

**HINDUSTAN SHIPYARD LIMITED
VISAKHAPATNAM-530 005**

**ENQUIRY TECHNICAL SPECIFICATION OF MARINE ELECTRIC CABLES FOR
INSTALLATION ON 50 T BOLLARD PULL TUG FOR INDIAN NAVY OUR
YARD NO.11162 -64**

1. SCOPE OF SUPPLY:

- 1.1 The supply shall include the complete material as described in the subsequent paragraphs of the technical specification.
- 1.2 All the cables shall be supplied in non-returnable drums of not less than 250 Metres +5% length.
- 1.3 **Quantity of cables Indicated in this specification is tentative. The same may be increased or decreased or some of the sizes may be deleted at the time of ordering.**
- 1.4 Testing of all cables shall be carried out in the presence of the Surveyors to the Indian Register of Shipping (IRS) as specified under Clause-4 below and the Inspection Reports from the above Surveyors and the Maker's Works Test Certificates duly attested by relevant Surveyors shall be supplied for all the cables. The offered Cables shall be ABS / IRS Class / IMO Type Approved. 4 copies of validated Type Approval certification and Maker's Works Test Certificates shall be supplied along with the Cables.
- 1.5 The scope of supply shall include secure packing, transporting and delivery of the Material in Shipyard. Both loose ends of the cables on drum shall be covered with watertight caps to avoid entry of moisture into the cables during storage. All cables shall be round in shape.
- 1.6 Cables shall be identified by Printing / Embossing on the outer sheath of the cable. The Marker material shall be suitable for its service and should give the following information at regular intervals.
Manufacturer's or Trade Name, IEC-60092-350, Halogen Free, IEC-60332-3, Category 'A', Year of Manufacture, Size and Voltage Grade.
- 1.7 The cables are required for installation on ocean going 50 Ton Bollard Pull Tug for Indian Navy our yard nos. 11162 – 64.

2. STANDARDS:

- 2.1 The finished cables as a whole and the quality and quantity of the materials employed Therein shall conform to IEC Publication 60092-350 with the latest amendments, and to be provided with IRS certificate of compliance for use in marine applications. All cables shall be flame retardant type complying with the latest requirements of SOLAS 1997 [Safety of Life at Sea] Regulations. For this purpose the cables when bunched shall satisfy the vertical flammability test as per IEC Publication 60332-3,

Category-'A' and Halogen Free-satisfying Test requirements of IEC 60754-1&2. The vessel is classified with Indian Register of Shipping. Hence, the cables for this vessel shall be inspected, tested and certified by IRS Surveyors only.

2.2 All cables shall be round in shape and non-compacted.

2.3 Where cables are to be fire resistant they are to comply with tests IEC 60331-21 series.

3 TECHNICAL SPECIFICATION:

Requirements of the various types of cables are specified below. The construction of Cables shall be as per the requirements of IRS and IEC Publication No.60092-350.

3.1 Power Cables:

3.1.1 Construction:

The power cables of the following construction shall be supplied.

3.1.1.1 Annealed, Tinned, Circular Stranded Copper Conductors in accordance with IEC- 60228, Class-2.

3.1.1.2 Suitably compounded Ethylene Propylene Rubber (EPR) E85 Insulation / Cross Linked Polyethylene XLPE R85 insulation as per IEC 60092 – 350. **Type of Insulation offered shall be indicated in the offer.**

3.1.1.3 Over insulation suitable tape shall be provided. The quality of tape shall be such that it shall prevent any possibility of mixing of plasticizers with insulation and damaging it. The insulation of the core shall be with printed numbers for each core, for identification. Alternatively, the insulation itself may be coloured with different colour for each core, for identification.

3.1.1.4 Required Number of Cores laid up.

3.1.1.5 Halogen Free Inner sheathing. The sheath shall be applied filling interstices of each insulated core. The sheathing shall be in accordance with IEC – 60092-350. **Type of sheathing material shall be indicated in the offer.**

3.1.1.6 Bedding shall be provided by applying suitable tape helically half lap for wire braiding.

3.1.1.7 Galvanized steel wire braiding shall be provided uniformly and surface shall be free from scratches. The coverage of braiding shall conform to the requirements of IEC 92 –350.

