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TECHNICAL JOB SPECIFICATION
499/2
REVISION 0
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HIGH PRESSURE (HP) TRANSMISSION SYSTEMS

TRENCHING AND EXCAVATION

QUALITY ASSURANCE PAGE

CHANGES LOG

REVISIONS LOG

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Job Spec. No 499/21
[Trenching and Backfilling for Pipelines Laid by or under Road Surfaces]

ELOT EN 1594
[Gas supply systems - Pipelines for maximum operating pressure over 16 bar - Functional requirements]

Π.Δ. 1073/1981 (ΦΕΚ 260/Α/16.9.1981)
«Μέτρα ασφαλείας κατά την εκτέλεση εργασιών σε εργοτάξια οικοδομών και πάσης φύσεως έργων αρμοδιότητας Πολιτικού Μηχανικού»
[Presidential Decree for Greek Regulations in Safety]

1.0 SCOPE

This specification specifies trenching and excavation for the construction of natural gas pipelines, as well as for pipes, cables etc.

It covers trenching and excavation in various types of soil, such as soft soil, semi-rock, rock, as well as in various types of terrain, such as flat areas, mountainous areas, or steep slopes in cross country and urban areas.

For trenching and excavation at areas with muddy bottom reference is made to relevant construction specification for muddy bottom replacement.

For trenching and excavation at crossings with roads, railways, watercourses, rivers, channels, etc. reference is made to relevant construction specifications for crossings.

For trenching and backfilling for pipeline laid by or under road surfaces reference is made to a relevant construction specification.

The requirements of the following, listed in order of precedence shall be fulfilled for trenching and excavation:

- Standard Drawings and Typical Details in referenced Documents.
- This Specification.
- Other Specifications listed in Reference Documents.
- **ELOT EN 1594.**

2.0 GENERAL

The approximate location of underground utilities (such as water and sewage lines, fuel lines, power and communication cables, etc.) shall be shown on the pipeline route drawings.

Contractor has to verify the actual location of all these underground utility lines and get the required information about the existence of other installations not shown on the drawings in order to avoid any damage to these underground utilities.

Contractor's information about underground utilities shall be verified by the relevant authorities and Owners. In case of damage of any underground utilities then Contractor has to repair these damages in accordance with the instructions of the utilities Owner.

3.0 CONSTRUCTION

All buried pipelines shall be placed in trenches, which have been leveled at the bottom, giving to the pipes an even and continuous support. The cross-section geometry of the trenches shall satisfy the requirements of the relevant safety authorities as well as the **Presidential Decree for Greek Regulations in Safety (Π.Δ. 1073/1981 (ΦΕΚ 260/A/16.9.1981)).**

The Contractor shall reconstruct the pipeline route with reference to the route plans and the bench marks located during the hand-over of the route (as shown in **Job Specification No. 499/1).**

The centerline of the trench shall follow the route, although at changes of direction or gradient the trench shall be excavated to conform to the type of bend specified at that location.

The excavation shall be carried out without mixing topsoil and subsoil, as shown in **Job Specification No. 499/1.** Cover after backfilling of the trench varies in relation to certain parameters (such as: road crossings, roads in urban areas, river crossings, crossing requirements imposed by Authorities, etc.) and will be up to a maximum height of 2.5 m.

The trench shall be excavated to such a depth that the minimum cover will be provided everywhere after backfilling of the trench. Unless otherwise specified on the longitudinal sections, the minimum cover shall be 1,00m under all the kinds of soil conditions (normal soil, semi-rock and hard rock conditions).

Without reducing the requirements for minimum cover given above, a trench bottom bedding of quarry sand, at least 20 cm thick, shall be provided below the pipe where either:

- the trench bottom is rocky or semi-rocky, or where
- the excavated material mainly consists of stony material, including semi-rock materials, or where
- extremely low-resistivity soil prevails (e.g. clay, salty soils, etc), as will be shown on the longitudinal sections, or where
- chemically polluted soil (particularly organic dissolvent) is struck, or
- on all rivers, streams, torrents and ravine crossings.

The trench walls generally shall be vertical. In case of poor soil conditions the trench walls shall be constructed with a proper inclination to avoid any collapse. This shall be performed following all applicable safety regulations and after Owner's Representative approval.

Sandbags by linen material (linatsa) are acceptable as bedding particularly on sloping ground, and they shall provide a distance between pipeline bottom and bottom of trench at least 20cm. The distance between sandbags shall not exceed 4m. After lowering the pipe string, bedding should be completed (filling of the area between the sandbags), according to the a.m. restrictions i.e. using quarry sand.

In such a case it has to be assured that bedding material has been evenly placed under the pipeline between the sandbags, providing an even and continuous support to the pipe. Cutting out of the sandbags by knife, will be done after filling of the intermediate distance area between sandbags, with bedding material as described above.

