

PERFORMANCE SPECIFICATION SHEET

CABLE, FIBER OPTIC, LOOSE TUBE, TWELVE FIBER, SINGLE SUBUNIT,
CABLE CONFIGURATION TYPE 1 (BUFFERED FIBER), APPLICATIONS A AND B
(AIRBORNE AND 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.

SCOPE. This cable specification sheet addresses the requirements of a fiber optic cable containing 12 loose fibers within a 2 mm outer diameter. Coverage includes both fiber types and temperature ranges.

Design constraints. Figure 1 shows the cable construction and provides essential dimensioning detail for a fiber optic cable with a 2 mm outer diameter that contains 12 loose fibers within the loose tube cable. Cable construction consists of an outer jacket (with a 2 mm diameter), strength member (aramid yarn or aramid tape), and loose fibers (12 optical fibers). Following figure 1 are requirements design and construction, material, and performance.

CLASSIFICATION:

Fiber optic cable configuration type: 1 (Buffered fiber).

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

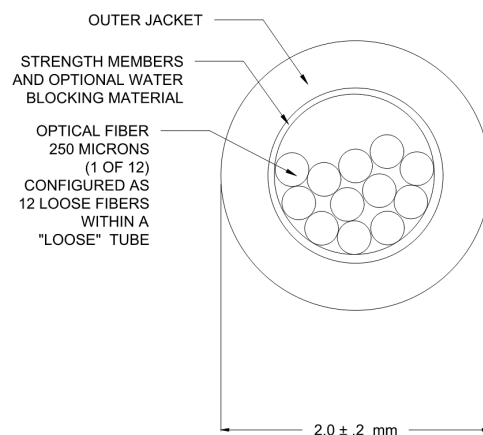


FIGURE 1. Twelve fiber loose tube cable (single standalone subunit).



Part or Identifying Number (PIN):

- 12 fiber loose tube cable (multimode, temperature range 1): M85045/37-1.
 12 fiber loose tube cable (single mode, temperature range 1): M85045/37-2.
 12 fiber loose tube cable (multimode, temperature range 2): M85045/37-3.
 12 fiber loose tube cable (single mode, temperature range 2): M85045/37-4.

DESIGN AND CONSTRUCTION:

Temperature ranges: Temperature range designations shall be in accordance with table I.

TABLE I. Temperature range designation.

Temperature range designation	Operating temperature	Operating temperature	Non-operating temperature	Non-operating temperature	Storage temperature	Storage temperature
	°F	°C	°F	°C	°F	°C
1	-18 to +185	-28 to +85	-40 to + 158	-40 to +70	-40 to +158	-40 to +70
2	-67 to +329	-55 to +165	-67 to +185	-55 to +85	-67 to +185	-55 to +85

Fiber:

- For temperature range 1 cable, MM fibers shall be [MIL-PRF-49291/6](#) (PIN: M49291/6-03).
 For temperature range 1 cable, SM fibers shall be [MIL-PRF-49291/7](#) (PIN: M49291/7-01).
 For temperature range 2 cable, MM fibers shall be [MIL-PRF-49291/12](#) (PIN: M49291/12-02).
 For temperature range 2 cable, SM fibers shall be [MIL-PRF-49291/11](#) (PIN: M49291/11-02).

Buffer diameter: 250 ±15 µm after coloring (inking).

Fiber color coding: Each optical fiber in the subunit shall be color coded for identification in accordance with TIA-598 (see 3.4.2.4.1 of [MIL-PRF-85045](#)). A visual inspection performed after the temperature life test shall show that the colorant on each optical fiber remains intact with no flaking or other degradation in addition to no change outside specified limits for appearance (color) on the samples.

Finished cable:

Dimensions and configuration: See figure 1.

Dimensions. See figure 1.

Fabrication. Each loose fiber shall have no defective fibers or splices.

Kink resistance: Applicable.

Mass per unit length: ≤ 5 kg/km.

Outer cable jacket color:

- Temperature range 1: Slate for Class MM fiber. Yellow for Class SM fiber.
 Temperature range 2: Color of the cable jacket shall conform to optical fiber size as specified in table 1104-I of [MIL-STD-1678-1](#). The colors shall be within the light and dark color limits in accordance with 3.4.2.1.1 of [MIL-PRF-85045](#).

Material:

Cable jacket material: Cable jacket shall be compounded to meet the performance requirements specified herein and in [MIL-PRF-85045](#). For temperature range 1, the cable jacket shall be composed of a low halogen, low smoke, low toxicity polymer material.

