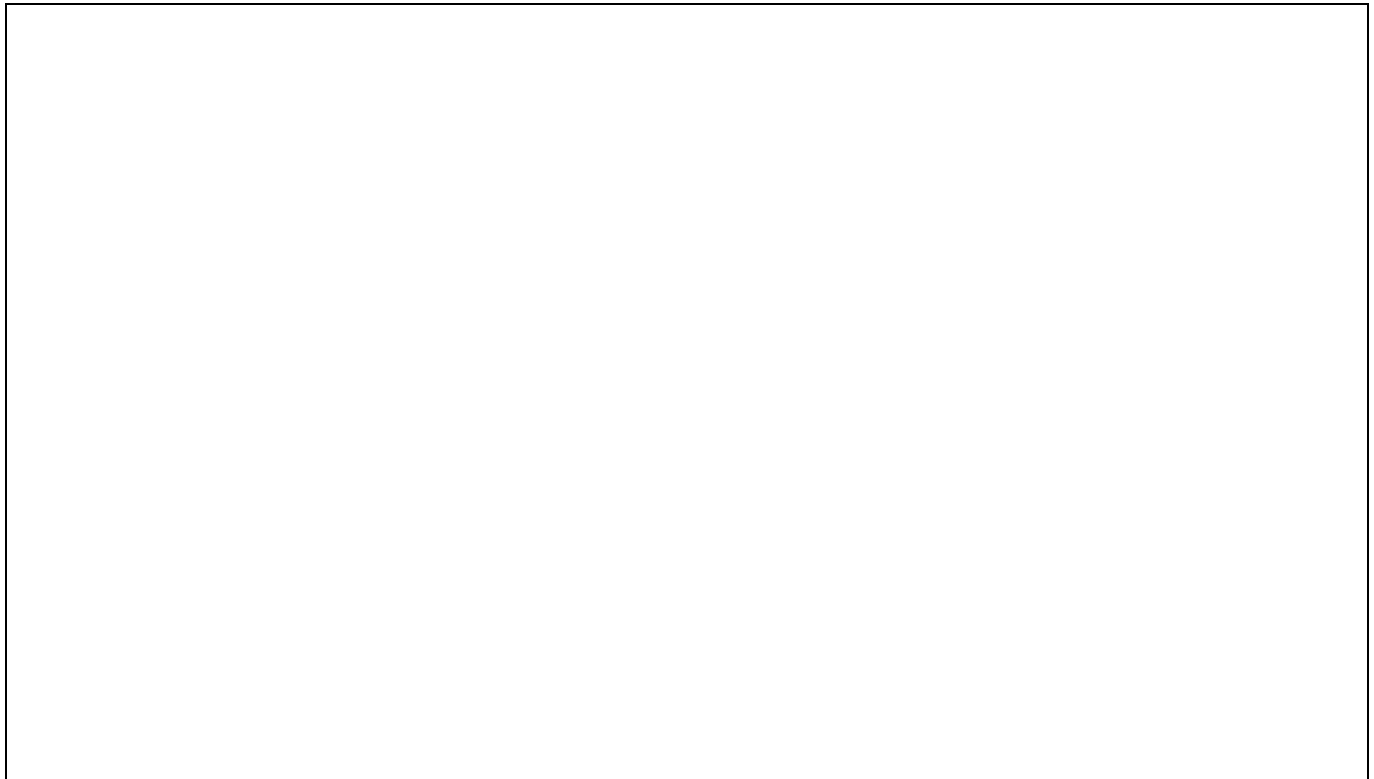








TRANS ADRIATIC PIPELINE PROJECT OFFSHORE PIPELINE DETAIL DESIGN






01	12.12.2014	Re-Issue for Construction	Conforti	Marchionni	Badalini
00	02.12.2013	Issue for Construction	Conforti	Marchionni	Badalini
0A	30.09.2013	Issue for Review	Conforti	Marchionni	Badalini
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Rev.	Date	Description	Prepared	Checked	Approved

		<h2>Functional Specification for Microtunnel Construction</h2>						
								
Originator Job 022720	Doc. 01-LA-E-81011	Contract: 4502485266 CTR E06.01-H04.00			LCI	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		
		Document Number						
		OPL00	SPF	124	Q	TSF	0002	01
		Project No.	Orig. Code	System/area	Disc. Code	Cod. Type	Seq. No.	Rev.




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1 INTRODUCTION

1.1 TAP Project Summary

The Trans Adriatic Pipeline (TAP) is a proposed pipeline in the Southern Gas Corridor that will bring gas from new sources in the Caspian region to Western and South Eastern Europe. The 871 km pipeline will connect to existing gas networks and start in Greece, cross Albania and the Adriatic Sea and come ashore in southern Italy, allowing gas to flow directly from the Caspian basin into European markets.

The Trans Adriatic Pipeline is divided into two parts, where Statoil ASA is technical service provider for TAP AG (TSP West), and E-on Ruhrgas is technical service provider for TAP AG (TSP East).

