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ΕΛΛΗΝΙΚΗ ΤΕΧΝΙΚΗ ΠΡΟΔΙΑΓΡΑΦΗ

HELLENIC TECHNICAL SPECIFICATION

Συστήματα πλαστικών σωληνώσεων για την προστασία και διαχείριση καλωδίων σε ηλεκτρικές εγκαταστάσεις

Cable plastic conduit systems for cable protection and management in electrical installations

Pricing class: **7**

Preamble

This Hellenic Technical Specification revises and replaces ELOT TS 1501-04-20-01-02:2009.

This Hellenic Technical Specification was prepared by Experts and checked and evaluated in its field by a Supervisor/Specialist - Expert, who assisted the work of the Technical Committee ELOT/TE99 “Specifications of Technical Works”, the secretariat of which belongs to the Directorate for Standardisation of the Hellenic Organization for Standardization (ELOT).

The text of this Hellenic Technical Specification ELOT TS 1501-04-20-01-02 was adopted on 2023-02-10 by ELOT/TE 99 in accordance with the Regulation on the drafting and publication of Hellenic Standards and Specifications.

The European, international and national standards referred to in the standardisation references are available by ELOT.

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Content

Introduction

This Hellenic Technical Specification (HTS) is part of the technical texts originally prepared by the Ministry for the Environment, Spatial Planning and Public Works and the Institute for Constructions Economy (IOK) and was subsequently edited by ELOT in order to be applied to the construction of national public technical works, with a view to produce works that are robust and capable of meeting and satisfying the needs which have dictated their construction, and be beneficial for the society as a whole.

Under a contract between NQIS/ELOT and the Ministry for Infrastructure and Transport (online publication number 6ΕΟΒ465ΧΘΞ-02Τ), ELOT was assigned the editing and update as 2nd Edition of three hundred fourteen (314) Hellenic Technical Specifications (HTS), in accordance with the applicable European Standards and Regulations and the procedures laid down in the Regulation on the drafting and publication of Hellenic Standards and Specifications and in the Regulation on the establishment and operation of Technical Standardization Instruments.

This Hellenic Technical Specification was prepared by the contractor of the restricted tender No 1/2020 for the award of the work “Revision of the 1st edition of 314 HTS” (online publication number ΩΕΕΑΟΞΜΓ-ΞΗΔ), checked and evaluated in its field by a Supervisor/Specialist - Expert and submitted for Public Consultation. It was approved by the Technical Committee ELOT/TE 99 “Specifications of Technical Works”, which was set up by the Decision of the Managing Director of the NQIS, Δν.Σ. 285-19/08-02-2019 (ΑΔΑ6ΩΛΡΟΞΜΓ-15Ξ).

This HTS covers the requirements arising from the EU law, the relevant New Approach Directives currently in force and the National Law, and refers to and is compatible with harmonised European standards.

Cable plastic conduit systems for cable protection and management in electrical installations

1 Objective

The purpose of this Technical Specification is to define the requirements for the configuration of cable plastic systems for cable protection and management in electrical installations.

For plastic cable trunking systems ELOT TS 1501-04-20-01-06 applies.

2 Standardization references

This Technical Specification incorporates –by way of references– provisions of other publications, whether dated or not. These references refer to the respective parts of the text and a list of these publications is presented thereafter. In case of references to dated publications, any subsequent amendments or revisions thereof shall apply to this document when incorporated in it by means of amendment or revision. With regard to references to undated publications, their latest version shall apply.

