

METRIC

MIL-PRF-85045/28
27 March 2007

PERFORMANCE SPECIFICATION SHEET

CABLE, FIBER OPTIC, NINETEEN TUBE, BLOWN OPTICAL FIBER, STANDARD AND ENHANCED PERFORMANCE, CABLE CONFIGURATION TYPE 5 (TUBE), APPLICATION B (SHIPBOARD), CABLE CLASS SM AND MM, (METRIC)

This specification is approved for use by all Departments and Agencies of the Department of Defense.

The requirements for acquiring the product described herein shall consist of this specification and [MIL-PRF-85045](#).

CLASSIFICATION:

Fiber optic cable configuration type (Tube): 5.

Fiber cable class: MM (graded-index, glass core and glass cladding, multimode).
SM (dispersion-unshifted, glass core and glass cladding, single-mode).

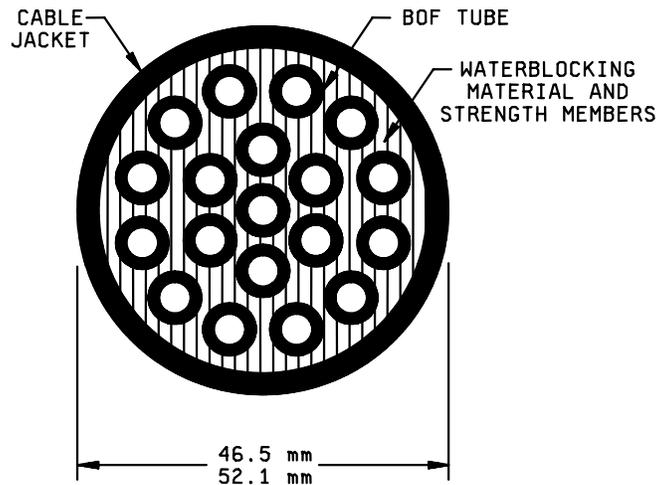


FIGURE 1. Nineteen tube cable.

AMSC N/A

FSC 6015

Part or Identifying Number (PIN):

M85045/28-01S (Standard performance).
M85045/28-01E (Enhanced performance).

DESIGN AND CONSTRUCTION:

FINISHED CABLE:

Dimensions and configuration: See figure 1. Nineteen tubes shall be helically laid in two layers around a central tube. The minimum outer jacket thickness shall be not less than 2.00 mm.

Concentricity: ≥ 0.80 .

Jacket material: The overall jacket shall be composed of a low halogen, low smoke, low toxicity polymer material.

Cable Jacket Color: Shall be Black or Blue

Mass per unit length: $\leq 2,000$ kg/km.

Short term minimum bend diameter: 1.0 m. (The short term minimum bend diameter is to be used in all environmental and mechanical tests which specify a cable minimum bend diameter.)

Long term minimum bend diameter: 1.27 m.

Blown optical fiber (BOF) tube:

Dimensions and configuration: See figure 2.

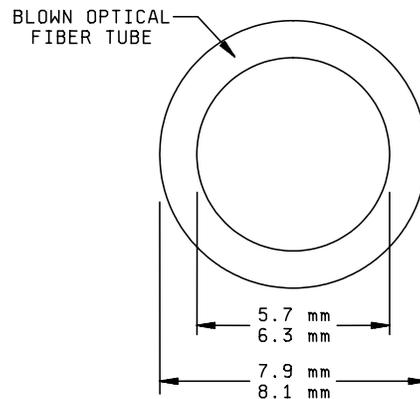


FIGURE 2. Blown optical fiber tube.

Short term minimum bend diameter: 127 mm.

Long term minimum bend diameter: 127 mm.

Tensile loading: ≥ 89 N.

Tube material: The tube shall be composed of a low halogen, low smoke, low toxicity polymer material.

Tube marking: Each tube shall be uniquely marked with a number between 1 and 19. The form of the marking shall be the printed spelling of the number, followed by a dash, followed by the printed arabic numeral. The marking shall be applied and repeated every 0.10 m (4 inches) along the tube. Tube number 1 shall be located at the center of the cable. Tubes in the innermost ring shall be consecutively numbered from 2 through 7. Tubes in the outermost ring shall be consecutively numbered from 8 through 19.

PERFORMANCE REQUIREMENTS:

Optical properties:

Attenuation rate: Not applicable.

Change to optical transmittance: Not applicable.

Crosstalk: Not applicable.

Mechanical properties:

Tensile loading and elongation: Applicable, tensile loading $\geq 3,300$ N. Change in optical transmittance is not applicable. A ball bearing with a minimum outer diameter of 4.0 mm shall pass through each tube after the test.

Operating tensile loading: Applicable, except change in optical transmittance is not applicable. A ball bearing with a minimum outer diameter of 4.0 mm shall pass through each tube during and after the test.

Dynamic bend: Not applicable.

