
	OFFSHORE ENGINEERING SERVICES	FUNCTIONAL SPECIFICATION FOR SUBSEA COMPOSITE CABLE	Spec. No.	FS 4020
			Rev. No.	7
			Discipline	ELECTRICAL
			Page: 1 OF 18	

FUNCTIONAL SPECIFICATION FOR SUBSEA COMPOSITE CABLE

Prepared / Revised by	Reviewed by	Co- reviewed by	Approved by	Total No. of Pages	Date	Rev. No.
Disp Engg	Disp Head	Grp Head	HOD	18	17.12.2018	7

FORMAT No. OES/SOF/028	Ref. PROCEDURE No.	ISSUE No. 03	REV. No. 00	REV. DATE: 26.02.2018
---------------------------	--------------------	-----------------	----------------	--------------------------

	OFFSHORE ENGINEERING SERVICES	FUNCTIONAL SPECIFICATION FOR SUBSEA COMPOSITE CABLE	Spec. No.	FS 4020
			Rev. No.	7
			Discipline	ELECTRICAL
			Page: 2 OF 18	

1.0 SCOPE


This specification defines the functional requirements for the design, factory inspection, testing, load out, laying and termination of sub-sea composite cables made up of High Voltage power cables in combination with optical fiber unit. The termination of subsea cable shall be done through splitter box/straight through joint at the platform. The cable shall be designed & manufactured to meet the technical requirement.

2.0 APPLICABLE CODES, STANDARDS & REGULATIONS

As a minimum, all offered sub-sea cables and associated accessories shall be designed, manufactured, tested, supplied and installed in accordance with the applicable provisions of the latest revision of relevant National/International Codes, Standards & Regulations listed below. In the event of a conflict between various Codes and Standards, the one which is most stringent, shall be applicable.


BIS	Bureau of Indian Standards
BSI	British Standards Institution
CENELEC	European Standards published by CENELEC
IEEE Std 1120-2004	IEEE Guide for the Planning, Design, Installation, and Repair of Submarine Power Cable Systems
DNVGL-RP-F401(2017):	Electrical Power Cables in Subsea Applications
NEC	National Electric Code (USA)
NACE	National Association of Corrosion Engineer (USA)
International Electro Technical Commission (IEC):	
IEC 60038	IEC Standard Voltages
IEC 60794	Optical Fibre Cable
IEC 60060-1	High Voltage Test Techniques - General Definitions and Test Requirements.
IEC 60060-2	High voltage test techniques - measuring systems
IEC 60071-1	Insulation coordination - definitions, principles and rule

FORMAT No. OES/SOF/028	Ref. PROCEDURE No.	ISSUE No. 03	REV. No. 00	REV. DATE: 26.02.2018
---------------------------	--------------------	-----------------	----------------	--------------------------

	OFFSHORE ENGINEERING SERVICES	FUNCTIONAL SPECIFICATION FOR SUBSEA COMPOSITE CABLE	Spec. No.	FS 4020
			Rev. No.	7
			Discipline	ELECTRICAL
			Page: 3 OF 18	


IEC 60071-2	Insulation coordination - application guide
IEC 60183	Guidance for the selection of high-voltage A.C. cable systems
IEC 60228	Conductors of insulated cables
IEC 60229	Electric cables - Tests on extruded over sheaths with a special protective function
IEC 60230	Impulse tests on cables and their accessories
IEC 60287-1-1	Electric cables - Calculation of the current rating - Part 1-1: Current rating equations (100 % load factor) and calculation of losses - General
IEC 60287-1-2	Electric cables - Calculation of the current rating - Part 1: Current rating equations (100 % load factor) and calculations of losses - Section 2: Sheath eddy current loss factors for two circuits in flat formation
IEC 60287-1-3	Electric Cables - Calculation of the Current Rating Part 1 - Current Rating Equations (100% load factor) and calculation of losses - Current sharing between parallel single- core cables and calculation of circulating current losses
IEC 60287-2-1	Electric Cables - Calculation of the Current Rating Part 2-1 - Thermal Resistance - Calculation of Thermal Resistance
IEC 60287-2-2	Electric Cables - Calculation of the Current Rating Part 2-1 Thermal Resistance Section 2 - A method for calculating reduction factors for groups of cables in free air, protected from solar radiation
IEC 60287-3-1	Electric Cables - Calculation of the Current Rating - Sections on operating conditions - reference operating conditions and selection of cable type
IEC 60502-1	Power Cables with Extrude Insulation and their Accessories for Rated Voltages from 1 kv (U[M] - 1.2 kv) upto 30 kv (u[m] = 36 KV) Part 1 - Cables for rated voltages of 1 kv (U[M] = 1.2 kv) and 3 kv (U[M] = 3.6 kv)