ELOT EN ISO 9001	*Quality Management Systems – Requirements -- Συστήματα διαχείρισης της ποιότητας - Απαιτήσεις*
ELOT EN 13501-1	*Fire classification of construction products and building elements – Part 1: Classification using data from reaction to fire tests – Ταξινόμηση δομικών προϊόντων και στοιχείων σχετικά με την φωτιά – Μέρος 1: Ταξινόμηση με τη βοήθεια δεδομένων από δοκιμές αντίδρασης σε φωτιά*
ELOT 60364	*Requirements for electrical installations -- Απαιτήσεις για ηλεκτρικές εγκαταστάσεις*
ELOT EN 60423	*Conduit systems for cable management - Outside diameters of conduits for electrical installations and threads for conduits and fittings -- Συστήματα σωλήνων για διαχείριση καλωδίων - Εξωτερικές διάμετροι σωλήνων για ηλεκτρικές εγκαταστάσεις και σπειρώματα για σωλήνες και εξαρτήματα.*
ELOT EN 60529	*Degrees of protection provided by enclosures (IP Code) – Βαθμοί προστασίας παρεχόμενης από περιβλήματα (κωδικός IP)*
ELOT EN 60670-1	*Boxes and enclosures for electrical assessories for household and similar fixed electrical installations - Part 1: General requirements -- Κιβώτια και περιβλήματα για ηλεκτρικά εξαρτήματα για οικιακή και παρόμοιες σταθερές ηλεκτρικές εγκαταστάσεις - Μέρος 1: Γενικές απαιτήσεις.*
ELOT EN 61386-1	*Conduit systems for cable management - Part 1: General requirements -- Συστήματα σωληνώσεων για διαχείριση καλωδίων - Μέρος 1: Γενικές απαιτήσεις.*
ELOT EN IEC 61386-21	*Conduit systems for cable management - Part 21: Particular requirements - Rigid conduit systems – Συστήματα σωληνώσεων για διαχείριση καλωδίων – Μέρος 21: Ειδικές απαιτήσεις – Άκαμπτα συστήματα σωλήνων*
ELOT EN 61386-21	*Conduit systems for cable management - Part 21: Particular requirements - Rigid conduit systems -- Συστήματα σωληνώσεων για διαχείριση καλωδίων - Μέρος 21: Ειδικές απαιτήσεις - Συστήματα δύσκαμπτων σωληνώσεων* (is replaced by ELOT EN IEC 61386-21, with withdrawal date 17/05/2024

ELOT EN IEC 61386-22	*Conduit Systems for cable management - Part 22: Particular requirements - Pliable conduit systems -- Συστήματα σωληνώσεων για διαχείριση καλωδίων - Μέρος 22: Ειδικές απαιτήσεις - Διαμορφώσιμα συστήματα σωλήνων*
ELOT EN 61386-22	*Conduit systems for cable management - Part 22: Particular requirements - Pliable conduit systems -- Συστήματα σωληνώσεων για διαχείριση καλωδίων - Μέρος 22: Ειδικές απαιτήσεις - Συστήματα αναδιπλούμενων σωληνώσεων* (is replaced by ELOT EN IEC 61386-22, with withdrawal date 17/05/2024
ELOT EN IEC 61386-23	*Conduit systems for cable management - Part 23: Particular requirements - Flexible conduit systems -- Συστήματα σωληνώσεων για διαχείριση καλωδίων - Μέρος 23: Ειδικές απαιτήσεις - Εύκαμπτα συστήματα σωλήνων*
ELOT EN 61386-23	*Conduit systems for cable management - Part 23: Particular requirements - Flexible conduit systems -- Συστήματα σωληνώσεων για διαχείριση καλωδίων - Μέρος 23: Ειδικές απαιτήσεις - Συστήματα εύκαμπτων σωληνώσεων* (is replaced by ELOT EN IEC 61386-23, with withdrawal date 17/05/2024
ELOT EN 61386-24	*Conduit systems for cable management - Part 24: Particular requirements - Conduit systems buried underground -- Συστήματα σωλήνων για διαχείριση καλωδίων - Μέρος 24: Ειδικές απαιτήσεις - Συστήματα σωλήνων υπόγειας εγκατάστασης*
ELOT EN 61386-25	*Conduit systems for cable management - Part 25: Particular requirements - Conduit fixing devices -- Συστήματα σωληνώσεων για διαχείριση καλωδίων - Μέρος 25: Ειδικές απαιτήσεις - Διατάξεις στερέωσης σωληνώσεω.ν*

3 Terms and definitions

The following terms and definitions are used in this Technical Specification:

3.1 Light-type plastic tubes

(1) Suitable for electrical installations recessed inside the coating, on false floors, suspended ceilings, etc. in prefabricated buildings, in areas without moisture, with light mechanical stresses.

(2) Withstand compression up to 320 N and impact ≥ 1 Joule (in accordance with ELOT EN 61386-1).

(3) Use temperature from -5 °C to + 90 °C (in accordance with ELOT EN 61386-1).

(4) Do not spread flames for t < 30 sec (in accordance with ELOT EN 61386-1).