Cable strain relief material requirement. Cable shall include a strength member (i.e., cable strain relief such as one made from an aromatic polyimide, otherwise known as aramid yarn, or other solid form of a liquid crystal polymer, such as an aromatic polyester). For temperature range 2 only, cable strain relief material shall be braided. This cable strain relief material shall be capable meeting the cable strain relief pullout force. Trade names for aramid yarns include Kevlar, Twaron, Nomex, New Star and Tejinconex or equal. Trade names for an aromatic polyester include Vectran or equal.

Jacket red light transparency: Fiber breaks inside the cable jacket shall be easily recognized when a pulsed, red light from a laser (monochromatic light) is sent through the optical fiber in the cable. The monochromatic light shall have a nominal wavelength of 635 nm, a nominal pulse rate of 3 Hz and a minimum optical power level of 1 mW. Fracture in the optical fiber shall be created by placing the middle of a 1 meter length of fiber optic cable in a free form loop until a kink occurs in the cable jacket and the change in optical transmittance of the cable is reduced by at least 20 dB.

Number of fibers: 12.

Concentricity: ≥ 0.80 .

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 that 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. If lengths less than 0.5 km are specified in the purchase order, a conformance inspection shall be performed on test specimens not less than 0.5 km in length from which the purchase order lengths are cut.

Marking: Markings shall be in accordance with 3.9 of [MIL-PRF-85045](#).

PERFORMANCE REQUIREMENTS:

Optical properties:

Maximum attenuation rate:

Temperature range 1: 3.5 dB/km at 850 ± 20 nm, 1.0 dB/km at 1300 ± 20 nm for class type MM fiber.

Temperature range 1: 0.4 dB/km at 1310 ± 20 nm and 0.3 dB/km at 1550 ± 20 nm for class type SM fiber.

Temperature range 2: 3.0 dB/km at 850 ± 20 nm, 0.8 dB/km at 1300 ± 20 nm for class type MM fiber.

Temperature range 2: 0.40 dB/km at 1310 ± 20 nm and 0.30 dB/km at 1550 ± 20 nm for class type SM fiber.

Point discontinuity (attenuation uniformity).

Method. The attenuation uniformity of each individual fiber shall be measured in accordance with TIA-455-78. Unless otherwise specified, the attenuation uniformity shall be measured at a wavelength of 850 nm and 1300 nm for multimode and at 1310 nm and 1550 nm for single mode. Requirement. There shall be no discontinuities in attenuation along the length greater than 0.1 dB for single mode and no discontinuities in attenuation along the length greater than 0.2 dB for multimode.

Change in optical transmittance: For temperature range 1, measurements shall be made at 1300 ± 20 nm for multimode and 1310 ± 20 nm and 1550 ± 20 nm for single mode. For temperature range 2, measurements shall be made at 850 ± 20 nm for multimode and 1550 ± 20 nm for single mode.

Measured fiber positions within the cable. The minimum number of active fibers required to be measured for a change in optical transmittance during mechanical and environmental testing shall be as follows: The twelve fiber positions in each cable shall be active.

For shock and vibration testing only four fibers shall be required to be monitored, two outer fibers and two inner fibers (as defined by the position in the array where the outer fibers are identified by positions 1, 2, 11 and 12 and the inner fibers by positions 5, 6, 7, and 8). For temperature range 1 shock and vibration testing only, single mode measurements at 1310 ± 20 nm are required at a minimum (1550 ± 20 nm is not required).

Crosstalk: Not applicable.

Mechanical properties:

Low temperature flexibility: Applicable.

Cyclic flexing: For temperature range 1, test shall be performed for 500 cycles at 25 ± 2 °C and 100 cycles at -28 ± 2 °C. For temperature range 2, test shall be performed for 500 cycles at 25 ± 2 °C and 100 cycles at -55 ± 2 °C. Minimum load shall be 1.0 kg. Change in optical transmittance measurements shall 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 except that the compression loading shall be not less than 250 N, shall be held for 1 minute and released and shall be applied at a rate of not less than 250 N/min.

Cable twist-bending: Applicable except perform 500 cycles at $+25^\circ\text{C} \pm 2^\circ\text{C}$ and 100 cycles at $-28^\circ\text{C} \pm 2^\circ\text{C}$ for temperature range 1. Perform 500 cycles at $+25^\circ\text{C} \pm 2^\circ\text{C}$ and 100 cycles at $-55^\circ\text{C} \pm 2^\circ\text{C}$ for temperature range 2. The test load shall be 10 N. Change in optical transmittance measurements shall 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: Not applicable.

