



Exploration & Production

GENERAL SPECIFICATION

ELECTRICAL

GS ELE 311

Cable trays and ladders

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1. Scope

This specification covers the minimum requirements for the design, manufacture, inspection, testing and delivery of cable trays/ladders for offshore and onshore installations.

2. Reference documents

The reference documents listed below form an integral part of this General Specification. Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published at the EFFECTIVE DATE of the CONTRACT.

Design and construction of the equipment shall be in accordance with the current edition of the following documents listed in order of precedence:

- COMPANY Particular Specification and data sheet (if any)
- COMPANY General Specifications
- Applicable International Electrotechnical Commission (IEC) and ISO publications
- Applicable CENELEC standards
- NEMA

Applicable recognized standards and codes (UTE, BS, VDE, etc.) when IEC publications have not yet been issued.

Standards

Reference	Title
EN 50014	Electrical apparatus for potentially explosive atmospheres – general requirements
IEC 60695-2-1	Fire Hazard testing
IEC 61537	Cable tray systems and cable ladder systems for cable management
ISO 4582	Determination of changes in colour and variations in properties after exposure to daylight under glass, natural weathering or laboratory light sources
ISO 4589	Determination of burning behaviour by oxygen index
ISO 527-5	Determination of tensile properties
NEMA FG1	Test conditions for unidirectional fibre-reinforced plastic
NEMA VE1	Fibre glass cable tray systems
	Metal cable tray systems

Professional Documents

Reference	Title
Not applicable	

Regulations

Reference	Title
Not applicable	

Codes

Reference	Title
ASTM A 123	Standard specification for Zinc (Hot-Dip Galvanized)

Other documents

Reference	Title
Not applicable	

Total General Specifications

Reference	Title
Not applicable	

3. Environmental conditions

The cable trays/ladders shall be suitable for installation in a saliferous, corrosive and marine environment.

Design ambient temperature shall be 40°C with 100% humidity.

4. Technical requirements

Cable trays/ladders systems shall be of the following types:

- **Offshore and costal areas:**
 - **Outdoor:** Aluminium 5754 or stainless steel ref. 316 L or GRP
 - **Indoor :** Same as outdoor or hot dip galvanised steel

For North Sea installations, cable trays/ladders shall be made of stainless steel ref. 316 L unless regulations/codes authorise use of Aluminium 5754.

For telecommunication and low level signals, only metallic cable trays should be used to limit lightning effects and enhance EMC.

Cable trays and ladders shall have obtained the accreditation for use in offshore/marine installations, from at least two major classification societies such as Bureau Veritas, Lloyds Register, ABS etc..

- **Onshore installation:** Hot dip galvanised steel, for indoor and outdoor.
 - **Alternate:** Aluminium 5754, GRP or stainless steel ref. 316 L trays/ladders may be used where environment is corrosive.

Cable tray/ladder systems shall be complete with all Manufacturer accessories and prefabricated fittings. Lids shall be fixed with heavy duty removable clips/clamps.

Cable trays shall have safe rolled flanges and no sharp edges.

Minimum cable ladder width shall be 300mm.

Ladders shall have a minimum external depth of 150 mm.

Cable ladders mechanical resistance as per [NEMA FG1 / VE1](#) tests shall be selected in accordance with the detailed cable routing and support studies:

- NEMA class 10B (span =3m) or 20B (span = 6m): Load =110kg/m
- NEMA class 10C (span =3m) or 20C (span = 6m): Load =150kg/m

The suitable cable trays mechanical resistance shall be defined by MANUFACTURER according to the expected loads and spans given by CONTRACTOR.

Mechanical rigidity shall be guaranteed at splice connectors, which shall have sufficient structural capacity.

4.1 Hot dip galvanised cable trays/ladders

Cable trays/ladders shall be made of mild steel.

Cable trays shall be of perforated type.

Cable tray sheet steel thickness shall be 1.5 mm as a minimum.

The mild steel shall be hot dip galvanised after fabrication as per [ASTM A 123](#).

Cable trays shall be supplied in standard length of 3m. Ladders may be supplied in standard length of 3m or 6m.

Bolts, nuts, washers, screws shall be hot dip galvanised.

4.2 Aluminium 5754 - Cable trays/ladders

Cable trays/ladders shall be manufactured to comply with [NEMA VE1](#) requirements.

Cable trays shall be channel type with perforated bottom.

The thickness shall be 1.5 mm as a minimum.

Trays shall have a maximum width of 500 mm and shall be supplied in standard length of 3m.