Low temperature flexibility: The following procedure shall be used. A 4.0 m test specimen shall be placed in a straight configuration and conditioned at the exposure temperature for 4 hours. For standard performance cable, the exposure temperature shall be the minimum operating temperature. For enhanced performance cable, the exposure temperature shall be -40°C . The test specimen shall be removed from the conditioning chamber and formed into a single loop around a mandrel with a diameter equal to the cable short term minimum bend diameter. The time between the removal of the cable from the chamber to the completion of the loop shall be a maximum of 50 seconds. The specimen shall be secured to maintain its bent shape and allowed to return to room temperature. A ball bearing with a minimum outer diameter of 4.0 mm shall pass through each tube after the test.

Cyclic flexing: 100 cycles at +25°C ±2°C and 20 cycles at -28°C ±2°C. Change in optical transmittance is not applicable. A ball bearing with a minimum outer diameter of 4.0 mm shall pass through each tube after every 25 cycles for the 100-cycle exposure and after the 20-cycle exposure. The cycling may be halted to perform the ball bearing test.

Crush: Applicable, except that the load shall be 2,650 N and the change in optical transmittance and crosstalk are not applicable. A ball bearing with a minimum outer diameter of 4.0 mm shall pass through each tube after the load is removed.

Cable twist bending: Not applicable.

Radial compression: Applicable, except the change in optical transmittance is not applicable. A ball bearing with a minimum outer diameter of 4.0 mm shall pass through each tube during and after the test.

Impact: Applicable, except that the drop hammer mass shall be 6 kg. 50 cycles shall be conducted at +25°C ±2°C and 20 cycles shall be conducted at -40°C ±2°C. The change in optical transmittance is not applicable. A ball bearing with a minimum outer diameter of 4.0 mm shall pass through each tube after the test.

Corner bend: Applicable, except the change in optical transmittance is not applicable. A ball bearing with a minimum outer diameter of 4.0 mm shall pass through each tube during and after the test.

Hosing: Low pressure applicable, except the cable leakage shall be not greater than 430 ml. Tube ends shall be capped with end caps during this test.

Dripping: Applicable.

Cable jacket tear strength: Applicable, except the cable jacket tear strength shall be not less than 35.0 newtons per centimeter (N/cm) for standard performance cable.

Tube tensile strength and elongation: Tube specimens shall be tested in accordance with FED-STD-228, method 3021 and 3031, with 2.5 cm (.98 inch) benchmarks, 6.35 cm (2.5 inch) jaw separation, and a rate of travel of 25 cm/min (9.8 inch/min). The tensile strength of the tube shall be not less than 900 N/cm². The percent elongation-at-break shall be not less than 125 percent.

Cable scraping resistance: 750 cycles.

Cable to cable abrasion: 500 cycles.

Cable shrinkage: Applicable, except that the total shrinkage shall be not greater than 35.0 mm.

Cable element removability: Finished cable jacket, waterblocking materials, and strength members shall be easily and cleanly removable by mechanical means without damage to the cable or BOF tubes. No evidence of surface scratches, punctures, kinking, crushing, or defects to BOF tubes shall be visible after cable elements have been removed. The cable waterblock or filler materials, if applicable, shall be flexible and easily removable from any part to which it is in contact through the use of fingers only. The presence of occasional particles or slivers of filler residue will be acceptable, provided that these can be removed by light brushing with the fingers or with a dry cloth. Filler material which leaves residue that is removable only by vigorous wiping or through the use of solvents shall not be acceptable.

Pressure withstand: One end of three tubes shall be capped and a static pressure of 1.4 MPa (200 psi) applied internal to the tube for 10 minutes. After the test, tubes shall show no evidence of splitting, cracking, or rupture. Perform as part of Group 1 on three tubes in each of the three 0.5 km samples.

Environmental properties:

Temperature range:

Operating: -28°C to +65°C.

Nonoperating: -40°C to +70°C.

Storage: -40°C to +70°C.

Temperature cycling: Change in optical transmittance is not applicable. A ball bearing with a minimum outer diameter of 4.0 mm shall pass through each tube at the high temperature plateau, the low temperature plateau, and after the test.

Thermal shock: Not applicable.

Temperature humidity cycling: Change in optical transmittance is not applicable. A ball bearing with a minimum outer diameter of 4.0 mm shall pass through each tube at the high temperature plateau, the low temperature plateau, and after the test.

Storage temperature: Applicable, except the change in optical transmittance is not applicable. A ball bearing with a minimum outer diameter of 4.0 mm shall pass through each tube after the test.

Life aging: Applicable, except the change in optical transmittance is not applicable and a minimum test sample length of 150 m may be used. For standard performance product, the test shall be conducted as specified in the basic specification. For enhanced performance product, the test shall be conducted as specified in the basic specification except that the jacket material shall be tested at +175°C for 4 hours. A minimum of 3.5 m of the sample shall be maintained at the long term minimum bend diameter throughout the test. A ball bearing with a minimum outer diameter of 4.0 mm shall pass through each tube after the test.