Impact (temperature range 2 only): Not applicable for temperature range 1. Applicable for temperature range 2 except the test shall be performed for 50 cycles at $25^\circ\text{C} \pm 2^\circ\text{C}$ and for 20 cycles at the minimum operating temperature.

Altitude immersion (temperature range 2 only): Test shall be performed in accordance with TIA-455-15 using the setup and procedure specified in measurement 3305 of [MIL-STD-1678-3](#). Instrument end connections shall not be submerged and shall be either routed outside the chamber or to an optical interface port. The change in optical transmittance shall be measured during and after the test. During each cycle, optical transmittance measurements shall be made at each ramp and during the plateau. The requirements for the change in optical transmittance shall be met. No damage to the cable shall occur and there shall be no evidence of water penetration into the cable interior.

Flammability (60 degree angle): Applicable.

Tensile loading and elongation: Applicable, tensile loading ≥ 270 N.

Operating tensile loading: Applicable.

Dynamic bend: Applicable. The tensile load shall be not less than 90 N.

Corner bend: Applicable except that test force shall be 132 N. The radius for the corner bend to use for single subunit cable shall be the same as specified for the short term bend diameter.

Kink resistance (OFCC kink): Applicable.

Cable clamp (temperature range 2 only): Not applicable for temperature range 1. Applicable for temperature range 2. The specimen length shall be (two 1 m minimum lengths, using same specimens after performed kink resistance) with 6 standard plastic straps spaced 100 mm (4 inches) apart, shall be held for 24 hours and shall be measured for the change in optical transmittance. The change in optical transmittance shall not exceed the values specified in 3.5.2 of MIL-PRF-85045 during and after the test. Cable length shall be placed adjacent to the length of a 25 mm (approximately 1.0 inch) diameter metal mandrel. The plastic straps (adjustable, self-clinching, plastic tie down strap) used shall conform to MS3367-4 of [SAE AS33671](#). Plastic straps shall be installed using a tool in accordance with [SAE AS90387](#) with the tool maximum tension setting listed in SAE AS90387 for the strap part number being used. This configuration shall be specified for test purposes only as miniature nylon straps and are not used on military aircraft. Visual inspection shall be performed after the test and shall reveal no kinking, cracking, splitting, tearing or collapsing of the cable jacket.

Serpentine cable bend (temperature range 2 only): Not applicable for temperature range 1. Applicable for temperature range 2. The specimens shall be tested between two plates on which mandrels (rods) with a 10 mm mandrel diameter (A) are welded or otherwise permanently affixed. A load shall be applied on the top plate of 50 N (11.2 lbs.) for 24 hours and the change in optical transmittance shall be measured. Change in optical transmittance shall not exceed the values specified in 3.5.2 of [MIL-PRF-85045](#) during and after the test. Visual inspection shall be performed after the test and shall reveal no kinking, cracking, splitting, tearing, or collapsing of the cable jacket. Bottom plate shall have three mandrels placed adjacently and touching each other in the middle of the plate. Top plate shall have four mandrels placed adjacently and touching each other in the middle of the plate. Specimens shall be placed onto the bottom plate so that cable length is perpendicular to mandrels circumference. The top plate shall be placed onto the bottom plate for this test so that the inner two diameters of the mandrels on the top plate are placed between the two spaces of the three mandrels on the bottom plate. Applying and removal of the load shall not exceed a rate of 50 N/minute (11.2 lbs/min). Fixture used to apply the loading shall conform to figure 2.

Hosing: Not applicable.

Dripping: Not applicable for temperature range 1. Applicable for temperature range 2 except that test is performed at 200 °C (392 °F).

Water absorption: Not applicable.

Cable jacket tear strength: Applicable for temperature range 1, except the cable jacket tear strength shall be not less than 35 N/cm of jacket thickness for standard performance cable. Applicable for temperature range 2. Five strips of flat extruded jacket material shall be used.

Cable jacket mechanical strippability (temperature range 2 only): Not applicable for temperature range 1. Applicable for temperature range 2 except that the test shall be performed on the outer cable jacket in accordance with [TIA-455-178](#). Once the outer cable jacket is cut 360 degrees along the cable circumference (i.e., ring cut), the axial force to remove a 25 mm (1.0 inch) length of cable jacket shall not exceed 15.6 N (3.5 lbs.). A strip rate of 250 ± 50 mm/min (10 ± 2 inch/min) shall be used.