The responsibilities are:

- TSP East will be responsible for the onshore pipeline, onshore fibre optic cable and all facilities in Albania, Greece and Italy;
- TSP West will be responsible for the offshore pipeline, offshore fibre optic cable and the landfalls in both Albania and Italy.




This report refers to TSP West Pipeline.

1.2 TSP WEST Pipeline Description

The pipeline system covers the offshore pipeline across the Adriatic Sea from the first dry weld on the Albanian side to Italy's southern Puglia region for further transport to Western Europe. The TSP West pipeline system consists of an approximately 105 km long offshore pipeline, with landfalls in both Albania and Italy.

The Italian pipeline landfall will be on the coast between San Foca and Torre Specchia Ruggeri in the municipality of Melendugno, while the Albanian landfall area is located North-West of Fier.

The project will also contain a FOC installed parallel with the pipeline to enable communication between the TAP Receiving terminal, the pressure stations in Albania and Greece as well as the block valve stations installed along the 871 km long pipeline.




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2 SCOPE OF WORK

Scope of the specification is to define the requirement for the construction and drilling of the microtunnel to be built in San Foca for the future installation of the project pipeline. The installation of the pipeline inside the tunnel is not part of the following SOW.

In addition to the microtunnel construction, CONTRACTOR scope include also the installation of a steel casing pipe backward the MT entry, enable to house the future carrier pipe pulled through the MT along the same pulling axis as indicated in drawing Ref. [10].

| This document is re-issued to be in compliance with the latest project requirements.

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3 DESIGN DATA

3.1 General

Unit System

The International Unit System is adopted throughout this document and shall be applied throughout the whole project, unless otherwise specified.

Coordinate system




The Coordinate system are the following:

- Datum WGS 84
- Projection UTM (Zone 34)
- Central meridian 21°E
- Vertical Ref. Level LAT

3.2 Geotechnical data

The background to be used for design are included in Ref. from [19] to [22].

CONTRACTOR shall be responsible for the soil condition characterization related to the microtunnel construction progress.

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4 DEFINITIONS, ABBREVIATIONS AND SYMBOLS

4.1 Definitions

Company	TAP AG
CONTRACTOR	Party who performs the work specified herein
Project:	TRANS ADRIATIC PIPELINE PROJECT Offshore Pipeline Detail Design
Acceptance Criteria:	Express the level of health, safety and environmental performance deemed acceptable for a given period or phase of the Project.

4.2 Abbreviations

D.L.	Decree-Law
D.M.	Ministerial Decree
MT	Microtunnel, Concrete jacking pipes installed using a tunnelling drilling head TBM.
LTE	Land terminal end
TBM	Tunnel Boring Machine
IJS	Intermediate Jacking Station
SOW	Scope of Work
HSE	Health Environment & Safety
RFO	Ready for Operation
TAP	Trans Adriatic Pipeline

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5 REFERENCE DOCUMENTS

The reference documentation has been grouped as follows:

- Rules, Standard and General References;
- Project Documents;
- Reference Documents.




Unless specifically indicated, latest revision to be applied.

5.1 Rules, Standards and General References

- | | | |
|-----|-----------------------|--|
| [1] | DNV OS F101 | Submarine Pipeline Systems, August 2012 |
| [2] | DNV RP-F109 | On-bottom stability design of submarine pipelines |
| [3] | D.M. 17.04.2008 | Regola Tecnica per la progettazione, costruzione, collaudo, esercizio e sorveglianza delle opera e degli impianti di trasporto di gas naturale con densità non superiore a 0.8 |
| [4] | D.L. 10.8.2012 n. 161 | Disciplina dell'utilizzazione delle terre e rocce da scavo - Criteri qualitativi da soddisfare per essere considerati sottoprodotti e non rifiuti – Attuazione articolo 49 del DI 1/2012 ("DI Liberalizzazioni") |
| [5] | D.M. 11 Marzo 1988 | Norme tecniche riguardanti le indagini sui terreni e sulle rocce, la stabilità dei pendii naturali e delle scarpate, i criteri generali e le prescrizioni per la progettazione, l'esecuzione ed il collaudo delle opere di sostegno delle terre e delle opere di fondazione. |

5.2 Project Documents




- | | | |
|------|--------------------------------|---|
| [6] | OPL00-SPF-150-G-TRB-0001,Rev02 | Design Basis |
| [7] | OPL00-SPF-150-G-TRD-0004,Rev01 | On Bottom Stability Report |
| [8] | OPL00-SPF-160-S-TRE-0004,Rev0A | Italian Landfall – Alternative F – Hazard Identification Report |
| [9] | OPL00-SPF-160-G-DGB-0002,Rev00 | Italian Landfall General Layout |
| [10] | OPL00-SPF-124-Q-DQP-0001,Rev01 | Microtunnel Installation Map & Profile |
| [11] | OPL00-SPF-160-G-DGD-0011,Rev01 | Shaft Requirements |
| [12] | OPL00-SPF-150-G-TRD-0001,Rev03 | Metocean Design Parameter Report |