FORMAT No. OES/SOF/028	Ref. PROCEDURE No.	ISSUE No. 03	REV. No. 00	REV. DATE: 26.02.2018
---------------------------	--------------------	-----------------	----------------	--------------------------

	OFFSHORE ENGINEERING SERVICES	FUNCTIONAL SPECIFICATION FOR SUBSEA COMPOSITE CABLE	Spec. No.	FS 4020
			Rev. No.	7
			Discipline	ELECTRICAL
			Page: 4 OF 18	

IEC 60502-2	Power Cables with Extrude Insulation and their Accessories for Rated Voltages from 1 kv (U[M] - 1.2 kv) upto 30 kv (u[m] = 36 KV) Part 2 - Cables for rated voltages of 6 kv (U[M] = 7.2 kv) and upto 30 kv (U[M] = 36 kv)
IEC 60502-4	Power Cables with Extrude Insulation and their Accessories for Rated Voltages from 1 kv (U[M] - 1.2 kv) upto 30 kv (u[m] = 36 KV) Part 4 - Test requirements on accessories for Cables with rated voltages from 6 kv (U[M] = 7.2 kv) and upto 30 kv (U[M] = 36 kv)
IEC 60811-1-1	Common test methods for insulating and Sheathing materials of electric cables and optical cables Part 1-1 - Methods for General application - measurement of thickness and overall dimensions - Tests of determining the mechanical properties.
IEC 60811-1-2	Common test methods for insulating and Sheathing materials of electric cables and optical cables Part-1 methods for general application - Section Two: Thermal Ageing methods.
IEC 60811-1-3	Common test methods for insulating and Sheathing materials of electric cables and optical cables - methods for General Application - Methods for determining the density - Water absorption Tests - Shrinkage Test
IEC 60811-1-4	Insulating and Sheathing materials of Electric cables - Common Test Methods Part 1-4 - General Application - Tests at Low Temperature
IEC 60811-2-2	Insulating and Sheathing materials of Electric cables - Common Test Methods Part 2-1 - Methods specific to elastomeric compounds - Ozone Resistance, Hot Set Mineral Oil Immersion Tests
IEC 60811-3-1	Common Test Methods for Insulating and Sheathing materials of Electric cables - Methods to PVC Compounds - Pressure Test at High Temperature - Tests for Resistance to cracking
IEC 60885-3	Electrical Tests Methods for Electrical Cables - Test methods for partial discharge measurements on lengths of extruded power cable
IEC 60793-2	Optical fibres - Part 2: Product specifications - General.
IEC 60794-1-1	Optical fibre cables - Part 1-1: Generic specification - General

FORMAT No. OES/SOF/028	Ref. PROCEDURE No.	ISSUE No. 03	REV. No. 00	REV. DATE: 26.02.2018
---------------------------	--------------------	-----------------	----------------	--------------------------

	OFFSHORE ENGINEERING SERVICES	FUNCTIONAL SPECIFICATION FOR SUBSEA COMPOSITE CABLE	Spec. No.	FS 4020
			Rev. No.	7
			Discipline	ELECTRICAL
			Page: 5 OF 18	

IEC 60794-1-2

Optical fibre cables - Part 1-2: Generic specification - Cross reference table for optical cable test procedures

IEC 60304

Standard colors for insulation for low-frequency Cables and wires

ITU-T Recommendations

G.650

Definition and test methods for the relevant parameters of single-mode fibers

G - 652

Characteristics of Single Mode Fiber

G - 655

Characteristics of a non-zero dispersion shifted single-mode optical fiber cable.

G - 656

Characteristics of a fiber & cable with non-zero dispersion for wide band optical transport.

3.0 FUNCTIONAL DESCRIPTION


3.1 Scope of Supply

The sub-sea composite cable shall be manufactured, supplied and laid in a single length without field joints. The vendor shall furnish all required information for the offered cable in the data sheet DS 4020. The vendor shall also provide details of the maximum allowable tension during laying and pulling operations.