(5) Ensure IP 64 rating of water-tightness, in accordance with the Standard ELOT EN 60529, i.e. they are watertight to dust and water splashes.

3.2 Medium-type plastic tubes

(1) Suitable for electrical installations recessed inside the coating, on false floors, suspended ceilings, etc., in prefabricated buildings, in areas with moderate mechanical stress, for formwork inside concrete, for infrastructure works and underground networks.

(2) Withstand compression up to 750 N and impact ≥ 2 Joules (in accordance with ELOT EN 61386-1).

(3) Operating temperature from -15 °C to + 105 °C. (in accordance with ELOT EN 61386-1).

(4) Do not spread flames for t < 30 sec (in accordance with ELOT EN 61386-1).

(5) Ensure IP 65 rating of water-tightness, in accordance with the Standard ELOT EN 60529, i.e. they are watertight to dust and water jets.

3.3 Heavy duty plastic tubes

(1) Suitable for electrical installations recessed inside the coating on false floors, suspended ceilings, etc., in prefabricated buildings, for formwork in concrete, for infrastructure works, for outdoors (mansions, gardens, etc.), for industrial spaces, for installation in an acidic and alkaline environment.

(2) Withstand compression up to 1250 N and impact ≥ 6 Joules (in accordance with ELOT EN 61386-1).

(3) Use temperature from -25 °C to + 120 °C (in accordance with ELOT EN 61386-1).

(4) Do not spread flames for t < 30 sec (in accordance with ELOT EN 61386-1).

(5) Ensure IP 65 rating of water-tightness, in accordance with the Standard ELOT EN 60529, i.e. they are watertight to dust and water jets.

3.4 Conduit system

A cable management system consisting of tubes and fittings therefor for the protection and management of insulated conductors and/or cables in electrical or telecommunications installations, allowing them to be pulled and/or replaced, but not inserted laterally.

3.5 Halogen-free plastic tubes (HF)

In the manufacture of plastic tubes made of polymers, combustion retardants (Flame Retardants, FRs) consisting of either halogenated compounds or metal hydroxides are widely used.

Both impart excellent fire resistance to the polymer matrix, but halogens when burned emit toxic gases and thick smoke, making them environmentally unfriendly, while metal hydroxides require very high concentrations to be effective, thus affecting its mechanical behavior polymer. For this reason, more advanced categories of combustion retardants have evolved, such as non-halogen-Free Intumescent FRS (Halogen-Free Intumescent FRS) and very low halogen FRS (Very Low Halogen), which are environmentally friendly and comply with the new Fire Protection Regulation (Presidential Decree 41/2018 – Government Gazette 80/A/7-5-2018).

4 Requirements

4.1 Embedded materials in plastic electrical conduit systems

Installed plastic electrical pipe systems with regard to their resistance and response to fire (Euroclasses, smoke release, etc. according to ELOT EN 13501-1) shall comply with the requirements laid down in the Building Fire Protection Regulation (see Bibliography [22]) depending on the space they pass through. The relevant requirements should be specified in the Passive Fire Protection Study of the building.

Plastic conduit systems for passage and protection of pipelines and cables in electrical installations shall be configured with the following materials:

(1) Linear plastic tubes, rigid, of halogen-free material, manufactured in accordance with the Standard ELOT EN 61386-1 (General Requirements) and the Standard ELOT EN 61386-21 (power up to 17/5/2024) / ELOT EN IEC 61386-21 (special requirements).

(2) Corrugated (spiral) plastic pipes, malleable (curved by the application of moderate force) manufactured in accordance with ELOT EN 61386-1 (general requirements) and ELOT EN 61386-21 (valid until 17/5/2024) / ELOT EN IEC Standards 61386-22 (special requirements) and flexible (which bends with the application of less force) manufactured according to the Standards ELOT EN 61386-1 (general requirements) and ELOT EN 61386-23 (valid until 17/5/2024) / ELOT EN IEC 61386-23 (special requirements) and in terms of cross-sections in accordance with ELOT Standard EN 60423.

(3) Plastic underground pipes manufactured in accordance with ELOT EN 61386-1 (General Requirements) and ELOT EN 61386-24 (specific requirements).

