploded ordnance) areas a desktop study was prepared to describe possible explosive hazards and to propose measures to mitigate these risks.

The Contractor shall, if necessary, execute and support UXO survey and clearance works, which includes earthworks (e.g. UXO identification, topsoil removal, excavation, backfill, etc.).

In locations where UXO was identified during the pre-construction study (unexploded ordnance report), a relevant survey must be carried out prior to any interference in the soil cover (e.g. topsoil removal, excavation, underground facility excavation pit, etc.)

3.8 Third party lines and structures

Contractor is responsible to detect, locate and mark all existing third party structures, lines and other facilities / utilities in the area affected by the construction works. The information about these facilities given in the project documentation is for information only and needs to be verified on site prior to start any construction activities.

The Contractor shall implement and maintain marking system which quickly and clearly identifies type and position of any underground structure or facility. The marking must differentiate between different types of utilities such as power lines, cable and optical lines, gas, oil, telephone, signalling lines, drinking water, sewage, discharge lines, drainage, irrigation pipes, etc. Marking of the third party lines and utilities must be maintained through the entire construction period.

The Contractor shall also prepare and provide list of tools and excavation techniques used for each crossing or each type of crossing. The Contractor also must provide details about type of protection of any third party facility.

The Contractor shall verify the crossing method as in the Project documentation or propose alternative for crossing of the third party line or facility based on the actual situation on site and condition of the utility / facility crossed (e.g. open cut, relocation, thrust boring). The alternative crossing method used shall be approved by relevant third party line / facility owner or operator and Employer.

The Contractor shall notify the relevant Authorities and third party line owners / operators about the start of the work in the vicinity of these structures, lines, or facilities. If required by the owner / operator of any third party installation Contractor shall only perform works related to the crossing of such service in the presence of the authorized representative of the owner / operator of the service.

During the execution of the construction works the Contractor to ensure that the third party line / facility is not damaged. The Contractor shall protect the third party structures

and facilities against damage during the crossing or excavation activities. The protection method shall be based on the actual site conditions. The Contractor shall promptly notify any third party line / facility damage to the relevant Authorities, owners or operators and to the Employer and agree on further steps. Any damaged property of a third party must be reinstated by the Contractor at his own expense and according to the instructions of the third party concerned.

Upon completion of works on the crossing of the third party utility line / facility, the Contractor shall prepare a handover protocol which shall be signed by the utility owner / operator. Photo documentation of the crossing shall be part of the handover protocol. The signed handover protocol shall be submitted to the Employer without any delay.

Every crossing shall be surveyed before backfilling and the all details of the crossing must be part of the as-built documentation.

If the pipeline construction lies in the vicinity of existing underground utility lines and facilities, Contractor shall avoid moving vehicles and machinery over the lines or to take special protection measures to avoid damage, e.g. by using concrete slabs, rig mats, steel plates, etc. when passing over. Appropriate protection measures shall be implemented in agreements with the owners or operators of the concerned utility lines and facilities.

3.9 Archaeological areas

The construction work will be carried out in areas with archaeological findings. The sites were localized during the first phase of archaeological survey.

Archaeological construction supervision will be present on site and will supervise all excavation works. Contract between the archaeological construction supervision is secured by the Employer.

During carrying out of the earthworks, it is required to comply with the conditions of Act No. 20/1997 Sb., as amended about heritage care.

Survey activities in the area of archaeological sites shall begin as soon as possible after the signing of the Contract between the Employer and the Contractor. If the site of the archaeological survey is overlapping with the UXO areas, the survey and clearance of UXO shall be carried out in a first step.

In the event of an archaeological finding the Contractor must interrupt the construction works in the area and in cooperation with Archaeological construction supervision report these findings to the relevant Authorities and to Employer. All construction works in this area shall be suspended until the further notice from relevant Authorities. The Contractor must cooperate with archaeological survey teams in term of allowing access to the site, excavation and other works as required.

3.10 Working strip clearing and preparation

3.10.1 General

Prior to start of any preparatory work within the working strip, the Contractor must be thoroughly familiarized with all permit requirements and regulations by the Employer. Preparatory work must be in accordance with these requirements and regulations to avoid unnecessary damage to vegetation, crops, property or adjacent land plots. The Contractor is responsible for any damage including all relevant claims for these damages if the works are not provided in line with given requirements and regulations.

Particular attention shall be paid to environmental and other protected zones.

The Contractor shall provide appropriate protection for objects of particular importance affected by the construction (e.g. sacred sites, monuments, memorial trees, etc.).

3.10.2 Clearance

Prior to start of construction activities the Contractor shall ensure that the working strip is accessible in full length as far as practicable. This includes, in particular, clearing of vegetation, removal of obstacles from the working strip, working strip stabilization, improvement, levelling and grading, construction of access roads or their improvements and obstacle crossings mitigation. Specific measures shall be taken at steep slopes and side cuts (e.g. side cut at KM 8+575 to 9+230).

All facilities within the working strip which are not subject of removal shall be properly protected in coordination with their owner's / administrator's (e.g. power and telephone poles, CP posts, pipeline and FOC markers, manholes, roads, bridges, weirs, and other above ground facilities). In case of agreed temporary removal, these facilities shall be reinstated to its owner's / administrator's satisfaction and handed over in writing.

3.10.3 Demolitions and Relocations

In case of presence of any objects in the route and the protection zone of the planned pipeline the Contractor shall arrange for their demolition or relocation as allowed in the Project documentation and eventual relevant permits. Demolitions are not foreseen for the pipeline construction. Objects which must be preserved shall be maintained in place or temporarily removed and reconstructed afterwards (e.g. markers, cathodic protection boxes, etc.). For live objects (such as cathodic protection boxes) owner / administrator approval for any works on this object must be secured.

During construction period for all traffic and transportation related to construction activities the Contractor must pay particular attention to avoid damage to the road, existing road signs, accessories and other third party facilities. If existing infrastructure, such as bridges, roads, fences, pipelines, building cables or other structures, is damaged

by the construction equipment or other construction vehicles movement, the Contractor shall provide immediate temporary repair until final repair or restoration. The Contractor shall be responsible for the final repair or replacement of such infrastructure either immediately (if possible) or after the completion of works with final acceptance by the respective Project Stakeholders.

The maximum capacity of all bridges used by construction vehicles and equipment must be verified with regard to possible damage to the structure due to age or external influences such as landslide, flood, etc. Escort vehicles shall coordinate manoeuvres of vehicles or equipment with heavy loads and where necessary allow only one truck crosses a bridge at a time.

When a request for the removal / relocation of cables, pipelines or other types of utilities or infrastructures is made due to the transport of material for the construction, the Contractor shall arrange a consultation with relevant Authorities and owners or operators and take appropriate measures to carry it out these activities at his own expense.

In areas where an existing metal cable or FOC, both in the property of the Employer, will collide with the proposed pipeline, the cable will be interrupted and during the construction of the pipeline will be reconstructed. The new cable will be located in the pipeline trench and will be connected professionally to the existing cable.

All works carried out near railways, roads or other areas with public access, the Contractor shall place adequate warning signs and lights as required or requested. These signs shall be visible at any weather conditions to prevent accidents or damage to public, environment and properties of third parties. Entrances and exits of vehicles to the working strip and pipe yards shall be marked by traffic signs; if necessary a traffic lights or by designated traffic control staff.

Crossing of a railway or a road by construction equipment and vehicles can only be done in designated / approved locations; Contractor to ensure sufficient protection of the crossed object at these locations. The Contractor must coordinate all the railway crossings by construction equipment with the relevant railway Authority (SŽDC, etc.).

3.10.4 Water bodies

The Contractor shall install temporary culverts in all drainage ditches, canals, creeks and other drainage structures where the existing structures are blocked due to the construction activities to avoid any damage to the third party property. The Contractor shall as soon as practicable reinstate all these existing structures. Watercourses crossing by construction equipment is possible only at designed locations as per the Project documentation or via public roads. Other locations are prohibited.

Where water courses are crossed by the construction road the Contractor shall ensure water flowing by installing pipe culverts, pumping or overflow bridges and where allowed by watercourse diversion.

3.10.5 Fire protection

The Contractor shall take all necessary precautions to prevent a fire occurring at the construction site and adjacent areas. A special caution shall be taken in places where flammable materials are present and near locations with organic materials (e.g. bushes, trees, etc.). All areas where welding and similar activities are executed and where flammable gases are used, must be equipped with relevant fire extinguishers.

3.10.6 Topsoil stripping

Topsoil will be removed on agricultural land (arable land, meadows, pastures) within the working strip at a specified width (without the area for topsoil storage) and in the areas of bell holes. On not stripped areas the movement of machinery is prohibited. After topsoil stripping, a control survey of the working strip level and width shall be carried out. The topsoil stripping depth shall be in general 0.3 m but adjusted to results of the pedological survey and real situation for upper topsoil stripping. In the places of the pipeline trench, in the area of bell holes and excavations, the topsoil, including bottom topsoil if applicable, shall be removed in a depth as identified by the pedological survey. All the earth works shall respect the outcome of the pedological survey. The topsoil removal in the protection zones of the third party lines shall be carried out according to the agreements or requirements of the third party line owners and operators.

For the period of construction, the topsoil shall be deposited at the edge of the working strip separately from the excavated material to avoid their mixing. In sections of the narrowed working strip (no space for topsoil) the topsoil shall be transported to the nearest available space within the working strip and back during the reinstatement works. After backfilling, the topsoil shall be spread back, with subsequent reinstatement and re-cultivation of the land.

Topsoil and bottom topsoil, where stripped, shall be stored on independent piles to avoid mixing with waste soil. Topsoil and bottom topsoil stripping shall be executed in a way avoiding stripping of bottom waste soil.

In the area of crossings with roads and railways topsoil and bottom topsoil stripping shall be executed in a way avoiding stripping of bottom waste material of trenches, terraces and embankments, located in the immediate vicinity of roads.

Deposits of topsoil, bottom topsoil and waste soil must be protected against erosion. When the deposits are stored for more than 1 year, these areas must be grassed.

The topsoil in the area of the existence of quality soils (I. and II. class of protection) shall be carried out on the basis of pedological survey and under the supervision of a pedologist.

During excavation, handling and depositing of the topsoil on the deposit, it must be ensured that the soil is not contaminated.

During the subsequent reinstatement of the working strip, the basic sequence of the storage of the topsoil horizons and smooth connection to adjacent land plots shall be kept. After construction, quality and appropriate revitalization of the terrain within the working strip must be ensured.

3.10.7 Dewatering, drainage

The Contractor must ensure proper dewatering of surface water and groundwater from the site, excavated trenches and thrust boring pits, unless laying of pipeline into the flooded ditch in selected watercourses is allowed. For such a crossing Contractor prepare a method statement and provide to the Employer for approval. The Contractor shall be responsible for reinstatement and repairs of existing sewerage and drainage systems damaged by the construction; the repairs must be carried out properly and in timely manner during the construction period or immediately after construction works are done in these areas.

3.10.8 Tree and shrub felling

With the exception of trees and plant species identified for relocation or protection, the Contractor shall clear the full width of the working strip from all hedges, fences, trees, large stones, walls, bush, vegetation, timber, stumps, tree roots and other obstacles.

All cleared materials and items shall be immediately removed from the working strip and disposed in accordance with applicable Project procedures. Cut trees shall be handed over to their owners as per their statements.

In forest sections the proper exploitation (felling, approaching and transportation of timber) will be carried out by the relevant forest owner or administrator.

In relation to significant landscape elements and the territorial system Natura 2000, felling of trees throughout the route can only be carried out outside the growing season, e.g. from the beginning of the October to the end of the February (unless stricter limitations are specified). The term can be adjusted in order of days according to the course of the particular vegetation season after consultation with the biological control. Part of felling will be proper and immediate removal and disposal of cut wood.

3.10.9 Temporary access and construction roads

Required temporary roads including road slips and proper erosion protection measures shall be graded and built up so as to withstand the anticipated traffic (load and frequency during the entire period of intended use and in accordance with the relevant construction codes and project requirements for the construction of roads.

The Contractor shall install all necessary drains and culverts as required to ensure adequate and safe drainage of all surrounding areas.

Contractor shall construct all temporary accesses including ramps, temporary bridges and overpasses to enable plant, equipment and personnel to cross obstructions safely and efficiently. The temporary accesses shall permit continuous use of vehicles and construction traffic and shall preserve banks and structure of crossings.

If required the Contractor shall install temporary fences and gates to maintain public safety or safety of adjacent livestock operations during the operation of the temporary access. If required Contractor shall restrict public access to temporary access roads i.e. through proper signing and/or the installation of barriers or gates.

The Contractor shall maintain such accesses in a usable condition throughout the duration of the construction activities.

After the completion of construction activities Contractor shall reinstate such access to a condition equal or better to that existing before the commencement of the work.

For the use of the public roads, §19 of Act No. 13/1997 Sb. (The Road Act), as amended, shall apply.

3.10.10 Sand for construction

Sand used for all construction purposes shall be purely the sand of required fraction from a sand quarries. The volumes of sand required for the construction shall be acquired well in advance to avoid any construction delay. The Contractor shall proceed with the purchase and transportation of the material at his own expense.

4 MATERIAL, LOADING, TRANSPORT AND STORAGE

4.1 Material supply

The Contractor to supply all construction material, fittings and equipment required for completion of the works as part of his scope of work except for LLIs and material supplied by the Employer.

4.1.1 Fittings and equipment

Mainly:

- Piping, equipment and fittings smaller than DN300
- Assembly material (bolts, nuts, gaskets, etc.) for above mentioned
- Balloon necks and balloons

- Temporary end caps
- Pipe supports
- Casing pipes and associated assemblies such as end seals, filling (if applicable), leak detection pipes, spacers, etc.
- Temporary and permanent drainage pipes and structures
- Site and pipeline marking equipment and material
- Cathodic protection equipment and material
- FOC infrastructure equipment and material
- ICT equipment
- Testing equipment
- Cleaning, calibration and drying equipment and material
- Welding, coating/ painting, cleaning and construction equipment
- Other required fittings and equipment

4.1.2 Construction material

Mainly:

- Concrete and reinforced concrete
- Temporary and permanent supporting structures
- Temporary and permanent protecting structures
- Temporary and permanent crossings structures
- Temporary and permanent pavement structures
- Bedding and padding, gravel, rip rap, stones
- ROW and unbearable soil stabilization material
- Ditch breakers and clay plugs
- Welding material
- Field coating and painting material
- Sand (sand/ cement) bags or alternatives
- Drainages installation and reparation material
- Sheet piling and trench stabilization materials and structures
- Pressure test sets

- Temporary and permanent fencing and signs
- Engineered backfill and layers for road crossings restoration
- Material for restoration and reinstatement
- Other required material

4.2 Material receipt and acceptance

The Contractor shall check all the materials delivered for completeness and damage and elaborate a material take over report and submit to the Employer or to the designated Employer's representative. In the event of any damage detected during the handover of material, the Contractor shall repeat the control of material with the involvement of the Employer or the designated Employer's representative.

4.3 Transportation

All Contractor's transport arrangements shall to comply with the road safety rules and traffic regulations of the Czech Republic, the requirements from statements of the road Authorities, the instructions of the material and equipment manufacturers and suppliers as well as with the standard practice for material and equipment transportation.

It is assumed the equipment and material will be delivered from manufacturer by railway to the nearest railway stations and from there by trucks to the designated pipe yards or directly to the construction site. Alternatively transport shall be done directly from the manufacturer to the construction site by trucks via the designated access roads.

Any deviation from approved transport routes are subject to approval by the Employer and relevant Authorities. Any discrepancy in transportation and related activities shall be clarified with the Employer before starting of transportation. In case of additional access routes are required by Contractor, the Contractor shall arrange all the approval and relevant permits as well as construction of these additional access roads at his own expense.

The Contractor shall bear the responsibility for damage occurring to any road or other infrastructure as a result of his transportation activities.

Where the access road crosses the overhead power line a height restriction bar shall be installed to ensure safe traffic and transportation of equipment and materials to and from the site.

4.4 Material handling and storage

Contractor shall store all materials in accordance with material manufacturer's requirements, project requirements and in compliance with an approved procedure for material storage.

All materials must be suitably stored and protected from external influences including theft and vandalism. Safe access for inspection, testing and handling must be ensured during storage. When loading, unloading, transporting, storing and laying, materials must always be handled in such a way as to avoid damage, material damage or personal injury. When handling pipes and materials, the material identification must be preserved.

If the pipe supplier is not selected at the time of construction of the pipe yards and storage areas, the area shall be prepared according to the project documentation. If the supplier is known, the procedures and requirements of the pipe supplier shall be followed.

The maximum height of the stored material is approx. 4.3 m. Wooden boards shall be placed under the pipes and equipment to ensure handling and stability in the storage area. To reduce the influence of earth magnetism on material quality, the axis of the pipes must be orientated east-west as far as applicable. All stored pipes shall be earthed, including the connection of the individual pipes to earthing system. The pipe yard earthing must not be connected to the earthing conductors of the high power lines.

It is assumed that a mobile crane with high lifting capacity will be used for handling (allow more pipe handling from one position). When handling the pipes damage of coating and pipe ends shall be avoided i.e. the crane hooks must be coated with a plastic material and the length and the angle of rope meets the manufacturer's requirement. In case of using a lifting beam, the lash straps must be made of cloth.

The Contractor must maintain the pipe yards and storage areas at his own expense. The Contractor shall be responsible for the material stored and the safety of personal within these areas. The Contractor shall ensure drainage of surfaces in the pipe yards and storage areas in case of rain or snow. Any aboveground and underground facility, object or utility line of a third party affected by pipe yard and storage areas and related activities must be properly protected. The areas shall be always accessible at any time and under any weather conditions for heavy vehicles and mobile cranes. The Contractor shall provide appropriate lighting of the areas to ensure safe working conditions. The Contractor shall comply with all safety regulations, in particular to ensure that unauthorized persons do not enter material storage facilities. Any extension of the storage yard operation beyond the agreed period and associated costs shall be borne by the Contractor.

Land lease, preparation of documentation for the applicable permits and biological reinstatement will be provided by the Employer. The Contractor shall be responsible for

management of the pipe yards and storage areas, design modification based on the requirements and manuals of pipe manufacturers if any, pipe yards operation for the required period of time (e.g. energy, personnel, security, etc.), disposal of the pipe yard and storage area and reinstatement of the land into the original condition including technical reinstatement. The Contractor shall prove the reinstatement of the land by the documentation of their condition prior to its construction and after the technical reinstatement. The documentation shall be handed over to the Employer.

4.4.1 List of pipeyards

- Hora Svaté Kateřiny
- Vrskmaň
- Nezabylice
- Chudeřín
- Vroutek
- Malměřice
- Pastuchovice (limited space, placing of bending machine is not foreseen)
- Dražeň
- Úněšov
- Těchlovice u Stříbra
- Holostřevy
- Souměř

4.5 Bill of material

The Contractor shall register and keep all the records of materials throughout the whole construction period. In these records all material, material received, material stored, material installed, material required, spare material and material damaged which cannot be used shall be documented. In addition, the Contractor shall have the all the required documentation for each material (certificates, acceptance test reports, manuals, handling instructions) and this documentation shall be accessible to the Employer throughout the whole construction period. The Contractor must immediately inform the Employer of the missing material for the planned construction in order to minimize the delays of the construction.

During and after the completion of the construction, the Contractor must ensure the collection of the remaining material supplied by the Employer such as pipes, bends,

flanges, bolts, etc. and safely transfer the material to the storage yard designated by the Employer for future use. Pipe cut-offs of a length less than 1.5D and material specified by the Employer for disposal shall be collected by the Contractor at the location as specified by the Employer. Any spare and remaining material cannot be removed without Employer's approval.

During construction or no later than one month after completion of the works the Contractor shall prepare a report of all material, quantities and related certificates and reports for handover to Employer. The report shall contain a comparison of the received, installed, and returned materials.

The Contractor is also responsible to reimburse any cost related to the damaged material supplied by the Employer.

