

METRIC

MIL-PRF-85045/20A  
16 September 1999  
SUPERSEDING  
MIL-C-85045/20  
26 May 1995

PERFORMANCE SPECIFICATION SHEET

CABLE, FIBER OPTIC, TWENTY-FOUR, THIRTY-THREE, AND THIRTY-SIX FIBERS, ENHANCED PERFORMANCE, CABLE CONFIGURATION TYPE 2 (OFCC), 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 (OFCC): 2.

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

DESIGN AND CONSTRUCTION:

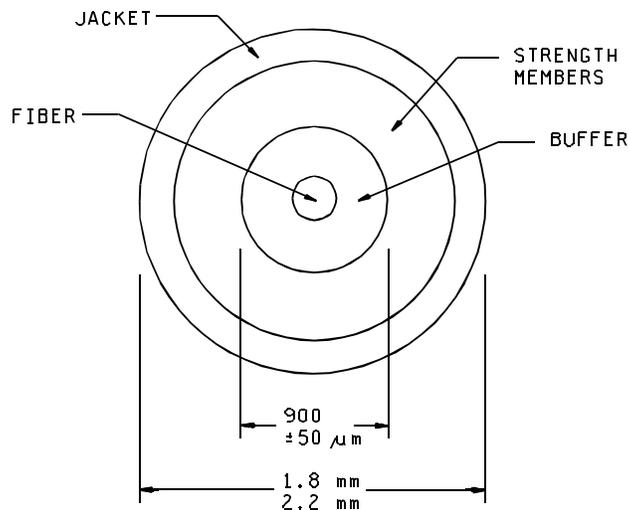
Fiber:

Class MM fibers shall be in accordance with MIL-PRF-49291/6.  
Class SM fibers shall be in accordance with MIL-PRF-49291/7.

Buffer diameter:  $900 \pm 50 \mu\text{m}$ .

OFCC:

Dimensions and configuration: See figure 1.



NOTE:

1. Dimensions are in millimeters.

FIGURE 1. Optical fiber cable component.

Mass per unit length:  $\leq 15$  kg/km.

Short term minimum bend diameter: Eight times the OFCC outer diameter.

Long term minimum bend diameter: Sixteen times the OFCC outer diameter.

Tensile loading:  $\geq 270$  N.

Dynamic bend tensile load: 90 N minimum.

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

OFCC color:

Slate (MIL-PRF-49291/6 fiber).

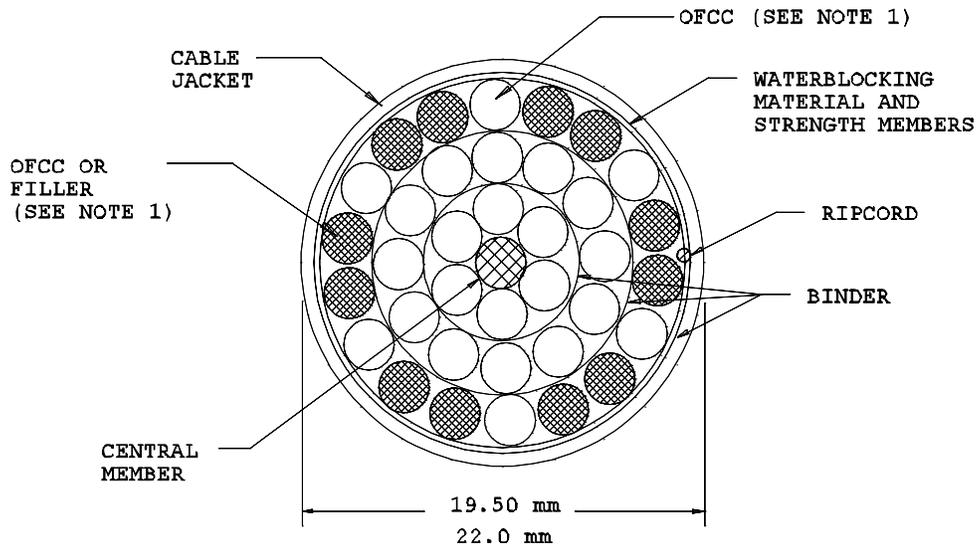
Yellow (MIL-PRF-49291/7 fiber).

