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**TECHNICAL JOB
SPECIFICATION**

499/19

REVISION 0

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HIGH PRESSURE (HP) TRANSMISSION SYSTEMS

F.O CABLE CONDUIT INSTALLATION

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QUALITY ASSURANCE PAGE

CHANGES LOG

REVISIONS LOG

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REFERENCE DOCUMENTS

- Job Spec. No. 499/4
[Backfilling]
- Std Drawing No. STD-1-43-22
[P.O. Conduit Cable Manhole and Handhole]
- Std Drawing No. STD-4-41-17
[Fibre Optic (P.O.) Cable Conduit Installation]

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1.0 SCOPE

This specification specifies materials, installation methods and requirements for underground cable conduit system for routing the fiber optic cables.

The requirements of the following, listed in order of precedence shall be fulfilled:

- **This specification.**
- **Standard Drawing No. STD-1-43-22**
- **Standard Drawing No. STD-4-41-17**

2.0 GENERAL

2.1 CONDUIT SPECIFICATION

Cable conduits and fittings shall fulfill the requirements of Codes and Standards referred in Material Requisition "HDPE Pipe for FOC" and the requirements of this specification.

- Material : High density PE pipe
- Outlet diameter : 40 mm
- Inner diameter : 32.6mm
- Design pressure : 10 bar
- Standard length : 2000 m

3.0 INSTALLATION OF CONDUITS

3.1 GENERAL

The conduits shall be installed in straight runs with as few bending as possible. Minimum distance between bending must be at least 60 m.

Bending radii must not be less than 1500 mm. Any type cross-sectional deformation is not acceptable.

Conduit joints may be made at a minimum distance of 2 km. If Contractor for any reason wishes to reduce this distance less than 2 km this shall be effected with the permission of the Supervisor. The joints shall be made in strict compliance with the Manufacturer's recommendations and must not cause any inside burrs, edges or deformations to the conduit.

3.2 CONDUIT INDIVIDUAL ROUTE IN PIPELINE TRENCH

Backfilling up to first backfill level shall be carried out according to **Job Spec. No. 499/4**, as shown on **Std Dwg. No. STD-4-41-17, figure 1**.

The material shall be compacted properly to prevent it from subsiding.

After laying the conduit in the backfilling layer a plastic warning mesh shall be laid down according to **Job Spec. No. 499/4** in a position of 160 mm above the conduit.

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3.3 CONDUITS FASTENED TO CONCRETE ENCASED PIPELINE

The conduits can be fastened by means of suitable plastic ties preventing slipping, as shown on **Std Dwg. No. STD-4-41-17, figure 2, alternative 1.**

Preferably and according to Supervision instructions the conduits shall be embedded in concrete as per alternative 2 shown in figure 3.

It shall be assured by Contractor that the conduit shall not be deformed by the plastic ties. Backfilling shall be carried out properly without causing any damage to the cable conduit.

Conduits shall be fastened to the pipeline at a spanning of 5 m maximum.

Conduit shall be protected by partial backfill with sand and lightweight concrete tiles, approximately 300x600mmx25mm.

3.4 CONDUITS INSTALLED IN THE PIPELINE CONCRETE ENCASEMENT

The conduits shall be installed before concreting the pipeline encasement as shown on **Std Dwg. No. STD-4-41-17, figure 3.**

3.5 CONDUITS FASTENED INTO CONCRETE SADDLES

The conduits shall be fastened on concrete saddles by means of suitable plastic lugs as shown on **Std Dwg. No. STD-4-41-17, figure 4.**

For supplementary requirements see **Section 3.3** herein above.

3.6 CONDUITS FASTENED INTO THE PIPELINE CASING PIPE

The conduits shall be fastened by means of suitable plastic ties as shown on **Std Dwg. No. STD-4-41-17, figure 5.**

The fixing point shall be placed between two insulating spacers. The distance between spacers must not exceed 2.5 m and the distance between fixing points must not exceed 5m.

4.0 CALIBER TEST

Upon completion of the installation, a caliber test shall be performed for each part of the conduit between conduit joints in order to detect and identify several distortions of the conduit.

For the purpose of the test, a special made pig shall be used. This pig will consist of an Aluminium rod axis, on which two rubber gauges of 31 mm diameter and 6 mm thickness are fastened at a distance of 50mm. (See **Figure 1**).

Coupling device, pipe to compressor, shall be as per pipe Manufacturer's recommendations.

In case there is a severe distortion and the pig stops, the distortion point shall be detected by means of a second pig with a light string attached to it and by measuring the length of string.

The pipe at the location of the defect shall be cut out and repaired using new pipe and HDPE couplings following the pipe Manufacturer's recommendations.

The pipe section at the repair area shall be retested at Contractor's expenses.

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5.0 TIGHTNESS TEST

The HDPE conduits shall be pneumatically tested with air at 5 bar pressure.

The tightness test shall be performed after the pipe sections have been laid in the ditches and the trench is backfilled up to a height of at least 0,4 m on top of the HDPE pipe.

The pressure shall be increased with a max. rate of 2 bar/min.

The test shall last (3) three hours at least after a stabilization period of (1) one hour.

The maximum acceptable pressure drop is + 0.1 bar.

For this test only certified Manometers shall be used with scale 0-10 bars, class 1.5 and error ± 0.01 bar.

In case of a pressure drop greater than 0.1 bar, indicating a rupture or leaking in the duct, the test shall be repeated, for the whole pipe section after the rupture is identified, using the H₂ Method, and it shall be repaired at Contractor's expenses.

By using the H₂ method, a low concentration of hydrogen gas, for example 5% to 10% of hydrogen in nitrogen, is injected into the leaking pipe section.

Hydrogen penetrates easily leaks of the pipes as well as the backfilling material.

The identification of the leak point will be done with a gas detector which is especially designed to detect only hydrogen, even when the concentration of the hydrogen in the air is less than 0,0001%.

FIGURE 1
PIGGING DEVICE FOR HOPE CONDUIT TESTING