4.6 Line pipes distribution

Standard pipe of 18.0 mm wall thickness ("category A") is used at the most sections. At certain sections ("static") and within stations increased pipe of 21.5 mm wall thickness ("category B") is designed. The pipe wall thickness distribution shall be as follows:

Chainage from [m]	Chainage to [m]	Length (horiz.) [m]	Northing [m]	Easting [m]	Pipeline Section*	Pipe Cat.
0	143	143	-977033	-803575	Station	B
143	11371	11228	-977093	-803705	Pipeline	A
11371	11780	409	-986295	-803710	Station Jirkov	B
11780	13928	2148	-986673	-803611	Pipeline	A
13928	14079	151	-988654	-803757	Station Vrskmaň	B
14079	26620	12540	-988763	-803863	Pipeline	A
26620	26818	199	-999438	-804639	Station Hrušovany	B
26818	30512	3694	-999601	-804644	Pipeline	A
30512	31346	834	-1002509	-805554	Static + Ohře Watercourse	B
31346	37179	5833	-1002774	-806271	Pipeline	A
37179	37595	416	-1007324	-806416	Static + Liboc Watercourse	B
37595	44657	7063	-1007739	-806411	Pipeline	A

Chainage from [m]	Chainage to [m]	Length (horiz.) [m]	Northing [m]	Easting [m]	Pipeline Section*	Pipe Cat.
44657	44799	141	-1014276	-806167	Station Sýrovce	B
44799	58026	13228	-1014417	-806162	Pipeline	A
58026	58281	255	-1023715	-813798	Static + Podhora Watercourse	B
58281	62863	4582	-1023935	-813920	Pipeline	A
62863	63073	210	-1027994	-815163	Station Malměřice	B
63073	74945	11872	-1028190	-815135	Pipeline	A
74945	75060	115	-1039004	-816408	Static	B
75060	81721	6661	-1039118	-816409	Pipeline	A
81721	81901	180	-1044252	-819519	Station Mladotice	B
81901	83095	1194	-1044271	-819698	Pipeline	A
83095	84197	1102	-1044991	-820520	Static + Střela Watercourse	B
84197	96316	12119	-1045581	-821353	Pipeline	A
96316	96455	139	-1052426	-829997	Station Hubenov	B
96455	101242	4786	-1052405	-830135	Pipeline	A
101242	101555	313	-1053351	-834617	Static + Třemošná Watercourse	B
101555	110602	9047	-1053386	-834928	Pipeline	A
110602	110890	288	-1056422	-842503	Static + Křelovický Watercourse	B
110890	114474	3584	-1056544	-842764	Pipeline	A
114474	114695	220	-1057430	-845984	Station Sviňomazy	B
114695	133857	19162	-1057576	-846067	Pipeline	A
133857	134164	307	-1067635	-859413	Static + Starý potok Watercourse	B
134164	139604	5440	-1067705	-859693	Pipeline	A

Chainage from [m]	Chainage to [m]	Length (horiz.) [m]	Northing [m]	Easting [m]	Pipeline Section*	Pipe Cat.
139604	139784	181	-1068612	-864842	Station Bor	B
139784	149828	10044	-1068734	-864974	Pipeline	A
149828	149919	91	-1070681	-874171	Station Přimda	B
*For direct pipe borings which are not listed above (selected watercourses) category B pipe with additional GRP coating shall be used.						

4.7 Factory bends distribution

Note: For supplied factory bends the Contractor shall consider tolerances in line with EN 14870-1.

Nr.	Type	Chain.	X	Y	Angle	15°	22.5	30°	35°	Rest	Cat.
1	HOR	2495	979029	804918	26.4°	0	0	0	0	26.4°	A
2	HOR	2566	979076	804970	-64.0°	0	0	1	0	34.0°	A
3	HOR	7061	983271	805143	-50.8°	0	0	1	0	20.8°	A
4	HOR	7355	983057	804943	55.0°	0	0	1	0	25.0°	A
5	HOR	7384	983060	804912	30.0°	0	0	1	0		A
6	HOR	7451	983098	804857	48.9°	0	0	1	0	18.9°	A
7	HOR	8006	983624	804699	-60.3°	0	0	1	0	30.3°	A
8	HOR	8072	983649	804636	61.4°	0	0	1	0	31.4°	A
9	HOR	9333	984641	804075	47.9°	0	0	1	0	17.9°	A
10	HOR	9582	984876	803996	20.6°	0	0	0	0	20.6°	A
11	HOR	9698	984985	804035	30.0°	0	0	1	0		A
12	HOR	9717	984998	804050	-29.0°	0	0	0	0	29.0°	A
13	HOR	10166	985325	804351	-71.3°	0	1	1	0	18.8°	A
14	HOR	10846	985831	803934	30.4°	0	0	0	0	30.4°	A
15	HOR	10883	985866	803921	-28.5°	0	0	0	0	28.5°	A
16	HOR	11521	986438	803708	-45.0°	0	2	0	0		B
17	HOR	11671	986580	803658	-24.3°	0	0	0	0	24.3°	B
18	HOR	11731	986623	803616	37.5°	1	1	0	0		B
19	HOR	12534	987417	803659	-58.1°	0	0	1	0	28.1°	A
20	HOR	12592	987459	803615	57.7°	0	0	1	0	27.7°	A
21	HOR	12960	987822	803686	-50.5°	0	0	1	0	20.5°	A
22	HOR	13287	988083	803489	45.0°	0	2	0	0		A
23	HOR	14155	988817	803916	-43.5°	0	1	0	0	21.0°	A
24	HOR	15375	990037	803929	59.3°	0	0	1	0	29.3°	A
25	HOR	15441	990071	803988	-62.8°	0	0	1	0	32.8°	A
26	HOR	26683	999472	804692	-90.0°	0	0	3	0		B
27	HOR	26769	999552	804641	37.1°	1	0	0	0	22.1°	B
28	HOR	28822	1001392	804306	30.0°	0	0	1	0		A
29	HOR	30563	1002508	805605	-42.0°	0	1	0	0	19.5°	B
30	HOR	31292	1002827	806245	77.0°	0	0	2	0	17.0°	B
31	HOR	31461	1002671	806323	-46.0°	0	0	1	0	16.0°	A
32	HOR	35599	1006067	806944	-65.5°	0	0	0	1	30.5°	A
33	HOR	35790	1006167	806778	90.2°	0	0	2	0	30.2°	A
34	HOR	41465	1011219	806068	-57.2°	0	0	1	0	27.2°	A
35	HOR	41562	1011287	805996	60.0°	0	0	2	0		A
36	HOR	43485	1013104	806203	42.2°	0	1	0	0	19.7°	A
37	HOR	44888	1014505	806143	-30.0°	0	0	1	0		A
38	HOR	44942	1014543	806105	30.0°	0	0	0	0	30.0°	A
39	HOR	52164	1020019	809599	60.0°	0	0	1	0	30.0°	A
40	HOR	52765	1020320	810043	44.2°	0	1	0	0	21.7°	A
41	HOR	58062	1023738	813825	-22.0°	0	0	0	0	22.0°	B

Nr.	Type	Chain.	X	Y	Angle	15°	22.5	30°	35°	Rest	Cat.
42	HOR	66579	1030812	816372	-28.8°	0	0	0	0	28.8°	A
43	HOR	67582	1031813	816406	-27.0°	0	0	0	0	27.0°	A
44	HOR	77116	1040957	816904	35.0°	0	0	0	1		A
45	HOR	78643	1042038	817952	27.3°	0	0	0	0	27.3°	A
46	HOR	79598	1042705	818384	43.0°	0	1	0	0	20.5°	A
47	HOR	79708	1042803	818438	-45.0°	0	2	0	0		A
48	HOR	79757	1042850	818425	60.0°	0	0	2	0		A
49	HOR	80212	1043260	818612	60.0°	0	0	2	0		A
50	HOR	80234	1043265	818636	-60.0°	0	0	2	0		A
51	HOR	80816	1043812	818834	-21.2°	0	0	0	0	21.2°	A
52	HOR	80841	1043837	818830	30.4°	0	0	0	0	30.4°	A
53	HOR	81091	1044072	818915	60.0°	0	0	2	0		A
54	HOR	81763	1044257	819561	-12.6°	0	0	0	0	12.6°	B
55	HOR	81775	1044261	819573	12.6°	0	0	0	0	12.6°	B
56	HOR	82256	1044363	820036	-30.0°	0	0	1	0		A
57	HOR	82283	1044384	820054	30.0°	0	0	1	0		A
58	HOR	82339	1044402	820107	30.0°	0	0	1	0		A
59	HOR	82366	1044397	820134	-30.0°	0	0	1	0		A
60	HOR	83253	1045129	820598	50.4°	0	0	1	0	20.4°	B
61	HOR	83320	1045138	820665	-25.7°	0	0	0	0	25.7°	B
62	HOR	83537	1045282	820827	56.3°	0	0	1	0	26.3°	B
63	HOR	83602	1045270	820892	-32.3°	0	0	0	0	32.3°	B
64	HOR	83842	1045361	821114	-50.6°	0	0	1	0	20.6°	B
65	HOR	83890	1045408	821129	60.0°	0	0	2	0		B
66	HOR	83961	1045424	821200	-45.0°	0	2	0	0		B
67	HOR	84145	1045581	821299	57.6°	0	0	1	0	27.6°	B
68	HOR	88246	1047821	824562	-62.4°	0	0	1	0	32.4°	A
69	HOR	92319	1049752	827937	-30.0°	0	0	0	0	30.0°	A
70	HOR	92351	1049779	827955	29.4°	0	0	0	0	29.4°	A
71	HOR	92417	1049808	828014	-30.0°	0	0	1	0		A
72	HOR	92449	1049835	828031	30.0°	0	0	1	0		A
73	HOR	110189	1056247	842129	15.2°	0	0	0	0	15.2°	A
74	HOR	111904	1056926	843650	30.5°	0	0	0	0	30.5°	A
75	HOR	114542	1057454	846047	-90.0°	0	0	3	0		B
76	HOR	114640	1057553	846009	90.0°	0	0	2	0	30.0°	B
77	HOR	115176	1057870	846429	41.0°	0	1	0	0	18.5°	A
78	HOR	117983	1059086	848862	-60.0°	0	0	2	0		A
79	HOR	118065	1059169	848852	30.0°	0	0	1	0		A
80	HOR	121600	1061580	851172	30.0°	0	0	1	0		A
81	HOR	121651	1061590	851222	-30.0°	0	0	1	0		A
82	HOR	123465	1062061	852929	61.0°	0	0	1	0	31.0°	A
83	HOR	123516	1062045	852979	-60.0°	0	0	2	0		A
84	HOR	127280	1064988	854840	-54.5°	0	0	1	0	24.5°	A

Nr.	Type	Chain.	X	Y	Angle	15°	22.5	30°	35°	Rest	Cat.
85	HOR	129439	1066328	856335	-75.1°	0	0	2	0	15.1°	A
86	HOR	130429	1067131	856258	-30.0°	0	0	1	0		A
87	HOR	130480	1067178	856276	60.7°	0	0	1	0	30.7°	A
88	HOR	131214	1067235	857006	-46.8°	0	0	1	0	16.8°	A
89	HOR	131295	1067287	857070	79.5°	0	0	2	0	19.5°	A
90	HOR	133777	1067564	859402	-60.0°	0	0	2	0		A
91	HOR	133823	1067610	859388	60.0°	0	0	2	0		A
92	HOR	133854	1067634	859410	24.4°	0	0	0	0	24.4°	A
93	HOR	133931	1067664	859480	60.2°	0	0	1	0	30.2°	B
94	HOR	133980	1067632	859522	-60.0°	0	0	2	0		B
95	HOR	138292	1068249	863676	-60.0°	0	0	2	0		A
96	HOR	138389	1068327	863737	60.0°	0	0	2	0		A
97	HOR	139409	1068589	864650	33.6°	0	0	0	0	33.6°	A
98	HOR	140557	1069019	865691	60.1°	0	0	1	0	30.1°	A
99	HOR	140852	1068830	865920	-52.7°	0	0	1	0	22.7°	A
100	HOR	146154	1070171	870780	-45.9°	0	0	1	0	15.9°	A
101	HOR	146218	1070227	870814	49.7°	0	0	1	0	19.7°	A
102	HOR	147629	1070449	872155	60.0°	0	0	2	0		A
103	HOR	147744	1070411	872266	-60.0°	0	0	1	0	30.0°	A
104	HOR	148487	1070877	872846	48.4°	0	0	1	0	18.4°	A
105	VER	7077	983263	805129	-15.0°	1	0	0	0		A
106	VER	10216	985374	804328	-17.0°	0	0	0	0	17.0°	A
107	VER	28513	1001083	804284	-15.0°	1	0	0	0		A
108	VER	28534	1001104	804285	15.0°	1	0	0	0		A
109	VER	30592	1002527	805628	15.0°	1	0	0	0		B
110	VER	31249	1002817	806203	-30.0°	0	0	1	0		B
111	VER	31261	1002820	806215	29.0°	0	0	0	0	29.0°	B
112	VER	37227	1007372	806415	20.0°	0	0	0	0	20.0°	B
113	VER	37245	1007390	806415	-23.0°	0	0	0	0	23.0°	B
114	VER	60789	1025930	815041	-25.0°	0	0	0	0	25.0°	A
115	VER	62962	1028092	815155	-20.0°	0	0	0	0	20.0°	B
116	VER	62972	1028102	815154	20.0°	0	0	0	0	20.0°	B
117	VER	63008	1028126	815141	28.0°	0	0	0	0	28.0°	B
118	VER	63019	1028136	815140	-28.0°	0	0	0	0	28.0°	B
119	VER	74999	1039057	816409	-15.0°	1	0	0	0		B
120	VER	83659	1045292	820945	-15.0°	1	0	0	0		B
121	VER	83750	1045326	821029	-15.0°	1	0	0	0		B
122	VER	101466	1053378	834839	-16.0°	0	0	0	0	16.0°	B
123	VER	110938	1056564	842807	-15.0°	1	0	0	0		A
124	VER	111678	1056791	843470	-15.0°	1	0	0	0		A
125	VER	112843	1057114	844516	-35.0°	0	0	0	1		A
126	VER	120213	1060697	850104	-15.0°	1	0	0	0		A
127	VER	126393	1064549	854194	-24.5°	0	0	0	0	24.5°	A

Nr.	Type	Chain.	X	Y	Angle	15°	22.5	30°	35°	Rest	Cat.
128	VER	126403	1064560	854193	15.0°	1	0	0	0		A
129	VER	134065	1067666	859602	-19.0°	0	0	0	0	19.0°	B
130	VER	148303	1070769	872697	-20.0°	0	0	0	0	20.0°	A
131	VER	149890	1070676	874232	-25.0°	0	0	0	0	25.0°	B
132	VER	149899	1070676	874242	25.0°	0	0	0	0	25.0°	B

5 LINEAR SECTION CONSTRUCTION

5.1 Stringing

The materials and pipes shall be delivered to the site directly from the pipe yards or manufacturers on the approved roads and accesses to the working strip. Pipes or material shall not be delivered to the site before inspection of working strip is carried out and all temporary roads have been provided.

Depending on the working strip condition, hauling and stringing shall be performed by side booms with padded "A" frames, 4x4 truck and trailer combinations or special equipment suitable for travelling and hauling pipes on the working strip under the actual weather and site conditions.

The pushing, pulling or towing of loaded truck trailer combinations on the working strip is not permitted. Immobilized or broken down vehicles shall be offloaded prior to recovery.

The unloading of pipes on the working strip shall be performed by side booms or other suitable equipment.

Pipes shall be strung along the working strip without blocking vehicle access along the working strip and leaving passages providing cross working strip access.

Pipes shall be lowered onto suitable supports such as wooden supports, sand bags or soft soil piles protected from washout by a geotextile, so as to avoid damage to the pipe, pipe coating and to prevent an accidental movement or rolling of the pipe. All pipes shall be at least 150 mm off the ground and protected with the steel bevel protection.

Contractor shall ensure that pipes are strung along the working strip with the correct wall thickness as indicated in the pipeline alignment sheets and other drawings as well as according to the by Employer approved method statement provided by the Contractor.

In case of various yield strength of the pipes those with lower yield strength should be string to higher locations while those higher yield strength to lower locations to allow reasonable stress test sections distribution. Any damages of coating or pipe ends caused by the pipe handling shall be immediately repaired by Contractor.

5.2 Bends

Directional changes in pipeline alignment are realized through bends. Depending on the required deflection angle, available space and other constraints three different types of bends shall be used:

- Factory Bends
- Field Bends
- Elastic Bends (exceptional and limited use)

All bends shall be installed in stress free condition. The pushing, pulling, holding or restraining of the bend or the adjacent line pipe during the installation of the bend or the adjacent line pipe is not permitted.

The contact of the bend or line pipe with the trench wall is not permitted.

The use of mitre joints is not permitted.

5.2.1 Factory Bends

Horizontal and vertical curves for factory-made bends are considered with $R=14.2$ m (10D), exceptionally with $R=7.1$ m (5D). Horizontal and vertical curves with an angle of $> 35^\circ$ for factory bends are shown in drawings with $R=20.0$ m (multi-pipe curve radius - approximation).

In case that factory bends do not exhibit the same or similar material properties and wall thickness as the adjoining line pipe, the Contractor shall qualify any required additional welding procedures for the welding of field bends to line pipe and if required provide for adequate transition pieces.

The use of Factory bends other than those identified in the Project documents provided by Employer is subject to specific approval by Employer

5.2.2 Field Bends

Prior to the performance of field bending works Contractor shall perform a bending survey, determining the relevant bending angles and types of bends i.e. sag-bends, over-bends and combination bends.

The minimum radius for field bends is 40D, max. angle $1.5^\circ/D$. Type of pipes has to be also considered for minimum pipe bending radius (e.g. spiral welded pipes). Horizontal and vertical curves of the route with an angle: $\leq 9^\circ$ for field bends (cold bends) are shown in drawings with $R=76.0$ m. Horizontal and vertical curves with an angle of $> 9^\circ$ for field bends (cold bends) are shown in drawings with $R=112.0$ m (multi-pipe curve radius - approximation).

The pipes with FZM-N coating (if applicable) must be bent according to DVGW GW 340 with limited radius to avoid FZM-N damage. Any damage to the FZM-N coating caused by bending shall be repaired by the Contractor on site e.g. with Cemtex, Ergelit, etc. The piping with FZM-N coating designed with a bending radius greater than that permitted radius for the piping with FZM-N coating shall be FZM-N coated only after the bending.

Bends must be made in such a way as to avoid damage to the pipe coating or creation of cracks or wrinkles higher than the wall thickness of the bent pipe. Generally, the field bends shall fulfil the requirements of ČSN EN 1594, Art. 9.2.9.2. The minimum bended pipe wall thickness, as reduced during the bending, must not drop below the nominal wall thickness minus manufacturing tolerance – therefore pipes with higher wall thickness shall be used for bending preferentially. The maximum allowable ovality at any point of the bend is 2.5%. The bent section of a pipe must be at least 1D from the pipe end.

Prior to the start of production field bending operations, Contractor shall perform a procedure qualification with procedure qualification tests. Examination and testing results of the tested field bends shall be part of the bending procedure qualification and production test.

The procedure qualification shall be carried out on at least 3 pipes from the Category A pipe and one from the Category B. Testing pipes shall be used for construction if the field bend will be bent in satisfactory quality. Test bends shall be bent to the smallest bending radius to be used for construction, on the pipe with minimum wall thickness. The visual inspection shall check that the pipe does not show unacceptable folding, buckling, cracks or damaged coating after bending. The pipe wall thickness and ovality shall be checked at least at 3 points of the pipe in the bend section.

The Contractor shall verify the compliance with the allowable tolerance of the bend ovality and the buckling of the pipe wall by pulling the soft steel gauging plate through the bend. The diameter of the gauging plate shall be determined in the bending technology method statement, which shall be developed by the Contractor and approved by the Employer. The Contractor shall prepare a report on the result of bending testing and inspection.

Field bends produced prior to the approval of Contractor's bending procedure shall be rejected. Accepted field bends produced during the bending procedure qualification may be transported to the working strip and used at a suitable location.

For every bending machine Contractor shall use internal padded mandrel suitable for the relevant line pipe diameter.

In case of spiral welded pipes bend step directly at the spiral weld shall be moved away.

The bending machine(s) shall be supplied with adequately sized and padded bending shoes so as to prevent damage to the pipeline coating during the bending process.

Contractor may perform field bending on the working strip or at selected pipe yards. The Employer shall be informed about each location where bending operations shall be performed.

In case that systematic or repetitive damage to the pipe or pipe coating is observed, Contractor shall stop bending operations and rectify the bending equipment and/or bending procedure. Field bending operations shall only be commenced upon rectification of the equipment or re-qualification of the bending procedure in case that bending parameters have been changed.

Contractor shall maintain a record of all field bending operations, identifying:

- a) Date of field bending;
- b) Location of field bending;
- c) Serial No. of the bending machine;
- d) Operator of the bending machine;
- e) Pipe number and heat number of the parent pipe;
- f) Position of longitudinal weld seam during field bending (if applicable);
- g) Number of bending steps and individual deflection angles;
- h) Total bending angle;
- i) Position (chainage) in the pipeline
- j) Calliper inspection passed;
- k) Performed repairs (i.e. coating repair).
- l) Results of tests and checks

5.2.3 Elastic Bends

Use of elastic bends shall be limited and is permitted only for vertical bends. For details TPG 702 04 applies. In general the Contractor shall avoid the use of elastic bends unless specifically approved or for the application of a special construction method (e.g. horizontal directional drilling). Elastic bending shall only be performed along the calculated elastic bending radius for the line pipe. At elastic bends the pipeline trench has to be excavated along the alignment of the elastic bending radius. Radius for elastic bends shall be defined also in accordance with the relevant stress calculations.

5.3 Preparation for field welding

5.3.1 Pipe cutting

Pipes may have to be cut in order to ensure the proper positioning of bends and other appurtenances that shall be welded into the pipeline, thereby producing left over pipe pieces, which are referred to as “cut pipes” or PUP pieces.

The Contractor shall plan the pipe laying and welding in way to minimize the number of cut pipes less than 1.5 D in length.