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[13] OPL00-SPF-160-G-TRF-0002,Rev00	Italian Landfall and Nearshore Feasibility Report
[14] OPL00-SPF-160-G-TVN-0005,Rev0A	San Foca Landfall – Southern Alternative Option Screening Study
[15] OPL00-SPF-160-G-TVN-0007,Rev01	Italian Landfall - Pipeline Safety Distance Report
[16] OPL00-SPF-160-G-TVN-0009,Rev00	RFO Lines Layout Selection
[17] OPL00-SPF-124-Q-TRE-0001,Rev00	Tunnel Construction Methodology
[18] OPL00-SPF-124-Q-TRX-0001,Rev01	Pipeline Installation inside the Microtunnel
[19] OPL00-DAP-160-Y-TRE-0006,Rev00	Survey Report – Geophysical Survey, Italian Landfall
[20] OPL00-DAP-160-Y-TRE-0007,Rev00	Field Report - Geotechnical Survey, Italian Landfall
[21] OPL00-DAP-160-Y-TRE-0008,Rev00	Factual Report, Geotechnical Survey, Italian Landfall
[22] OPL00-DAP-160-Y-TRE-0010,Rev00	Interpretative Report - Geotechnical Survey, Italian Landfall

5.3 Reference Documents

[23] TAP-C001-OF-GEN-REP-0001,Rev02	Energy Report – TAP Gas Export Pipeline – Stability Assessment
[24] 309840-ENG-001,RevA	TAP Installation Study Allseas
[25] TAP-HSE-PO-0001	HSE Policy
[26] TAP-C005-OF-GEN-REP-0001,Rev02	Feasibility Study for Installation of 42” and 36”(Saipem)
[27] TAP-CAL00_ERM-643-S-TAE-0014	Environmental and Social Impact Assessment –Annexes
[28] EM-STA-SPF-0011	Updated TAP RFO Philosophy, email dated 2 April 2013
[29] CP14.4041.1,Rev.1	Micro Tunnel Construction Study, email EM-STA-SPF-0169
[30] EM-STA-SPF-0122	Geotechnical drilling logs

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6 FOREWORD

The proposal is relevant to a "curved microtunnel", designed for the best fitting to the morphology of the area between the starting point and the arrival point, aiming at avoiding any impact on the crossed area.

CONTRACTOR shall propose a microtunnel methodology demonstrating the capability to respect as much as possible the design axis given in the design documentation; the methodology proposed by CONTRACTOR shall assure in particular the respect of the clearance to existing buildings on the ground surface.

Normally the microtunnel drilling is driven by a TBM (Tunnel Boring Machine), which dig a full bore section and followed by reinforced concrete jacking pipes; the drilling system is powered by hydraulic jacks arranged in the shaft thrust, acting on the concrete jacking pipes (Ref. [17]).

The method proposed by CONTRACTOR shall ensure:

- The drilling and removal of debris without disturbance of the ground surface avoiding or minimizing the interference with the water table;
- The directional control of the tunnel during its progress;
- Erection of a continuous lining suitable for the further pipeline pull-in inside
- The perfect stability control of the excavation front and the immediate placement of the final lining;
- limitation of the effects of disturbance and / or risk induced on services and structure on the surface

Construction activities will be performed ensuring compliance with all conditions and prescriptions stated on the permits, consents, authorizations and authorities approvals.




CONTRACTOR shall organise a pre-construction site visit, including required topographic survey, along the landfall pipeline route. The survey report shall be submitted to Company for review.

CONTRACTOR shall prepare a method statements/procedures necessary to carry out the landfall Microtunnel.

CONTRACTOR shall prepare construction drawings complying with the specifications indicated in the project documents (Refs. [10], [11]) and shall guarantee the following:

- Respect of the geometric requirements target (point coordinates)
- Respect of the given bending radius, 6000 m
- Suitable contingency to stick to the construction schedule
- Secure the further smooth pipeline installation

The characteristics and the geometric requirement are given in Ref. [10].

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7 CONTRACTOR PROJECT DOCUMENTATION

7.1 General

CONTRACTOR shall review all Specifications and Drawings provided. After review, CONTRACTOR shall, without undue delay, report any inconsistencies or discrepancies. CONTRACTOR's proposals for revisions to the Specifications and Drawings shall be submitted for approval. CONTRACTOR shall review and implement into his procedures all the document revisions and implementation of supplied documentation.

CONTRACTOR shall provide:

- The procedures for execution of the Microtunnel (execution plan);
- The technical specifications and data sheets of the equipment and jacking pipes to be used for the execution of Microtunnel;
- The possible interventions that CONTRACTOR believes have to be performed in case of failure of some major equipment during the construction of Microtunnel;
- The list of available spare parts on site;
- List of staff employed in the various phases of work;
- The HSE plan

7.2 Microtunnel design

CONTRACTOR shall consider that Microtunnel has to be designed for the easier pipeline installation from offshore lay-barge, where the pipeline shall be assembled and laid with S bending and then pulled into the Microtunnel.




