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TECHNICAL SPECIFICATION

Doc No: DSF-SPC-CPR-008

Rev. 1

Page 1 of 14

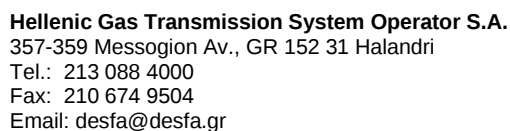
HIGH PRESSURE (HP) TRANSMISSION SYSTEMS

PRECAUTIONS AGAINST PROXIMITY EFFECTS DURING THE CONSTRUCTION PHASE

JUNE 2021

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Doc No: DSF-SPC-CPR-008

Rev. 1

Page 2 of 14

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Doc No: DSF-SPC-CPR-008

Rev. 1

Page 3 of 14

Table Of Contents

1	INTRODUCTION	4
2	SCOPE AND OBJECTIVES.....	4
3	REFERENCES	4
4	ACRONYMS	6
5	GENERAL.....	6
6	GENERAL MEASURES DURING CONSTRUCTION IN THE VICINITY OF HIGH TENSION OVERHEAD LINES AND HIGH TENSION CABLES	6
7	SPECIAL MEASURES DURING CONSTRUCTION WITHIN A PROXIMITY AREA	9
8	SPECIAL MEASURES DURING CONSTRUCTION OUTSIDE THE PROXIMITY AREA.....	11
9	APPENDIX A	12

	Hellenic Gas Transmission System Operator S.A. 357-359 Messogion Av., GR 152 31 Halandri Tel.: 213 088 4000 Fax: 210 674 9504 Email: desfa@desfa.gr	TECHNICAL SPECIFICATION
Doc No: DSF-SPC-CPR-008	Rev. 1	Page 4 of 14

1. INTRODUCTION

The installation of the Cathodic Protection System will be following this specification, the Study of the Cathodic Protection System, which shall be carried out by EPC Contractor during the detail engineering phase, the Standard drawings for Cathodic Protection System, as well as the applicable codes and standards referred to in paragraph 3.2 here in.

2. SCOPE AND OBJECTIVES

This Specification comprises the regulations and measures which Contractor shall fulfil to obviate dangerous contact voltages on pipes, equipment, and machines, in proximity of high-tension systems during the construction phase.

3. REFERENCES

3.1 Reference Documents

- DSF-SPC-CPR-001: Cathodic Protection Anode Material.
- DSF-SPC-CPR-002: Cathodic Protection Transformer Rectifier Cabinets at Anode Beds.
- DSF-SPC-CPR-003: Cathodic Protection Polarization Probe, Reference Electrode and ER Coupon.
- DSF-SPC-CPR-004: Electrical Resistance Welding "Pin Brazing".
- DSF-SPC-CPR-005: Installation of Cathodic Protection System.
- DSF-SPC-CPR-006: Cathodic Protection Commissioning and Start-up.
- DSF-SPC-CPR-007: Marker and Measuring Posts.
- STD-00-78-01: Cathodic Protection for Pipelines - Transformer Rectifier Cabinet.
- STD-3-78-02: Cathodic Protection for Pipelines - Installation of Transformer / Rectifier Cabinet.
- STD-00-78-04: Cathodic Protection for Pipelines - Location of Reference Electrode.
- STD-00-78-05: Cathodic Protection for Pipelines - Anode Bed Installation for Impressed Current Horizontal Anodes.



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TECHNICAL SPECIFICATION

Doc No: DSF-SPC-CPR-008

Rev. 1

Page 5 of 14

- STD-00-78-06: Cathodic Protection for Pipelines - Anode Bed Installation for Impressed Current Vertical Anodes.
- STD-00-78-07: Cathodic Protection for Pipelines - Anode Bed Installation for Sacrificial Anodes.
- STD-00-78-15: Cathodic Protection for Pipelines - Measuring Posts K3S.
- STD-00-78-16: Cathodic Protection for Pipelines - Measuring Posts K3J, K3G / A & B.
- STD-00-78-18: Cathodic Protection for Pipelines - Measuring Posts K4J, K4G / A & B.
- STD-00-78-29: Cathodic Protection for Pipelines - Cable Laying in Casing Pipe.