All cut pipes 1.5 D and longer shall be moved forward along the string and welded into the pipeline at the most optimal location. It is not permitted to assemble sections from cut pipes in series and it is also forbidden to use the cut pipes to create a bend.

If line pipe is cut, a record shall be established, identifying at least - Date of cutting; Location of cutting (chainage); Pipe Number; Heat Number; Initial length of pipe; Length of each pipe piece; Purpose and installation location for each pipe piece (i.e. pup piece, transition piece, straight pipe segment).

The end preparation (beveling) of all cut pipes shall be performed as required for the employed welding method. The cutting of pipes shall include the removal of the pipe coating 150 mm either side of the cut.

Pipe ends shall be inspected for cracks and lamination by ultrasonic examination over the 100% of the pipe circumference at each end for a distance of at least 100 mm. The inspection and inspection results shall be recorded. Laminations or cracks shall be cut out by removing the concerned section from the pipe.

5.3.2 Re-beveling

Prior to line-up and field welding Contractor shall re-bevel all pipes if needed to ensure compatibility with the employed welding method and to ascertain complete removal of all traces of rust, mill scale and potential contamination with foreign materials or substances from the pipe face.

Re-beveling shall be performed with an automated machine that is self-centring via an internal alignment clamp (CRC-type or equivalent). Bevelled pipe ends shall be square to the axis of the pipe. It is not allowed to make bevels manually by use of a cutting torch.

All metal pieces and chips from beveling operations shall be collected and stored in a suitable container for daily removal from the working strip.

5.3.3 Buffing of Pipe Ends

After re-beveling, the adjacent area of the pipe shall be buffed with wire brushes and/or buffing discs to remove all corrosion and particles of foreign matter.

5.3.4 Pipe internal cleaning

Each pipe ready for joining shall be thoroughly cleaned before welding. Any foreign material in the pipe shall be removed at the expense of the Contractor.

The Contractor shall take all necessary precautions to keep the inside of the pipe free of dirt, waste and other foreign matter before welding. Every pipe shall be inspected visually and if necessary the Contractor shall clean the inside of the pipe by appropriate methods approved by the Employer.

Upon completion of welding, each open end of the pipeline section must be equipped with a cover to prevent people, animals, dirt or water and other foreign substances from entering the pipeline.

In the event of a temporary interruption of welding, the covers must be provided at the open ends of the pipeline for the duration of the interruption of the work. On completed pipeline sections, these covers shall be removed only when the tie-ins are carried out.

The covers shall be properly secured to the pipeline. The cover shall be designed to prevent damage to the bevelled ends of the pipe.

5.3.5 Pre-heating

Prior to welding, the pipe shall be pre-heated to the temperature specified in the welding procedure specification. Pre-heating shall be performed with appropriate equipment, such as internal gas burners/flame rings or induction heated mats, so that the temperature is evenly distributed among the entire circumference of the pipe. The pre-heat temperature shall be measured with heat sensitive crayons (wax indicator crayons) or calibrated temperature measuring equipment at least 15 seconds after the removal of the heaters. Pre-heating shall cover the entire circumference of the pipe and over a distance of at least 50 mm.

5.3.6 Line-up

During line-up pipes shall be lifted and secured by non-slipping pipe slings and moved into position with adequate construction equipment (e.g. sideboom).

Pipes shall be aligned by internal pneumatic line-up clamps and aligned with proper spacing tools. External line-up clamps shall be used only for tie-in welds, joining welds and in the locations where use of internal line-up clamps is not possible.

5.4 Field welding of pipes

Contractor shall develop a detailed field welding procedure covering the aspects of all employed welding methods, such as but not limited to:

- Manual welding
- Automatic welding

The selection of the welding method(s) for the Project is subject to approval by Employer. The relevant approval may be revoked if the weld repair rate exceeds 10% per working day.

The Contractor's welding crew shall always have an approved welding procedure and approved welders for the work site.

Field welding shall be performed in accordance with the requirements of the applicable Project specification for the welding of the pipeline.

The minimum spacing between the girth welds of the pipeline section shall be at least 1.5D. The minimum spacing between the welds in the stations shall be 0.5D but at least 100 mm.

When welding pipe strings with longitudinal or spiral welds, the pipes shall be turned so that the circumferential distance between the ends of the welds is at least ten times the wall thickness, however not less than 100 mm.

Each pipe weld shall be marked with a unique identification number, which shall be specified in Contractor's procedure for the identification and marking of pipeline welds.

For each pipe weld Contractor shall establish a record identifying at least:

- Date of welding;
- Location by chainage (and coordinates after pipe laying);
- Weld number;
- All welders by welder identification number and relevant weld layer;
- Type of welding wire or rod for each weld pass;
- Date of NDT (first and second);
- NDT result (first and second);
- Date of Repair;
- Repair Procedure;
- Repair welders by welder identification number.

The weld number shall be written on the downstream line pipe at least 200 mm away from the edge of the line pipe coating so that it will not be covered or damaged by subsequent field coating works. The number shall be written between 10 o'clock and 14 o'clock position. The letters shall be made with a white, non-washable permanent marker and shall be at least 100 mm in height.

The Contractor shall avoid, wherever practicable, welding under or in the close vicinity of an overhead high voltage power line.

During the welding activities the pipes must be grounded. It is recommended to ground each 500 m of the pipeline with earth bar of a minimum length of 1 m. For the connection line between the pipe and the earth conductor use of an insulated copper cable with a cross section of 16 mm² is recommended.

The Contractor shall weld pipes and elements together to form a continuous pipeline sections (strings) as far as practicable.

The pipe strings welded adjacent to the pipeline trench shall be securely positioned on skids, cradles, supports, sand bags, etc. until the pipe string is lowered in the trench. The Contractor shall provide sufficient quantities of supports of sufficient dimensions to avoid deflection, damage or fall of the pipeline section. Supports must be used to withstand longitudinal movements of the entire pipe string due to thermal expansion and to avoid damage to pipe coating. The height of the supports and pipes must allow easy welding and inspection of welds and pipe coating.

5.5 Non-Destructive Testing (NDT) and inspection

All welds are subjected to Non-Destructive Testing.

NDT of welded joints shall be executed in accordance with the NDT specification.

The non-destructive testing (NDT) of welds shall be performed by the NDT contractor selected by the Employer. The Contractor shall cooperate fully with the NDT contractor to not cause any delay or obstruction for the fulfilment of the NDT contractor activities. The NDT contractor shall provide reports of weld test results to the Contractor. The Contractor shall make any necessary repairs detected by the NDT contractor or the Employer's Supervisor. All weld repairs shall be carried out at the Contractor's expense.

Any difficulties regarding the cooperation, performance or interfaces between Contractor and NDT contractor shall have to be notified in written form to the Employer or Employer's supervisor without delay.

The NDT contractor and the Employer, Employer's Supervisor or designated Authorised Expert are the only parties authorized to perform all NDT activities to check the quality of welding works during the construction (this does not apply to visual inspection). The Employer, Employer's Supervisor or designated Authorised Expert having the right to take a final decision on the interpretation in case of uncertain situations.

5.5.1 Non-Destructive Testing (NDT)

Prior to execution of the testing the Contractor shall clean the tested surfaces, remove any material spattered during welding and other residual contamination. Also prepare a

smooth surface without any grooves or scratches as required by the NDT contractor. NDT of welds shall proceed after the final heat treatment and cooling of the weld. The NDT of golden welds shall be carried out with a minimum delay of 12 hours.

The NDT results shall be recorded and identified with the appropriate unique weld identification marking. The position on the weld shall be indicated using appropriate markings.

NDT contractor, the Contractor and the Employer or Employer's representative shall exchange all information and maintain accurate records to reflect the actual installation of all pipes and supplied material.

5.5.2 Pipeline welding inspection

It is the responsibility of the NDT contractor to keep all records of the tests performed. It is the Contractor's responsibility that each of the welds is tested and all relevant information are recorded in such a way, that every record for each of the weld can be identified. The Contractor is also responsible for keeping the Pipe Book with NDT information provided by the NDT contractor.

5.5.3 Inspection of golden welds

All golden welds are subject to Visual Testing (VT), Radiographic Testing (RT), and Manual Ultrasonic Testing (MUT/TOFD) or as required by the Employer.

5.6 Field Coating and Painting

All Field coating works shall be according to the Coating and Painting Specification.

Prior to start of coating works an Application Procedure Specification ("method statement") shall be provided by Contractor and approved by Employer as well as Pre-Production Trial and Procedure Qualification Trial if required.

The pipes supplied to the Project are coated by HDPE coating. After welding of the pipes welding and NDT of welds the Contractor shall protect the field joints against corrosion as per relevant procedure or specification.

All coating and painting materials to be used by the Contractor during construction must be approved by the Employer in advance. All external coating materials must be supplied with the relevant material safety data sheets (MSDS). Prior to the start of the coating works, workers shall be demonstrably trained to read and understand the information provided on MSDS and relevant work procedure. Relevant PPE must be used by all construction personnel as required.

5.6.1 Surface preparation

Surface preparation shall be carried out in accordance with the recommendations of the coating manufacturer and Application Procedure Specification approved by Employer.

All welding slag, spatter, rough capping, burrs, laminates and the like shall be removed or rounded at a radius of no less than 2 mm before surface preparation may commence. The received line pipe and bends due for coating shall be inspected by Contractor to make sure that mentioned treatments are performed to a satisfactory level.

All surface contaminants such as oil, grease, tar, salt, or other contaminants on the pipe surface shall be removed in accordance with a procedure approved by Employer. Depending on the extent and the characteristics of the contamination, solvent cleaning in combination with a post treatment (i.e. water washing) could be considered as a suitable method. Considering field conditions, care has to be taken that the work space and the surrounding area will not be polluted by solvents etc. The removal of hydrocarbon contamination shall be confirmed by a water spray test, where a fine spray is applied to the surface and uniform wetting confirms the removal. Items found to be contaminated shall be cleaned as above and re-blasted if testing after blasting establishes that salt, chloride or hydrocarbon contamination is still present. The remainder of the batch concerned shall all be checked individually. All water used for rinsing or cleaning purposes shall be potable with less than 200ppm total dissolved solids and 50ppm chlorides.

After cleaning and prior to abrasive blasting the surface of the items shall be dry and all moisture shall be removed. If the ambient temperature is below 20°C, the surface of the items shall be uniformly heated up to a maximum temperature of 50°C. To avoid any condensation, the temperature of the surfaces to be blasted shall always be at least 3°C above the dew point. In cases where the prevailing relative humidity is higher than 85%, continuation of production requires approval of Employer's Supervisor.

Bare steel area shall be thoroughly blasted to a near white metal finish as specified in ČSN EN ISO 8501-1. Blasting material shall be either industrial grade grit subject to approval by the Employer. Expendable/disposable grit like garnet or corundum is preferred. Sand shall not be used.

The total elapsed time between the start of blasting of any pipe, bend or fitting and the heating of that pipe, bend or fitting to the specified temperature shall not exceed 30 minutes, otherwise complete re-blasting shall be required. Following abrasive blasting the surface shall not be contaminated with dirt, dust, metal particles, hydrocarbons, water, chlorides, sulphates or any other foreign matter which would be detrimental to the coating. Any dust or loose residue that has accumulated during blasting and/or grinding operations shall be removed by the use of clean compressed air.

In addition, the steel shall be checked for damage and any defects (dents, bevel damage, wall thickness reduction caused by nicks and defects and the like). The

identification of materials (for example pipe identification) shall also be checked after grit-blasting.

Prior to application of the corrosion protection material, the Contractor shall measure the application conditions such as surface temperature, surface roughness, humidity, etc. and write them down to the coating log book at least twice per shift in order to achieve the parameters specified in the specification and working procedure.

5.6.2 Application of the coating

Coating system must be applied on all equipment of the pipeline exposed to atmospheric and soil conditions (except plastic and stainless steel surfaces).

The coating may only be carried out by personnel holding a relevant certificate obtained on the basis of examination according to TGP 927 02 or equivalent. Only approved materials can be used for coating.

Additional mechanical protection by cement based tape shall be used to protect the welds of pipes delivered with fibre-reinforced cement coating as well as welds of pipes additionally coated with fibre-reinforced cement coating on site where additional protection of coating of induction bends, field cold bends, under concrete weights and wherever resistance to mechanical damage is required (e.g. thrust boring without casing or where compaction under roads is performed).

Additional requirements for painting, coating and mechanical protection by the tape applied on site are described in detail in the relevant Painting and Coating Specification.

5.6.3 Inspection and testing

The Contractor shall ensure inspection and testing of coating during and after completion of the construction. The coating surface shall be subjected to visual testing, 100% holiday testing by defined voltage and two destructive peel strength tests per every 100 girth welds. The Contractor shall ensure repair of all defects according to relevant specifications. A quality assurance report shall be issued from all inspections and tests carried out. The Employer or Employer's Supervisor or designated Authorised Expert shall be invited to witness the inspections and tests. The inspection and testing requirements are described in detail in relevant Painting and Coating Specification.

At least 6 months after backfilling, the Contractor shall perform a Pearson insulation resistance test, which shall be performed with the participation of the Employer's representatives. Any found defects to be repaired by the Contractor at his expense.

5.7 Excavation

Before start of excavation, all crossed lines and facilities shall be marked and possibly uncovered.

Excavated soil shall be piled up along the trench at a sufficient distance to comply with the requirements of relevant regulations, and to avoid falling back or being swept by rainfall back into opened trench.

The excavated material (subsoil) shall not be contaminated with organic material and shall be stored separately from the topsoil. In the case of sections with restricted working strip where the topsoil or other material cannot be stored, the Contractor shall transport the material to other designated storage site and store the excavated material there for the duration of construction, and transport back for backfilling. The excavation material and topsoil must be preferably placed in the close vicinity within a standard working strip width according to the relevant typical drawings.

Contractor shall observe the conditions or limitations of other rights holders at crossing with other services, i.e. load restrictions, supervision requirements or requirement for hand excavation.

Contractor shall repair any damage that occurs to existing services, cables or installation as instructed by the owner/operator of the service, which may include the performance of preliminary repairs to maintain the functionality of the relevant service or installation. All repairs have to be approved by the owner/operator of the service and shall be performed to a condition equal or better than the initial condition.

If the pipeline route crosses the catchment areas of public or private wells the Contractor shall take appropriate protection measures not to interfere with the functionality of these wells or contaminate.

5.7.1 Trench Excavation

The excavation of the trench shall be in accordance with ČSN 73 6133 "Design and execution of the road base" and the Project documentation.

The selected method of excavation shall not contradict the applicable standards, regulations and contract provisions. The Contractor shall properly select the construction equipment to avoid any damage to existing infrastructure or other facilities (e.g. pipelines, underground and aboveground utilities, houses, bridges, etc.).

The pipeline trench shall be excavated:

- Along the staked alignment as depicted on the pipeline alignment sheets;

- To sufficient depth to provide the cover as specified in the pipeline alignment sheets or relevant special design drawings, allowing extra depth for any bedding required underneath the pipe;
- To allow the lowering of the pipe string without damaging the pipe or pipe coating;
- To fit the prepared pipe string without the use of external force and without contact of the sides of the trench with the pipe;
- To allow the padding material to be properly embedded and compacted around the lower parts of the pipe;
- To obtain a smooth profile for the pipeline and to minimize field bending;
- To follow the curvature of the bends (field or factory bend) at intersection points;
- To a width that the minimum clearance between the trench wall and the pipe, bend, concrete pipe coating or any other appurtenance of the pipeline is maintained, as specified in the relevant typical drawing or legal requirements;
- With a profile so as to ensure the stability of the trench walls for the time period between excavating and backfilling of the trench, unless provisions of for the shoring of trench walls are applied. When ground conditions are such that the sides of the trench do not remain stable for the period of time between trenching operations and lowering in of the pipe, the Contractor shall provide timbering and supports, sheet piling or other means to retain the trench sidewalls. Gradients of the excavation slopes from 1:0.25 to 1:1 depend on geotechnical conditions are expected.

The bottom of the pipeline trench shall be graded so that the pipeline is evenly supported throughout its length.

The finished trench shall be free from roots, stones, rocks or other hard objects, which may damage the pipe or pipe coating.

The Contractor shall make provisions for dewatering of the trench, if required.

Where the trench has been over-excavated the Contractor shall re-fill the trench to the required level to ensure that the pipe is properly supported, by backfilling the trench with compactable material. Compaction shall be performed in layers not exceeding 0.3 m.

Bell holes in the pipeline ditch shall be properly sized according to relevant project requirements and protected to allow the safe execution of the works and the required inspections inside the ditch.

Where access is required across the working strip, the Contractor shall provide safe access across the trench. Such access shall be provided at reasonable intervals and where required by law, landowners or tenants.

The ditch must be excavated and left open for the shortest possible time.

5.7.2 Bell Holes

Whenever works shall be performed inside the pipeline trench e.g. welding and coating of tie-ins bell holes shall be excavated.

Bell holes shall conform to the requirements of the relevant specifications for subsurface works and working in confined spaces. Particular attention shall be given to the stability of the trench wall. Shoring shall be performed as required for the safe execution of the works.

All works inside bell holes shall be supervised at all times by a supervisor located outside of the bell hole.

Bell holes shall have a minimum length of 2 m and provide a minimum clearance of 1 m around the pipe.

Bell holes shall be kept free of water and shall be equipped with safe accesses, i.e. ladders.

Bell holes for tie-ins shall be marked and excavated prior to the lowering-in of the relevant pipe strings.

The Contractor must provide a dry surface for the personnel performing the work in the bell hole. The Contractor shall take all necessary precautions to protect all utilities located in vicinity of the bell hole during all works inside bell holes.

5.7.3 Pipe Cover

The standard depth of the pipeline trench shall be made by the Contractor so that the final cover over of the pipeline pipe or casing pipe is at least 0.8 m or 1.1 m at the agricultural areas (where deep ploughing may be expected) and as specified in the relevant typical drawings, detailed drawings or alignment sheets. In case of discrepancy between this specification and the approved project documentation (alignment sheets, detailed drawings etc.) or requirements from permits, information given in these documents shall supersede this specification.

The depth of the pipeline cover shall be measured from the original ground surface or the expected graded surface after reinstatement, whichever is lower, on both sides of the trench to the top of the pipe. The Contractor shall adjust the depth of the trench as per approved documentation or where a higher pipeline cover is required by the relevant Authority (crossings of roads, railways, rivers and brooks, underground utility lines, etc.) and to reduce the need of installing additional bends (especially factory bends).

5.7.4 Bedding

Prior to the introduction of bedding material, the trench bottom shall be cleaned and all rocks or foreign matter shall be removed. The material used for bedding shall be soft, sand or fine grain material free from sharp stones, flints or foreign particles, 0-8 mm.

The pipeline shall be bedded onto soft, fine grain material free from sharp stones or flints, perishable matter or other materials which could damage the pipe or the pipe coating. Whenever this cannot be achieved through cleaning of the trench bottom, i.e. in rocky areas a bedding layer shall be introduced into the pipeline trench as specified in relevant typical drawings. Contractor shall provide adequate levelling or compaction of the bedding material as required.

Use of sandbags under or around the pipeline shall be avoided unless approved for specified purposes, such as at thrust boring pits, crossings of third-party lines or steep slopes according to typical drawings.

In case of winter construction Contractor shall carefully lay the pipes on the trench bottom which shall be free of any frozen soil blocks to avoid damage of the pipe or coating.

5.7.5 Dewatering of the trench

The construction trench shall be kept dry at all times, until completion of the backfilling of the trench. In areas with high groundwater table Contractor shall plan and implement the necessary drainage works prior to the opening of the trench.

Depending on the site conditions drainage may be achieved through the installation of:

- Open drainage systems;
- Horizontal drainage system;
- Vacuum lances;
- Drainage wells;
- Other methods.

Prior to the performance of any works related to the drainage or lowering of the groundwater table, Contractor shall obtain the written approval from the relevant water Authorities.

Potential effects on third parties activities and installations adjacent to the working strip shall be monitored throughout the application of drainage or groundwater lowering activities. In case that any negative impacts are observed or reported Contractor shall apply required measures in order to mitigate and rectify any such impacts.

Contractor shall arrange for sufficient number materials equipment and installations, such as wells, pumps, filters, piping and settling basins to provide for ensure proper

drainage and dewatering through-out the entire duration of the construction activities in the concerned section.

All equipment like pumps and generators shall be fitted with appropriate mufflers and noise suppression devices.

After the implementation of the drainage measures and prior to the commencement of trenching activities, Contractor shall open trial pits or test holes to confirm that sufficient dewatering has taken place.

Contractor is responsible for the proper disposal of drained water. This may include, but not limited to:

1. The installation of settling basins;
2. The treatment of water contaminations and filtering;
3. The implementation of flow control and erosion control measures;
4. The implementation of other requirements, as specified by the relevant Authorities.

Contractor shall monitor the quality of disposed water as required by the local Authorities.

5.8 Pipe Lowering

Prior to the commencement of the lowering work the Contractor shall prepare a method statement for the pipe lowering and submit for approval to the Employer.