3.1.1.8 Black coloured Outer sheath of halogen free, heat resistant and flame retardant type conforming to IEC – 60092-350 as amended shall be provided. The sheath shall also comply with the requirement to meet flame retardant test of IEC – 60332-3 Category - “A”. **Type of sheathing material shall be indicated in the offer.**

3.1.2 Sizes and Quantity Requirement of Power Cables:

Sl. No.	Nom. Section of Each Conductor (Sq. mm)	No. of Cores	Voltage Grade (KV)	Quantity Req'd. for 3 Tugs (Mtrs)
1	95	1	0.6/1.0	250
2	35	4	0.6/1.0	300
3	35	2	0.6/1.0	300
4	50	3	0.6/1.0	600
5	10	4	0.6/1.0	250
6	16	3	0.6/1.0	1250
7	10	3	0.6/1.0	300
8	10	2	0.6/1.0	300
9	6	4	0.6/1.0	250
10	6	3	0.6/1.0	650
11	6	2	0.6/1.0	450
12	4	3	0.6/1.0	1050
13	4	2	0.6/1.0	450
14	2.5	4	0.6/1.0	450
15	2.5	3	0.6/1.0	3000
16	2.5	2	0.6/1.0	5500

3.2 Control Cables:

3.2.1 Construction:

Construction of the control cables shall be same as power cables detailed under 3.1.1 above. However, core identification for cables, numbered tape shall be provided by printing Arabic Numbers on insulation itself for each core.

3.2.2 Sizes and Quantity Requirement of Control Cables:

The Sizes and quantities required of the control cables specified under 3.2.1 are indicated in the following table.

Sl. No.	Nom. Section of Each Conductor (Sq. mm)	No. of Cores	Voltage Grade (KV)	Quantity Req'd. for 3 Tugs (Mtrs)
1	1.5	16	0.6/1.0	650
2	1.5	12	0.6/1.0	650
3	1.5	10	0.6/1.0	1050
4	1.5	7	0.6/1.0	400
5	1.5	5	0.6/1.0	600
6	1.5	4	0.6/1.0	300
7	1.5	3	0.6/1.0	2500
8	1.5	2	0.6/1.0	8000
9	1.5	2	0.6/1.0	1000
10	1	20	0.6/1.0	650
11	1	16	0.6/1.0	650
12	1	7	0.6/1.0	350
13	1	5	0.6/1.0	1150

14	1	4	0.6/1.0	250
15	1	3	0.6/1.0	250
16	1	2	0.6/1.0	3000

¥ - Fire Resistant cable to comply with IEC 331-21.

3.3 Telephone Cables:

3.3.1 Telephone Cables of the following construction shall be supplied.

3.3.1.1 Annealed, Tinned, Stranded Copper Conductor of high conductivity.

3.3.1.2 EPR / XLPE 85°C Insulation as per IEC 60092 - 350

3.3.1.3 Core Identification shall be by providing numbered tape on insulation or by printing Arabic numbers on insulation itself for each core.

3.3.1.4 The cores shall be twisted together into pair / pairs and laid up.

3.3.1.5 Halogen Free Inner sheathing. The sheath shall be applied filling interstices of each insulated core. The sheathing shall be in accordance with IEC – 60092-350.
Type of sheathing material shall be indicated in the offer.

3.3.1.6 Over the sheath bedding shall be provided with a suitable polyester tape for wire braiding.

3.3.1.7 The assembly shall be provided with annealed, copper wire braiding on the above bedding, conforming to IEC-60092-350 requirements.

3.3.1.8 Black coloured Outer sheath of halogen free, heat resistant and flame retardant Type confirming to IEC – 60092-350 as amended shall be provided. The sheath shall also comply with the requirement to meet flame retardant test of IEC – 60332-3 Category – “A”. **Type of sheathing material shall be indicated in the offer.**

3.3.2 Sizes and Quantity Requirement of Telephone cables:

The sizes and quantities required of the Telephone cables specified under 3.3.1 are indicated in the following Table.