3.2 Reference Codes and Standards

- EN 12068: Cathodic Protection, External organic coatings for the corrosion protection of buried or immersed steel pipelines used in conjunction with cathodic protection, tapes and shrinkable materials
- EN 12954: General principles of cathodic protection of buried or immersed onshore metallic structures.
- ISO 15589-1: Petroleum, petrochemical and natural gas industries — Cathodic protection of pipeline systems — Part 1: On-land pipelines.
- ELOT EN 13509: Cathodic Protection Measurements Techniques.
- EN ISO 18086: Corrosion of metals and alloys - Determination of AC corrosion - Protection criteria.
- ELOT EN 50122: Railway applications - Fixed installations - Electrical safety, earthing and bonding.
- ISO 21857: Petroleum, petrochemical and natural gas industries — Prevention of corrosion on pipeline systems influenced by stray currents.
- EN 50443: Effects of electromagnetic interference on pipelines caused by high voltage A.C. electric traction systems and / or high voltage A.C. power supply systems.
- AfK Recommendation No. 3: Measures for the installation and operation of pipelines in the vicinity of three-phase high voltage systems and single line traction systems.



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TECHNICAL SPECIFICATION

Doc No: DSF-SPC-CPR-008

Rev. 1

Page 6 of 14

- ISO 15589-1: Petroleum & Natural Gas Industries – Cathodic Protection of Pipeline Transportation Systems. On-land Pipelines.
- IEC 60502-1: Power Cables with extruded insulation and their accessories – Cables for rated voltages of 1KV.

4. ACRONYMS

CP	Cathodic Protection.
EN	European Norms.
ELOT	Hellenic Organization for Standardization.
NG	Natural Gas
T/R	Transformer Rectifier

5. GENERAL

The Contractor is fully responsible to execute all required construction works in compliance with the requirements of this specification.

During thunderstorms at the construction site the risk in connection with work on metallic equipment is increased.

Consequently, all work on the pipeline itself must be interrupted during such weather conditions.

6. GENERAL MEASURES DURING CONSTRUCTION IN THE VICINITY OF HIGH TENSION OVERHEAD LINES AND HIGH TENSION CABLES

It is important that, during work on the pipeline in the vicinity of high-tension systems, the personnel are carefully instructed about the elements of risk and the purpose of the applied protection precautions.

Skilled foremen shall be made supervisors.



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TECHNICAL SPECIFICATION

Doc No: DSF-SPC-CPR-008

Rev. 1

Page 7 of 14

At work within a distance of at least 15 m from high tension pylons for overhead lines above 60 kV and within a distance of at least 50 m from high tension stations, the contractor personnel shall wear electrically insulating boots and gloves.

Insulated tools shall also be used.

Agreements, concerning work within the declaration area of a high-tension line, shall be made with the electricity company, in question, as early as possible.

The electricity company shall be informed of work in the vicinity of the declaration area of a high-tension line.

Distance requirements from overhead lines and cables appear from Figures 1 to 4 and from the requirements of Greek Public Power Corporation (P.P.C.).

Neither personnel nor tools and contractor's vehicles are allowed in the hatched area.

In special cases, it is possible to achieve a dispensation from the above distance requirements, if it is judged that construction work cannot take place without violating the distance requirements.

In such cases Contractor shall contact the electricity company in question to obtain special instructions, concerning performance of the construction work.

Contractor is totally responsible that any instruction from the electricity company is strictly adhered to and shall bear all expenses in this connection.

Contractor's personnel not using vehicles must not touch vehicles or units hoisted up by the vehicles, sojourning under the network, and shall as far as possible keep away from these.

Contractor's operator, who due to incorrect maneuvering, has come into contact with high tension lines or so close to these that flashover takes place, must not leave the vehicle. Leaving the vehicle is highly dangerous.

The vehicle shall drive away from the hazardous area by its own force without assistance from others elsewhere shall wait until persons from the electricity company have confirmed that the voltage in the high-tension line has been interrupted. The vehicle must not be left until then.

Special arrangements shall be made to avoid that wires on contractor equipment by breakages may flow upward and touch high tension lines.

Digging and excavation work when crossing the routing of Public Power Corporation (P.P.C.) high tension line, or closer than 70 m from pylon foundations and other pylon construction parts, must not take place without special permission from the electricity company in question.