A continuous uniform rectilinear gravel surface, approximately 280 m long (embankment 170m and open trench 110m), will be prepared by others starting from the offshore exit of the microtunnel in order to allow a controlled contact at the pipe touch down point (TDP).

For this reason the Microtunnel bottom profile and the gravel embankment after dredging have to be aligned so that to allow a uniform pull-in avoiding irregularity on the profile. CONTRACTOR has to take into consideration the related interface activity.

Moreover, as the pipeline is pulled into the micro-tunnel, to reduce the potential risk that the weight and dynamic loads may displace the tunnel sections at the entrance leading to a blockage or damage to the pipeline, a special "bell-mouth" shall be installed at the MT sea end to safely guide the pipeline from the dredged trench into the microtunnel itself.

This operation shall follow the removal of the TBM from the microtunnel, carried out by CONTRACTOR.

CONTRACTOR shall consider this issue when designing the ending section of the microtunnel; the leading sections of tunnel segments (first jacking pipes after the TBM) shall be connected together before the installation of the bell-mouth structure at the micro-tunnel exit.

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7.3 Allowed tolerances

CONTRACTOR shall indicate in its methodology the achievable Tolerances in term of deviation at exit point and supply information about the adopted control system enable to assure the respect of designed axis during drilling.

The expected tolerances at exit point H and V: ± 30 cm.

7.4 Execution plan

CONTRACTOR shall provide all construction engineering documents and drawings necessary to complete the Work. CONTRACTOR shall maintain an updated copy of all relevant construction engineering documents and drawings at the location at all times during the execution of the Work.




CONTRACTOR shall prepare a Construction execution plan including all the documentation necessary to perform the Work in accordance with the requirements of the Contract and in accordance with the approved schedule for issue and submission of CONTRACTOR's documents.

The following calculations and verifications shall be included in execution plan:

- Calculation of jacking forces and intermediate Jacking station definition (IJS).
- Calculations and verifications for the foundation and construction of the shaft.
- Determination of the amount of excavation and dredging data including sediment transport evaluation, relevant to the trenching work for TBM recovery.
- Calculations relevant to contingency procedures.

The Construction execution plan shall include at least:

- Plan and sections which indicate the characteristics of the geometric Microtunnel;
- Description of site preparation area and their accesses;
- Description of equipment and drilling system including type and characteristics of TBM used;
- Description of the procedure for execution of the starting point (thrust wall and shaft features)
- Shaft detail design drawing and structural calculation
- Type and characteristics of hydraulic seal ring into the entrance of the perforation;
- Description of the procedure for execution of the marine work for TBM recovery.
- Jacking pipes data sheet
- Intermediate Jacking Station characteristics and data sheet
- System of hydraulic seal of the joints between the segments and between reinforced concrete elements;
- Drilling control system
- Type of lubricant used and methods of use in the system Jacking Pipe;
- Slurry system for the excavated material transport;

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- Filling between the outer wall of the Microtunnel and the surrounding soil.
- Waste water treatment system and disposal.
- Contingency procedures and spare parts philosophy
- Casing pipe method statement for installation

7.5 TBM requirements

The TBM shall be a closed type, full face excavation machine with a hydraulic slurry circuit. The soil to be excavated shall be removed by using a cutterhead suitable to the expected soil features.

In expected mixed geologies, proper cutter heads shall be selected by CONTRACTOR. A cone-shaped crusher inside the excavation chamber crumbles the stones and the other obstructions to a conveyable grain size while tunnelling end advancing. Afterwards, the material falls through openings similar to a strainer in front of the suction port and is then removed through the slurry line together with the suspension.

TBM shall be equipped with various gyro systems and electronic water leveling systems allowing for exact positioning. The interaction between articulation joint and steering cylinders in the front section of the shield has to keep the TBM precisely on course even in three-dimensional curves and tight radii.

CONTRACTOR shall provide the selected Microtunnel TBM (data sheet), suitable to cope the design requirement.




7.6 Jacking Pipes data sheet

The jacking pipes shall be manufactured under a quality system certified ISO9002. The main characteristics of the pipes are:

- Material: steel reinforced concrete;
- Minimum inside diameter: DN 2400mm

CONTRACTOR shall supply information and data sheet including at least:

- Length:
- Outside diameter (Wall Thickness)
- Material class (concrete and reinforcement)
- Rubber sealing characteristics
- Weight and buoyancy consideration.
- Allowable jacking force
- Material concrete C 40/50 acc. EN 206-1 and DIN 1045-2
- Pipe joint spigot end, chamber sealing
- Buoyancy verification (at microtunnel seaward end).

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| Typical Jacking pipe joint is shown in Figure 7.1.