The allowable utilization factors for load for Installation, normal operation and abnormal operation shall be as per clause 3.8.1 of DNVGL-RP-F401(2017).

The vendor shall be responsible for ensuring that all the offered cables and accessories are suitable for the operating/site conditions specified in the bid

FORMAT No. OES/SOF/028	Ref. PROCEDURE No.	ISSUE No. 03	REV. No. 00	REV. DATE: 26.02.2018
---------------------------	--------------------	-----------------	----------------	--------------------------

	OFFSHORE ENGINEERING SERVICES	FUNCTIONAL SPECIFICATION FOR SUBSEA COMPOSITE CABLE	Spec. No.	FS 4020
			Rev. No.	7
			Discipline	ELECTRICAL
			Page: 6 OF 18	

package. The contractor shall ensure presence of cable manufacturer's representative on laying barge/ vessel during offshore installation and commissioning.

3.2 Technical Integrity & Safety

The vendor shall be responsible for the technical integrity of the offered cables and accessories including their design, materials, manufacture, testing, performance and specified engineering services. All such activities shall be in accordance with the scope of supply, this functional specification and interface information supplied by the Company or Purchaser.

3.3 Materials, Workmanship & Suitability

All materials used in the construction of sub-sea cables and accessories shall be of latest specifications, new and in current production.

3.4 Design life

Unless specified otherwise, all cables/ accessories shall be suitable for a design life of 25 years.


3.5 Units & Information

All quantities, measurements and dimensions shall be expressed in metric units only. All information, manual, certificates, data and inscriptions shall be in English language only.

4.0 TECHNICAL REQUIREMENTS

4.1 General

FORMAT No. OES/SOF/028	Ref. PROCEDURE No.	ISSUE No. 03	REV. No. 00	REV. DATE: 26.02.2018
---------------------------	--------------------	-----------------	----------------	--------------------------

	OFFSHORE ENGINEERING SERVICES	FUNCTIONAL SPECIFICATION FOR SUBSEA COMPOSITE CABLE	Spec. No.	FS 4020
			Rev. No.	7
			Discipline	ELECTRICAL
			Page: 7 OF 18	

The cable shall be suitable for laying at designated water depth .The cable shall be laid unburied on seabed and subjected to large water cross-currents. Coefficient of friction shall be taken from route survey report subject to a maximum of 0.7. Vendor shall perform required calculation to ascertain that the supplied cable is self stable in the seabed environmental condition. The On Bottom Stability calculations shall be submitted for approval prior to proceeding with cable manufacture. The vendor shall use the "Simplified Static Stability Analysis" method described in DNV RP-E305, 1988 or DNV RP-F109.

The vendor shall provide calculations for cable current rating on sea bed and when laid in air through J tube.

Centralizer shall be placed to protect the cable from abrasion in J-tube specially at bell mouth.

The free span (from the bell mouth of the J tube to the touch down point) shall be qualified with respect to fatigue as per methodology described at Appendix A (Qualification with respect to fatigue) of DNVGL-RP-F401(2017).

For cable crossing over pipeline, a barrier of minimum 350 mm shall be maintained. An impact protector such as uraduct, spiral duct, SCIP (Spirally Cut Impact Protector) or equivalent shall be provided for crossings. Further, similar protection shall be provided for the submarine cable from the bell mouth of the J tubes up to 50 m at each end of subsea cable.


The system voltage at the originating platform is 11KV and/or 6.6 KV, 3 phase, 50 HZ.

The cable insulation shall be rated to withstand

- a maximum continuous conductor temperature of 90°C at 100% continuous load
- a conductor temperature of 250°C during short-circuit conditions.

4.2 Power Conductors

FORMAT No. OES/SOF/028	Ref. PROCEDURE No.	ISSUE No. 03	REV. No. 00	REV. DATE: 26.02.2018
---------------------------	--------------------	-----------------	----------------	--------------------------

	OFFSHORE ENGINEERING SERVICES	FUNCTIONAL SPECIFICATION FOR SUBSEA COMPOSITE CABLE	Spec. No.	FS 4020
			Rev. No.	7
			Discipline	ELECTRICAL
			Page: 8 OF 18	

Conductors shall be of compact round, stranded, annealed uncoated copper wires conforming to IEC-60228.