(4) Fittings (special pieces) of pipes, such as muffles, curves, collars/stands, fittings, boxes, etc. manufactured in accordance with ELOT EN 61386-1 (general requirements) and ELOT EN 61386-2 5 (special requirements)

(5) Branching and stop boxes in accordance with ELOT Standard 60670-1.

(6) Self-extinguishing plugs with corresponding screws and supports.

(7) Insulating materials for passing pipes through building materials.

Please note that non-self-drying pipes are not allowed in the above-ground facilities. They can only be used in underground facilities. In general, plastic cable protection tube systems used, as well as passing cables, are recommended to be based on HF polymers, public aggregation areas and high fire protection areas.

4.2 Classification of plastic cable protection tubes

The classification (or characterisation or categorisation) of plastic tubes shall be carried out in accordance with sections 2.1, 2.2 and 2.3 of ELOT EN 61386-1 and Annex A thereto to a laboratory accredited by the ESYD or an equivalent body of the European Union in accordance with Regulation EC/765/2008 (see Bibliography [14]).

The Classification Code contains twelve (12) digits referring to:

(1) Compression resistance (scale 1 to 5)

(*1: very weak, 2: weak, 3: moderate, 4: strong, 5: very strong*)

(2) Impact resistance (scale 1 to 5)

(*1: very weak, 2: weak, 3: moderate, 4: strong, 5: very strong*)

(3) Minimum permanent application and installation temperature (scale 1 to 5)

(*1: +5ºC, 2: -5ºC, 3: -15ºC, 4: -25ºC, 5: -45ºC*)

(4) Maximum permanent application and installation temperature (scale 1 to 7)

(*1: +60ºC, 2: +90ºC, 3: +105ºC, 4: +120ºC, 5: +150ºC, 6: +250ºC, 7: +400ºC*)

(5) Resistance to bending, (scale 1 to 4)

(*1: rigid, 2: configurable, 3: configurable/self-recoverable, 4: flexible*)

(6) Electrical Properties, (scale 0-3)

(*0: none mentioned, 1: with electrical continuity characteristics, 2: with electrical insulation characteristics, 3: with electrical continuity and insulation characteristics*)

(7) Resistance to the admission of solid objects (scale 3 to 6)

(*3: protection against bodies with $\varphi \geq 2.5$ mm, 4: protection against bodies with $\varphi \geq 1.0$ mm, 5: dust protection, 6: dry from dust*)

(8) Resistance to water inflow (range 0 to 7)

(*0: none mentioned, 1: protection against drops falling vertically, 2: protection against drops falling vertically and pipe slope <15º, 3: water spray protection, 4: protection against water splashes, 5: protection against water jets, 6: protection against strong water jets, 7: protection from the effects of temporary immersion in water*)

(9) Corrosion resistance of metal and composite pipe systems (scale 1 to 4)

(*1: low protection inside and out, 2: moderate protection inside and out, 3: moderate protection inside, high protection outside, 4: high protection inside and outside*)

(10) Tensile voltage (range 0 to 5)

(*0: none mentioned, 1: very weak, 2: weak, 3: moderate, 4: strong, 5: very strong*)

(11) Resistance to flame propagation (scale 1 to 2)

(*1: not spread the flames, 2: dissemination*)

(12) Load bearing capacity (range 0 to 5)

(*0: none mentioned, 1: very weak, 2: weak, 3: moderate, 4: strong, 5: very strong*)

4.3 Cable Protection Tube Diameter Selection Criteria

The factors on which the choice of tube depends on:

(1) The use of space.

(2) The temperature that increases in space.

(3) The routes required.

(4) The number and cross-section of the conduits that are to pass through the roads.

Ducts shall be placed in the tubes in such a way as to facilitate their further maintenance and without causing damage to them. The inner diameter of the pipes is standardised in accordance with ELOT EN 60423 and its choice depends mainly on the number and cross section of the ducts it encloses, in order to extract the heat that develops in them when they are leaked from current. The inner diameter also depends on the type of installation, i.e. whether it is visible (wall tube, on the masonry) or recessed (recessed tube, built into the coating and concrete). In most cases the diameter of the tubes in a recessed installation is larger than in a visible installation, given that in the recessed one the heat is more difficult to extract.

Empirically, the inner diameter of the tube is also calculated from the ratio:

$D_o = 1.5 \cdot \Sigma(D_K)$

where $\Sigma(D_K)$ is the sum of the outer diameters of the cables (by insulating them).

