

MOOS JDR-EOM CABLE SPECIFICATION

Revision 1.0

Rev. 1.0 – 14NOV05 Broke the firm requirements of the original specification out into this separate document. A. Hamilton

1.0 CABLE CONSTRUCTION REQUIREMENTS.

- 1.1 **Length.** Cable shall be delivered in a continuous length of 4100 meters. A minimum of five meters shall be accessible at both ends of the cable to allow for testing on the shipping drum.
- 1.2 **Strength member.** The cable strength member shall be synthetic fiber consistent with a minimum seawater weight and good fatigue life over the service life.
- 1.3 **Fishbite protection.** The fish-bite protection consisting of 48X2 SS wires shall extend 3350m from the buoy end of the cable.
- 1.4 **Jackets.** All sections of the cable shall be jacketed with a polyethylene jacket for protection and to allow the operation of inductively coupled data modems on the riser cable. The outer jacket color shall be BLACK for the fishbite protected section and high visibility ORANGE in the non-fishbite protected section (inner jacket). The jacket shall be free of any skips or gaps that would expose the armor to seawater.
- 1.5 **Jacket Markings.** The jacket shall be marked with meter markers at least every 5 meters, starting at zero from the buoy end (FishBite protected end).

2.0 CABLE PERFORMANCE REQUIREMENTS.

- 2.1 **General and Environmental.** The riser cable performance shall not be degraded by conditions typical of the working environment, including:
 - 2.1.1 Continuous submergence in seawater over working life.
 - 2.1.2 Temperatures from 0 to 25 degrees Centigrade.
 - 2.1.3 Hydrostatic pressure equivalent to 4000 meters seawater (6000 psi).
- 2.2 **Mechanical**
 - 2.2.1 Diameter: NonFishBite Section 28mm +/- 5mm
FishBite Section 34.5mm +/- 5mm
 - 2.2.2 Working Strength 6000 lbs.
 - 2.2.3 Breaking Strength 30000 lbs. minimum.
 - 2.2.4 Elongation. The strain on the optical package in the cable is not to exceed 0.65% at 6000lbs. load including initial constructional stretch.
 - 2.2.5 Rotation. The mooring design does not include a swivel, therefore it is important that the cable be torque balanced as much as possible and strain induced rotation shall be minimized.
 - 2.2.6 Minimum Bend Radius. 50cm.
 - 2.2.7 Packaging: Cable drum that will accept a 5 inch diameter steel shaft. The drum shall not exceed 106 inches in diameter nor 68 inches in width. The anchor end of the cable (the end without the fish-bite braid) shall be on the outside of the shipping drum and a minimum of ten meters shall be accessible at both ends of the cable to allow testing and termination on the shipping drum. For shipping, the open part of the drum should be battened shut to protect the cable from improper handling.

2.3 Optical

- 2.3.1 Fiber Count. There shall nominally be **four** single-mode optical fibers. Fibers shall be Corning “SMF 28” or other suitable fiber selected by cable vendor. Use of alternate fiber shall be by written agreement between vendor and MBARI. The optical specifications must be met over the specified cable service life during continuous operation under the conditions described in the “General and Environmental” and the “Mechanical” sections above.
- 2.3.2 Optical Attenuation. Attenuation in each fiber shall not exceed the following values under cable working conditions (see mechanical specifications for working condition values):
 - 0.7 dB per kilometer at 1310 Nm. wavelength
 - 0.7 dB per kilometer at 1550 Nm. wavelength
- 2.3.3 Optical Attenuation Uniformity. No single point attenuation discontinuity in any fiber in the finished cable shall be greater than 0.15 dB at either 1310 Nm. or 1550nm. wavelengths, as measured with an OTDR.
- 2.3.4 Optical Dispersion. Individual fiber specifications for optical dispersion in the completed cable shall meet the pre-cabled fiber manufacturer’s specifications for the fiber used, as measured by EIA/TIA 455-175.
- 2.3.5 Fiber Proof Test. Individual fibers will be proof tested at the time of manufacture to a minimum of 150kpsi.
- 2.3.6 Fiber Identification. Fibers or their over-jacketing shall be color coded or otherwise indelibly marked at least every meter for identification.

2.4 Electrical

- 2.4.1 General. The cable will be used for electrical power transmission while submerged in the marine environment. The cable shall provide a minimum of two electrical conductors insulated from one another, and from seawater.
- 2.4.2 Working Voltage. The cable will be used at a working voltage between conductors, or between conductors and seawater, of up to 425 Volts DC. At this voltage, the maximum electrical stress present at any point in the cable insulation system shall be less than or equal to 2.0 kV/mm (51 volts/mil). The insulation system used must be suitable for continuous high D.C. electric field stress.
- 2.4.3 Insulation Resistance. The Insulation Resistance of each conductor in the as-built cable shall be a minimum of 3,000 Megohms per kilometer, measured at the working voltage of Section 2.4.2 above. The resistance shall be measured between the test conductor, and the other conductor(s) plus the cable armor plus any other metallic cable elements, tied together.
- 2.4.4 Conductor Resistance. The cable will be used at a working current of up to one ampere per conductor. The maximum as-built, as-cabled, round trip (two way) resistance of the two cable conductors in series shall be a maximum of 8.6 ohms per kilometer (nominally 4.3 ohms per kilometer per conductor, although equal resistances are not required), measured at a conductor

temperature of 20 degrees C. The as-built conductor resistance shall have a tolerance of +/- 5%.

- 2.4.5 Production Testing. Each individually insulated conductor shall be tested for insulation resistance, before cable assembly, in a water bath. The test conditions and criteria for acceptance shall be as specified in Section 2.4.2 above. The completed cable shall be evaluated for Partial Discharge at the working voltage of Section 2.4.1 above. No detectable discharge is permitted, within the detection limits of the test equipment employed.
- 2.4.6 Conductor Identification. The individual conductors shall be color coded or otherwise made visually distinguishable from one another, either throughout their length, or at regular increments not to exceed 0.33 meter.

2.5 CABLE QUALIFICATION TESTS.

The following tests may be performed by MBARI or an independent test contractor at MBARI expense prior to final acceptance of the cable. Failure to meet the specified Cable Performance Requirements in section 2.0 is cause to reject the cable.

- 2.6 **Electrical.** A riser cable specimen will be subjected to conductor resistance and insulation resistance tests to obtain the as delivered values.
- 2.7 **Optical Static Attenuation.** The riser cable will be tested for optical attenuation at 1310Nm and 1550Nm wavelengths to obtain the as delivered values.
- 2.8 **Optical Characterization.** The optical attenuation in response to tensile loading will be measured.
- 2.9 **Mechanical Characterization.** A riser cable section will be tested for tension induced changes in elongation, diameter, torque and rotation. The riser cable will also be tested for yield and breaking strength, and for susceptibility to damage by repeated bending.

3.0 DELIVERY.

Delivery shall be quoted FOB destination, Moss Landing, California, 95039. Cable shall be delivered suitably packaged for transportation and storage. Cable shall be delivered in a continuous length.