4.3 Voltage Designation

Voltage designation for cables shall be as following in line with IEC - 60183 & 60092 - 353. However cables need to be supplied as per following rating:

System Voltage (kV)	Voltage grading for cables and accessories [U_0/U (U_m)] (as per IEC - 60183) (kV)
0.440	0.6 / 1.0 (1.2)
3.3	3.6 / 6 (7.2)
6.6	6 / 10 (12)
11	8.7 / 15 (17.5)

4.4 Water barrier

Block against water transport along the conductor shall be fitted. Water blocking along conductors shall be as per clause 3.5.1 of DNVGL-RP-F401(2017)


4.5 Insulation

The insulation shall be Cross-Linked Polyethylene (XLPE). The insulation thickness shall conform to IEC-60502.

4.6 Conductor shielding

A layer of semi-conducting compound compatible with the insulation and conductor shall be extruded over the conductor to form a stress control layer. Tape shall not be used and the maximum operating temperature of the shielding shall be equal to or higher than that of the insulation. The outer

FORMAT No. OES/SOF/028	Ref. PROCEDURE No.	ISSUE No. 03	REV. No. 00	REV. DATE: 26.02.2018
---------------------------	--------------------	-----------------	----------------	--------------------------

	OFFSHORE ENGINEERING SERVICES	FUNCTIONAL SPECIFICATION FOR SUBSEA COMPOSITE CABLE	Spec. No.	FS 4020
			Rev. No.	7
			Discipline	ELECTRICAL
			Page: 9 OF 18	

surface of the shield shall be cylindrical and firmly bonded to the overlying insulation.

4.7 Insulation shielding

The insulation shielding shall consist of extruded layer of semi- conducting compound bonded firmly and continuously to the insulation.

4.8 Metallic Shield

The insulation shielding shall be covered with two overlapping uncoated plain annealed copper tapes. A semi- conducting bedding tape may be applied between the insulation shielding and the metallic shielding.

4.9 Conductor Identification


Each conductor shall be identified by a different coloured plastic tape placed under the metallic shield. The color code shall be Red, Yellow and Blue.

4.10 Optical Fibre Core

The optical fibre cable in composite cable shall have high strength, low loss and should be designed to meet both mechanical, optical requirement.

Unless otherwise specified in the basic bid work, the optical fibre Cable shall consist of adequate number of single mode fibres with 100 % redundancy (minimum of 12 nos. single mode fibres), complying with ITU-T-G-652/655/656 suitable for working in the applicable wavelength region. LSTK contractor and subsea Cable vendor shall ensure the compatibility of subsea cable optical fibres and the optical convertors for signal propagation. Number of fibres of each kind and their construction shall be selected so as not to load the individual fibres beyond 50% of their bandwidth capacity. In addition to the above, a minimum of 4 nos. fibres shall be part of the cable conforming to ITU - T -G - 655 or 656 specifications for optical wideband transport.

FORMAT No. OES/SOF/028	Ref. PROCEDURE No.	ISSUE No. 03	REV. No. 00	REV. DATE: 26.02.2018
---------------------------	--------------------	-----------------	----------------	--------------------------

	OFFSHORE ENGINEERING SERVICES	FUNCTIONAL SPECIFICATION FOR SUBSEA COMPOSITE CABLE	Spec. No.	FS 4020
			Rev. No.	7
			Discipline	ELECTRICAL
			Page: 10 OF 18	

The housing of FO cables shall be slotted type with stainless steel tube.

Splicing and preparation of optical fibres for termination shall be done with standard and approved / certified equipment. All optical fibre cores coming shall be first terminated at fibre termination cabinet. Terminals and adapters used shall conform to the relevant specifications.

4.11 Assembly of Cores

The three insulated power conductors and one optical fibre unit shall be laid up together with suitable non-hygroscopic fillers and wrapped with suitable overlapping binding tapes.

4.12 Anti Teredo Tape and Armour Assembly


Two layers of uncoated copper tapes shall be helically applied over the assembled core. The two tapes shall be laid helically so that the outer tape is approximately central over the gap of the inner tape. The gap between two adjacent turns of each tape shall not exceed 50% of the width of the tape. A suitable bedding tape(s) shall be applied under the anti-teredo protection and anti-corrosive compound shall be applied over the anti-teredo protection. Alternatively, when the cable water submerged weight shall be increased for the on-bottom stability issue, Tape armour can be applied instead of Antiteredo Protection tapes.

A single layer of polypropylene yarn shall be applied over the tape to provide a bedding for the wire armour. A single layer of galvanized steel wire armour shall be provided over the protective tape. An anti- corrosive compound shall be applied over the armour.