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TECHNICAL SPECIFICATION

Doc No: DSF-SPC-CPR-008

Rev. 1

Page 8 of 14

Mounds, for example depots of excavated soil, must not be placed within the distance requirements given by the (P.P.C.) regulations, unless special agreements have been made with the electricity company in advance.

In case an agreement is made with the electricity company, concerning interruption of an electricity installation, this will normally comprise:

At interruption of line installations for 130 kV and above, as well as essential 50-60 kV lines, a telephone shall be available at the site by means of which the electricity company in question is able to call one of the Contractor's responsible site manager.

Before work starts, the site manager shall obtain work permission by the electricity company. When the work has been completed, the site manager shall notify the electricity company. At interruptions of long duration Contractor's equipment shall, at the end of the work every day, be placed in such a way that the regulations as above are fulfilled, and notice shall be given to the electricity company who will suspend the work permission. Every morning, before the work is continued, work permission shall be obtained from the electricity company. If a high-tension line, for working reasons, shall be put under operation, the work permission will be suspended, and the site manager shall on demand of the electricity company without delay, ensure that the requirements on distances in as above are fulfilled.

Excavation work, within a horizontal distance of 20 m from high tension cables, must not take place unless agreement with the respective electricity company is available.

The electricity company shall state on site the location of the high-tension cable. The cable trenches are covered by concrete slabs 0.25x0.5m.

Regarding the uncovering of high-tension cables, agreement with the various electricity companies, concerning interruption or temporary removal of the cable installations in question shall be made on time.

If damages occur to high tension lines or high-tension cables during construction, the electricity company in question shall immediately be notified.

Conductive connections must not be established between the pipeline and high-tension pylons or any other high-tension installation.

In order to divert capacitive charging of pipeline sections, which are placed on wooden support or the like in the proximity area, the following precautions shall be taken:



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TECHNICAL SPECIFICATION

Doc No: DSF-SPC-CPR-008

Rev. 1

Page 9 of 14

- At distances of 50 m and below from the outer phase conductor.
If the pipeline exceeds 150 m, one earthing shall be installed. Additional earthing's shall be installed for every 500 m pipeline.
- At distances from 50 m to 100 m from the outer phase conductor: Earthing with earthing electrodes for every 500 m pipeline shall be installed.

The earthing electrodes shall be placed as far as possible from the high-tension pylons and high-tension lines.

The following shall be used as earthing electrodes:

- a hot galvanized steel pipe with an external diameter of at least 25 mm or
- a copper coated massive steel pole with a diameter of at least 12 mm,
which is driven at least 0.5 m into the ground.

The earthings must not be removed before the pipeline section has been lowered in the trench, and only:

- if an earthing is connected to the pipeline within a distance of max. 500 m and,
- after a bonding has been established, in paragraph 7.1.

7. SPECIAL MEASURES DURING CONSTRUCTION WITHIN A PROXIMITY AREA

Due to the proximity of the transmission line within high tension lines, certain sections of the transmission line route are classified high tension proximity area.

Actual high-tension proximity areas are specified in the tender material.

During work, within a proximity area, certain precautions against dangerous voltages on the pipeline system shall be taken, at the Contractor's expense.

To secure the contractor personnel, two alternative methods can be used:

- a) Contractor's personnel shall wear electrically insulating boots and gloves. Insulated tools shall be used.

All bellholes in the pipe trench shall be provided with insulating mats.



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TECHNICAL SPECIFICATION

Doc No: DSF-SPC-CPR-008

Rev. 1

Page 10 of 14

The insulating mats shall be of such an extent that a person has the metallic parts, of the pipe system within reach only when he stands on the insulating mat. Furthermore, all conductive parts which at the same time may be touched by persons standing on the insulating mats, shall be bonded. The insulating mat shall have a thickness of a minimum 5 mm.

The insulating mat shall be able to withstand a 50 Hz test voltage of at least 3 kV, for one minute.

Before tested, the insulating mat shall be kept in 91-95% relative humidity at a temperature of 20-30°C for 7 days.

Bellholes in the pipe trench shall be kept free of water by drainage or pumping. In rainy weather the site shall be shielded with a tent or the like.