The maximum time interval between ditch excavation and pipe lowering must not exceed 7 days

The lowering in of pipe strings shall be performed in relevant sections.

Prior to the start of lowering:

- The Contractor shall ensure that the welded pipeline is lowered into the excavated ditch with the bottom provided with the adequate bedding as defined in the Chapter “5.7.4 Bedding” and trench bedding shall be completed;
- All timber, sticks, stones, hard clods of earth, rocks and other hard objects, which might damage the pipe or pipe coating shall be removed from the bottom of the trench;
- The pipeline trench shall be free of water (except for selected watercourses);
- The pipe string shall be visually inspected for damages to the pipes, the pipe- and field joint coating;
- The pipe coating shall be tested by the holiday detection method;

- All defects to the pipe, pipe coating and field joint coating shall be repaired properly cured, re-inspected and re-tested by the holiday detection method.

The inspection of the pipe trench and the inspection and testing of the pipe string shall be witnessed by Employer's Supervisor and lowering-in shall only commence after Employer's or Employer's Supervisor's written approval.

Contractor shall calculate the permissible free span length and elastic bend radius of the pipe and perform the lowering-in by sufficient number of side booms with relevant bearing capacity, so as to avoid overstressing and deformation of the pipe string.

The pipe string shall be lifted and cradled into the trench by roller cradles and/or non-abrasive band slings suitable for the actual pipe diameter.

During the lowering activities movement of any personnel in the trench or in its close proximity and the proximity of the construction equipment is prohibited.

The entire lowered pipe string shall be supported by levelled/ compacted bedding material except at the location of tie-ins (bell holes).

If the free span length of a lowered-in pipe string exceeds the permissible limits, or if the minimum pipe cover is not maintained, Contractor shall remove the relevant pipe section from the trench and replace said pipe section at his own expense.

The pipe string shall fit the trench so that it can be lowered in without the use of external force and without contact to the sides of the trench with the pipe.

Any stones or foreign objects that fall into the trench during lowering-in of the pipe string shall be removed prior to backfilling (padding) of the pipeline trench.

5.9 Weighting and Mechanical Protection

The installation of weighting and mechanical protection of the pipeline shall be carried out at locations according to the approved Project documentation. The sections of application are specified in relevant typical drawings, detailed drawings and alignment sheets.

The weighting is usually installed in the locations with higher risk of buoyancy. The mechanical protection of the pipeline is usually used in the locations with higher risk of mechanical damage to the pipelines like crossings.

Types of weighting and mechanical protection considered for this Project are:

- Concrete weights
- Concrete coating
- Casing pipes

- Reinforced concrete panels and concrete slabs
- Additional coatings

5.9.1 Concrete weights:

Concrete weights are precast concrete blocks weighing approx. 2750 kg, which are installed on the top of the pipeline coated with geotextile at locations with a risk of pipeline uplift due to the buoyancy, like water courses, swamps, wetlands and water-bearing soils, and flood areas.

The protection using concrete weights and its dimensioning is addressed in typical and detailed drawings or in relevant alignment sheets.

5.9.2 Concrete coating

Protection by concrete coating shall be mainly used to protect pipeline in the case of waterbody crossings where concrete weights are not suitable or crossings with selected existing roads which are located in close proximity to streams and selected watercourses. The concrete coating shall be made in-situ by the Contractor on site using reinforced concrete applied in the prepared formwork. The pipes and the thickness of the separating layer must be selected in such a way that eliminates any loss of integrity of the concrete coating during the stress test of the pipeline.

The detailed information is described in the Pipeline Static Calculation.

5.9.3 Casing pipes

Concrete casing pipes shall be installed by the Contractor on the pipeline crossings with existing roads (local-, specific-, field- and other roads) and where required by the law, the owner of the road or relevant road Authority. If defined, the concrete casing pipe can be used in case of crossing with the existing underground utilities.

Two concentric steel casing pipes (filled with reinforced concrete) shall be installed at railway crossings.

Details of protection by concrete or steel casing pipe are described in reference documents and addressed in typical and detailed drawings or in relevant alignment sheets.

5.9.4 Reinforced concrete slabs

Protective concrete slabs shall be installed above the pipeline at the crossing with certain field roads or pathways and in cases of crossing with existing underground utility lines (e.g. water pipelines) if required by the owner or operator.

Details of protection by protective slabs are described in reference documents and addressed in typical and detailed drawings or in relevant alignment sheets.

5.9.5 Additional coatings

Following types of additional coating may be used on the pipeline:

- Cemtex or approved alternative (e.g. GRP - Glass fibre Reinforced Polyester or Ergelit) – for sections where additional protection is prescribed e.g. watercourses or open cut road crossings in full length of a crossing with overlap of 0.5 m on each side (e.g. beyond last weight).
- For open cut road crossings alternatively HDPE rockshield mesh in thickness of 10 mm, grid of 4x4 mm and with min. overlap of 150 mm shall be used. The rockshield shall be fixed by PP bands each 0.8 m with locks located on 4/8 hours. In case of longitudinal overlap it shall be located on 6 hours. With overlap as per typical drawings.
- Non-woven geotextile 1000g/m², wrapped over the pipe with min. overlap of 150 mm shall be used – for sections where additional protection is prescribed e.g. steep slopes or wet areas. Geotextile shall be installed in full length of the area (not only under concrete weights or ditch breakers). The geotextile to be always glued / fixed at overlap by heat gun and in entire surface if required. The geotextile shall be additionally fixed by PP bands each 0.8 m with locks located on 4/8 hours.
- GRP or FZM-S (fibre-reinforced cement coating – special) – for the trenchless crossings of product pipe e.g. watercourses.

Details of additional coating are described in reference documents and addressed in typical and detailed drawings or in relevant alignment sheets.

5.10 Backfilling and Padding

Prior to pipeline padding and backfilling, the Contractor shall submit a method statement describing all methods and equipment used.

The pipeline and fibre optic cable padding and backfilling requirements are given in relevant typical drawings or specifications for earthworks.

The pipeline padding shall be carried out within 48 hours after the pipeline lowering, the backfill within 5 days after the pipeline lowering.

5.10.1 Padding

Following the lowering of the pipeline and prior to the start of padding operations the pipeline shall be visually inspected and damages to the pipe or the pipe coating inflicted

during the lowering in operations shall be repaired. All tie-in works, connecting of cables (i.e. CP cables) or installation of protection measures to the pipeline (i.e. buoyancy control) or on the bottom of the pipeline trench (i.e. stray current wire) and the as-built survey works shall be completed prior to the start of padding operations. These checks and surveys shall be witnessed and approved by the Employer's Supervisor. In the case of crossings the crossing shall be checked by the utility line owner, operator or by relevant Authority and this shall be confirmed in written by hand over documentation, including photographic documentation. All temporary utility line supports shall be carefully removed before or during padding and backfilling.

Contractor shall rectify any non-conformances prior to the start of padding operations.

The pipeline trench shall be free of water prior and during the performance of padding works. In vicinity of watercourses, streams and areas prone to trench material erosion the trench shall be protected and stabilized in such a way that the bedding, padding and backfill material is not washed out through the pipeline lifetime.

Any voids under the pipeline shall be filled so as to ensure adequate support of the pipeline over its entire length. The distance from the pipe or any appurtenance to the trench wall shall conform to the specified minimum value. The minimum pipe cover shall be confirmed through evaluation of the as-built survey data.

Padding material shall be introduced in layers and carefully compacted around the pipe, so as to ensure that the pipe is properly supported around its entire circumference to avoid ovalization or deformation of the pipe. The compaction shall be according to the typical drawings.

Padding shall continue to a level of 30 cm above the top of the pipe, or any pipeline appurtenances.

The material used for padding shall conform to the requirements for bedding and padding material as specified in relevant specifications or herein. The material used for padding shall be soft, sand or fine grain material free from sharp stones, flints or foreign particles, 0-8 mm.

5.10.2 Marking of the underground installations

Pipeline, FOC conduits and cables installed for the pipeline shall be marked by a warning tape or markers. The warning tape shall be laid on the padding approx. 30 cm above the top of pipeline (on padding layer). The pipeline shall be provided with a yellow warning tape with black text "NET4GAS PLYNOVOD" with a 50 mm overlap on both sides of the outer edges of the protected pipeline. The fibre optic cable shall be provided with an orange warning tape with the black text "NET4GAS OPTICKÝ KABEL", with an overlap of min. 50 mm from the outer edges of the outer HDPE conduits.

5.10.3 Backfilling

Following the completion of the pipeline padding and marking, the remaining pipeline trench shall be backfilled with suitable material taking into account the original structure of the soil horizons.

For remaining trench backfill excavated soil shall be used. The material shall be compactable and shall not consist of stones larger than 150 mm in diameter. Stones larger than 150 mm in diameter shall be hauled away from the working strip and disposed in designated disposal pits. The Backfilling shall be performed in layers of 30 cm. The pipeline backfilling shall be compacted without cavities. Pipeline backfilling shall be carried out in such a way as to minimize unwanted settlement after return of topsoil (e.g. by vibrating plate, vibratory soil compactors, etc.).

Wherever a trench support piling is used the piles shall be pulled out gradually to avoid bulking of the compacted soil.

The use of dozers for pushing the backfill material into the pipeline trench is not permitted.

In the stations areas the padding and backfilling of the pipeline shall be compacted to with the same parameters as compacting for the minor road crossings to eliminate settlement of the other facilities.

5.11 Crossings

Prior to the crossing of any foreign service or third party installation Contractor shall obtain a permit or authorization from the owner/operator or the relevant Authority.

If required by the owner/operator of any third party installation Contractor shall only perform works related to the crossing of such service in the presence of the authorized representative of the owner/operator of the service.

The Contractor shall implement all the requirements obtained from owners/operators, approval Authorities and as specified during the design for the proper protection and support of the service or installation during the performance of excavation works.

Contractor shall classify all additional crossings identified during his pre-construction survey or during the performance of the construction activities in accordance with the crossing types and classifications. The classification of each crossing type and the allocation or selection of the appropriate crossing method shall be subject to the approval by the owner/operator or the relevant Authorities and Employer.

Contractor shall confirm all crossing classifications as well as the appropriate crossing method and design parameters, i.e. type of casing pipe, length of casing pipe, increased wall thickness, separation distance, actual cover and others with the owner/operator or the relevant Authorities and Employer as part of his design activities.

All crossings where mechanical protection is required shall be photographed during construction, including the protection provided. Each crossing shall be photographed including the surrounding landscape and included in the photographic documentation to be handed over to the Employer.

The spacing, protection limits and depth of cover of the pipeline as showed in the Project drawings shall be considered as minimum.

Watercourse and road crossings shall be in general executed prior the remaining part of the pipeline to reduce problems with tie-ins and to reduce additional stresses in the pipeline.

Excavation around existing services shall be carried out by hand and with such care as is necessary to avoid damage to the services. The trench shall be excavated so that the clearance between the buried pipeline and any other underground service or structure is not less than 0.3 m or as specified in the relevant typical drawings or design drawings. All underground services shall be located prior to the opening of the working strip as specified in Chapter 3.2.

5.11.1 Watercourse crossings

The construction activities related to crossings of watercourses must be in line with the relevant national codes regulations – TPG 702 04, ČSN 75 2130 and ČSN 73 6005 as well as with requirements of relevant watercourse owners, administrators and Authorities.

Prior to the commencement of construction works on a watercourse, the Contractor shall submit a method statement for the execution of the crossing and the schedule of the construction works for approval by Employer and relevant Authority.

In navigable waterways the Contractor shall liaise with the relevant Authority and ensures that disruption of traffic is minimized and that adequate warning is given of any obstruction or hazard.

Minimum depth of cover for the pipeline or top of the concrete weights / concrete coating shall be 1.5 m below the actual bottom of the watercourse as specified in relevant detailed and typical drawings; or 1.2 m in the case of selected watercourses under the administration of Forests Administrator of Czech Republic or State Land Fund (in Czech: LČR, SPÚ). For major rivers (Ohře, Mže and Střela) the min. pipe cover shall be 2 m. Pre-fabricated siphons for these major rivers shall be hydrotested prior to lowering in.

The pipeline shall be protected by additional coating in sections where the concrete weights will be installed. Pipes and factory bends and parts of the pipeline where additional coating is required shall be coated by the Contractor on the site to the extent according to Project documentation.

During the construction of watercourse crossings Contractor shall avoid obstruction to the flow of water and ensure that back up in waterways does not give rise to any flooding.

During the performance of works on river crossings, the Contractor shall:

- Observe all requirements of the EIA, which includes seasonal constraints for the performance of the works and special measures for the protection of watercourse life;
- Implement appropriate measures to protect downstream areas from damage and silting;
- Implement adequate protection including river banks to prevent instability and erosion of the river bank and watercourse down the stream;
- Avoid changes to the depth/width ratio of the river at the crossing area.

Where the protection of the watercourse bottom is not required, the watercourse bed layer shall be restored to the original natural conditions. Where the protection of the watercourse bottom is foreseen by crossing design or requirement from owner or Authority the protection shall be installed in line with relevant detailed or typical drawings or with the requirements of the watercourse administrators or Authorities.

The Contractor must reinstate any damages that occurred during construction (e.g. damaged watercourse embankments, existing protections, service roads, etc.).

Special attention needs to be paid to the existing flooding protection installations; these must be reinstated to original or better conditions to ensure full functionality after the reinstatement and handed over including all the documentation to the relevant owners or Authorities.

5.11.2 Road crossings

The construction activities related to crossings of roads shall be in line with the relevant national codes regulations – TPG 702 04, ČSN 75 5630 and ČSN 73 6005 as well as with requirements of the relevant road owners, administrators and Authorities.

Prior to the commencement of the construction works at road crossings the Contractor shall submit a method statement for the execution of the crossing and the schedule of the construction works for approval by Employer and relevant Authority.

For the road crossing are foreseen two methods – by open cut and trenchless by thrust boring.

Crossing of roads by open cut is assumed for local, field, forest and specific roads incl. planned roads. Several of these roads must remain usable during construction works as

per their administrators statements. Temporary bridges, by-passes or detours shall be provided based on agreement with their administrators.

For paved roads or roads where the crossing is performed by open cut, the minimum pipe cover is 1.2 m or 1.0 m for the casing pipe measured from the road surface to the top of pipe. Details of crossing and relevant protection for paved roads are shown in relevant alignment sheets, typical drawings and detailed crossing drawings.

Minimum pipe cover and relevant type of protection of pipelines at local and specific road, filed and forest pathways and selected land plots of other roads according to the cadastral information are shown in relevant alignment sheets, typical drawings and detailed crossing drawings.

Trenchless crossing by thrust boring with a concrete casing pipe is assumed for highways and motorways as well as for most of the I, II and III class of roads or if the trenchless method is required by the relevant road administrator or Authority.

For trenchless crossing of roads is the pipe cover for the pipeline or the casing pipe 1.5 m measured from the road surface to the top of pipe. Void space inside the concrete casing pipe shall be filled with the bentonite mixture.

5.11.3 Railway crossing

The construction activities related to crossings of railways must be in line with the relevant national codes regulations – TPG 702 04, SŽDC S4, ČSN 75 5630 and ČSN 73 6005 as well as with requirements of the relevant railway owners, administrators and Authorities (SŽDC).

Prior to the commencement of the construction works on railway crossings the Contractor shall submit a method statement for the execution of the crossing and the schedule of the construction works for approval by Employer and relevant Authority.

All the railway crossings shall be executed trenchless by thrust boring with two concentric steel casing pipes (filled with reinforced concrete).

The minimum pipe cover for the railway crossings shall be 1.5 m measured from the top of the outer casing pipe to the natural ground level (subsoil) and at the same time at least 2.0 m to the sleeper top and 1.5 m to the adjacent drainage ditch bottom.

5.11.4 Drainage crossings

At the crossing with existing drainage or melioration its function might be temporarily interrupted during the pipeline construction activities. Main - catch drainage lines shall be interconnected temporarily.

The exposed ends of interrupted drainage pipes must be protected from clogging - the inflow end of the pipe with a watertight cover and the outlet with a permeable cover.

After the lowering of the pipeline all the drainage pipe interconnections shall be restored to the original or better conditions and handed over to the relevant owner or Authority.

The crossing of irrigation lines shall follow the criteria for crossing of water pipelines i.e. by temporary interconnection outside the trench.

The crossing of open drainage or irrigation channels shall follow the criteria for crossing of small watercourses.

5.11.5 Crossing of underground services

These services are usually gas, product and water pipelines, telecommunication, power, and fibre optic cables, sewer lines, culverts, etc.

Prior to the commencement of the construction works, the Contractor shall submit a method statement and construction schedule of the works for approval by Employer and relevant service owner, operator or Authority. The method statement shall be based on relevant Project documentation, regulations and codes.

The Contractor shall be fully responsible for identifying, locating, detecting and identifying of all underground utility lines and installations. Position accuracy given in the documentation depends on source of information (paper maps, as-built, detection, etc.) and therefore may vary. It is fully in scope of Contractor's works to identify these services prior to excavation including request the service owner / administrator for setting out.

Prior to the start of excavation works Contractor shall notify the relevant Authority or owner / operator of the relevant service.

The pipeline trench shall be excavated so as to provide the specified minimum clearance or separation distance between the pipeline and the installation or the specified protective installation as specified in relevant Project documentation.

Contractor shall take special care to prevent damage to the services and installations, excavations in the vicinity of the service or installation shall be performed by manual excavation. Excavated structures shall be properly supported.

All damages shall be repaired in accordance with the requirements of the owner / operator of the service or installation. In case of damage of the service during construction works is the Contractor also responsible for reimbursement of all costs related to outage of damaged service.

During backfilling of the pipeline care shall be given to the proper compaction of the padding/bedding material underneath the foreign underground service. Backfilling to be performed in maximum layers of 0.3 m. Compacting of each layer by a tamping device shall be performed prior to adding the next layer.

If not otherwise specified, the foreign installation or service shall be completely surrounded with a minimum 0.3 m thick layer of padding material.

5.11.6 Aboveground line crossings

These are overhead power lines, telecommunication and other lines

Prior to the start of construction works in the vicinity of overhead lines the Contractor shall notify the relevant Authority or owner / operator of the relevant line.

If an earthing system for power line is detected within the pipeline axis it shall be immediately reported to relevant power line owner / operator and Employer and relocated as agreed with relevant power line owner / operator.

At the crossings with overhead lines a protective height restriction bar shall be erected with visible signage lines each side of the crossed line and in full width of working strip.

All power line posts and towers within the working strip shall be highlighted and if required properly protected.

During the construction work is in the close proximity to overhead power lines the construction equipment shall be grounded and the personnel shall wear the relevant PPE.

Welding of pipeline directly below the power lines shall be avoided.

All lifting equipment during the lifting and lowering-in activities in the vicinity of overhead lines shall be additionally observed by designated staff to avoid any interference with the overhead line.

The pipes and pipeline strings stored in the vicinity of the power line shall be properly grounded to protect against potential inducted current.

Contractor shall take special care to prevent damage to the overhead lines during the construction activities. All damages shall be immediately reported to the Employer or Employer's Supervision and relevant owner / operator of the line and the Contractor shall cooperate during reparation works of the service as required by the owner / operator of the line. In case of damage of the line during construction works is the Contractor also responsible for reimbursement of all costs related to outage of damaged overhead line and their accessories.

Contractor shall install all relevant CP and AC appurtenances as well as other protective items as per relevant Project documentation.

Based on the analysis of undesirable effects of overhead lines on the planned pipeline, protective measures have been recommended and calculated. By executing the proposed corrective measures on the side of the planned pipeline, the Contractor shall ensure the safety and protection of the pipeline against corrosion by alternating currents.

In the sections which were designed for a protective measure, an earth conductor shall be installed in parallel with the pipeline, which will be connected to the protected pipeline at designated points via an AC surge arrester. The grounding function shall be provided

by a FeZn 4 x 30 mm² earth strip, which shall always be installed between the influencing line and the protected pipeline at a distance of 0.3 m to 1.5 m. At the crossing point of the pipeline, the earth strip shall be laid 0.3 m from the pipe wall. At all other cases, if it is technically possible, it shall be placed 1.5 m away from the pipe wall. The earth resistance of the earth strip shall be properly measured and possibly added so that the resulting earth resistance of the earth strip is less than 5 Q.

5.11.7 Pastures and preserves crossings

The following measures and rules must be followed within pastures:

- always notify land owners / tenants prior to entering the area (e.g. Jan Zatloukal)
- kettle must not be allowed to escape – working strip and area shall be temporarily fenced in agreement with land owners / tenants
- construction works to be executed under agreement or supervision with land owners / tenants
- permanent above ground facilities must be protected against damage by kettle as per project documentation and as agreed with land owners / tenants and the Employer

The following measures and rules must be followed within preserves:

- always notify land owners / tenants prior to entering the area
- deer must not be allowed to escape – working strip and area shall be temporarily fenced in agreement with land owners / tenants
- construction works to be executed under agreement or supervision with land owners / tenants

5.12 Tie-Ins

For the purpose of this specification it shall be distinguished between two different types of Tie-Ins:

- Tie-Ins prior to Hydrotesting
- Tie-Ins after Hydrotesting and prior to Mechanical Completion of the pipeline

All tie-in works into a (lowered) pipe string shall be performed in a pre-excavated bell hole for which the provisions of section “5.7.2 Bell Holes” applies.