4.13 Overall Serving

Two layers of polypropylene yarn shall be applied over the armour.

FORMAT No. OES/SOF/028	Ref. PROCEDURE No.	ISSUE No. 03	REV. No. 00	REV. DATE: 26.02.2018
---------------------------	--------------------	-----------------	----------------	--------------------------

	OFFSHORE ENGINEERING SERVICES	FUNCTIONAL SPECIFICATION FOR SUBSEA COMPOSITE CABLE	Spec. No.	FS 4020
			Rev. No.	7
			Discipline	ELECTRICAL
			Page: 11 OF 18	

4.14 Markings

The white narrow tape printed with the following information in black shall be applied throughout the length of the cable over the laid-up cores -

- manufacturer's name and/or trade name
- year of manufacture

5.0 QUALITY ASSURANCE, INSPECTION AND TESTING

5.1 *Inspection*

The inspection and testing requirements for the component parts of the submarine composite cable shall be submitted as part of the Vendor's bid in his Quality Plan for approval by the Company.


After Company approval of the detailed design the Vendor shall procure the necessary components and proceed to manufacture and assembly of the submarine composite cable.

All material and equipment shall be inspected and tested to the requirements of relevant standards & specification. Contractor/Company reserves the right to witness such inspection/tests.

Company/its authorized representative or certifying agency shall have access to inspect the equipment at any stage during manufacture. During inspection, material certificates and shop test data, shall be furnished so as to ascertain that the specifications and quality are complied with.

Any or all the tests, including hydrostatic tests, shall at company's option be witnessed by the Company/its authorized representative or certifying agency.

FORMAT No. OES/SOF/028	Ref. PROCEDURE No.	ISSUE No. 03	REV. No. 00	REV. DATE: 26.02.2018
---------------------------	--------------------	-----------------	----------------	--------------------------

	OFFSHORE ENGINEERING SERVICES	FUNCTIONAL SPECIFICATION FOR SUBSEA COMPOSITE CABLE	Spec. No.	FS 4020
			Rev. No.	7
			Discipline	ELECTRICAL
			Page: 12 OF 18	

Vendor shall give minimum 15 days prior intimation regarding testing schedules.

5.2 *Sub-sea composite cable testing*

Vendor shall carryout the factory tests specified. Contractor/Company shall have the option of witnessing all factory testing. Contractor/Company shall be informed at least two weeks in advance of any testing.

5.2.1 Tests during manufacture

The manufacturer shall carry out, during the manufacturing process, tests at various stages, as set down in the approved quality control plan in order to prove integrity and compliance with specifications, but should include testing of each power core as follows:-

i) Partial discharge test

Requirements : As per IEC-60502 for one sample for each extruded run of insulation.

ii) HV AC Test : As per IEC-60502 for entire length of manufactured cable cores

iii) Conductor Resistance for entire length of manufactured cable cores:

The DC electrical resistance each conductor shall be measured and shall conform to values as per IEC 60228.


iv) Dimensional check

Dimensional checks of following, conforming to IEC 60502 shall be performed on two samples from each size of cable.

5.2.2 Power Cable Tests

Composite submarine cable manufaturer(s) shall carry out routine tests as per IEC 60502-2 or latest amendments.

FORMAT No. OES/SOF/028	Ref. PROCEDURE No.	ISSUE No. 03	REV. No. 00	REV. DATE: 26.02.2018
---------------------------	--------------------	-----------------	----------------	--------------------------

	OFFSHORE ENGINEERING SERVICES	FUNCTIONAL SPECIFICATION FOR SUBSEA COMPOSITE CABLE	Spec. No.	FS 4020
			Rev. No.	7
			Discipline	ELECTRICAL
			Page: 13 OF 18	

The contractor shall furnish a certificate from a third party testing agency acceptable to ONGC confirming that all type or qualifying tests as required under IEC codes have been successfully completed prior to its shipment.

The following special test on finished cable shall be carried out though not limited to same:

1. Conductor examination
2. Measurement of thickness of insulation and non-metallic sheaths
3. Measurement of thickness of metallic sheath
4. Measurement of diameters of various layers
5. Hot set test for XLPE insulation
6. Measurement of capacitance
7. Measurement of voids, contaminants and protrusions of XLPE insulation

Type Test Certificates

Type test certificates for the following tests shall be produced.