Based on this relationship, cable capacity tables of the usual protective tubes used in practice are drawn up by the producers.

Depending on how the pipes are installed, Standard ELOT 60364 indicates their proposed characteristics, which are in accordance with ELOT EN 61386-1 as in Table 1. The values in the table refer to the first four digits of the pipe classification code (paragraph 4.2).

Table 1: Proposed pipe characteristics by ELOT EN61386-1
(Source: ELOT 60364[a] – Table F 52.1)

Conditions of installation	Resistance to crushing	Impact resistance	Minimum operating temperature	Maximum operating temperature
Exposed outdoors	3 (Moderate)	3 (Moderate)	2 (-5 °C)	1 (60 °C)
Indoors				
Exposed	2 (Weak)	2 (Weak)	2 (-5 °C)	1 (60 °C)
Under the floor (floor coverings)	2 (Weak)	3 (Moderate)	2 (-5 °C)	1 (60 °C)
Built in concrete (only pipe systems with orange colour are allowed)	3 (Moderate)	3 (Moderate)	2 (-5 °C)	1 (60 °C)
Built in hollow walls of wood (flammable materials), masonry, structural gaps or ceiling gaps	2 (Weak)	2 (Weak)	2 (-5 °C)	1 (60 °C)
Aerial mounting	4 (Strong)	3 (Moderate)	3 (-15 °C)	1 (60 °C)

Note: [a] The Hellenic Standard ELOT 60364 “Requirements for electrical installations” has been drawn up on the basis of the harmonisation documents of the European Committee for Electrotechnical Standardisation (CENELEC), which come mainly from the HD 60364 series but also from the HD 384 series.
In accordance with the provisions of Ministerial Decision 101195/17.9.2021 (Government Gazette, 4654B/21) “General and specific requirements for electrical installations”, and in the light of the transitional provisions referred to therein, the Internal Electrical Installations (EEE), or parts thereof, are presumed to satisfy the safety and proper functioning requirements of the above mentioned Decision in their intended and reasonably foreseeable use, provided that they are designed, constructed, modified, maintained and audited in accordance with the general and specific requirements of standard ELOT 60364, or an equivalent international, European, or national standard, or technical specifications providing an equivalent level of safety.

The ducts of a single circuit or the ducts of several circuits which are protected by the same protective device (safety or micro-automatic switch) may be passed in one pipe.

For the installation of pipes, various accessories are required, such as: couplings (or muffles) for the jointing of two sections of pipes, curves, corners and/or branchers for changing pipes, support collars to support visible installations, tips (or fittings) to connect to devices in a permanent position and junction boxes where horizontal or vertical branching is required.

Inside the branch line boxes the connection of the pipes should be made with connection components and in no case by physical connection (unification of the nude pipes to each other by twisting).

4.4 Acceptable materials

Plastic conduit systems accepted for installation should come from industrial plants that apply a production process certified in accordance with ELOT EN ISO 9001 or equivalent. The materials should:

(a) bear the CE marking.

be accompanied by an EU declaration(s) of compliance with Directive 2014/35/EU (LVD),

Please note that the standards used for the type tests of the materials should be clearly stated in the declaration(s) of conformity.

(c) bear the appropriate markings, as referred to in Directive 2014/35/EU, which was harmonised in Hellenic law by Ministerial Decision 51157/ΔΤΒΝ 1129/2016 (Β' 1425).

4.5 Requirements for the installation workshop

The installation should be carried out by qualified electricians, holders of a certificate of notification, under the guidance of a chief technician or an installer of an electrician, who is authorised to carry out the professional activity in question in the group where the installation is assigned, in accordance with the provisions of Articles 2, 3 and 4 of Presidential Decree 108/2013 (see Bibliography [15]).

5 Method for the execution of works

5.1 Transport and deposition of materials

The materials to be incorporated should be transported and unloaded on the construction site with care, in order to avoid distortions which may result in damage to the cables during traction through the conduit or inability to support it in the building elements. They should be deposited on the construction site in a protected storage area, inaccessible by unauthorised persons and without any form of building activity. Also, the deposit area should ensure the materials against moisture and dust.

5.2 Installation of plastic conduits in electrical installations

Conduits should be constructed in such a way that conduits or cables can be added or removed with ease and without risk of destruction.