Welding shall be carried out according to the Welding Specification unless otherwise agreed and approved by the Employer.

The tie-in welds shall be completed without interruption of welding.

5.12.1 Tie-ins prior to Hydrotesting

Tie-ins prior to Hydrotesting are typically performed for:

- The connection of pipe strings after being lowered into the trench;
- The insertion of pre-fabricated sections;
- The connection of pre-installed crossings with the pipe string.

Tie-ins shall be made by at least 2 welds (but not more than 3). The two adjacent tested sections shall be laid in-line in pipeline trench and not side by side (or above each other).

At Tie-ins a sufficient length of pipeline shall be left uncovered, to allow the movement of the pipe string(s) without exercising excessive force onto the pipe string(s) and without bending or denting the pipe. Bend or dented pipe sections have to be cut-out and removed from the pipeline.

Tie-In welds shall be performed with the use of external line-up clamps. Pipe end shall be fitted together without the use of external force. The pushing, pulling or anchoring of the pipe ends during the tie-in welding operations is not permitted. The removal of the external line-up clamp is not permitted until the maximum possible length of root pass has been made and anyhow no less than 60% of the circumference of the joint.

For the performance of non-destructive testing of Tie-In welds the provisions of Chapter “5.5 Non-Destructive Testing (NDT) and inspection” shall be observed.

Prior to the performance of any Tie-In works the Contractor shall give a 24 hours advance notice to Employer. All Tie-in works shall be monitored / witnessed by Employer or Employer’s Supervisor.

5.12.2 Tie-ins after Hydrotesting

The welds performed at Tie-ins after hydrotest are referred to as “Guarantee Welds” or “Golden Welds”, subject to specific welding and testing requirements.

Tie-ins after Hydrotesting are typically performed for:

- The tie-in of hydrotest sections after completion of the hydrotest;
- The insertion of pre-tested assemblies into the pipeline after completion of the hydrotest, subject to specific approval by Employer;
- The replacement of a damaged pipe section without repetition of the hydrotest, subject to specific approval by Employer.

For the performance of Tie-ins after hydrotest all provisions of section “5.12.1 Tie-ins prior to Hydrotesting” shall apply unless otherwise specified hereinafter.

For the performance of non-destructive testing of Tie-In welds the provisions of Chapter “5.5 Non-Destructive Testing (NDT) and inspection” shall be observed.

Golden welds on adjacent pipes of different wall thicknesses are not permitted.

The sections may be interconnected by a maximum of three guarantee welds.

Golden welds for tested sections interconnection shall be made by at least 2 welds (but not more than 3). Particularly for connections of tested sections, the test heads of the two adjacent tested sections shall be laid in-line in pipeline trench and not side by side.

5.13 Hydrotesting

5.13.1 General requirements

The pipeline shall be pressure and stress tested. The Contractor shall designate an Authorized Inspector to prepare and approve a method statement based on the requirements of Regulation No. 85/1978 Sb., final design, its appendices and evaluation of pressure tests.

The project of the planned construction of the pipeline has been divided into two separate sections (Lot 1 & 2). The pressure tests shall be performed independently for each part of the separate section. The actual division into final sections must be performed by the relevant Authorized Inspector based on the construction documentation and on the basis detailed information and specifications of the construction. General information for pressure tests and stress tests of the pipeline and objects, section distribution with regard to reliable water sources, location of possible water supply and discharge after the pressure tests, preliminary division into sections are provided in the document Pressure Tests and Stress Tests Specification, and associated documentation Stress test of pipeline shall be carried out according to TPG 702 04.

The Employer will review, comment and approve relevant method statement for the pressure tests submitted by the Contractor and reserves the right to stringent the requirements or change the conditions of the test specifications, without prejudice to the liability of the Authorized Inspector for compliance with the relevant specification requirements. The Authorized Supervisor of the Employer (TDI), the Employer and the representative of the Technical Inspection Authority of Czech Republic (TIČR) shall be invited to the pressure tests.

The Contractor shall prepare and submit to the Employer a detailed method statement for cleaning, gauging, pressure testing, drainage and drying of the pipeline. The procedures shall respect all applicable standards, technical regulations and specifications related to construction and shall be approved by the Employer, Employer's supervisor or Authorised Expert prior to commencing the works.

5.13.2 Preparation for Hydrotesting

Pressure test of test sections should commence as soon as practicable after construction of sections have been completed. Following documentation of mechanical completion shall be provided by Contractor for approval prior to start of hydrotesting:

- pipebook (with all pipe and weld records);
- as-built survey records of the top of pipe;
- sign-offs by site supervision on burial depth, in trench installations, backfill, etc.;
- permits for water take and discharge;
- hydrotest profile;
- hydrotest procedure;
- any other relevant documents as required by Employer.

The Contractor has to supply and install all auxiliary materials necessary for the pressure test, such as provisional scraper traps, scrapers, end caps, fittings, flanges, gaskets, pumps, compressors, measuring equipment, etc. All such auxiliary materials shall be suitably rated to the maximum test pressure; the assembled test equipment shall be approved by Employer.

Personnel, vehicles, communications equipment, warning signs, supervision of crossings and public places is in the scope of the Contractor.

Contractor is obliged to locate an approved water supply for filling and testing, and is responsible for disposal of water. The required water demand, water extraction and disposal have to be coordinated with and approved by Authority. Contractor is responsible for obtaining all necessary permits from owner / local authority concerning supply & disposal of line-fill water.

Possible sources of water:

- water reservoir Kyjice / Bílina
- river Chomutovka
- river Ohře
- stream Podhora / Kryrský rybník – according to recommendation of Povodí Ohře (possible source of water from water reservoir Vidhostice)
- river Střela
- Úterský potok
- river Mže

Water discharging points:

- water reservoir Kyjice / Bílina
- river Chomutovka
- river Ohře
- stream Podhora / Kryrský rybník
- river Střela
- Úterský potok
- river Úhlavka

The Contractor has to take care not to damage the internal pipe lining / coating in any way by any construction activities.

The Contractor has to obtain written approval for the starting of every pressure test from the Employer.

Prior to the start of the pressure tests and stress tests, individual sections of the pipeline must be cleaned and calibrated.

5.13.3 Cleaning and gauging

Before starting any water filling and hydro-test pressure works on the pipeline, the Contractor shall have undertaken cleaning scraper runs using a series of scrapers and swabbing, to ensure that all extraneous materials have been removed from the pipeline section and that the respective section is sufficiently clean to allow water filling to commence.

The cleaning and preliminary gauging shall be carried out in accordance with the Stress Test specification and specification herein. The cleaned section shall be the same as the section to be stress tested. The section must be completed and backfilled.

The Employer or Employer's Supervisor shall make the final decision in respect of pipeline cleanliness, and if so required, the Contractor may require undertaking additional cleaning runs.

After line cleaning is completed, the Contractor shall be required to carry out a gauging PIG run with an aluminium plate fixed behind the first cup rubber of the scraper.

The PIG shall be equipped with locating devices and shall be traceable whilst travelling inside the test section.

The gauge plate shall be made out of an aluminium plate with relevant thickness depending on the size of the PIG body. It is important to guarantee the necessary material softness of the gauging plate in order to avoid the PIG stuck in the pipeline.

The gauge plate diameter shall be determined as follows:

$$D_{gp} = 0,98 \cdot D_{tmin} - 10 \text{ mm}$$

D_{gp} – diameter of the gauge plate [mm]

D_{tmin} – minimum internal diameter of the relevant pipeline section, out-of-roundness and tolerance of wall thickness is not considered [mm]

Gauging PIG runs shall have an induced back pressure of 0.5 bar minimum adjusted at the receiver end.

The gauging run shall help identify obvious reductions in pipe bore caused by buckles, dents, wrinkles or flattening. The introduction of the gauging PIG into the pipeline and removal of the PIG from the pipeline shall always be undertaken in the presence of the Employer or Employer's Supervisor.

After receipt, the gauging plate will be examined for any signs of damage or irregularities such as dents and buckles by Employer or designated specialist. Gauge plate to be preserved as evidence of passed or failed pipeline section.

If damages noted to the gauging plate after completion of the gauging run, the Contractor shall be responsible to locate the defect and repair these at his own costs. The sole approval of the gauge plate is at the discretion of the Employer.

Once the gauging plate has been accepted by the Employer, the Contractor shall then continue with his hydrotesting operations by filling the test section.

5.13.4 Procedure and execution of the hydrotest

Prior to the start of the hydrotesting and stress tests, individual sections of the pipeline must be cleaned and calibrated. The test section is filled with water by using of filling PIGs (separation elements).

The stress test has the following main phases:

- preliminary leakage test;
- first pressure load;
- second pressure load - strength test;
- leakage test.

During the hydrotest the temperature, water pressure (pressure gauge with an accuracy of at least 0.1% with recording, temperature gauge with resolution of at least 0.1 °C with recording) shall be monitored in the tested section in line with test schedule. The exact amount of water filled into the test section of the pipeline shall be monitored as well. Detailed calculation of the parameters of the stress tests, pressure tests, leakage tests,

supervision and process procedure must be ensured by Contractor designated competent specialist.

The pipes for tie-in connections and for gaps between hydrotest sections shall be also stress tested.

Prior to commission of the pipeline into service shall be the station piping subjected to the pressure test, i.e. the strength test and leakage test as well and it shall be executed in accordance with ČSN EN 1594, ČSN EN 12327 and TPG 702 04 at the stations up to the limits of the already tested pipeline. The stress test limits are defined by end of section of pipes Category A + 1 pipe Category B or to the limits defined in the Project documentation / method statement.

5.13.5 Hydrotest documentation

The hydro test results indicating both successful and failed hydro tests shall be documented and made available to the Employer. The documentation shall be issued according to the hydrotest procedure. Contractor shall make available the test documentation for approval by Employer.

The relevant documentation - implementation plan and its appendices as well as stress test evaluation must be prepared by the Authorised Inspector of gas installations. Following documents to be prepared:

- Hydrotest Implementation plan (hereinafter "Implementation Plan").
- Final summary report, database of records.

The Implementation Plan

- updates and specifies the relevant part of the Project documentation and shall include the following:

- actual division into test sections, technical description of test sections, description and sequence of operations relevant to the hydrotest;
- execution of the stress test of tie-in connections and for gaps between hydrotest sections, technical description of test sections, description and sequence of operations relevant to the test;
- method of provision and disposal of the water for hydrotest, including the necessary permits from the relevant Authorities and the affected individuals, including chemical analysis of the used water;
- filling and venting of the pressurized sections;
- pressurizing;
- depressurizing;
- list and parameters of the used equipment and measuring devices;

- list of used materials, equipment and fixtures for the pressure test;
- pressure test acceptance parameters;
- safety measures;
- map overview of the tested sections;
- the longitudinal profile of the tested sections including elevation and chainage of the pipeline as well as indication of crossings with roads, watercourses, power lines, etc.;
- layout map of the tested sections with the indication of the water take-off point, the method of the delivery to the test site and showing the location of the equipment required for the test;
- procedure for filling the pipeline with water, including the specification of the equipment used (amount of filling PIGs, method of detecting their position during filling, dimensions of gauging plates, etc.);
- procedure for detection and repair methodology of pipe leaks (especially in the locations backfilled with soil);
- procedure for discharge of water from the pipeline and drying of the pipeline;
- procedure for compliance with obligations towards the organization of state professional inspection and representatives of the Employer;

Final summary report

- a technical report is to be prepared about the process and evaluation of the test which shall be kept in at least one copy during the lifetime of the tested section of the pipeline together with other documentation of the pipeline and shall be provided to the pipeline operator.

The report shall include, in particular, the technical data of the tested pipeline section, the calculation of the main parameters of the hydrotests and stress test (limits of pressure, etc.), a description of the pressurization process of the tested section, i.e. the measured values of pressure and the water quantity during the individual pressure loads, the measured temperature, etc. The data must be given in the form of tables and charts.

The report shall also include, in particular, graphs of the dependence of the pressure on the volume of filled water and the time-pressure characteristic in the tested section.

A protocol from the pipeline tests shall be prepared and this will be an integral part of the as-built documentation of the pipeline.

5.14 Pipeline dewatering and drying

After a successful hydrotesting the Contractor shall empty and dry the pipeline.

The Contractor shall prepare method statement for pipeline dewatering and drying in accordance with TPG 702 11 and submit for approval to Employer.

5.14.1 Dewatering

After hydrostatic testing the pipeline shall be completely dewatered by using sufficiently sized air compressors to launch the dewatering scraper runs, previously installed in the section prior to filling the line. These scrapers shall be driven from the launcher end of the section towards the receiver end. The scrapers will drive the hydro test water, and where possible, the water shall be transferred into the next adjacent test section (if applicable). Any additional fill water volumes and water additives needed for the adjacent test section shall be added as necessary.

Valves equipped with remote control shall be used for pipeline depressurization; these valves shall be firmly connected to the drainage pipeline. The drainage pipeline shall be straight and perpendicular to the pipeline section which will be dewatered.

During any drainage operations, Contractor shall make the necessary arrangements for the drained water to be suitably disposed of, in order to avoid pollution, damage to crops, to land, to existing works, obstructions to traffic and to comply with authority approval and agreements. The water may be drained and disposed back to the water body of original source or to another discharge system. Contractor shall comply with the requirements of the water authorities and treat the water in such way it does not become a waste water (e.g. temperature difference, particles content, chemical composition, etc.). Contractor shall therefore bear in mind these provisions during the scheduling stages of hydrostatic tests.

5.14.2 Swabbing Pig Runs

Once dewatering of the section is completed the pipeline section shall be dried to an acceptable level by use of foam swabbing scraper/PIG runs to remove any free residual water. Once the foam scraper runs have been completed and the Employer or Employer's Supervisor accepts the level of drying, the previously tested block valve fabrications shall be installed in the line and the valve ball fully opened prior to the calliper survey. During swabbing of the pipeline the velocity of the PIG should not be higher than 2 km/h.

5.14.3 Drying

The drying of the pipeline shall be in accordance with TPG 702 11. The purpose of the drying is to remove all residual water and moisture from the pipeline.

The pipeline drying process can begin as soon as the individual pipe sections have been drained. The drying of the pipeline could be done in the same sections as for

hydrotesting or after connecting to the adjacent sections. However the length of these sections shall not exceed 50 km.

For drying, similar equipment and procedures shall be used as for swabbing. In case the permanent launchers and receivers are already installed, these can be used for drying activities. Pipeline drying shall be carried out by introducing a large quantity of dry air into the pipeline section at a low pressure so as to maximize water absorption. The air before being introduced into the pipeline shall be dried to a dew point below -60 °C.

The compressor and air dryer installed between the compressor and the launcher shall be adequately dimensioned in relation to the volume of air required for the drying of the pipeline.

At the end of the testing and drying operations, the Contractor shall remove the provisional scraper traps as well as other temporary installations connected with the test. The Contractor shall also complete the tie-in of the pipe sections to the previously tested section of pipeline and carry out all work according to the project specifications and procedures described in this specification. These final tie-in welds shall be considered as Golden Welds and shall be 100% radio graphed and 100% ultrasonically inspected.

5.15 Gauging and geometry inspection

Once the pipeline sections are all tested, dried and tied in, the Contractor will undertake a calliper PIG survey with electronic recording of the results. It is recommended that the final gauging and geometry inspection will be carried out on a completely assembled pipeline, including permanently installed launcher and receiver stations so that the inspection covers the whole pipeline including all stations.

Ovality larger than tolerances described in this specification shall not be allowed, unless reasonably justified to the Employer and so accepted by him. When interpretation of dents is unclear, the worst case has to be assumed. The ovality must be within the allowable limits.

Contractor has to excavate and verify all locations where the calliper PIG has indicated possible deformations exceeding allowable limits. Repairs have to be executed and the area of work has to be properly backfilled and reinstated at Contractor's expense.

Should the calliper survey identify damage that results in mechanical repairs due to the Contractor's own construction defects, the Contractor shall be required to fully repair the damaged pipeline in accordance with all applicable Project specifications, and thereafter initiate all hydrostatic testing activities again to the full satisfaction of the Employer.

The final evaluation of the results of the gauging and geometry inspection shall be carried out by an authorised specialist with relevant experience with this activity and has authorisation to decide on the follow-up steps.

The Employer, Employer's supervisor and relevant Authorised Expert shall be invited to the evaluation of the results of the gauging and geometry inspection.

5.16 Environmental protection measures during construction

5.16.1 General

During the construction, no air and water pollution may occur, so the measures will be implemented during construction to reduce dust emissions and transport materials from the site to roads – e.g. cleaning of vehicles on used roads, covering transported materials and limiting their free storage, non-execution of earthworks during unfavourable conditions, spraying of the site surface, etc. There must be no risk to road traffic safety, its pollution, restriction of access to adjacent buildings or land plots and existing infrastructure.

Only construction equipment in good technical condition shall be used. During construction, leakage of petroleum substances from any vehicles or machinery, or water contamination by dangerous substances must be avoided. Parked machinery must be secured against oil and spills e.g. by catch spill containers or absorb mats.

5.16.2 Set of measures to minimize adverse effects on the environment

During construction, the following set of general measures will be followed to minimize potential adverse environmental and public health impacts. Eventual references to segments are referring to EIA documentation (public document) and Biological Assessment (part of project documentation):

- a) Construction site facilities will not be located near residential, recreational facilities, watercourses, water resources and specially protected areas of nature. At night time (between 21:00 and 7:00) there will be no construction work. At the same time, there will be no parking or maintenance of the machinery and there will not be stored substances that may endanger the quality of surface or ground water or easily washable material.
- b) In the protection areas of water sources, the contractor will pay increased attention to the construction execution, in particular to secure and supervise the perfect condition of the machinery, and to respect the prohibition of the use and storage of dangerous substances. Execution construction site facilities is prohibited in water protection areas. It is also forbidden to park the machinery and carry out maintenance, refuelling and repairs. Construction work must be carried out continuously in the protection areas of water resources, without unnecessary time delays between operations.
- c) It is forbidden to place store materials, construction site facilities and parking for machinery on land intended for forestry purposes. Forest areas outside of the

pipeline working strip and the access roads, must not be damaged by the machinery.

- d) The construction organization will be designed to meet hygienic noise limits (see Government Order No. 217/2016 Coll.) The contractor, for example, avoids the simultaneous use of more noisy mechanisms. In the case exceeding the hygiene limits of noise, the construction organization will be further modified.
- e) The Contractor will apply measures to reduce dust emissions, especially near to residential areas. These include, amongst others, the minimization of areas prone to dusts (e.g. a requirement of minimum work section split and length) and the limitation of the storage of granary and fine materials to the minimum possible extent. As a padding and bedding material will be used sand or selected material (preferably screened), which will be put into the excavation immediately after being screened. If sand is used, it should be brought to the construction site directly from the sand pit without intermediate storage. Vehicles for the import of granary and fine materials must be in good technical condition and loaded in such a way that the material do not fall off during transport, if necessary, transported materials will be covered. Under adverse climatic conditions, in the case of increased dust, communications in residential areas will be sprinkled with water. Vehicles will be cleaned before entering public roads if necessary, and if roads get dirty, it will also be cleaned immediately.
- f) Transport will be organized in order to minimize the emission (minimization of transport of machinery between the workplaces, empty transports and idle running).
- g) The watercourses, ponds and water habitats regime, must not be impacted or disturbed for a long time. The construction works in their vicinity must therefore be carried out smoothly, without unnecessary time delays between operations. In the areas concerned, leakage of oil and other dangerous substances and the risk of eutrophication (increasing algal production in ponds and reservoirs by nutrient supply, especially nitrogen and phosphorus) must be avoided. Therefore, it is forbidden to park the construction machinery and carry out maintenance, refuelling, refilling of operating fluids and repairs.
- h) During painting and coating works, it is necessary to avoid contamination of the terrain (e.g. placing of catch spill containers or absorb mats). Paint and coating materials and solvents must be stored in such a way that they cannot leak (e.g. in closed containers, containment tanks, etc.).
- i) For mobile machinery with an open circuit of lubrication (e.g. chain saws), it is necessary to use biodegradable oils and lubricants.
- j) In case of a threat to the quality of surface or groundwater, the emergency plan shall be followed, indicating both preventive measures to prevent the accident and procedures for its removal.