- Tensile Bending test
- Tensile Test
- Impulse voltage test followed by AC Test
- Heating cycle voltage test
- Loss angle and capacitance measurement test
- Water penetration test (conductor longitudinal)- CIGRE 490
- Mechanical dimensional check
- Overall dimension
- Manufacturer shall also carry out the following tests :-
 - Manufacturer shall carry out the mechanical testing of Submarine Composite Cables as per IEEE 1120 & CIGRE ELECTRA 171.
 - Insulation resistance Test (as per clause 18.2.1, IEC-60502-2)

FORMAT No. OES/SOF/028	Ref. PROCEDURE No.	ISSUE No. 03	REV. No. 00	REV. DATE: 26.02.2018
---------------------------	--------------------	-----------------	----------------	--------------------------

	OFFSHORE ENGINEERING SERVICES	FUNCTIONAL SPECIFICATION FOR SUBSEA COMPOSITE CABLE	Spec. No.	FS 4020
			Rev. No.	7
			Discipline	ELECTRICAL
			Page: 14 OF 18	

- High Voltage test (as per clause 18, IEC-60502-2)

This test is conducted to prove that insulation system is suitable for the nominal system voltage for the system designed life. This is an accelerated test using empirical data to determine test voltage, test duration corresponding to system voltage and system designed life.

5.3 Factory Acceptance Tests (FAT) On Sub-sea Composite cable

The total length of sub-sea composite cable shall be subjected to FAT after completion of manufacturing of the cable. Sub-sea cables shall be tested in compliance with the requirements of the Standards to which they are manufactured along with all optional tests. Company shall be advised at least four weeks in advance of the scheduled date of each test and again twenty days prior to the actual test.

i) DC Resistance of Power Cable

The DC resistance and capacitance of the power cable shall be measured on the entire length.

ii) DC High Voltage Test on Power Cable - As per of IEC - 60502

iii) Time Domain Reflecto-meter Test


The power cable shall be checked by performing measurement with a Time Domain Reflecto-meter.

(iv) Longitudinal water blocking shall be tested in accordance with clause 3.5.2 and 3.5.3 of DNVGL-RP-F401(2017).

5.4 Pre Load-Out Test & Post Load-Out Tests

Vendor shall carry out the recommended tests before and after load out to confirm the integrity of the entire cable quantity supplied. The tests shall be witnessed by the Company or its authorized representative. The contractor shall

FORMAT No. OES/SOF/028	Ref. PROCEDURE No.	ISSUE No. 03	REV. No. 00	REV. DATE: 26.02.2018
---------------------------	--------------------	-----------------	----------------	--------------------------

	OFFSHORE ENGINEERING SERVICES	FUNCTIONAL SPECIFICATION FOR SUBSEA COMPOSITE CABLE	Spec. No.	FS 4020
			Rev. No.	7
			Discipline	ELECTRICAL
			Page: 15 OF 18	

ensure that all material employed shall be available prior to and after the manufacture of the cables for Company's inspection by the cable manufacturer. Immediately after completion of the tests, certificates for the tests conducted along with all back-up documents, log sheets, test results, etc., shall be furnished to the Company.

The contractor shall furnish all necessary information in respect of the supply of cables to the Company's Inspector or Representative. The Inspector shall have free access to the manufacturer's works for the purpose of inspecting the process of manufacture during all stages and shall have authority to reject any material or finished product which appears to be unsuitable or of unsatisfactory quality.

6.0 SUB-SEA COMPOSITE CABLE REPAIR KIT

Vendor shall hand over the following spare for each cable size as specified in the Bid-


- (i) Two sub- sea composite cable repair kits.
- (ii) Sub- sea composite cable spare length of 200 m plus additional length equal to twice the water depth, stored on reel.

Vendor shall provide full details of recommended repair splice kits possibly required during installation due to damage and future maintenance of the submarine composite cable. Vendor shall furnish detailed procedure for carrying out submarine composite cable repair after installation. The contents of a complete kit shall be described in the procedure.