5.2.1 General attention points

(1) The requirements of Joint Ministerial Decision 41020/819/2012 (see Bibliography [17]) should be considered as regards the proximity to 'sick streams'. When several electrical conduits are going in parallel with conduits of other installations (e.g. passages of weak currents, water pipes, etc.), they must be at least 30 cm away from them and in any case be higher than plumbing. The distance of 30 cm is empirical in order to avoid electromagnetic compatibility problems between the conduits. However in practice many times it cannot be observed because there is a problem of space, but can also be much smaller if used to transmit signals shielded cable or optical fibre.

(2) Fixing of the pipes on the walls must be carried out exclusively with a strong cement mortar. Use of plaster is expressly prohibited.

(3) The pipes shall meet the entry points of the boxes in the horizontal branch or vertical direction.

(4) Pipes should be placed slightly inclined towards the boxes and do not show traps (siphon tubes), so that if water enters them it is heading towards the boxes.

(5) In the passages through ceilings, walls or floors, it is forbidden for the pipes to have any joint.

(6) Where there are spaces with special requirements, the lines should be constructed in accordance with the instructions given in the drawings (general or details).

(7) The connections of light and medium-type plastic pipes to the branch boxes should be passed.

(8) The connections of heavy-duty plastic pipes to the branch boxes must be made with appropriate fittings.

(9) In heavy-duty pipes for which concrete elements are encased (by order of the Supervising Engineer), the intersection of pipes with the reinforcement should be avoided. Cutting or deforming the reinforcement is strictly prohibited. The pipe shall be fastened to the reinforcement or formwork to prevent its movement during the injection of concrete.

(10) The curves of the conduit shall be formed by special pieces of the same material of the pipes.

(11) Plastic pipes penetrating elements of the building, such as floors, walls, roofs, etc. should be sealed in accordance with the prescribed degree of fire resistance of the corresponding element of the construction of the building.

(12) The seals used shall be compatible with the materials of the conduits, shall permit the thermal expansion of the electrical line without encumbering the quality of the sealing material and shall have sufficient mechanical stability. A metal pipe may also be used and through it, the plastic pipe can be passed within ± 250 mm of the limit of the fire compartment (wall or floor).

5.2.2 Recessed plastic conduits

The grooves for the wall installation of the pipes should be carefully opened in order to minimize the damage to the mortars and the walls. Carving of concrete structures (walls, columns, beams, etc.) is prohibited.

Recessed pipes and branch boxes, switch boxes, etc. shall be placed before the coating and at such a depth that after the final layer the trimmings of the boxes are flat with the surface. This is achieved (in a new construction) by constructing “guides” from coating.

Recessed lines on walls or ceilings (coated)

Depending on the category of premises and according to the Study, pipes may be constructed using:

(a) light rigid plastic pipes (straight).

In all areas as well as for sections of lines that do not require increased mechanical strength.

(b) light flexible plastic pipes (spiral).

In all spaces for sections of lines where a large radius of curvature of the conduit is required.

Recessed lines in concrete elements

Recessed lines in concrete elements can be formed with medium- or heavy-duty plastic pipes.

The use of flexible plastic pipes (spiral) of heavy or medium type and the use of rigid plastic pipes (straight) of heavy or medium type are allowed. Ideal plastic pipes for use in concrete elements are flexible double-walled structures with a smooth inner surface and alternatively also flexible multilayer pipes.

Conduits encased in reinforced concrete ceilings must follow the main reinforcement and be placed during the manufacture of the formwork.

5.2.3 Visible plastic conduits

The visible plastic pipes are based on special bilateral supports in accordance with the designs of the Study.

Where high mechanical protection is required, visible lines shall be placed in heavy-duty plastic pipes.

6 Criteria for accepting completed works

6.1 Check of recessed main materials

(1) Check of accompanying documents of embedded materials.

(2) Visual check to verify the integrity of the material received. Defective or damaged or corroded materials should not be received.

Finding of non-compliance of the installation with the above shall mean that it is not received and the Contractor is obliged to take corrective measures in accordance with the instructions of the Competent Authority.

6.2 Visual inspection of installation

The visible parts of the installation shall be checked with regard to the device, the supports (their distances) and their anti-corrosion protection.

Fittings or parts of pipes showing damage, distortion or erosion shall not be accepted and the Contractor shall be instructed to replace them.