- k) The construction site will be equipped with technical means for remediation of leakage of fuel or other dangerous substances that may endanger the quality of surface or groundwater.
- l) In the case of thrust boring located in floodplain areas, waste soil material to be stored outside these areas in order to avoid possible washing into the river bed. Banks of watercourses must be secured in such a way as to avoid soil erosion during construction.
- m) A sufficient number of mobile chemical toilets must be available on construction site.
- n) The topsoil stripping shall be executed in the range according to the typical drawings and alignment sheets. In accordance with Decree No. 13/1994 Coll., which regulates certain details of the protection of the ZPF, a protocol (working diary) will be kept on the activities related to the stripping, transport, relocation, storage, protection and care of the topsoil.
- o) To prevent soil erosion, proper measures to be taken according to project documentation and good engineering practice, excess soil will be stored in such a way as to avoid erosion.
- p) Eventual surpluses of better quality agricultural soil are not expected, however they can be used to increase the fertility of the surrounding land.
- q) All produced waste will be collected, liquidated or recycled in accordance with valid legislation (Waste Act No. 185/2001 Coll., as amended). The waste collection containers will be located at proposed locations and marked accordingly.
- r) All transport and construction routes shall be as far as possible via existing public roads, approved local and field roads, workings strip and approved temporary roads on farm land. No other new roads shall be constructed. These roads shall as far as possible avoid centres of settlements and local municipalities.
- s) Main transport routes are planned mainly on main public roads. Nearby the working strip usually the only possible roads are selected. Its use or limitations must respect statements of affected municipalities.
- t) Eventual traffic restrictions on the communication network during the construction shall be solved by suitable transport organizational measures, agreed with the relevant municipalities. When transporting the pipes, transport trucks will be accompanied by one accompanying vehicle with a warning sign at the front and one at the back if needed. If necessary (especially when passing through settlements or dangerous sections of the main roads), Police of the Czech Republic will be asked to cooperate in this operation.
- u) After end of works, for a period of five years in the EVL East Ore Mountains section, in interval 3 x during the vegetation season, the working strip area and its

vicinity shall be monitored to occurrence of invasive plant species, eventual occurrences shall be eliminated immediately. The optimal dates for the monitoring and destruction of invasive plants are between 15 May - 15 June, 30 June - 30 July and 15 August - 15 September.

- v) In the km 1.8-3.3 of the route section all works shall be excluded, including the transport of the construction mechanisms, from 1 December to 30 June. From 1 July to 30 July, works may be carried out only from 9.00 to 19.00. This time applies also for tree felling which is possible only from the beginning of October to the end of November in this area.
- w) As part of reinstatement substitute planting according to the character of individual biotopes in relation to the territorial system of ecological stability shall be done. Autochthonous plants shall be used, in the pipeline protective zone it is possible to use shallow root species such as hazel, dog rose, hawthorn, on the wetland sites all types of willow. After reinstatement, spontaneous recovery of wetland biotopes must be enabled.
- x) When passing through segment 201, execution of earthworks is restricted to non-vegetative period, e.g. earthworks can be performed only between September and March. Time and execution of earthworks can be adjusted in agreement with the biological supervision according to the actual course of the growing season.
- y) When passing through/along highly valuable vegetation segments 200, 204, 245, 338, 647 and 931 a solid barrier (e.g. a wooden barrier), limiting even accidental enter of machinery to these biotopes, must be installed during initial setting out works.
- z) When passing through/along vegetation segments with the occurrence of specially protected plant species 200, 204 and a solid barrier (e.g. a wooden barrier), limiting even accidental enter of machinery to these biotopes, must be installed during initial setting out works.
- aa) In the area of the river terrace in location B11 / E8 Přívlačky, the pipeline route in this locality is designed in line with the route in the EIA documentation and does not deviate from the boundary of the existing tree felled area. At the same time, the pipeline is designed in the closest possible parallel routing with the existing gas pipeline (5 m), therefore just at the edge of existing pipeline protective zone. The working strip is reduced in this area and in line with Biological Assessment (document No. C4G-HPPL-ILF-GENER-GEN-TZP-019, amended by Biological Assessment from the EIA documentation) the project does not have a significant negative impact on the environment. See also layouts in the document C4G-HPPL-ILF-GENER-GEN-TZP-019 Biological Evaluation.
- bb) The working strip was minimized to its technological minimum in mature beech areas in line with the EIA documentation.

- cc) Segments No. 16, 496, 649, 895 must not be disrupted and any works must not affect these areas.
- dd) During construction the following segments must not be disrupted and any works must not affect these areas: 9, 12, 16, 20, 24, 25, 26, 200, 204, 213, 244, 245, 247, 252, 336, 338, 350, 361, 406, 451, 484, 496, 644, 645, 647, 649, 771, 890, 891, 895, 896, 931.

5.16.3 Especially protected parts of nature

See Overall Technical Report (C4G-HPPL-ILF-GENER-ING-TZP-002).

In order to avoid damage to the environment during construction, the Employer shall ensure the biological supervision acting in regular intervals. Construction works in ecologically important areas shall be executed under biological supervision.

5.16.4 Measures to reduce impact on fauna, flora and ecosystems

- a) Permanently ensure trenches, especially at watercourses and floodplains, against animal deaths. The site must be equipped with suitable measures (e.g. wooden ramps), allowing spontaneous escape of amphibians, reptiles and mammals, e.g. otters.
- b) Prior to the commencement of works, carry out an operational ornithological monitoring of the occurrence of sensitive bird species within the working strip (during the nesting season), which may identify some construction time limits specified herein unnecessary, e.g. because there are no sensitive species that year.
- c) After the termination of works in segments 723, 754 and 757, re-planting shall be done by suitable autochthonous plants (e.g. maples, oaks, ashes) in linear parts of the greenery. In the similar way, based on re-planting project, autochthonous plants to be planted wherever non-forest greenery is affected.
- d) At areas with possible occurrence of specially protected animal species, their rescue transfer shall be planned and executed just prior commencing of works.
- e) In the 1.8 to 3.3 km section of the route, exclude all disturbances, including transport, from 1 December to 30 June. Between 1 July and 30 July works can be done only from 9.00 to 19.00.
- f) In sections of 12.6 to 12.9 km, km 19.0 to 23.0, 57.8 to 58.7 and 126.1 to 126.5 start disturbing works before 30 March to protect sensitive bird species against disturbance during nesting, if the works do not commence prior to this date, then it is necessary to apply a time restriction for work during nesting season, e.g. at least

from April 1 to June 30. Similarly to be proceed around km 25.0 , 22.5, 27.0, 53.0, 58.0, 65.5, 114.5.

- g) In sections 139.7 to 140.0 and 144.0 to 144.2 time restriction for works applies during nesting season, e.g. at least from April 1 to June 30.
- h) In sections 30.7 to 31.2 km time restriction for works applies during nesting season, e.g. at least from April 1 to August 15.
- i) Prior to working strip preparation, rescue transfer of amphibians and their larvae from affected water areas and pools shall be executed, especially in segments 17, 104, 141, 661, 716, 763, 881, 882, 901, 931. Rescue transfer at these locations will not be needed if work in these segments begins in the off-growing season. The need for rescue transfers may occur anywhere along the route (e.g. flooded boring pits at crossings) and it is therefore necessary to monitor the risk sites in co-operation with biological supervision and to solve eventual occurrence case by case.
- j) Throughout the whole project, continuous control of trenches, excavations and pits is required. If necessary, the rescue transfer of accidentally fallen animals, especially amphibians and reptiles, away from the working strip shall be carried out.
- k) As a measure for amphibians in segments 17, 662, 716, 901, during reinstatement of the working strip, the terrain to be suitably shaped in a way creating permanent pools suitable for amphibians habitat and reproduction. At the same time it will be necessary to repair pools in segments 763 and 931 if case of damaged by construction works.
- l) In sections between 0.0 to 6.5 and 149.2 to 150.3 several shelters (about 10) to be built for reptiles at the edge of the trees, especially for the European viper. Shelters shall be stacked piles of stones with a diameter of max. 20 cm without soil. The size, number and location of shelters should be determined in cooperation with the relevant environment authority.
- m) Before commencement of works at Střela river crossing (in 534 segment), rescue transfer of aconite (*Aconitum variegatum*) shall be carried out.
- n) After termination of works in 646 segment, the terrain shall be shaped as suitable biotope for insects, under biological supervisor surveillance.
- o) The crossing of Liboc watercourse shall be carried out without any impact to the watercourse – thrust boring. Entry of machinery into the Liboc watercourse and associated banks is strictly prohibited, except for opening boring pits in nearby area. Water pumped from trenches must cleaned prior to discharge into the watercourses.

- p) Crossings of watercourses (except Liboc, PKP II and Chomutvka) could be carried out by an open cut, in case of crossings of important watercourses (especially Chomutovka, Ohře, Blšanka, Střela, Úterský and Křelovický watercourses) biological supervisor surveillance must be present.
- q) After end of works in littoral zones of Ujezd water reservoir, Sahara u Boru pond and the pool at Přimda (segment 931) the littoral zones and the pond shall be restored. The works shall not interfere with pools in segment 763.
- r) At watercourses crossings provisions of ČSN 75 2130 to be followed. Pipe cover must be at least 1.2 m according to the standard.
- s) A suitable date for open cuts is the early start of spring (March) or summer / autumn (e.g. from mid-August to late October).
- t) Prior to commencement of watercourse open cut works, check of work site (few days before) shall be done due to eventual presence of lampetra, crayfish, shellfish and unio and carry out their rescue transfer to the nearest suitable location within the watercourse, preferably against the stream.
- u) Appropriate measures against sediments and mud transfer into watercourses must be in place during excavation works (e.g. sedimentation mats, filtration, etc.).
- v) Duration of open cuts works must be minimized. Machinery shall not cross watercourses outside agreed crossings. When machinery is moving within watercourses any contamination of water by oil and other polluting chemicals must be avoided.
- w) Banks and bottom of watercourses must be reinstated after construction works to natural shape without any obstacles, sills, etc.
- x) During construction, erosion and wash of soils in watercourses must be avoided. Drainages must be installed/reconstructed in a way preventing waterlogging of land plots and pollution of surface and underground waters in the area.
- y) Entering of machinery into watercourses is prohibited unless open cut crossing is allowed. Open cuts crossings must be executed continuously and fast (in range of single days). At watercourse crossings the working strip must be minimized to technological minimum and crossing cannot be used as a material transport route. It is necessary to avoid pollution of watercourses by appropriate technology of open cut, in particular it is necessary to avoid works in rainy weather and under increased water levels or under a minimal water levels. It is necessary to transfer water over trenches by temporary piping (or other agreed means). Also eventual pumping must be executed in a way avoiding water pollution or unnecessary harm to vegetation.
- z) At crossings through wetland ecosystems and valuable natural habitats, the working strip to be minimized (23 m). Sections 53, 74, 122, 127, 157, 186, 207,

211, 273, 303, 357, 396, 414, 418, 433, 435, 436, 437, 438, 494, 495, 533, 534, 593, 608, 616, 642, 650, 661, 662, 682, 684, 712, 720, 751, 788, 856, 862, 881, 901, 904, 925. Minimize working strip is also necessary in peat-bog sections 13 and 17. In the forest sections 8, 11, 15, 74, 439, 440, 447, 459, 587, 596, 598, 618, 622, 625, 627, 640, 642, 710, 770, 775, 840 working strip to be minimized. In Segments 30, 53, 69, 72, it is necessary to narrow the working strip only on one side towards the edge of the forest. As a mitigation measure, working strip for segments 723, 754 and 757, which are part of a registered VKP, shall be minimized.

- aa) Construction shall be executed in a way which shall not endanger the memorial tree Dub pod Blatenským svahem in segment 406.

5.16.5 Measures to reduce impact on water resources and their monitoring

The contractor to secure authorized hydrogeologist for various works and sections of the pipeline.

- a) In the area of Mže River at Milíkov water supply protection zone parking, maintenance of mechanisms and machinery or pumping of fuel shall be done only on temporarily secured areas with a solid surface, and only in the 3rd zone of the protection zone. These areas shall be equipped with a system of temporary monitoring boreholes (at least 1 object per area) for monitoring groundwater quality in the area. Surface water quality in the area shall be also checked in profiles upstream and downstream. The C10-C40 hydrocarbons concentration must be monitored prior to commencement of the construction (approx. 1 week), at monthly intervals during construction, and at least two times after completion of works in the area (after approx. 2 months). Temporary boreholes shall be then professionally dismantled and liquidated.
- b) In second protective zone of water sources Žihle a trench bottom within Mladotický stream shall be sealed with clay prior to pipe lowering in to avoid income of artesian water. Works in this area shall be supervised by authorized hydrogeologist.
- c) Earthworks in second protective zone of water sources Žihle to be monitored by monitoring of groundwater quality in the HV-11 water well Žihle and by monitoring of surface water in two sections - upstream and downstream - on Mladotický stream. The C10-C40 hydrocarbons concentration must be monitored prior to commencement of construction works (approx. 1 week), at monthly intervals during construction, and at least two times after completion of works in the area (after approx. 2 months).

- d) Earthworks in second protective zone of water source Mladotice to be monitored by monitoring of surface water in three sections - upstream and downstream - on Mladotický stream and upstream on Štítkovský stream. The C10-C40 hydrocarbons concentration must be monitored prior to commencement of the construction (approx. 1 week), at monthly intervals during construction, and at least two times after completion of works in the area (after approx. 2 months).
- e) Earthworks in protective zone of water source Ondřejov to be monitored by monitoring of C10-C40 hydrocarbons concentration prior to commencement of the construction (approx. 1 week) and at least two times after completion of works in the site (after approx. 2 months).
- f) Earthworks nearby water source Líté to be monitored in selected representative objects by monitoring of C10-C40 hydrocarbons concentration prior to commencement of the construction (approx. 1 week) and at least two times after completion of works in the area (after approx. 2 months). The trench shall be (in agreement with the source authority) sealed with clay plugs between km 92.4 to 93.5 in order to eliminate the permanent drainage effect.
- g) Suitable technical measures (e.g. earth barriers) shall be executed to prevent direct washout from trenches into Úterský stream. Earthworks in protective zone of water source Krukanice to be monitored by monitoring of surface water in two sections - upstream on Úterský stream and downstream the water source. The C10-C40 hydrocarbons concentration must be monitored prior to commencement of the construction (approx. 1 week), at monthly intervals during construction, and at least two times after completion of works in the area (after approx. 2 months).
- h) Earthworks near protective zone of water source Benešovice-Pražka to be monitored by monitoring of groundwater quality in catch grooves of source area and by monitoring of surface water in two sections - upstream and downstream – of construction. The C10-C40 hydrocarbons concentration must be monitored prior to commencement of construction works (approx. 1 week), at monthly intervals during construction, and at least two times after completion of works in the area (after approx. 2 months).
- i) Prior to commencement of works, assessment and evidence of objects within Kundratice water source shall be provided. It shall consist of survey of groundwater level, survey of bottom level and the general description of the object (equipment, measuring point, utilization, connection, etc.), not later than 1 month before commencement of earthworks and about 2 months after termination of works in the area. The C10-C40 hydrocarbons concentration must be monitored for permanently used objects in the same time period.
- j) During construction works in area of water source Benešovice – Pražka, maximum protection of this source must be ensured and optimal crossing technology of watercourse IDVT 10263803 – No name stream to be selected.

- k) All water source (WS) protective areas must be respected in means of avoiding these areas with placing of site facilities and re-fuelling or longer parking of machinery and vehicles.

Protective measures defined in updated hydrogeological assessment:

- l) WS Příkladky – k. ú. Stranná u Nechranic - km approx. 30.7
- Hydrogeologist supervision at trench opening due to identification of sandy-gravel terrace / layer and its possible basal watering.
 - Setting out of pipeline between catch basin – water tank prior to construction – it is crossed by planned pipeline, during previous pipeline project damaged (to be avoided) and repaired afterwards.
- m) Natural healing water source (NHWS) Očihov – k. ú. Očihov – km approx. 53.5
- WS protective zones to be respected in means of avoiding these areas with placing of site facilities and re-fuelling or longer parking of machinery and vehicles.
- n) WS Mladotice – k. ú. Mladotice – km approx. 81.5
- WS protective zones to be respected (especially in section km 82.0 – 83.2) in means of avoiding these areas with placing of site facilities and re-fuelling or longer parking of machinery and vehicles.
- o) Private water wells on NW side of Lité village - k. ú. Lité – km approx. 92.5
- Control monitoring of water levels shall be executed in vicinity of the project (land plots 642, 544/2, 551/7 and 555/1) in interval approx.1 once a month in period of 6 months prior to start of earthworks, during construction and 6 months after end of works (trench backfill).
- p) WS Horní Bělá – k. ú. Horní Bělá a Hubenov u Horní Bělé – km approx. 96.0
- WS protective zones to be respected in means of avoiding these areas with placing of site facilities and re-fuelling or longer parking of machinery and vehicles.
- q) WS Kšice – k. ú. Kšice – km approx. 117.8
- Hydrogeologist supervision at trench opening in km 117.8 – 118.0 due to eventual identification of fractured (disturbed) zone hydraulically connected with water source springs.
 - Setting out of pipeline between catch basin – village prior to construction – it is crossed by planned pipeline.
- r) WS Milíkov – k. ú. Milíkov u Stříbra – km approx. 126.4

- Elimination of potential negative effects by watercourse bottom cleaning (e.g. by vacuum truck) and installation of 2 profile river barriers in distance of 100 m and 200 m downstream the river for catch of fuel and sediment leaks.
 - This measure to be in detail discussed and agree directly with WS authority, respectively Povodí Vltavy.
- s) WS Benešovice - Pražka – k. ú. Benešovice – km approx. 129.0
- In the lowest pipeline section in vicinity of WS second protective zone (at watercourse) filtrating devices/measures shall be installed for whole construction duration to avoid fine and sandy fractions washout during rains (e.g. fixed geotextile sheets via watercourse + hay bales, etc.)
 - All excavated soil, except topsoil, shall be store on E and SE of the trench. Allowing function of filtrating measures defined above.
 - WS protective zones to be respected in means of avoiding these areas with placing of site facilities and re-fuelling or longer parking of machinery and vehicles.
- t) WS Kundratice– k. ú. Kundratice u Přimdy – km approx. 146.5
- Hydrogeologist supervision at trench opening and backfill in km 146.3 – 146.7 (incl. installation of measures proposed below) due to documentation of water source springs and detailed specification of measures proposed below.
 - Installation of inspection shaft on a pipeline between ST-3 and ST-2 in the closest vicinity to the pipeline trench on its S side for additional collection of underground water from watered layer of the pipeline backfill in km 146.5 to 146.6 and connection of drainage (see below) to this shaft.
 - Padding/bedding and backfill of trench portion with draining material layer (e.g. round corn sand-gravel 4/8 mm) with installation of a drain pipe (e.g. DN100) and connection to inspection shaft to collect springs drained by the pipeline trench which at present flows in direction to ST-2A and ST-2.
 - Installation of a trench clay (or cement-bentonite) plugs right at the new inspection shaft and down the slope in 50 m interval between km 146.25 – 146.5.
 - Setting out of pipeline between ST-3 – ST-2 prior to construction – it is crossed by planned pipeline.
 - Measures above to be well documented and after finalization of works supported by hydrogeological assessment made by hydrogeologist supervisor.
 - WS protective zone (planned) to be respected in means of avoiding these areas with placing of site facilities and re-fuelling or longer parking of machinery and vehicles.

- Monitoring by hydrogeologist in means of water levels monitoring and performance of WS in N area of catch basin area (ST-2, ST-2A, ST-3) in interval approx. once a month in period of 6 months prior to start of earthworks, during construction and 6 months after end of works (trench backfill).
- u) Water source spring – land plot 1799/3 – k. ú. Kunderatice u Přimdy – km approx. 149.8
- Hydrogeologist supervision at trench opening and backfill in km 149.6 – 149.8 (incl. installation of measures proposed below) due to documentation of water source springs and detailed specification of measures proposed below.
 - Padding/bedding and backfill of trench portion with draining material layer (e.g. round corn sand-gravel 4/8 mm) with installation of a drain pipe (e.g. DN100) and connection to existing inspection shaft (or installation of a new shaft with connection to existing shaft) to collect springs drained by the pipeline trench which at present flows in direction to water source spring area. The new drain pipe with suitable size shall cross the road by means of closed crossings.
 - Installation of a trench clay (or cement-bentonite) plugs right at the inspection shaft.
 - Measures above to be well documented and after finalization of works supported by hydrogeological assessment made by hydrogeologist supervisor.
 - WS protective zone (planned) in km 149.5 – 149.8 to be respected in means of avoiding these areas with placing of site facilities and re-fuelling or longer parking of machinery and vehicles.
 - Monitoring by hydrogeologist in means of performance of WS monitoring in interval approx. once a month in period of 6 months prior to start of earthworks, during construction and 6 months after end of works (trench backfill).

5.16.6 Construction period limitations

Type of limits	Term
After termination of works, for a period of five years in the section adjacent to and passing through EVL Východní Kručnohoří, 3 times during the vegetation season, monitor the working strip for the occurrence of invasive plant species.	15. 5. - 15. 6., 30. 6. - 30. 7. a 15. 8. - 15. 9
In the km 1.8-3.3 route section, exclude all works, including machinery and vehicle transport.	12. - 30. 6., 1. 7. - 30. 7 (work only 9.00-19.00)
In sections of 12.6 to 12.9 km, 19.0 to 23.0, 57.8 to 58.7,	Before 30.3.

Type of limits	Term
126.1 to 126.5, start noisy works:	
In the vicinity of km 25.0, 22.5, 27.0, 53.0, 58.0, 65.5, 114.5 term limitations for works during the nesting season.	1.4. – 30.6
In the vicinity of km 30.7 – 31.2, 139.7 – 140.0 a 144.0 – 144.2 term limitations for works during the nesting season.	1.4. – 30.6
Felling can be done out of the growing season.	1.10. –1.3.