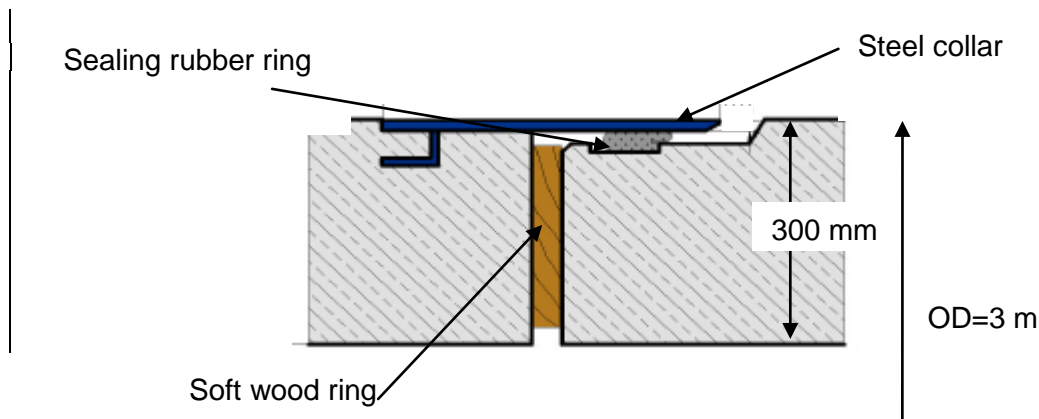


Figure 7.1 - Typical jacking pipe joint

7.7 Intermediate Jacking stations

The maximum drive length during jacking operation depends on the available jacking force and the system forces such as skin friction and heavy dead loads related to the 3 m jacking pipes outer diameter. Automatic lubrication systems shall reduce the friction between pipe skin and soil by injecting bentonite into the annular gap.

Additional hydraulic intermediate jacking stations (IJS) shall be considered by CONTRACTOR for a safe performance of the drilling.

These are installed in the MT at intervals which are defined specifically considering the soil condition.

By dividing the pipe string into individual sections, the necessary thrust force is reduced and distributed as requested by each section.

A calculation sheet and diagram, showing the total thrust forces and the IJS location and spacing plan shall be included in the CONTRACTOR method statement.




7.8 Slurry system

CONTRACTOR shall allocate a dedicated area of the construction yard where bentonite and polymers shall be mixed for the preparation of the mud.

The slurry system is necessary for:

- Pressure balance at drilling front where TBM shield operates;
- Formation of lubrication film between external surface of jacking pipes and borehole ground;
- Transport to surface of the excavated soil in suspension.

The removal and transport of crushed soil from the drilling front will be carried out in hydraulic circuit of "slurry", which provide that spoil material shall be in a mud

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suspension pumped out from shield front, through the proper hoses circuit installed in the MT.

The system must then be provided with sieves, de-sander unit and a decanter basin for the separation of the spoil material from the drilling mud.

The production plant will be equipped with a mixing unit for the preparation of the mixture, an automatic dispenser, storage silos, basin for removal and /or decanting of the slurry; adequate pumps shall assure the slurry recirculating within the hydraulic circuit.

Injections of fluidization During drilling operation and when required by the actual soil conditions, fluidizing additives should be provided in the slurry mix, in order to avoid excessive plasticization of the soil during drilling. The selection of such additives shall be proposed by Construction Contractor to be environmental friendly and in compliance with ESIA prescriptions.

7.9 Drilling monitoring and inspection

CONTRACTOR must provide continuous recording of drilling parameters and mud pressure values used in the course of work.

At drilling completion, the system shall be visually inspected in order to verify:




- the integrity of the joints
- the concrete jacking lining (excluding wall misalignments)
- the perfect execution of the joints sealing.

7.10 Installation of Casing pipe

Once the jacking pipe is completed, the thrusting equipment shall be removed from the starting shaft. CONTRACTOR shall complete the pipeline alignment by installing a Casing pipe backward the microtunnel.

A steel casing pipe, with a minimum DN 48", is considered for the purpose. CONTRACTOR could consider different conventional methods of installation depending also on the final soil quality, ground water condition, authority requirement.

The starting point of the drilling requires that a hole is made through the wall of the shaft, which can be prepared in advance. After casing installation the gap will be carefully sealed to prevent contamination of the soil behind the shaft wall (Ref. [18]).

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7.11 TBM recovery work

After completion of micro-tunnel construction, CONTRACTOR will recover the TBM. The method of this marine work has to be proposed including:




- equipment cranes and barge
- diving operation and HSE aspects
- sediment control plan
- dredged material disposal
- time schedule for TBM recovery work

7.12 As built dossier

On work completion CONTRACTOR shall prepare and submit to Company, for acceptance of the work, the Microtunnel as-built dossier including:

- microtunnel coordinates
- geometry and internal surface control to assure that the continuity of floor formed by jacking pipes have no any steps
- the final layout drawing.

Drillers logs are maintained for all drilling activities and daily records will be produced and transmitted to the client as per the requirements of the contract. This information will also be included in the As-built information.

