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## TECHNICAL SPECIFICATION

Doc No : DSF-SPC-CIV-008

Rev. 1

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## HIGH PRESSURE (HP) TRANSMISSION SYSTEMS

# EARTH WORKS

JUNE 2021

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## **1 SCOPE AND OBJECTIVES**

The scope of this technical specification is to describe the minimum requirements of the construction process for the Earth Works at M/R, M, R Stations, L/V Stations and Compressor stations. It also covers various civil engineering works. This specification shall be fulfilled with EN 1997 (Eurocode 7).

## **2 REFERENCES**

- EN 1997 [Eurocode 7: Geotechnical design]
- ΠΤΠ Ο-155 [Greek Standard Technical Specification Construction of road base courses]
- DSF-SPC-CIV-003 - TECHNICAL SPECIFICATION FOR EXCAVATION
- DSF-CIV-CIV-005 - TECHNICAL SPECIFICATION FOR BACKFILLING

## **3 ACRONYMS**

|     |                              |
|-----|------------------------------|
| DN  | Nominal Diameter             |
| PN  | Nominal Pressure Rating      |
| NG  | Natural Gas                  |
| PED | Pressure Equipment Directive |

## **4 EXECUTION**

### **4.1 Clearing**

Trees, bushes, fences, boulders, etc., shall be removed by Contractor and the holes shall be filled with earth and shall be compacted. Any excavated materials, not required for further use during Earth Works will be removed from site and disposed off in an appropriate and environmentally friendly area.

Contractor shall ensure careful protection of trees and bushes, which are not to be removed.



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### **4.2 Surface Stripping**

On areas to be hard-surfaced, leveled or excavated, the humus or topsoil shall be stripped up to a minimum depth of 20 cm or to the depth identified by Geotechnical investigation report. The stripped soil shall be laid out on areas to be planted.

### **4.3 Leveling**

The site shall be leveled to a smooth surface with mild slopes, so that the area within the fence can be reinstated as shown on the drawings and the fence can be erected with straight line top.

Furthermore, leveling shall be carried out simultaneously with the construction of roads.

Soft clay, turf, etc. should not be used for filling. Soil shall be filled at maximum 0.3m with well compacted material in layers.

Soil to be added or to be driven away to achieve desired terrain shall be Contractor's Scope of Work.

### **4.4 Excavation**

Excavation shall be executed for the following reasons:

- a) Remove unsuitable soils under soil bearing foundations.
- b) Placement of foundations at the specified bottom of footing elevation
- c). The construction of underground utilities.
- d) Provide ditches to drain plant site.
- e) Backfill and controlled compaction around specified foundations required by design calculations to develop passive resistance.
- f) Provide temporary access roads
- g) General excavations for the construction of internal roads.
- h) For the construction of fencing.

The extent of excavation as per paragraph shall be determined insitu by Owner's Representative.



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The extent of excavation as per paragraph shall be as defined in the applicable foundation drawings.

Excavations shall be carried out so that drainage of the excavated area is maintained continuously. Dewatering in excavated areas shall be provided until completion of the excavation.

Bottom surfaces of excavations shall be graded to provide a uniform bearing.

Excavations shall be kept dry during the construction works.

New excavation adjacent to an existing structure and at a depth greater than that of the existing foundations shall be at a distance so that the ratio horizontal distance to vertical rise shall be 2: 1. In addition no point of the excavation is to come closer than 0.5m to the existing foundation. If so then the existing footing shall be underpinned or protected against settlement with a relevant method.

After excavation adequate clearance adjacent to the works for all necessary activities shall be provided by Contractor. In no case the dimensions of the excavation shall be smaller than those shown on the drawings.

The shape of the excavation for footings shall be protected from deterioration during construction. This can be accomplished applying one of the methods here below.

- a) Pouring concrete the day the excavation is completed.
- b) Avoid excavating the top 150mm of the bottom unless the footing is ready to be formed and poured.
- c) For excavations that will remain open for a considerable time, a thin seal slab of lean concrete shall be poured on the soil.

Excess excavated material, which is not required for backfilling, shall be located, hauled, unloaded and leveled in designated area or approved by the Owner's Representative.

Ground water level shall be as indicated in the soil report.

For deep excavations dewatering system shall be provided by Contractor. Proposed dewatering system shall be submitted for Owner's Representative approval.

Over excavation below the specified level shall be filled with mass concrete by Contractor.

In general, the excavation is carried out by mechanical means, unless special reasons do not permit their use in special areas. Special care should be taken for the protection, suspension and support of pipelines or installed networks. All water of any origin or nature should be removed from the trench or foundation either by water pumping or by natural flow. Finally, the



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slopes of the trench should be supported with appropriate wooden or metal structure if there is danger of collapse.

## **5 BACKFILLING**

Structural fill shall be provided by Contractor:

- a) Around foundations, if the excavation exceeds the foundation size.
- b) Under all concrete paving and building slabs.

The extent of structural fill required shall be as shown on applicable job drawings.

Non-structural fill shall be provided for non-load bearing areas where the purpose of the fill is grade or drainage control.

Structural fill material shall be of well graded granular materials as indicated in the soil report. Proportions shall be as follows:

- a) Fines of 0.06 dia shall not be more than 3%.
- b) Sand shall be 2% to 70%.

Backfill behind retaining walls and around pits shall be placed only after 14 days of the final concrete pour, unless proper means are provided to protect the concrete structure from damage due to the earth pressure.

Fill shall be formed in layers as indicated in soil report.

Fill shall be compacted using the proper mechanical equipment for the areas and the fill material used. Fill shall be moistened or aerated with whatever means

Contractor deems necessary to achieve the specified compaction. Compaction shall be carried out with optimum moisture. Degree of compaction shall be as indicated in the soil report.

## **6 COMPACTION CONTROL REQUIREMENTS**

Compaction of backfill shall be uniform and fulfill the following requirements for the degree of compaction, K with standard Proctor tests:

K = 94% standard Proctor for cohesive soils.

K = 97% standard Proctor for frictional soils.



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The indicated degrees of compaction shall be regarded as the average of at least 5 tests. No single value may be more than 3% below the required average.

The top 0.2m of the soil below the completed subsoil level in excavations and below the stripped ground in backfill shall be compacted in accordance with the above mentioned requirements.

Unless otherwise requested by the Owner's Representative, every 100 square meters of structural fill required per paragraphs 3.1 (a), 3.1 (b) or per this specifications and every 400 square meters of structural fill placed elsewhere, there shall be a compaction test performed to confirm specified compaction. Should more stringent requirements are met in the Soil Investigation Report, then Contractor shall comply with.

Adequate slope for drainage shall be provided at the compacted surface continuously. Water shall not be allowed to pond on the surface of the compacted material.

Backfilling shall be of compacted well graded granular material conforming to structural fill as per Standard Technical Specification ΠΤΠ Ο-155 under paved areas and conforming to general fill under unpaved areas.

## **7 ACCESS ROADS**

The necessary roads shall be constructed to provide the necessary access for materials transportation to the site, etc.

The maintenance of the access roads during the construction period, and demolish them after the construction period, are Contractor's Scope of Work.