5.16.7 Construction period recommendations

Type of recommendations	Term
Suitable term for open-cuts of watercourses	Start of spring (March) or at the turn of summer and autumn

5.17 Clean up

After completion of trench backfilling and prior to the start of the reinstatement works Contractor shall perform a site clean-up in addition to the regular working strip maintenance requirements. Contractor shall also remove all auxiliary installation devices and machinery.

The site clean-up shall include but not be limited to:

- The removal of all plants, equipment and materials not required for the performance of the reinstatement works;
- The removal of all surplus construction materials from the working strip, temporary storage yards and other locations;
- The removal and disposal of any displaced soil and other spoil from the working strip to designated disposal sites;
- The proper clean-up of all land contaminations within and adjacent to the working strip;
- The clean-up of all temporary accesses and sites no longer required for the performance of the reinstatement activities;
- Other activities as required to prepare the working strip, for the performance of reinstatement activities.

Contractor shall perform all clean-up activities in strict compliance with the Project procedures and legal requirements for waste management and the disposal of excess materials.

All surplus materials supplied by Employer shall be transported to Employer's storage yards as directed by Employer.

All surplus materials from Contractor's procurement shall be returned and stored at Contractor's storage sites.

5.18 Reinstatement

Prior to reinstatement activities, the Contractor shall prepare method statements for reinstatement based on the requirements of the relevant Authorities, land owners and administrators. For the reinstatement all conditions and requirements from the relevant statements have to be fulfilled.

All existing boundary markers, monuments, survey points, road signs, sacred items, etc. which have been removed or altered by the construction works and have been recorded by an officially Authorized Surveyor prior to construction works, shall be reinstated with the cooperation with the Authorized Surveyor at the Contractor's own expense.

The working strip cleaning and reinstatement shall be completed as soon as possible after backfilling of the trench or after the completion of the hydrotest and depend on weather conditions. It is assumed that the working strip will be reinstated to its original condition within four weeks after starting of the reinstatement works. The Contractor shall reinstate all working areas used for construction, such as working strip, pipe yards, site facilities, etc. at his own expense.

Construction not to restrict roads slipping of other road users from and to the forest roads. If this situation occurs, a new or reinstated road slip to the forest road to be built.

The final reinstatement will be assessed by the relevant Authority or the administrator with the participation of the land owners.

The Contractor shall reinstate the surface of the working strip to its original condition to ensure smooth connection to the surrounding terrain, agricultural land, forest areas, watercourses, etc.

The Contractor is fully responsible for final reinstatement after the construction. The reinstated areas shall be of the same character and use as before construction. Land use includes not only agriculture, but also pastures, wildlife, forestry, watercourses, etc.

Cooperation with farmers and landowners is important and required for successful reinstatement.

Special care has to be taken to the proper reinstatement of the topsoil especially in areas with thin topsoil layer.

Watercourse embankments and channels must be protected against erosion in an appropriate manner and all construction temporary structures necessary to cross watercourses shall be removed after completion of the construction works. The protection and reinstatement of the watercourses to the original condition shall be carried out in accordance with the Project documentation and the requirements of the watercourse administrators and owners.

Areas of steep slopes and areas prone to erosion must be protected against erosion in an appropriate manner (technical and biological measures). Apart of identified steep slopes at least the following areas shall be considered as significantly prone to erosion and proper measures shall be applied incl. detail design:

- KM 5+200 to 7+500
- KM 8+250 to 10+140

Temporary constructions and access roads built for the purpose of pipeline construction shall be removed. Any damage to existing roads, structures, objects shall be repaired by Contractor without exception.

Permanent service roads in the areas with steep slopes, which will be further use by service vehicles will be additionally improved with measures against erosions or will be provided with anti-erosion elements.

In agriculture used areas all the stones, rest of coating or other construction materials shall be removed and must not be left below or on ground in the entire width of working strip to avoid damage of the agricultural machinery.

The Contractor shall coordinate technical reinstatement with relevant owners / tenants of the agricultural or forest land concerned.

The sections not used for agricultural purposes shall be sown with appropriate seed. The procedure and type of sowing will depend on soil and climatic conditions and must be agreed with the Employer, the land administrators and owners.

The method of reinstatement to be further described in the separate documentation, mainly reinstatement plan and shall be based on stakeholder statements, EIA documentation, agricultural land removal annex, etc.

Complete technical and biological reinstatement shall be within the Contractor's scope of work.

Technical reinstatement consists mainly of trench backfill, return of excavated soils, surface levelling and spread of stripped topsoil and eventually bottom topsoil in a way

representing original layers stratification and avoiding mixing with waste soil. It is mainly important to execute the works fast (in single weeks).

Wherever is the pipeline section prone to undesired underground water flow alongside of the pipeline suitable measures shall be installed (e.g. clay plugs).

5.18.1 Farm land reinstatement

Farm land reinstatement shall be executed in line with annex. No. 7 to regulation 13/1994 Sb. in valid status. In the same time it is considered that affected land plots shall be reinstated to its original state and ready for farming in less than 1 year. Therefore in general these land plots will not be subject to agricultural land fund removal according to statements in § 9 of the law 334/1992 Sb (further referred as Law). An in the same time further requirements of the statements in § 8, § 9 par. 2) a of law 183/2006 Sb.

Basic width of the working strip is 36 m. On this width the topsoil shall be stripped in standard width of 26.5 m. Stripped material shall be stored and part of not stripped working strip – its edge or moved to a suitable location. Further will be stripped bottom topsoil from the trench (where prescribed) and waste rock. These materials shall be stored separately on already stripped part of the working strip. In case the bottom topsoil is not stripped the trench excavation may be executed in one go. After the pipe lying and padding the pipeline shall be backfilled at first by a waste rock, then by bottom topsoil (if applicable). In order to minimize generation of waste the waste rock shall be used as far as possible as a backfill or at construction site and eventual excess material shall be disposed to official disposal places. On such prepared and levelled surface the topsoil will be evenly spread with eventual harrowing or pre-seeding preparation.

Prior to topsoil spreading it is highly recommended, especially on heavy soils, to execute soil loosening on parts of a working strip where machinery was moving by suitable means (e.g. shallow ploughs, harrows, etc.)

In full width of working strip all stones, which might harm farm equipment, shall be removed and disposed at official disposal place.

Restoration of biological soil properties

After technical reinstatement part the following measures for improvement and restoration of biological soil properties shall be executed:

On farm land sections it is possible to return land plots to farming process applied on particular land blocks with appropriate cultivation by fertilizers. If allowed by particular farming process, it is recommended to always use inter plants (possible to choose 37 plants)

On grass land (meadows, pastures) it is necessary to provide seeding with seed mixture suitable for particular soil and climate conditions. Suitable is seed mixture of at least 3 or more components including e.g. grass and clover seeds which enables well funding and

consequent engagement of plants also in case of negative effect of some part of seeding mixture due to negative factors (e.g. climatic). The most important is seeding period which shall be either spring or autumn. In case the technical reinstatement shall be finalized in other periods the seeding must be postponed to the right period. In worse climate conditions (e.g. washing out of seeds, plant drying) additional or even new seeding must be provided.

Either on farm or grass land biological reinstatement shall be executed in cooperation with land owners or tenants who usually execute the reinstatement on their own with appropriate financial compensation from the Contractor.

Earthworks volume balance

Since stripped material shall be returned to its original location (except eventual excess material from trench) detailed soil balance, for purpose of its transport, is not made. In approximate condition and under consideration of 0.3 m of topsoil (without bottom topsoil stripping) is typical volume on 100 m section approx. 795 m³.

Time frame of particular reinstatement phases

Time frame shall be defined based on previous construction phases and agreements with land owners/tenants. For funding of grass areas and also inter plants as “green” fertilizers it is necessary to comply with suitable seeding periods allowing well conditions for plats growing and consequent engagement of the plants into the process.

Reinstatement shall be done in line with conditions mentioned in chapters 3.10.6 and 5.16.2, especially item n).

5.18.2 Forest land reinstatement

Forest land reinstatement shall be executed in line with reinstatement plan based on stakeholders statements and forest annex.

In full width of working strip all large stones, which might harm forest equipment, shall be removed and disposed at official disposal place.

5.18.3 Drainages

Systems of underground drainages may be encountered through the whole Project area even if not identified in the Project documentation. Also parallel drainage mains, directly in the pipeline route, may be encountered. Reinstatement, repair or relocation of these systems is in the Contractor’s scope of work.

All affected drainages shall be restored to its original or better state as per the Project documentation preserving its full functionality. New system of drainages must not hinder normal agricultural use of the land and its reconstruction must not negatively impact either underground or surface waters.

6 ANCILLARY INSTALLATIONS

6.1 Cathodic Protection

The pipeline shall be protected by cathodic protection. Cathodic protection shall be implemented according to the approved Project documentation and its components shall be installed within the pipeline working strip. Further details are specified also in the Cathodic Protection Specification and associated documents.

Cathodic protection system is planned as an extension of the existing system in use.

All installation works on the cathodic protection for the pipeline must be carried out by organization with a certificate of competence according to ČSN EN 15257:2007 with the scope of authorization Cathodic Protection.

Cathodic protection of the pipeline contains of aboveground objects and interconnecting cables along the pipeline route and cathodic protection stations.

All works where cables will be connected to the third party structures protected by cathodic protection system shall be provided under the direct supervision of the owner or operator of these facilities.

6.1.1 Pipeline part

The pipeline shall be connected to the existing pipelines cathodic protection system. Cathodic protection of the new pipeline shall be secured by connection to existing pipeline and interconnection to existing pipelines via interconnecting objects. All crossed facilities, protected by cathodic protection, must be interconnected. Installation of all proposed interconnecting objects, cables and stations is in scope of the Contractor.

6.1.2 Basic principles

In the crossings with underground utility lines or land plots following requirements shall be abided by the Contractor:

- Prior to the commencement of excavation works all underground utility lines shall be located within the working strip.
- Excavation and works in vicinity of third party assets must be in line with their operator's statements and both – new and existing installations must be properly protected.
- Stability and safety of all aboveground objects located in the working strip shall be ensured during all works.
- Existing aboveground cathodic protection objects shall not be affected or damaged during excavation unless these are part of the Project and subject of

reconstruction. Existing aboveground cathodic protection objects shall be preferably used also for the new pipeline wherever possible.

- The existing underground utilities shall be properly handed over to their operators or owners before backfilling.
- Photo documentation shall be part of the handover documentation. The handover documentation shall be submitted in paper and electronic form.
- The land plots shall be reinstated to original condition and handed over including relevant documentation to the owners.
- The survey of all affected underground installations shall be done before backfilling.

6.1.3 Locating of interconnecting objects

Existing interconnecting objects, in ownership of the Employer, shall be preferably used wherever possible.

New above ground objects must be well accessible and shall be placed in general each 0.7 -1 km.

New interconnecting objects shall be located approx. 0.5 m from the pipeline edge.

6.1.4 Interconnecting objects design

New boxes shall be made of plastic in dimensions approx. 400x650x280 mm and with ingress protection IP 43. Doors shall be lockable with universal cylinder.

The boxes shall be mounted on concrete pillar with dimension 150x150x2400 mm. Protective plastic conduits shall be mounted to the pillar by stainless bands.

Inside the box terminal plate type METRA shall be used. Terminal plated shall be labelled with existing and new connections as "HPPL", or "CH-HPPL" in case of the casing pipe interconnecting object, existing connections as per existing labels.

6.1.5 Connecting of interconnecting objects

Connections of interconnecting objects shall be executed as per ČSN 03 8376. Type of cables and welding shall be as per Cathodic Protection Specification. The cable shall be prior welding inserted into shrinkable tube and the cable shall be also wrapped in PERP 80 material patch.

Cables from box up to connected facility shall be installed in protective Kopoflex DN40 conduits or equivalent. Conduits shall be installed in trenches approx. 1 m depth up to the concrete pillar.

A warning tape with labelled “ELEKTRO”, in width of 33 cm, shall be installed above all conduits. Cables ends shall be labelled in boxes with description (type of cable, type of facility).

After connection, the connection place shall be coated and checked as per TPG 920 24.

6.2 Fibre Optic Cable

In parallel with the pipeline, the Contractor shall install two DN40 HDPE conduits for fibre optic cables (FOC) in a same trench as pipeline. Simultaneously with the pipeline, a NYY 4 mm² detection cable shall be laid. Further details are specified also in the Fibre Optic Cable Specification.

HDPE conduit installation shall follow after the gas pipeline is installed. The installation itself shall be in accordance with the Project documentation (specifications, typical drawings, detail drawings, alignment sheets), according to the common principles mentioned in Chapter “5.7 Excavation” of this document and according to NET4GAS internal regulations.

During the construction period the Contractor shall inspect the FOC conduit installation, conduit integrity, buckling, conduit joints, particle size of the padding material, the installation of couplings, etc.

The outdoor air temperature shall not be below 0°C during handling of the FOC HDPE conduit.

During installation of the FOC conduit the Contractor provide continuous surveying of the conduit route before backfilling. All shafts, joints, couplings, casing pipes at crossings, position of markers, etc. shall be surveyed as well.

The Contractor shall provide photo documentation of the conduit installation works. After finishing of the conduit installation, the Contractor proceeds the pressure test and gauging test and an inspection of the integrity of the conduit. All documentation from the inspections shall be part of the handover documentation to the Employer.

In places where the existing long-distance metallic cable or FOC, both in the property of the Employer, will collide with the proposed gas pipeline, the cable will be interrupted and during construction of the pipeline will be reconstructed. The new cable will be located in the same trench as gas pipeline and will be connected to the existing cable.

It was assessed, that for some places, the influence of high and very high outdoor voltage lines brings hazardous effects due to induction in the NYY detection cable. For these places the induced voltage exceeded the limits as per CSN 33 2160 and the protection measures are required.

Places and measures are listed in the table below:

Object	Km	Section Protection	Protection Measures
KS07B	14.40	KS07B-KK6	Surge arrester; Warning sign
KK6	20.40	KK6-TU51S	Surge arrester; Warning sign; Earthing - 2x earthing rod
KK6	20.40	KK6-KS07B	Surge arrester; Warning sign; Earthing - 2x earthing rod
TU51S	26.75	TU51S-KK6	Surge arrester; Warning sign
TU51S	118.13	KK38-KK40	Surge arrester; Warning sign; Earthing - 2x earthing rod
KK38	123.86	KK40-KK38	Surge arrester; Warning sign; Earthing - 2x earthing rod
KK44	134.40	KK44-TU48S	Surge arrester; Warning sign; Earthing - 2x earthing rod
TU48S	139.70	TU48S-KK44	Surge arrester; Warning sign

6.3 Marking

The Contractor is responsible for the delivery, location and installation of all underground and above ground pipeline, FOC and CP markings, cathodic protection test stations (posts), leak detector pipes and other accessories of the pipeline according to the Project documentation.

The marking shall be done by marker posts (markers) with indication plates in accordance with TPG 700 24. The marker posts shall be located to allow inter-visibility from one post to the other and at each change of direction of the pipeline. Each marker post shall be equipped with an indication plate.

Where marker posts are prone to damage it shall be protected by concrete rings filled with gravel.

The Contractor shall also install the leak detector pipes at the crossings with steel casing pipes. The leak detector pipe may serve as the pipeline marker.

In agricultural areas all above ground objects such as marker posts, leak detector pipes, cathodic protection test stations, etc. shall be located at field boundaries, track edges, the edge of irrigation channels, etc. to minimize the potential disturbance of normal land use by the marking installations. The location of all pipeline markers, cathodic protection test stations, leak detectors and accessories shall be incorporated by the Contractor into the as-built documentation.

The marker posts shall be installed to allow visual inspection done by walking, driving and airborne.

As a minimum the marker posts shall be installed at the following locations:

- Two marker posts shall be installed at watercourse crossings – one on each side of the crossing;
- Two marker posts shall be installed at highway and motorway crossings – one on each side of the crossing;
- At least one marker post shall be installed at crossings with other roads and railway crossings depending also on crossing width and visibility between markers;
- The marker posts shall be located to allow inter-visibility from one post to the other;
- At any change of the pipeline route direction. It shall be located within acquired easement limit and the closest to the real intersection point if not possible to place directly at this point.

The marker posts shall installed preferably on the same side of the crossing as the marker posts of the existing lines if any.

Additional marker posts shall be installed in locations along the pipeline route where construction activities may be expected such as crossings with roads and highways, other traffic areas, water bodies, etc. Additional marker posts shall be installed also at locations where damage or interference with the pipeline may be expected.

The fibre optic cable conduit shall be also marked by a specific marker posts.

7 LINE VALVE STATIONS

7.1 General

Contractor is responsible for the linear part of the pipeline, including the associated incoming/outgoing pipeline and stations as defined above as well as for installation of the Line Valve Stations (LVS) along the pipeline. Contractor is also responsible for access roads to all stations. All crossings of the access road and the pipeline shall be as per relevant design and typical drawings for road crossings.

The area of the LVS shall be fenced not accessible to the public and secured by relevant electronic security system against entry of unauthorized individuals.

Where planned, the existing line valve stations will be extended for installation of new pipelines and equipment. The construction activities will take place during the operation of the existing LVS. In the case of work being carried out directly in the area of the existing LVS, the Contractor shall proceed with the utmost care and comply with all requirements of permits issued by the owner or operator of the existing installations (e.g. pipelines or cables). During the works, the Contractor shall protect the existing installations in the area which remains in operation.

After completion and during the test operation of newly constructed stations the Contractor shall verify that the noise limits do not exceed the allowable limits. If the limit values are exceeded it is the responsibility of the Contractor to proceed with appropriate corrective measures to reduce the noise level below the permissible values.

7.2 Civil part

The requirements for construction works are detailed in the associated technical reports, specifications and in related Project drawings - Station Layouts, Structural Drawings, etc.

7.3 Mechanical part

The requirements for mechanical part are detailed in the document Mechanical Works and Requirements on Mechanical Completion by General Contractor.

Following installations will be in general installed in the line valve stations and distribution nodes:

- Valves (ball valves, gate valves, shut-off valves, control valves)
- Drainage and depressurization equipment
- Connection for instrumentation
- Pipe supports
- Isolating couplings (where applicable)
- Launchers and receivers - bidirectional (where applicable)

7.3.1 Valves and flanges

The Contractor shall store and install the valves in accordance with the manufacturer's recommendations.

During installation of the valves the Contractor shall secure these in vertical and horizontal direction to avoid unnecessary stresses in the adjacent joints. The valves shall be installed fully opened.

In the case of welding connection of the valves the temperature of the valve body shall be monitored and recorded throughout the welding process and shall remain within the limits allowed by the valve manufacturer.

All flanges shall be installed in such a way that the centres of two opposing holes for bolts are on the vertical axis.

For all valves and their drives which will be part of pressure tests the manufacturers' requirements and allowable limits of stresses shall be observed and the relevant measures shall be proceed after the pressure tests in order to avoid damage to the valves and their drives. After pressure tests the valve body shall be dried with compressed air or as recommended by the manufacturer.

Flanges of size DN 200 or larger must be tightened by a qualified worker using a hydraulic torque wrench. A tightening record shall be provided for every flange of size DN 200 or larger. Smaller flanges shall be tightened by a mechanical torque wrench.

7.3.2 Control valves

The installation of the control valves shall be carried out in accordance with the manufacturer's instructions, taking into account the prevailing direction of flow of gas in the pipeline.

7.3.3 Drainage and depressurization

The required location of drainage and depressurization installations is specified in Project documentation or the location may be determined on site. If additional drainage and depressurization installations are required for hydrotesting the installation shall be done in cooperation with the Employer. Any additional material regarding the drainage and depressurization required to perform the hydrotest shall be provided by the Contractor.

7.3.4 Connection of Instrumentation

The relevant connections for pressure and temperature measuring devices shall be as per relevant Project documentation.

7.3.5 Supports

The Contractor shall ensure the delivery and installation of all necessary pipe and valve supports according to relevant Project documentation. The supports shall be installed on reinforced concrete foundations.

The Contractor shall check the height and location of the support during the installation process and adjust if required.

During installation of the supports all recommendations and instructions provided by the manufacturer of the supports shall be followed.

Welding of hot dip galvanized supports is not allowed. In case of drilling in a hot-dip galvanized steel support the galvanized surface shall be repaired by cold zinc coating.

Apart of supports all piping and facilities shall be supported by various means (e.g. proper trench compaction) to avoid undesired settlements.

7.3.6 Insulating coupling

The insulating coupling shall be installed in accordance with the manufacturer's recommendations.

During welding of the insulating coupling the temperature limits shall be monitored to avoid damage of the insulating coupling. The functionality of the electrical insulation shall be checked before and after welding.

The insulating couplings shall be installed in a way (e.g. proper trench compaction, bottom slabs, fixing clamps, etc.) to avoid undesired movements and exceeding of allowable bending moments.