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8 GEOTECHNICAL/GEOPHYSICAL SURVEY

CONTRACTOR shall assure that the system allows for the tunnel construction under the expected soil conditions including the interface between different soil layers and the presence of any cavities (due to karstic features of the area) and hindrances (if found during soil investigation).




CONTRACTOR shall perform the necessary surveys to obtain required information level for the optimal performance of his construction works, such survey shall be carried out at his own cost.

CONTRACTOR shall establish a plan of required surveys, including Permit achievement, to be submitted to Company for review. CONTRACTOR shall document the characteristics of the instrumentation, equipment and procedures it intends to propose for carrying out the surveys and for data acquisition, in compliance with the requirements of the Contract documents.

CONTRACTOR shall make all geotechnical/geophysical surveys as it deems necessary for the construction design of the work.

CONTRACTOR shall also determine the movement of the groundwater, and be prepared for eventual operations of drying, and evaluate the possible interference of the works with the groundwater circulation.

Considering the karstic nature of the area, CONTRACTOR shall assess the risks for the work execution resulting from the possible presence of karst phenomena along the area affected by the work execution.

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9 SITE PREPARATION

9.1 Construction yard

For the preparation of the sites CONTRACTOR shall provide the following works:

- Access roads;
- Removing obstacles;
- Temporary fencing
- Drainage system;
- Preparation areas for containers and storage materials;
- Preparation areas for temporary deposition of the resulting material;
- Installation of lifting and handling equipment and materials.

CONTRACTOR shall plan the onshore site, site offices, storage areas, access roads, spoil storage areas, parking areas, seawater intake and discharge pipelines and all required facilities/equipment necessary to complete the Work.

In order to define the layout of the area, CONTRACTOR shall be aware of the interface with other Contractors involved in the same area, managed and coordinated by Company. The layout of the area shall be submitted to Company approval, taking in consideration the agreement on the interfaces.

9.2 Shaft

CONTRACTOR shall indicate the characteristics and the procedures for the shaft design and construction following the requirement of section 10 including reinforced concrete structural design and relevant document for permit and authority applications, drainage system of the shaft and adequate sealing to avoid interference with ground water table.




Shaft shall be dimensioned for the effective Microtunnel TBM housing and thrusting of jacking pipes. (Figure 10.1).

At Microtunnelling completion the shaft shall be suitable for the continuous pull-in of the pipeline and also for the installation of steel casing pipe and submersible pumps for Hydrotest, as per requirements in Ref. [11].

9.3 Site Restoration

CONTRACTOR shall define and plan all the works necessary for site reinstatement. CONTRACTOR shall be responsible for preparation of a plan for the disposal of all used construction consumables and works as a result of the Work including surplus soil from the excavation and tunneling works. Soil suitable for landscaping can be used for this purpose.

Engineering related to this activity shall fulfill Company requirements.

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10 SHAFT REQUIREMENTS

The walls and base platform of the thrust shaft must be adequate to withstand all involved external and internal forces (e.g. earth pressure, hydrostatic pressure, drilling thrust wall surface equipment overloads, etc.).

In correspondence of the drilling operation start through the shaft wall, the hydraulic sealing of the "hole" must be ensured with sealing rings to be applied by means of a dedicated concrete box properly anchored to the shaft walls (Figure 10.1).