Contractor shall ensure that no unauthorized personnel can get in contact with any part of the pipeline and/or apparatus connected to the pipeline within the proximity area.

To avoid unauthorized personnel from getting in contact with the pipeline, the Contractor must raise a fence around all potential sites.

The fence shall be marked in English and Greek: "Danger / High Voltage" and "ΚΙΝΔΥΝΟΣ / ΥΨΗΛΗ ΤΑΣΗ".

- b) A number of temporary electrical earthings shall be connected to the pipeline, and all pipe sections within certain subsections shall be in electrically conductive connection. All temporary electrical connections shall be established by the use of an insulated electrical bonding with a sectional area of at least 50 mm² Cu (see paragraph 7.1 a).

If the pipeline construction includes permanent electrical earthings, the contractor may benefit from this, i.e. it is advisable to construct these earthings in advance of the pipe construction.

The temporary earthings shall be established in accordance with Technical Specification DSF-SPC-ELE-017.

Position and resistance of the temporary electrical earthings shall be determined in cooperation with the Client's Representative.

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Doc No: DSF-SPC-CPR-008	Rev. 1	Page 11 of 14

7.1 General Precautions

At every welding within the proximity area of a new pipe string to the already established transmission line, the following procedure shall be applied:

- a) The two pipe sections shall be connected with a temporary, insulated electrical bonding of a sectional area of at least 50 mm² Cu. The bonding shall be attached to the adjacent pipe sections by secure and electrically conductive mechanical connections.

The temporary bonding must not be removed until the welding has been affected.

- b) If the pipeline in the trench is temporarily separated, an insulated electrical bonding of a sectional area of at least 50 mm² Cu shall be established in advance. This shall be performed in the same manner as described under paragraph 7.1 a.

The bonding must not be removed until the new weld has been affected.

The maximum allowable length of a welded pipe string, located above ground on wooden supports or similar within the proximity area, must not exceed 500 m. If this length has to be exceeded, due to local conditions, special precautions shall be taken in cooperation with the Owner's Representative.

Outside the proximity area no restrictions are given regarding the length of the welded pipe strings.

8. SPECIAL MEASURES DURING CONSTRUCTION OUTSIDE THE PROXIMITY AREA

Dependent on which of the alternative methods, is chosen in paragraph 7, the following precautionary measures outside the high tension proximity areas shall be taken:

Alternative a), paragraph 7. a.

Dependent on the direction in which the pipeline is laid in proportion to the proximity area, a space in the pipeline of approximately 12 m shall be left open just outside the proximity area to ensure complete electrical isolation between the pipe sections.

The pipe ends extending from the proximity area shall be properly enclosed and marked in English and Greek: "Danger / High Voltage" " KΙΝΔΥΝΟΣ / ΥΨΗΛΗ ΤΑΣΗ".



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Doc No: DSF-SPC-CPR-008

Rev. 1

Page 12 of 14

Only when permanent proximity precautions, limiting the touch voltages to acceptable levels, have been installed, or when all work on the entire metallic pipeline and hereto connected metallic installations have come to an end, the 12 m pipe string may be inserted, in accordance with the procedure given in paragraphs 7 and 7.1.

If it is not possible to observe the described electrical isolation between the pipe sections, for instance during pressure testing, the procedures given in paragraphs 7. a and 7.1 are valid for the entire metallic pipe system.

Alternative b), paragraph 7. b

The electrical isolation between the pipe sections shall be observed as described in para 5.1.1. If this is not possible temporary electrical earthings shall be established in accordance with paragraph 7. b.