7.3.7 Launchers and receivers

The Launchers and receivers in the (where applicable) shall be installed by the Contractor, including dismantle, transfer and adaptation of the existing scraper trap from RU Kateřinský Potok.

7.4 Electrical part

New electrical installation is considered for the newly constructed line valve stations (if applicable).

The power supply of existing line valve stations shall be checked and in case of non-compliant connections the Contractor shall provide new connections to the public distribution network with commercial metering. The relevant connection shall be carried out in accordance with the Project documentation, according to the common principles set in Chapter "5.7 Excavation" and according to the internal regulations of the Employer.

All electrical installations and wiring shall be in accordance with approved Project documentation. The electrical installation of the line valve station is according to the Regulation 73/2010 of the determination of the specific electrical equipment, classified in Class I, Group A: Equipment intended for use in potentially hazardous gas explosive

areas. Before start of installation works the Contractor shall notify the Technical Inspection Authority of Czech Republic (TIČR).

The Contractor shall extend the electrical installations of existing line valve stations in an appropriate manner. To connect the new equipment the existing switchboards from the shelters (KMB) shall be used.

The backbone cable routes shall be protected using the Kopoflex cable conduits and cable chambers or as per the Project documentation. Cable conduits shall be common for the electrical part as well as for I&C part.

The interface between the electrical and I&C system is on the power switchboard terminals. Interconnecting control and signal cables are included in the I&C part.

During handling of PVC cables the outdoor temperature shall not be below +5 °C.

For the specified technological equipment of the line valve station the Contractor shall provide illumination of the adjacent space by means of LED lights located on the outdoor light poles.

The earthing system of the line valve station is designed with a FeZn 30x4 earth strip laid in the trench. All equipment including line valve station fencing etc. shall be connected to the earthing system.

The pipeline part of the Project is protected by separate cathodic protection system and this shall be separated from the earthing system of the station. Aboveground pipeline shall be protected against atmospheric overvoltage by means of a protective gap fuse designed for hazardous gas explosive areas (Ex). The protective gap fuse will bridge the insulating coupling of the pipeline.

During the construction the Contractor shall carry out inspection of cable laying activities, particle size of the padding sand, coordination with other involved disciplines, completeness of supplies, etc.

All the cable routes and associated installations cable ducts, shafts, etc. shall be surveyed by Contractor before backfilling. Contractor shall provide photo documentation of all works as a part of inspection of these works. All documentation from the inspections shall be included into handover documentation for the Employer.

At the end of the installation of electrical equipment, the Contractor shall prepare an initial inspection report. The Class I equipment may be commissioned only on the basis of a permit issued by Technical Inspection Authority of Czech Republic (TIČR).

7.5 I&C

The requirements for I&C works are detailed in the associated technical reports, specifications and other related Project documentation.

8 COMMISSIONING AND START-UP SUPPORT

8.1 First Pipeline Internal Inspection - "Baseline Survey"

After filling the pipeline with gas the Employer shall perform or arrange for the first internal inspection of the pipeline by means of a "intelligent PIG" capable accurately record deviations in the pipeline, measure geometry of pipes, accurately locate imperfections and determine the type of imperfection. The results of inspection shall be further analysed, evaluated and displayed in a 3D presentation.

The analysis of the results of the first pipeline internal inspection and its evaluation shall be executed by the relevant contractor of the first inspection and the results shall be sent to the Employer for review and approval. The contractor of the first inspection shall notify the Employer about any deviations and irregularities. The outcome of the inspection shall confirm that the pipeline system can be safely operated. The results of the first internal inspection shall be saved as a reference model, and shall serve as a baseline document to compare results from next tests to determine the degree of wear of the pipeline.

For the first pipeline internal inspection one PIG run is assumed; repeatable smart PIG runs may be required if:

- a large extent of irregularities and damages is detected and based on the analysis a mechanical intervention into the pipeline to repair damaged sections is required;
- the results of the internal inspection and analysis are ambiguous.

In the case of detection of unacceptable defects, the results shall be presented to the Contractor and all these defects shall be corrected by the Contractor.

The results of the first internal pipeline inspection shall be also used to check the quality of the pipeline construction.

8.2 Commissioning Support

Prior to start of the pipeline operation, strength tests and leakage tests - pressure tests shall be carried out according to ČSN EN 1594, ČSN EN 12327 and TPG 702 04. The capability of the pipeline to start the service shall be documented by the Contractor by the appropriate inspection reports.

The Contractor shall provide technical support, personnel and equipment for the commissioning of the pipeline system as part of his activities. Contractor shall fully support all commission activities and immediately solve all issues and additional requests which may appear during commissioning and start-up procedure.

9 DOCUMENTATION

9.1 General

All construction and installation works can only be carried out by an authorized organization that provides their authorization certificates for the activities concerned, including the certification of its personnel, the certification of the authorised inspector and the required certificates for performing the relevant works in the Czech Republic.

Before start of any site activity the related detail design documents, ITPs and method statements, issued as IFC (Issued For Construction), must be approved by the Employer's engineers as well as uploaded onto the by Employer determined folder within the Project SharePoint (DIP). Without uploaded IFC documentation any site works of the Contractor cannot start.

Part of the construction documentation provided by Contractor shall be by Employer approved detail construction drawings such as plan and profile drawings and method statements for all activities connected to the construction of the pipeline. The activities covered by the method statements to be prepared by the Contractor prior to construction shall be but are not limited to:

- Access and new roads preparation, improvements and reinstatement
- Working strip preparation
- Handling, hauling and storage of materials
- Trenchless crossings
- Watercourse crossings
- Buoyancy control
- Road crossings
- Drainage reparation and relocation
- Dewatering, drainage
- Crossings and protection of third party lines and facilities
- Excavation
- Pilling and concreting works
- Pipe bending on the site
- Stringing of pipes
- Installation of linear part of the pipeline
- Installation of station piping (fabrication and installation)
- Installation of pipeline in steep slopes

- Welding
- Coating and Painting
- Pipe lowering
- Padding and backfilling
- Fibre Optic Cable - FOC (installation, pressure tests, gauging)
- Cathodic Protection – CP system installation
- Construction of line valve stations
- Pipeline cleaning
- Stress tests and pressure tests (hydrotesting)
- Individual and complex tests
- Pipeline dewatering and drying
- Pipeline gauging
- Commissioning procedure
- Reinstatement
- Pipeline, FOC and CP marking
- Environmental provisions

Construction and installation log books shall be kept for construction and installation works according to the applicable laws. Construction and installation log books shall be in Czech language. In case of foreign Contractor it shall be bilingual - in Czech and English language.

Following the Inspection and Test Plan all inspection and test reports shall be handed over on a regular basis to document the quality of the work carried out. The quality of the installed materials and components of the pipeline shall be documented by the relevant inspection documentation according to ČSN EN10204 art. 3.1 or art. 3.2 (according to Technical specifications), by the relevant certificates (e.g. ATEX, PED, etc.) and by the declaration of conformity.

Capability for commissioning of the pipeline, cathodic protection and earthing system shall be documented by relevant inspections and inspection reports, by pressure test reports, by Technical Inspection Authority of Czech Republic (TIČR) statements and by declarations of conformity.

9.2 Red mark documentation

Red mark drawings/documentation shall be provided by the Contractor for purposes of trial operation. The documentation must be approved and signed by the Contractor and approved and counter signed by the Employer or his representative.

Red mark drawing to include all modifications done compared to Issued for Construction (approved) drawings as per information from site construction and shall be submitted prior to as-built documentation.

All red mark drawing shall be handed over in both – electronic and hard copy formats. Contained information shall be clear, readable and complete.

9.3 As-built documentation

As-built documentation shall be part of the hand over documentation after finalization of construction and other supporting activities by the Contractor. The as-built documentation shall include at least:

- Accompanying and Technical Summary Report;
- Layout drawings;
- Documentation of objects including drawings (electrical, technical protection systems, structural parts and technological objects, TELCO, instrumentation and control, etc.);
- Geodetic survey and documentation of important structural elements such as tie-ins, valves, crossings with other utility lines, mechanical protection, actual position of the pipeline axis and HDPE conduits;
- Material and structural design;
- Welding and NDT records;
- Coating and painting documentation;
- Records of pressure tests and stress tests (hydrotesting);
- Pipeline internal inspection records and relevant documentation;
- Documentation as identified in the individual specifications of the Project documentation;
- The documentary part including:
 - documents according to the relevant legislation;
 - statements of the authorities and utility line administrators concerned (Project Stakeholders);

- authorisation documents and qualification certificates of personnel, authorization documents of the Authorized Inspectors;
- certificate of authorization issued by Czech Chamber of Chartered Engineers and Technicians Engaged in Construction (ČKAIT);
- construction work log books;
- notes and minutes of meetings;
- statements and certificates;
- bills of materials;
- results of inspection measurements and tests;
- reports of functionality and complex test;
- technical specifications;
- operation and maintenance instructions, guidelines, technical passports and manuals;
- photo documentation;
- other as required.

An integral part of the documentation shall also be the Construction progress reports (weekly, monthly, quarterly and final summary report).

All documentation shall be handed over by the Contractor (in electronic and paper versions in the same extent):

- in an editable (native) format in two copies on CD/DVD/flash disk:
 - Microsoft Office *.docx, *.xlsx;
 - Bentley Microstation *.dgn –version 8
 - AutoCad *.dwg – version 2004-2013;
 - and Adobe *.pdf format;
- two complete sets as a hardcopy in the bilingual Czech and English version unless otherwise agreed.

In case of use of any special commercial software for evaluation and review of any of the documentation, the software including the relevant licensing, shall be part of the submitted documentation. The software provided shall be usable without any additional associated costs.

The lists, scope and formats of the submitted documentation is further specified in the Contract and other project documentation.

The sample of the List of handed over documentation is shown in the following table.

Number	Document	Format			Deadline	Prepared	Checked	
		Hardcopy	pdf				Third Party	Net4GAS
	XXXXXX							
	XXXXXX							
	As-built documentation	X	X	X	xxx.xxx.xx		X	
	Contractor's technical report	X	X		xxx.xxx.xx		X	
	Initial gas equipment revision	X	X		xxx.xxx.xx		X	
	Initial electric equipment revision	X	X		regularly		X	
	Initial earthing system revision	X	X		xxx.xxx.xx		X	
	Test pressure reports	X	X		xxx.xxx.xx		X	
	Functional test reports	X	X		xxx.xxx.xx		X	
	Complex test reports	X	X		by			X
	Holiday test report	X	X		xxx.xxx.xx		X	
	Report of cathodic protection measurement	X	X		xxx.xxx.xx		X	X
	Copy of installation organization authorization	X	X		xxx.xxx.xx			X
	Copies of certificates of assembly- and authorised inspection technicians of specified gas installations	X	X		xxx.xxx.xx			X
	Copies of licences of individuals (fyzické osoby) performing selected activities in construction	X	X		xxx.xxx.xx			X
	List of welders	X	X		xxx.xxx.xx		X	
	List of coating personnel	X	X		xxx.xxx.xx		X	
	Main construction log book	X	X		xxx.xxx.xx		X	X
	Installation log book	X	X	X	xxx.xxx.xx		X	
	List of golden welds	X	X		xxx.xxx.xx		X	
	List of pipes, fittings, measuring equipment, filters, etc.	X	X		xxx.xxx.xx		X	X
	List of installed valves	X	X		xxx.xxx.xx		X	X
	List of welding materials (including certificates)	X	X		xxx.xxx.xx		X	
	List of coating materials (including certificates)	X	X		xxx.xxx.xx		X	
	Certificates of origin of the equipment and materials used, concrete quality certificates	X	X		xxx.xxx.xx		X	X
	Installation, maintenance and operating instructions	X	X	X	xxx.xxx.xx			X
	List of tests including record lists	X	X		xxx.xxx.xx		X	
	List of provided photo- and video documentation, list of provided data carriers	X	X		xxx.xxx.xx		X	
	Contractor's declarations, documents	X	X		xxx.xxx.xx		X	X
	Record of gas filling	X	X		xxx.xxx.xx	Net4GAS		X
	XXXXXX							
	XXXXXX							
	XXXXXX							

9.4 Documentation of the construction equipment

Following equipment is usually used for pipeline construction works - pipe laying machines (sidebooms), bending machines, excavators, dozers, trucks, transporters, boring machines, cranes and all other lifting devices and their accessories, welding equipment, pressure testing and pipe cleaning equipment, electrical equipment, etc.

9.4.1 Cranes and lifting equipment

Cranes and lifting equipment and associated works are addressed in particular in relevant regulation code - ČSN ISO 12480-1.

9.4.1.1 Obligations of the owner of the lifting equipment

- designate in writing an individual responsible for the operation and technical condition of the lifting device (authorized person);
- designate a lifting equipment inspection technician or ensure that inspections are carried out by an external inspection technician;
- keep record documentation of the lifting equipment;
- familiarize workers with the regulations on the equipment used, the operating instructions for the specific lifting devices, with practical handling of these devices and verify their knowledge and abilities;
- ensure regular medical examination of crane operators, slinger banksman operators and signallers once every 3 years;
- ensure professional installation, repair, maintenance and operation of the lifting equipment;
- ensure regular inspection, examinations and tests of the equipment;
- keep the equipment permanently operational and repair all defects occurred;
- establish and keep a maintenance plan;
- develop a safe work system for the operation of the lifting equipment.

9.4.1.2 Documentation of the operation of cranes and lifting equipment

- list of lifting equipment;
- designation documents of all authorized persons, professional technicians and inspection technicians;
- evidence records of trainings and tests of competent personnel;
- list of crane operators, slinger banksman operators and signallers;

- HSE documents.

All HSE requirements shall be followed for every lifting works whether it is a single lift operation or a group of repetitive operations. All the subjects involved into lifting operations must be familiarized with the HSE procedures and requirements.

The HSE procedures for the lifting operations shall include:

- Procedures for crane operations. All crane operation procedures shall be developed in line with the safety requirements for the works and shall take into account all possible risks. The procedures shall be prepared by authorized individuals with appropriate experience. In the case of repetitive and routine lifting activities, the procedures could be developed only for the initial phase with the setting of regular checks to detect any deviations from these procedures.
- Selection, provision and use of a suitable lifting equipment and associated accessories
- Procedures for maintenance, testing, inspection and other associated activities of the lifting equipment and associated accessories.
- Requirements for training and competency of personnel operating lifting equipment as well as assurance of personnel with relevant knowledge of responsibilities and responsibilities of other participants during operation of lifting equipment.
- Definition of adequate supervision by trained and authorized individuals with the relevant competence.
- Checking procedures of availability of all required documentation.
- Prohibition of unauthorized manipulation of the crane
- Procedures for ensuring the safety of persons not involved into the operation of lifting equipment.
- Coordination requirements for all parties involved into lifting activities, including the risk prevention and mitigation measures
- Defining of the communication system which will be acknowledged by all parties involved into the operation of lifting equipment.

9.4.1.3 Required documents for lifting equipment

Following documents shall be available for each of the lifting equipment:

- manufacturer's documentation (technical description of the equipment, description of allowable operating conditions, operating and maintenance instructions, routine maintenance instructions and spare parts list; for the equipment supplied prior to 1993 also the Technical Data Sheet or Technical Passport shall be provided);

- the logbook of the lifting equipment, with records of inspections, maintenance, cleaning and lubrication and list of failures or exceptional events;
- records of equipment testing;
- for new equipment, CE Declaration of Conformity as per Act No. 22/1997 Sb.

9.4.1.4 Certification, inspection, check and testing of the lifting equipment

All certification, inspections, checks and testing is mandatory for all lifting equipment (specified and non-specified equipment) and shall be performed at intervals defined by the manufacturer and relevant technical regulations and standards.

The inspection checks shall be executed on a daily and weekly basis. The daily inspections shall be performed by the equipment operator. Contractor shall designate an individual responsible for the weekly inspection checks. The scope of inspection is stated by annexes to the regulation code ČSN ISO 12480-1. Inspection records shall be kept in the lifting equipment logbook.

At least once every 6 months a regular overall inspection of the lifting equipment shall be performed. It shall be performed by an authorised technician. The inspection record must include an overview of the parts inspected. In case of any defects found the necessary measures which shall be performed prior to the next use of the equipment shall be reported to the responsible person.

The certification and regular re-certification of the lifting equipment shall be provided by relevant Authorised Inspector. The certification and regular re-certification of the electrical parts and electrical equipment shall be performed by Authorised Inspector of electrical equipment.

9.4.2 Construction machinery and equipment

The technical inspections of the construction equipment shall be carried out in line with the Czech Government Regulation No. 378/2001 Sb., as amended by latest regulations where are defined more detailed requirements for the safe operation and use of construction machinery and equipment. This regulation requires to keep following documentation for each of the equipment:

- accompanying documentation (manufacturer's instructions);
- operational documentation (certifications, inspections, etc.).

The inspection of the safety of operation of the equipment before start of operation shall be carried out according to the manufacturer's accompanying documentation, which must be in the Czech language. If the manufacturer of the equipment is not known or the accompanying documentation is not available, the scope of the equipment inspection

shall be determined by the local operational safety requirement for which the Contractor shall specify at least:

- the responsibilities of the equipment operator before start of the works and during the operation of the equipment;
- type of security of the machine during movement, decommissioning, repairs and against unintentional start of operation;
- positioning and securing the machine after the operation;
- extent, intervals and method of maintenance including regular inspections and certifications;
- prohibited acts and activities.

Subsequent check of the operating documentation shall be done annually to the extent specified in the local operational safety regulation, unless otherwise specified by the special legal regulation, accompanying documentation or standard code values. Operating documentation shall be kept during the complete operation period of the equipment.

9.4.3 Construction machinery and equipment operation

The basic requirements for the qualification courses of the operators of construction machines and the conditions for obtaining a machine operator's licence are specified in the Regulation No. 77/1965 Sb. Graduate of the training course obtains a machine operator's licence. The machine operator's licence is issued by the Ministry of Industry and Trade or relevant Authority authorized by the ministry and is valid in all regions of Czech Republic.

The requirements for the construction equipment operators are:

- operator of earth work machinery must hold a valid certificate of training for the relevant equipment;
- operators and individuals providing any the lifting and slinging operations shall possess appropriate qualification supported by a valid lifting equipment operator or slinger bankman's certificate;
- only qualified, properly trained and by Contractor authorized persons, shall operate the construction machinery and equipment.

9.4.4 Check of the machinery documentation by the Employer

The Employer reserves the rights to request submission of all the relevant documentation of the construction machinery at any time for review.

For all pipe laying machines (sidebooms) the Employer will require a lift test to verify their actual lifting capacity. The test shall be carried out with the participation of the Contractor's representative responsible for mechanization and Authorized Inspector of lifting equipment and with the participation of the Employer's representative (e.g. an authorized inspection company). Based on the outcome of the test a report shall be prepared showing the loading capacity of the equipment confirmed by the test.

The machine operators will be required to provide their licences or certificates for the operation of equipment issued in their country of origin.

9.5 Construction documentation administration and control

Construction manual

In the construction manual, the Contractor shall describe the method of management, execution and control of all construction activities, including a detailed list of supplies and activities which will part of the construction documentation.

Construction schedule

In the construction schedule, the Contractor shall provide all information related to organization and planned activities at all stages of construction works, broken down in accordance with the structure of the bill of quantities, including the number of work groups, equipment, mobilization plan, time schedule and other information for the planned duration of the construction work activities.

Engineering activities and execution

The Contractor shall provide all required engineering works unless these are provided by the Employer.

10 HSE AND QA/QC

During the construction period all applicable codes and regulations relating to occupational health and safety (in Czech: BOZP) and Fire Safety (in Czech: PO) must be followed without exception for all construction specific works (in particular Labour Code No. 262/2006 Sb., Act No. 309/2006 Sb., and Government Regulation 591/2006). Workplaces and conditions on the construction site, fabrication and working equipment as well as work organization and work processes shall be ensured and guaranteed by the Contractor within the meaning of Act. No 309/2006 Sb. and Government Regulation 591/2006. During preparation of construction works the Contractor shall prepare in accordance with this Act, a HSE Plan for the construction site. During construction the Contractor shall check the HSE plan for relevance for particular situations, works and

activities currently performed. The commencement and completion of the construction shall be notified to the relevant Regional Labour Inspectorate in advance.

The commencement and completion of construction work on the pipeline will be announced to “Odbor majetku města - útvar investic MěÚ Jirkov” (Ing. Reiner) and “Lesy Města Jirkov” (Ing. Fiala) at least 2 weeks in advance for the relevant pipeline section.

Contractor shall also observe the conditions stated by the Act No. 133/85 Sb. about the Fire Safety, as amended, and Reg. No. 246/2001 Sb. defining the conditions of Fire Safety and performance of the state Fire Safety supervision (fire prevention), as amended.

For work in the protection zones of high-voltage power lines, protection zones of power stations and protection zones of pipelines, the provisions of Act No. 458/2000 Sb., as amended, shall be observed.

Contractor's quality management plan shall be in line with ISO 9001 requirements.

The quality management system shall include procedures and processes in accordance with ISO 9004-1 requirements.

The Contractor shall prepare a quality plan covering the complete scope of the works specified in the tender documentation.

11 ATTACHMENTS

N/A