7.0 INSTALLATION AIDS

The Vendor shall be responsible for providing the suitably sized construction aids as listed below -

FORMAT No. OES/SOF/028	Ref. PROCEDURE No.	ISSUE No. 03	REV. No. 00	REV. DATE: 26.02.2018
---------------------------	--------------------	-----------------	----------------	--------------------------

	OFFSHORE ENGINEERING SERVICES	FUNCTIONAL SPECIFICATION FOR SUBSEA COMPOSITE CABLE	Spec. No.	FS 4020
			Rev. No.	7
			Discipline	ELECTRICAL
			Page: 16 OF 18	

- Bull Nose(s) or other suitably recommended pulling arrangement
- Hanger clamp attachment to transfer the load of the cable to J tube after installation
- Through joint kits and any protection devices for use on the offshore platform for control and power cable break-out jointing to the platform
- Temporary test caps required to establish the integrity of the cable at all times during installation
- termination kits at each end of the cable and cable lugs
- All glanding and cable earthing items
- Temporary cable abandonment device during installation.

The cable manufacturer/ vendor shall work in close co-ordination with the contractor to firm up all aspects of cable installation in offshore. In case vendor considers any other construction aids necessary for successful installation of the cable, the same shall be included in the offer.

8.0 CABLE LOADOUT

Vendor shall load out the manufactured and tested cable onto contractor supplied cable transport means, at the manufacturer's facility using internationally recognized and standard industry practices.

Vendor shall make available all specialized equipment and personnel necessary to affect the load out in an efficient manner.

The exposed cable ends shall be terminated in a pulling device and shall be protected to prevent damage to the cable. The individual phase conductors as well as plot wire core and fibre optic unit shall be sealed to prevent water ingress.

The cable shall be spooled onto the transportation/laying device in a manner that avoids slack and/or over-tensioning of the cable.

FORMAT No. OES/SOF/028	Ref. PROCEDURE No.	ISSUE No. 03	REV. No. 00	REV. DATE: 26.02.2018
---------------------------	--------------------	-----------------	----------------	--------------------------

	OFFSHORE ENGINEERING SERVICES	FUNCTIONAL SPECIFICATION FOR SUBSEA COMPOSITE CABLE	Spec. No.	FS 4020
			Rev. No.	7
			Discipline	ELECTRICAL
			Page: 17 OF 18	

Where called for in the requisition, short length of cable shall be delivered on drums.


9.0 DOCUMENTATION AND MANUALS

Consistent with the aim to minimize documentation, only documents which provide key interface information shall be required for review by the Company. All such documents shall be identified, discussed and agreed by both the contractor and vendor and shall be submitted for Company's approval to form the basis of an agreed document submission schedule.

However, following documents, in respect of sub-sea composite cable and cable accessories, shall be included as part of the Purchase Specification -

- Design documents such as calculation for sizing, short circuits, voltage drop, on-bottom stability under dynamic site conditions, etc.
- Type test certificates
- Cable data sheet and cross sectional drawings showing dimensional details of conductor, insulation, sheathing, core arrangement, etc.
- Product catalogue containing technical specification, design and construction features, etc.
- Cable installation/laying procedure
- Vendor's standard Quality Plan
- Manufacturing & Delivery schedule
- Details of after sale services offered
- Comments/ Deviations/ Exceptions
- Manufacturer's Operation & Maintenance Manual
- List of Sub- vendors with address and contact numbers
- Track record for the past supplies for similar applications

FORMAT No. OES/SOF/028	Ref. PROCEDURE No.	ISSUE No. 03	REV. No. 00	REV. DATE: 26.02.2018
---------------------------	--------------------	-----------------	----------------	--------------------------

	OFFSHORE ENGINEERING SERVICES	FUNCTIONAL SPECIFICATION FOR SUBSEA COMPOSITE CABLE	Spec. No.	FS 4020
			Rev. No.	7
			Discipline	ELECTRICAL
			Page: 18 OF 18	

Vendor shall furnish drawings and data in accordance with the requirements of the requisition and specification. Descriptive literature for all items together with a full system description shall be provided as part of the bid.

10.0 HEALTH, SAFETY & ENVIRONMENTAL REGULATIONS

The contractor/ vendor shall be responsible for ensuring that all the goods and services supplied meet all applicable regulations on health, safety and environmental issues.

11.0 CERTIFICATION

All sub-composite cables and accessories of similar design and construction features manufactured by the same vendor -

- shall have been type tested by an authority approved by the Company
- shall be having current certification/ approval/ listing by a national/ international statutory body or Company approved accredited agency.

FORMAT No. OES/SOF/028	Ref. PROCEDURE No.	ISSUE No. 03	REV. No. 00	REV. DATE: 26.02.2018
---------------------------	--------------------	-----------------	----------------	--------------------------