9. APPENDIX A

FIGURE 1 & 2

DISTANCE REQUIREMENTS FROM LOW TENSION OVERHEAD LINES AND CABLES

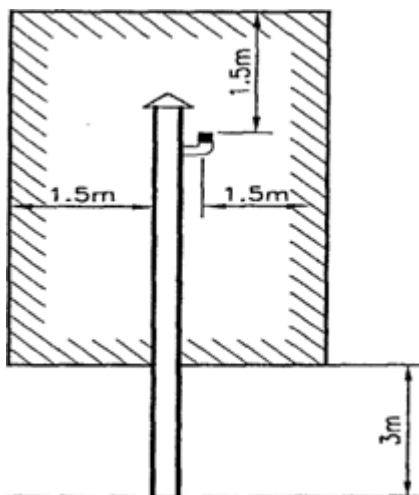


Figure 1



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Doc No: DSF-SPC-CPR-008

Rev. 1

Page 13 of 14

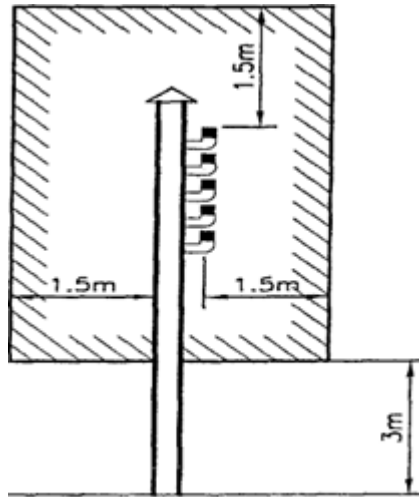


Figure 2

FIGURE 3 & 4

DISTANCE REQUIREMENTS FROM HIGH TENSION OVERHEAD LINES 10-40 KV AND 40-400 KV

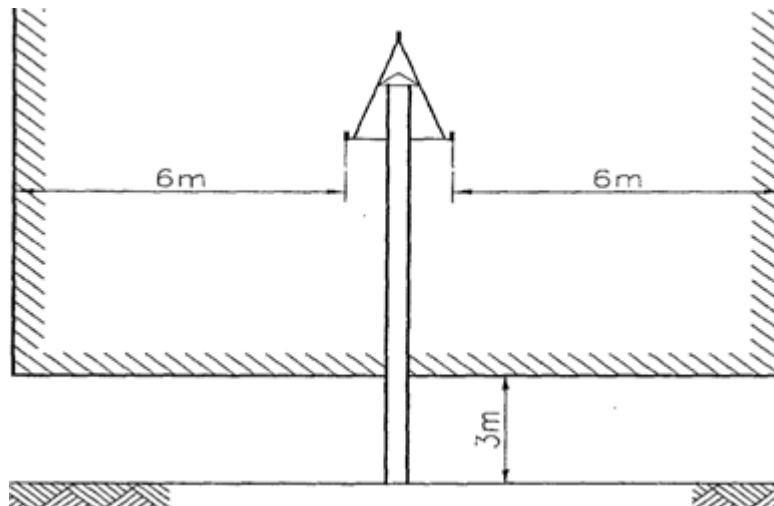


Figure 3, 10 – 40 KV



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Doc No: DSF-SPC-CPR-008

Rev. 1

Page 14 of 14

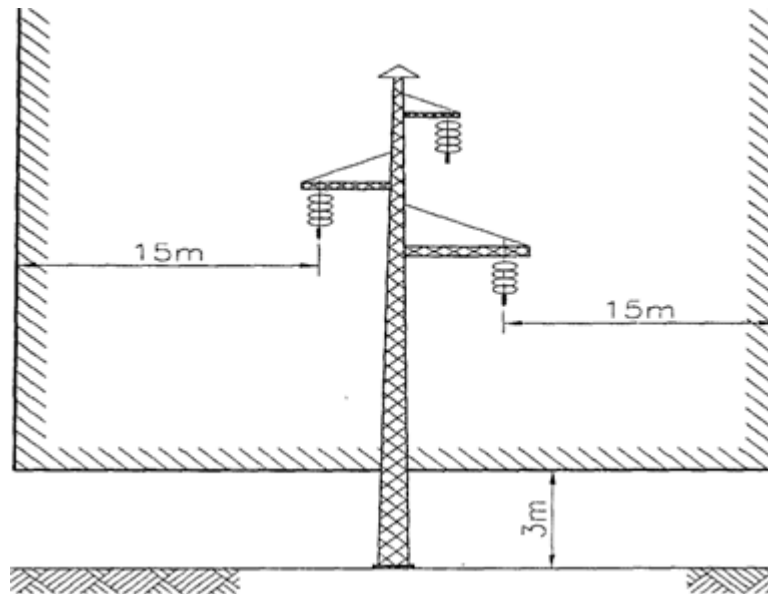


Figure 4 , 40 - 400 KV