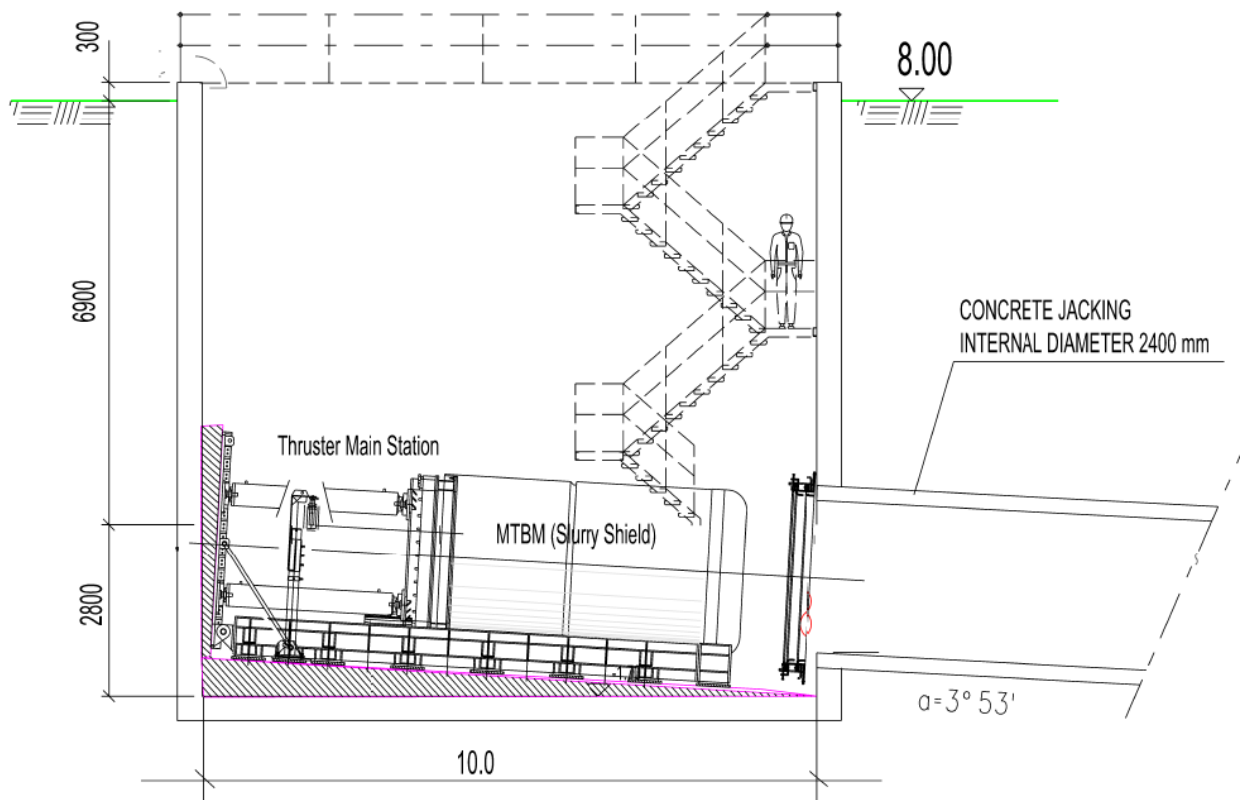





Figure 10.1 - Shaft dimension

Similarly to the micro-tunnel, the shaft structures have to be suitable to allow safe accessibility, and then to work in dry condition, during all construction phases and, subsequently, during pipeline installation up to the overall completion; hence the concrete structure of the shaft, is required to be realized with complete hydraulic seal. The lower part of the shaft is designed to be below the sea water level, and this is the result of various design optimizations, typically (but not limited to) to allow the supply of sea water (necessary for the testing of the pipeline) without affecting the groundwater in the area.




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This result will be achieved with conventional technologies (e.g. concrete diaphragms and / or jet grouting), that are required to be designed and carried out with methodologies used for permanent concrete works.

The construction of the reinforced concrete diaphragms for shaft walling shall be carried out for each single diaphragm section, including excavation (by mean of hydromill or clamshell bucket), then casting and reinforcement installation. To ensure the stability of the bottom of the shaft and prevent the filtration of water in relative proximity, the use of jet grouting is recommended (Figure 10.2).

To avoid pollution effects on the aquifer due to its permeability, a preventive insulation systems shall be put in place, if required, before the overall execution of the above works.

CONTRACTOR shall submit shaft design and the related erection procedure to Company for approval.

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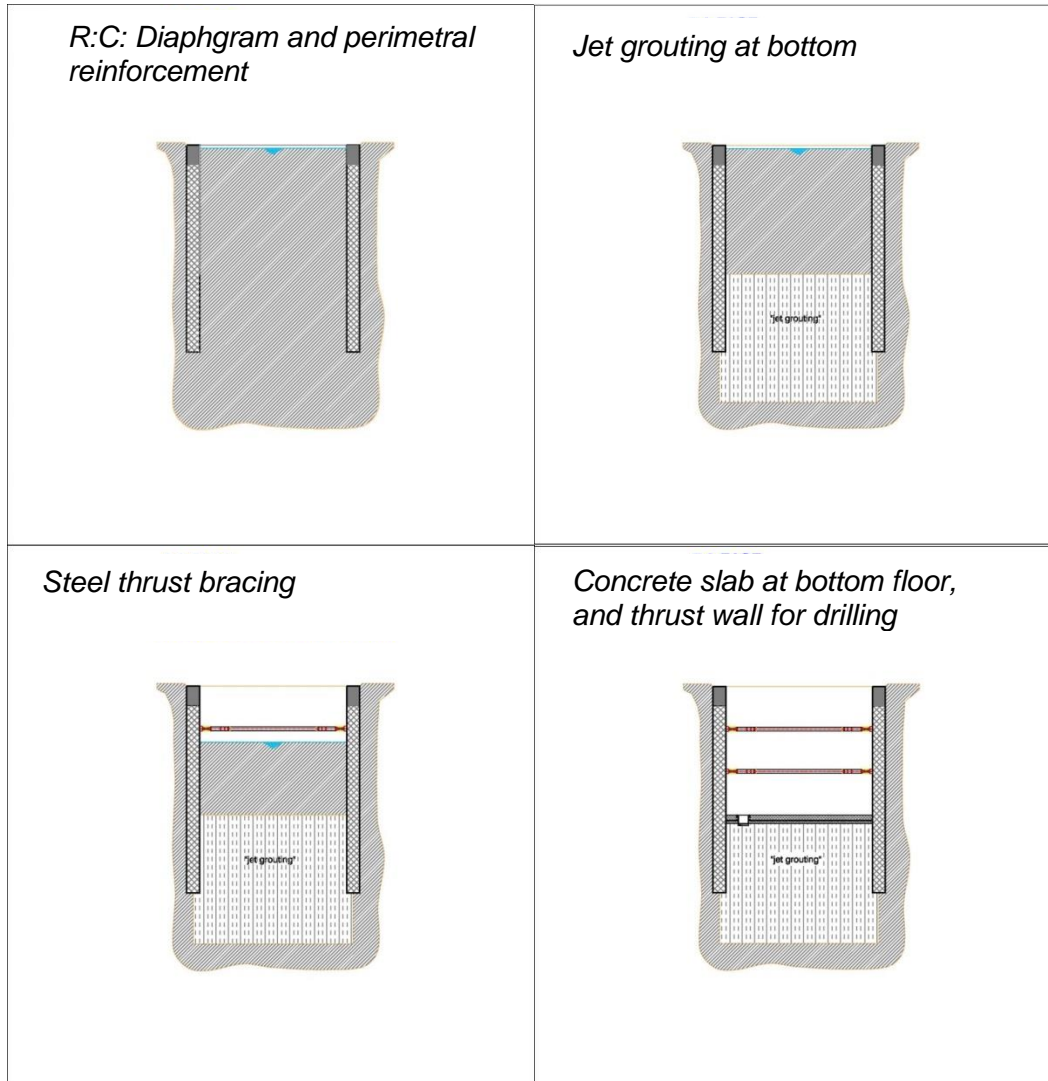