The minimum bottom width of the trench shall be the pipe diameter plus 0,4 m, except of pipe with DN 250 where the minimum bottom width of the trench shall be the pipe diameter plus 0,6m.

The trench shall be such that:

- The pipe may be laid in accordance with the drawings.
- The pipe may be laid at the bottom of the trench, free of axial compression or tension and without being elastically deformed with a radius less than the one specified on the longitudinal sections. In rocky areas where sand bedding is required, field bends are recommended instead of using elastic bending.
- The pipe may be placed on a firm bottom where settlements are precluded, i.e. soft soil organic deposits and similar conditions are removed and replaced by suitable materials below the pipe.
- The clearance between the pipe and any other underground installation shall be at least, 0.30 m, except for field drains with a diameter D ≤ 150 mm, where a

clearance of 0.15 m is allowed.

Contractor may use a trencher machine which performs the trench in dimensions specified in the Contract terms. In this case, all excavation material may be used for trench bottom bedding and middle padding, after the approval by the Supervisor, taking into consideration that the requirements of this specification must be fulfilled.

The location of cables, pipes etc. indicated on the drawings, shall be regarded as approximate. It is Contractor's responsibility to locate them accurately and to dig them free by hand. Contractor is responsible for any damage to existing services and for any compensation arising there from.

If it is advantageous to the Contractor, he may use after the Owner's Representative approval, field bends to reduce excavation work. He may also omit bends, after Owner's Representative approval, if the Contractor finds the extra excavation more beneficial to him. However, the resulting cover should never exceed 2,5 m.

In case of over-excavation, the bottom of the trench shall be restored to the required level by backfilling with backfill material, in accordance with **Job Specification No. 499/4.** This material shall be compacted in layers not exceeding 0.2 m. Should soft soil or organic deposits be found in the trench bottom, then the Contractor shall immediately bring this to the attention of the Owner's Representative.

In case of watery trench route, the pipe shall be lowered immediately after the trench has been constructed and lowering-in authorization obtained from the Supervision.

The trench shall be kept free of water during and after lowering-in so that floating is prevented and satisfactory backfilling and compaction can be achieved.

The following (or similar) methods of dewatering of ground water shall be used:

- Wells with the means of well point equipment.
- Ploughed-in drainage pipe, along the trench bottom - open sump pumping.

Dewatering shall be executed at Contractor's own cost.

The Contractor is responsible for determining the various parameters (e.g. well depth, pump spacing, etc.) in such a way that the trench or excavation is satisfactorily dewatered.

The Contractor shall dispose of water in a ditch or watercourse, at no extra cost to the Owner. The Contractor shall make all necessary arrangements with the authorities and/or landowners in connection with the water disposal.

The Contractor is liable for any compensation to landowners, in connection with dewatering exceeding a reasonable quantity and causing damage to properties.

If any structures or pipes or other utilities, which do not appear in the tender documents, are discovered during excavation, the Supervision shall be informed immediately.

The Contractor shall clean the trench immediately before the lowering of the pipe. All stumps, roots, etc. shall at no extra cost, be removed or cut back sufficiently to ensure that they are not in contact with the pipe.

If boulders or rocks with size exceeding 150 mm are encountered during excavation these shall be removed by the contractor at no extra cost as per **Job Specification No. 499/4.**

However, no lowering-in shall take place before Supervision has inspected the trench and authorization to commence lowering-in has been given.

Such authorization shall not constitute any waiver on requirements specified herein or in any other Specifications or drawings.

At rocky areas, where blasting is to be used this shall be authorized by the Owner's Representative and Supervision and shall only be carried out by qualified and experienced personnel which possesses a valid license for the use of explosives. Special precautions against damaging the pipeline and other existing installations shall be taken by Contractor.

At rocky areas, stringing and welding activities should be performed after trench blasting in order to avoid damages to the pipeline.

Blasting material, which cannot be used, shall be transported away after the Supervision approval.

In areas, where blasting is not permitted (urban areas etc.), the Contractor shall execute rock excavations mechanically, at no extra cost to the Owner.

If propping or shoring up of any excavation is required, this shall be done by the Contractor, according to the Supervision instructions, at no extra cost to the Owner.

In cases where trenching and excavation has to be carried out parallel to the contour lines on mountainous areas, the Contractor has to establish the R.O.W. in a safe method so that all heavy equipment may be transported safely.

In places where weld joints have to be done in the trench, the Contractor shall construct suitable hellholes. These shall be large enough to provide adequate access for welding, welding inspection and insulation and shall be constructed in a way that is acceptable according to the applicable safety requirements.

There shall be a clearance of at least 0.6 m around the pipe, and the length of the hellhole shall be at least 1.5 m in order to provide the necessary space for welding, coating and inspection operators. The hellholes shall be kept free of water and shall be secured against collapse. Bellholes shall be constructed at no extra cost to the Owner.