Sl. No.	Nom. Section of each conductor(Sq. mm)	No. of pairs	No. of cores	Voltage grade	Quantity Req'd. for 3 Tugs (Mtrs)
1	0.75	1	2	150 / 250 V	2050
2	0.75	2	4	150 / 250 V	1750
3*	0.75	2	4	150 / 250 V	450
4	0.75	4	8	150 / 250 V	450
5	0.75	5	10	150 / 250 V	450
6*	0.75	5	10	150 / 250 V	250
7	0.75	6	12	150 / 250 V	450
8	0.75	7	14	150 / 250 V	300

9*	0.75	7	14	150 / 250 V	300
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Note: * These cables shall have individual pair screening in addition to common copper wire braiding.

3.4 Cabin Wiring Cable:

3.4.1 Cabin wiring cable of following construction shall be supplied.

3.4.1.1 Tinned annealed circular stranded copper conductor of high conductivity

3.4.1.2 EPR [E85] insulation / XLPE (R85) . Insulation shall be coloured for core identification or numbered for each core.

3.4.1.3 Two core shall be twisted together and laid up.

3.4.1.4 Extruded black coloured Sheathing of flame retardant type conforming to IEC-60092- 350 and IEC -60332-3 Category-"A". **Type of sheathing material shall be indicated in the offer.**

3.4.1.5 Voltage grade of the cable shall be 250V

3.4.1.6 Conductor Section of each core shall be 1.5 Sq. mm. and No. of cores shall be two (2) and Three (3)

3.4.2 Total Quantity Required - 2 X 1.5 Sq. mm - 3000 Mtrs. for three Tugs.
3 X 1.5 Sq. mm – 3000 Mtrs. for three Tugs

4. TESTING AND INSPECTION:

The following tests shall be carried out on the finished cables in the presence of the Surveyors to Indian Register of Shipping. Inspection Certificates of above Classification Society and Maker's Test Certificates duly attested by the relevant surveyors indicating respective drum numbers shall be supplied for all the cable lengths in 5 copies. The testing shall be conducted as per the recommendations of the International Electro-technical Commission (IEC) Publication No.60092-350 and flammability Test shall be conducted on vertical bunched cables as per IEC Report 60332-3, Category-"A". Test on Electrical Cables for Gases evolved during combustion of Materials shall be conducted as per IEC 60754 – 1 & 2.

4.1 Routine Tests:

The following tests specified in IEC-60092-350 shall be conducted on all the cable lengths covered in the specification.

4.1.1 Measurement of Conductor Resistance.

4.1.2 Conductor Dimension.

4.1.3 High Voltage Test.

4.1.4 Insulation Resistance test.

4.1.5 Dielectric Strength.

4.2 **Special Tests:**

The following special tests specified by IEC 60092-350 shall be carried out on the sample from 10% of the total lengths of cables.

- 4.2.1 Conductor Examination.
- 4.2.2 Check of Dimensions.
- 4.2.3 Hot set Test for EPR / XLPE Insulation
- 4.2.4 Water tightness Test.
- 4.2.5 Test for Metal coating for copper wires.
- 4.2.6 Galvanizing Test.
- 4.2.7 Test at low temperature for PVC
- 4.2.8 Flame Retardant Test as per IEC-60332-3, Category-"A".

4.3 **Type Test**

The following tests specified by IEC-60092-350 shall be carried out on the sample length of only one size from each type of cable.

- 4.3.1 Type Tests, Electrical as per Clause-11 of IEC-60092-350
- 4.3.2 Type Tests, non-electrical as per Clause-12 and Table -I of IEC- 60092-350
- 4.3.3 Test for Halogen Free as per IEC – 60754 – 1 & 2.
- 4.3.4 Flame Retardant Test as per IEC-60332-3, Category-"A".

5 The Tenderer shall necessarily furnish the following in the Technical bid.

- 5.1 Complete Construction Details such as thickness of insulation, thickness of sheathing materials, diameter of wirebraid, overall diameters, weight, etc., along with technical leaflets / literature for the offered cables.
- 5.2 Copies of Type Approval Certificates for the offered cables.
- 5.3 Reference list.
- 5.4 The Clause wise confirmations to all the clauses of enquiry Technical Specification, indicating deviations if any, for our consideration.

MANAGER
(Electrical Designs)