Figure 10.2 - Shaft erection sequence

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11 HSE REQUIREMENTS

11.1 HSE project philosophy

The supreme goal in this project execution is that none of activities shall lead to injury, damage or loss. A high state of emergency preparedness shall minimize damage or loss in case of accidents.

CONTRACTOR shall provide a clear policy statement concerning the protection of health, safety and the environment during all his operations. This shall clearly demonstrate the responsibility and commitments to HSE matters at a management level.

CONTRACTOR, before beginning the work, shall analyze all the technical and operational issues related to interferences that arise between the structures affected by the work and the realization of Microtunnel with particular emphasis on ensuring the operational safety of the works and the workers and others involved in the work.

Prepare and establish a HSE program covering the acceptance criteria and key performance indicators within Contractual HSE targets. The program shall ensure and promote good HSE achievements and be accepted by Company.

11.2 Environmental issues

Groundwater is a sensitive issue in the area affected, CONTRACTOR to propose environmental friendly construction methods with regards to groundwater table interference, and indication on feasibility study is expected.

CONTRACTOR shall demonstrate that the methodology used shall avoid any settlement on the soil surface.




The bentonite mixtures, as required to reduce the external friction between the jacking pipes and the soil, shall be with minimum content of additives and anyway being prepared to guarantee the environmental compatibility.

It is expressly forbidden to CONTRACTOR to use oils or greases to replace bentonite in the slurry mixture.

11.3 Risk analysis

A Risk Analysis shall be performed by CONTRACTOR to identify and analyse all the hazards connected with the execution of the works. The risk associated to each identified hazard shall be evaluated. Where the risk will be considered not acceptable and the safeguards are not considered adequate for the hazard, corrective actions/additional mitigation measures shall be put in place. It shall include the risks for the human, the assets and the environment.

This document shall be in accordance with Company standards and guidelines and must be submitted to Company for approval before starting the work.

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11.4 Waste management

CONTRACTOR shall prepare a waste management plan, find the suitable dumping area and prepare the authorities application documentation in compliance with the law and code and requirement of EIA documentation. Waste material which comes from the Microtunnel shall be chemically characterized before their disposal in authorized dump sites.

Spoil suitable for landscaping shall be transported to the receiving facilities area for use in embankments. Any waste or unusable spoil shall be disposed according to waste disposal regulation.




CONTRACTOR shall supply all the necessary system with relevant to design and construction features, for slurry treatment spoil separation and disposal, waste water management. The discharge shall be within the limits given in the discharge approval given by authorities.

No pollution shall be accepted due to the water discharge, CONTRACTOR shall supply the necessary laboratory test to guarantee the required level of water quality.

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12 TIME SCHEDULE

The schedule of the MT construction activities proposed has to be in compliance with general project schedule given in contractual documentation. CONTRACTOR shall take into account in its planning of the Work, the schedule constrains regarding the latest completion dates related to the start-up of nearshore pipeline laying operations and the start up of the final RFO operation.

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Revision Record

Rev.	Date	Description
A	20/09/2013	Issued for IDC
0A	30/09/2013	Issued for Review
00	02/12/2013	Issued for Construction
01	12/12/2014	Re-Issued for Construction Revised sections:2, 5.2, 6, 7.2, 7.5, 7.6, 7.7, 7.8, 7.10, 9.2, 10, 11.1 and 11.2 as per relevant marking