Particular attention should be paid to:

(1) Damages to the bearing structure of the building at the passage points of the conduit.

If found, a local dismantling of the line and immediate repair of damage should be given in accordance with the instructions of a qualified civil engineer.

(2) Use of gypsum for fixing the conduit.

If found, an order should be given to remove the gypsum and to re-coagulate with appropriate (cementoidal) materials.

(3) Non-observance of conduit distances from other installations.

If found, an order should be given for dismantling and rebuilding the line from the Contractor.

6.3 Check of installation in accordance with the drawings

The installation should be checked in accordance with the drawings of the approved study in order to determine whether all the intended fittings have been placed.

7 Method of measurement of works

The measurement shall be carried out in metres (m) of completed, in accordance with this Technical Specification, plastic electrical installation conduit, depending on the nominal diameter and type of pipes fitted.

The above measured operations include:

(1) Supply of the necessary materials.

(2) Transport and temporary storage in the work.

(3) Their inclusion in the work.

(4) Wear and impairment of materials.

(5) Carrying out the required tests and checks in accordance with this Law, as well as taking corrective measures (work and materials) if non-conformities are found.

Annex A
(Information)

Health, Safety and Environmental Protection Terms

A.1 General

During the execution of the works, the applicable provisions on Safety and Health Measures for Employees shall be met and employees shall be equipped with the necessary Personal Protective Equipment (PPE) as appropriate, which must comply with the provisions of Regulation (EU) 2016/425.

The provisions laid down in the approved Health and Safety Plan (HSP)/Health and Safety File (HSF) of the work, according to Ministerial Decisions ΓΓΔΕ/ΔΙΠΑΔ/οικ/889 (ΦΕΚ/16 Β'/14-01-2003) and ΓΓΔΕ/ΔΙΠΑΔ/οικ/177 (ΦΕΚ/266 Β'/14-01-2001) shall also be strictly met.

A.2 Potential risks in the execution of the work

i. Loading and unloading of materials.

ii. Movement of elongated objects under tight space conditions.

iii. Use of scaffolding.

iv. Use of electric hand tools, pneumatic tools (cutting wheels, drills, etc.).

v. Handling sharp objects (pipe incision surfaces, risk of injury).

vi. Shanding and drilling of structural elements (powder, ejecting materials).

A.3 Facing occupational risks

Directive 92/57/EU on "minimum health and safety requirements for temporary and mobile construction sites" (as transposed into Greek legislation by Presidential Decree 305/96) and the Greek legislation on health and safety matters (Presidential Decree 17/96, Presidential Decree 159/99, etc.) shall apply.

Those performing the works of this Specification will be staff with adequate experience in electrical works as referred to in 5.1.

The Site Health and Safety Technician or site manager is responsible for:

(1) Informing employees about security measures (all staff belonging to either the Contractor or its subcontractors).

(2) Identification of dangerous positions or situations.

(3) Taking necessary security measures for personnel and third parties.

(4) Safe installation of scaffolding for the construction of networks and the installation of equipment or the use of safe and suitable lifting equipment.

(5) Compliance with hygiene rules during construction.

(6) Taking protective measures against damage to third parties.

(7) Checking for the adequacy of lighting.

(8) Checking the electrical safety devices for the equipment used.

When chemicals are used, the use of protective measures is required, as appropriate, by the personnel performing the works, as specified in the Material Safety Data Sheet (MSDS) of the respective material producer.

Workers must in all cases be equipped with the required personal protective equipment (PPE), depending on the object and location of the work to be carried out and the type of equipment used. The PPE must be in good condition, free of damage and bear a CE marking and a declaration of conformity in accordance with the provisions of Regulation (EU) 2016/425 and fall under the following Standards:

Table A.1 — Requirements for PPE

Type of PPE	**Relevant Standard**
Protective gloves against mechanical risks	ELOT EN 388
Industrial safety helmets	ELOT EN 397
Protective clothing – General requirements	ELOT EN ISO 13688
Eye and face protection for occupational use – Part 1: General requirements	ELOT EN ISO 16321-1
Eye and face protection at work – Part 3: Additional requirements for mesh type protectors	ELOT EN ISO 16321-3
Personal protective equipment - Safety footwear	ELOT EN ISO 20345

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