Weathering: Not applicable.

Fluid immersion: Standard performance product: Exposure to automobile gasoline and tap water are not required and the test temperature for lubricating oil exposure shall be 73°C to 77°C. The tensile strength retention of the cable jacket material after exposure to hydraulic fluid shall be not less than 30 percent.

Enhanced performance product: Exposure to automobile gasoline and tap water are not required and the following test temperatures shall be used for the fluids indicated: Fuel oil (98°C to 100°C), turbine fuel (48°C to 50°C), and lubricating oil (98°C to 100°C).

Flame extinguishing: Applicable. Tube ends shall be plugged with a non-flammable sealant to simulate end caps.

Smoke generation and flame propagation: Applicable. Tube ends shall be plugged with a non-flammable sealant to simulate end caps. The pass/fail criteria shall be as follows. The peak optical density and the average optical density of smoke produced shall be not greater than 1.2 and 0.25 respectively. In addition, the flame spread-time product at the 10-minute point shall be not greater than 27.5 meters-minutes when calculated in accordance with ASTM-E-84.

Shock: Applicable.

Paint susceptibility: Applicable.

Chemical properties:

Halogen content: < 0.2 percent.

Cross-link verification: This test is applicable for cables with cross-linked jackets only. The test shall be conducted in accordance with ICEA standard T-28-562 and run at 200°C. The test shall be sequenced after the fluid immersion test in the qualification test sequence and in the group C conformance test sequence. The hot creep shall not exceed 100 percent and the hot creep set shall not exceed 10 percent.

Qualification by similarity:

Manufacturers who produce products for both MIL-PRF-85045/25 and this specification sheet, and are qualified under MIL-PRF-85045/25, and whose standard performance product passes all applicable tests except for the fluid immersion, paint susceptibility, jacket self adhesion or blocking, cable jacket tear strength, cable jacket material tensile and elongation, water absorption, durability of identification, acid gas generation, halogen content, toxicity index, and fungus inspections specified herein, are qualified under this specification sheet for standard performance product. This qualification by similarity is applicable if the same cable jacket materials are used in the previously qualified MIL-PRF-85045/25 cable and the standard performance cable under test.

Manufacturers who produce products for both MIL-PRF-85045/25 and this specification sheet, and are qualified under MIL-PRF-85045/25, and whose enhanced performance product passes all applicable tests except for the fluid immersion, paint susceptibility, jacket self adhesion or blocking, cable jacket tear strength, cable jacket material tensile and elongation, water absorption, durability of identification, acid gas generation, halogen content, toxicity index, and fungus inspections specified herein, are qualified under this specification sheet for enhanced performance product. This qualification by similarity is applicable if the same cable jacket materials are used in the previously qualified MIL-PRF-85045/25 cable and the enhanced performance cable under test.

Qualification by similarity for change to outer cable jacket:

Manufacturers who produce products for MIL-PRF-85045/28 using one particular overall cable jacket compound and are qualified under MIL-PRF-85045/28 for that compound and pass visual and mechanical, low temperature flexibility, durability of identification, smoke generation and flame propagation, flame extinguishing, water absorption, acid gas generation, toxicity index, crosslink verification and all applicable requirements indicated below for cables with a modified overall cable jacket compound are also qualified under MIL-PRF-85045/28 for cables with the modified overall cable jacket compound.

In addition to the requirements identified above, the following requirements are also applicable if a change is made in the outer cable jacket compound. If the base material of the modified cable jacket compound is not the same as the already qualified cable jacket compound, then the modified cable jacket shall also pass fluid immersion, paint susceptibility, jacket self adhesion or blocking, dripping, cable scraping resistance, and cable-to-cable abrasion. If the modified cable jacket compound results in process changes, then the cable with the modified jacket shall also pass hosing: low pressure, and cable shrinkage. If the modified jacket compound results in a color change then the modified jacket shall pass fungus resistance and halogen content. The modified jacket compound shall pass fungus resistance unless colorants are fungus inert in accordance with MIL-HDBK-454 and compliance to the halogen content requirement may be achieved by providing formulation of colorants. If the modified cable jacket compound results in a change in jacket color and the jacket material tensile strength and elongation results for the qualified cable jacket are not the same as those for the modified cable jacket, then the modified cable shall pass cyclic flexing, barometric pressure, life aging, and cable jacket tear strength.

Referenced documents. In addition to MIL-PRF-85045, this document references the following:

MIL-PRF-85045/25
ASTM-E-84

FED-STD-228
ICEA T-28-562

MIL-HDBK-454

Custodians:
Navy - SH
Air Force - 99
DLA - CC

Preparing activity:
DLA - CC
(Project 6015-2006-001)

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