OFCC marking: Each OFCC shall be uniquely marked with a number between 1 and 36. 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 OFCC jacket. OFCC number 1 shall be located in the innermost ring of OFCCs. OFCCs shall be consecutively numbered starting with those in the inner most ring (1 through 6), then those in the middle ring (7 through 18) and finally those in the outer most ring (19 through 36). OFCC's numbered 1, 7 and 19 shall be located along approximately the same radial line within the cable.

FINISHED CABLE:

Dimensions and configuration: See figure 2. Twenty-four to thirty-six OFCC units shall be helically layered over the central member. The minimum outer jacket thickness shall be not less than 1.9 mm (establishes compatibility with termination and penetration devices).

Number of fibers: 24, 33, or 36 (one per OFCC).



Note 1.

OFCC - Optical fiber cable component

FIGURE 2. Twenty-four, thirty-three, and thirty-six OFCC fiber optic cable.

Concentricity:  $\geq 0.65$ .

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

Mass per unit length:  $\leq 640.0$  kg/km.

Short term minimum bend diameter: Eight times the cable outer diameter. (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: Sixteen times the cable outer diameter.

Minimum continuous length: The minimum continuous length of all cables shall be not less than 0.5 km (546.81 yards). If lengths less than 0.5 km are specified in the purchase order, Quality Conformance Inspection shall be performed on test specimens not less than 0.5 km in length from which the purchase order lengths are cut.

PERFORMANCE REQUIREMENTS:

Optical properties:

Maximum attenuation rate: 5.6 dB/km at 850  $\pm$ 20 nm, 2.0 dB/km at 1300  $\pm$ 20 nm for type MM fiber.  
1.5 dB/km at 1310  $\pm$ 20 nm and 1550  $\pm$  20 nm for type SM fiber.

For cables with radiation cross-linked jackets, the change in attenuation rate measurement may be made up to 30 days after cross-linking of the cable jacket.

Bandwidth: Fiber with a minimum bandwidth of 500 Mhz-km at 1,300 nm shall be used (multimode cables only).  
Bandwidth is not specified at 850 nm.

Change in optical transmittance: Measurements to be made at 1300  $\pm$  20 nm. A minimum of eight fibers shall be monitored for change in optical transmittance. A minimum of 2 fibers shall be monitored in the inner ring of OFCCs. A minimum of 2 fibers shall be monitored in the middle ring of OFCCs. A minimum of 4 fibers shall be monitored in the outer ring of OFCCs. The fibers monitored in each ring shall be randomly selected, but different fibers shall be monitored in each test sample. For shock testing only four fibers are required to be monitored (one in the inner ring, one in the middle ring and two in the outer ring of OFCCs).

Crosstalk: Applicable.

Mechanical properties:

Tensile loading and elongation: Applicable, tensile loading  $\geq 3,300$  N.

Operating tensile loading: Applicable.

Low temperature flexibility: The exposure temperature shall be  $-40^{\circ}\text{C}$ .

Cyclic flexing: 500 cycles at  $+25^{\circ}\text{C} \pm 2^{\circ}\text{C}$  and 100 cycles at  $-28^{\circ}\text{C} \pm 2^{\circ}\text{C}$ . Change in optical transmittance measurements are to be made every 100 cycles for the 500 cycle exposure and every 25 cycles for the 100 cycle exposure. Each change in optical transmittance measurement shall be performed with the test specimen in the same position in the test cycle. The cycling may be halted to perform the change in optical transmittance measurement.

Crush: Applicable.

Cable twist bending: 500 cycles at  $+25^{\circ}\text{C} \pm 2^{\circ}\text{C}$  and 100 cycles at  $-28^{\circ}\text{C} \pm 2^{\circ}\text{C}$ . Change in optical transmittance measurements are to be made every 100 cycles for the 500 cycle exposure and every 25 cycles for the 100 cycle exposure. Each change in optical transmittance measurement shall be performed with the test specimen in the same position in the test cycle. The cycling may be halted to perform the change in optical transmittance measurement.

Radial compression: Applicable.