Cable ladders shall have rails and horizontal rungs. Both of these shall be of same material. The rungs shall be placed 300 mm apart. The ladders shall be supplied in standard lengths of 3m or 6m.

Side rails and fittings shall preferably have holes all along their length as well as the rungs for easy fastening of the cables and for quick installation of the splice connectors.

All fittings such as bends, tees, reducers, crosses and droppers shall conform to [NEMA VE1](#). All nuts, bolts, washers, etc. shall be stainless steel, ref. 316 L.

Insulating materials such as PVC tape (Vinyl or Plexiglas) shall separate Aluminium trays/ladders from painted steel supports to prevent galvanic corrosion. In addition, plastic sleeves shall be installed around the bolts. A bimetallic Al/Cu washer shall be used for earthing connections.

4.3 Glass Reinforced Polyester (GRP) cable trays/ladders

GRP cable ladders shall be manufactured to comply with **NEMA FG1** destruction tests. Cable trays/ladders shall be corrosion resistant, fire retardant and ultraviolet rays resistant with:

- oxygen index > 32 according to **ISO 4589**
- conformity to **IEC 60 695-2-1** at 850°C
- conformity to **ISO 4582**, **ISO 4892-2** and **ISO 527-5**

GRP cable trays and cable ladders shall comply with **CENELEC EN 50014** - paragraph 7, regarding protection against electrostatic effects taking into account the humidity rating and the local environment of each project.

When specified, treatments may be required for a 0% halogen property (for indoor installation only).

Cable trays shall be channel type with perforated bottom. The trays shall have a maximum width of 300 mm. Cable trays shall be supplied in standard lengths of 3m

All accessories shall be smoothly curved to avoid cable injury.

Cable ladders shall be used for width above 300 mm. Cable ladders shall have rails and horizontal rungs. Design shall include means of secure cable fastening, such as perforation or cleating accessories.

Cable ladders shall be made of 100% GRP. Glue or thermo-plastic rungs fixing accessories are not acceptable for fire and mechanical safety purposes. Rungs shall be placed maximum 300 mm apart.

Ladders should be supplied in standard lengths of 3m maximum.

Ladders shall be heavy duty type and shall at least comply with one of the following requirements:

- Class "10 C" minimum (150 kg/meter at 10 feet supporting distance according to **NEMA FG1** test procedure).

All fittings such as bends, tees, reducers, crosses and droppers shall be available in GRP from the same manufacturer. All hardware such as nuts, bolts, washers, etc. shall be stainless steel, ref. 316 L.

4.4 Stainless steel 316 L cable trays/ladders

Cable trays shall be channel type with perforated bottom.

The trays shall have a maximum width of less than 500 mm. Trays shall be supplied in standard lengths of 3m.

Cable tray sheet steel thickness shall be 0.8 mm as a minimum.

Cable ladders shall have rails and horizontal rungs. Both of these shall be of same material. The rungs shall be placed 300 mm apart.

Side rails and fittings shall have holes all along their length as well as rungs for easy fastening of the cables and for quick installation of splice connectors.

All hardware such as screws, bolts, nuts, washers shall be stainless steel 316 L. Plastic sleeves shall be installed around the bolts.



4.5 Painting

SUPPLIER shall provide tins of cold galvanising as required for touch-up purposes of the hot-dip galvanized cable trays/ladders.

SUPPLIER shall provide tins of special paint resin as required for touch-up the GRP tray/ladder.

5. Testing and inspection

Testing and inspection of cables trays/ladders shall include but not necessarily be limited to the following:

- A quantitative check shall be made to ensure all items with accessories are in accordance with the purchase order and the packing list.
- A visual inspection shall be made, to ensure that good workmanship and practice were maintained throughout the fabrication.

Mechanical tests:

On COMPANY request, cable ladders shall be tested as per NEMA requirements (deflection and destruction tests).

6. Certification

All equipment manufactured by the same SUPPLIER shall:

- Have been type tested
- Have been used in continuous satisfactory service on offshore/onshore installations for a minimum of five years.

For GRP, the SUPPLIER shall provide type test certificates for the fire retardant and ageing properties (or 0% halogen when required).

In case the SUPPLIER is not the GRP manufacturer and the SUPPLIER has obtained type test certificates on its own name, all type tests reports shall clearly state the name and origin of the manufacturer (GRP processor) as well as the manufacturer product references.

For Aluminium 5754 and stainless steel 316 L, the SUPPLIER shall provide the mill certificates.

For all type of cable trays / ladders, the SUPPLIER shall provide the test reports.