Impact: 50 cycles at  $+25^{\circ}\text{C} \pm 2^{\circ}\text{C}$  and 20 cycles at  $-40^{\circ}\text{C} \pm 2^{\circ}\text{C}$ . Minor jacket damage such as splitting or cracking is permitted at the low test temperature.

Hosing: Low pressure applicable, except the cable leakage shall be not greater than 135 ml.

Hydrostatic: 2.1 MPa.

Dripping: Applicable.

Cable scraping resistance: 750 cycles.

Cable to cable abrasion: 500 cycles.

Environmental properties:

Temperature range:

Operating:  $-28^{\circ}\text{C}$  to  $+65^{\circ}\text{C}$ .

Nonoperating:  $-40^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$ .

Storage:  $-40^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$ .

Temperature cycling: Change in optical transmittance measurements may be made periodically. At a minimum, one optical transmittance measurement shall be made over a period of one hour at the end of each temperature plateau.

Temperature humidity cycling: Change in optical transmittance measurements may be made periodically. At a minimum, one optical transmittance measurement shall be made at the end of each temperature plateau.

Storage temperature: Applicable.

Life aging: Applicable, except that the jacket material shall be tested at  $+175^{\circ}\text{C}$  for 4 hours.

Weathering: Applicable.

Fluid immersion: Exposure to automobile gasoline and tap water are not required and the following test temperatures shall be used for the fluids indicated: fuel oil ( $98^{\circ}\text{C}$  to  $100^{\circ}\text{C}$ ), turbine fuel ( $48^{\circ}\text{C}$  to  $50^{\circ}\text{C}$ ) and lubricating oil ( $98^{\circ}\text{C}$  to  $100^{\circ}\text{C}$ ).

Flame extinguishing: Applicable.

Smoke generation and flame propagation: Applicable, except 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 0.5 and 0.15 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.

Electromagnetic effects: 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 weathering test in the qualification test sequence and after the fluid immersion test in the group C quality conformance test sequence. The hot creep shall not exceed 100 percent and the hot creep set shall not exceed 10 percent.

Part or Identifying number (PIN):

M85045/20-01L (24 fiber, multimode).  
M85045/20-01F (33 fiber, multimode).  
M85045/20-01M (36 fiber, multimode).  
M85045/20-02L (24 fiber, single-mode).  
M85045/20-02F (33 fiber, single-mode).  
M85045/20-02M (36 fiber, single-mode).

"L" designates a 24-fiber cable.

"F" designates a 33-fiber cable.

"M" designates a 36-fiber cable.

Qualification by similarity.

Manufacturers who produce products for both MIL-PRF-85045/17 and products for this specification sheet and are qualified under MIL-PRF-85045/17, and pass all applicable tests except the following, are qualified under this specification sheet: fluid immersion, paint susceptibility, jacket self adhesion or blocking, dripping, cable jacket tear strength, cable jacket material tensile and elongation, water absorption, weathering, durability of identification, acid gas generation, halogen content, toxicity index, thermal vacuum outgassing, odor, material toxicity, and fungus tests. This qualification by similarity is applicable if the same materials are used in the previously qualified MIL-PRF-85045/17 cable and the cable under test.

Manufacturers who are qualified under this specification sheet for multimode fiber cable and whose single-mode fiber cable passes the visual and mechanical, attenuation rate, temperature cycling, humidity, storage temperature, cyclic flexing, crush, cable twist-bending, impact (low temperature only), tensile loading and elongation, operating tensile loading, thermal shock and dynamic bend inspections specified herein, are qualified under this specification sheet for single-mode fiber cable. This qualification by similarity is applicable if the only difference between the previously qualified cable and the cable under test is that the optical fiber has been changed from a multimode fiber to a single-mode fiber. Testing may be performed on either one or two lengths of cable, each with a minimum length of 0.5 km. Test order must be observed up to and including the storage temperature test. If only one cable length is used, the thermal shock test shall be performed after the storage temperature test.

MIL-PRF-85045/20A

Custodians:

Army - CR  
Navy - SH  
Air Force - 11  
NASA - NA

Review activities:

Army - AR, AV, MI  
Navy - EC, YD  
Air Force - 02, 19, 80, 99  
DLA - CC

Preparing activity:

Navy - SH

Agent:

DLA - CC

(Project 6015-0034-08)