Cable jacket material tensile strength and elongation: Tensile strength shall be 900 N/cm² minimum, elongation shall be 125 percent minimum. Restrictions on the setup and test procedure and compliance with data recording shall be in accordance with measurement 3410 of [MIL-STD-1678-3](#).

Cable scraping resistance: Not applicable.

Cable to cable abrasion (temperature range 2 only): Not applicable for temperature range 1. Applicable for temperature range 2.

Cable shrinkage. Applicable for temperature range 1. Applicable for temperature range 2 except the total shrinkage of the 30 cm length shall be not greater than 3.18 mm (.125 inch).

Durability of marking (temperature range 2 only): Not applicable for temperature range 1. Applicable for temperature range 2.

Wicking (temperature range 2 only). Not applicable for temperature range 1. Applicable for temperature range 2 except maximum water penetration shall be 25 mm (1 inch).

Cable strain relief pull out force: The pull out force of the cable strain relief (that is, the cable member for strain relief to a connection device comprised of a material such as aramid yarn) shall be tested in accordance with TIA-455-6 by applying a 67 N (15 lb.) for a duration of 1 minute for a straight pull and 33 N (7.5 lb.) for a 1 minute duration at 90 degree pull. One end on each length of fiber optic cable shall be terminated onto the end of a [MIL-PRF-29504](#) terminus (or other suitable fiber optic connector if approved by the qualifying activity prior to test sample fabrication) or otherwise secured as specified.

- a. Temperature ranges 1 only, splice tray. Specimen shall consist of being secured with fiberglass cloth tape to the cable entry end of a splice tray per [MIL-STD-2042](#) Method 2K1 (see figure 2K1-14) and retaining adherence when the pullout force specified in [MIL-DTL-24728/8](#) is exerted on the cable for both the straight pull and the 90 degree pull.
- b. Temperature ranges 1 and 2, MT ferrule with an MPO type connector with a crimp barrel for a 2 mm crimp sleeve. Specimen shall consist of a commercial variant of the MPO connector with a 12 fiber MT ferrule. The connector shall be affixed to the 2-meter cable sample at one end and a suitable connector to mate with the optical instrumentation detector interface at the other cable sample end. A test cable shall interface the specimen through a commercial variant of the MT ferrule at one cable end and the optical source connection at the other cable end. The epoxy used to secure the cable strain relief to the terminus shall be in accordance with two-part liquid epoxy specified in table 4101 A-IV of [MIL-STD-1678-4](#) for temperature range 2 and as specified in table 4102 A-III of MIL-STD-1678-4 for temperature range 1.

An axial tensile load shall be applied on the detector end cable (specimen) through a mandrel or other approved means. Load shall not be applied to the coupling mechanism. For the MT ferrule (MPO) test configuration only, the change in optical transmittance shall be measured during and after the test and meet the optical requirement for this measurement. The cable strain relief shall be visually inspected after the test. No evidence of strain relief damage, breakage, or disengagement (pull out) shall occur.

Environmental properties:

Electromagnetic effects (temperature range 2 only): Not applicable for temperature range 1. Electromagnetic effects test shall be performed in accordance with measurement 3308 of MIL-STD-1678-3 for temperature range 2.

Temperature cycling:

Method: Cable shall be tested in accordance with [TIA-455-3](#) using the setup and procedure specified in Measurement 3301 of [MIL-STD-1678-3](#) with the temperature profile in Measurement 3301 table 3301-I for temperature range 1 and the temperature profile in Measurement 3301 table 3301-II for temperature range 2. The cable shall be visually examined after the test. Test fixtures, if used shall be of minimum mass and approved by the qualifying activity. No other mass shall be added inside the chamber. The change in optical transmittance shall be measured during and after the test. At a minimum for the measurements made during the testing, an optical transmittance measurement shall be performed towards the end of each soak period (maintain step) after every cycle for temperature range 1 and after every 5 cycles for temperature range 2. The cable shall be visually examined after the test.

Temperature cycling with mandrel (temperature range 2 only): Not applicable for temperature range 1. Applicable for temperature range 2. Testing shall be performed with a portion of cable wrapped around a 20 ± 1 mm ($.79 \pm 0.04$ inch) mandrel for 5 turns and that table 3301-I specified in measurement 3301 of [MIL-STD-1678-3](#) may be used in lieu of table XIII of [MIL-PRF-85045](#).

Temperature humidity cycling: Applicable except that the 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 (temperature range 1 only): Applicable.

Temperature life (life aging):

Method: Applicable for temperature range 1. Applicable for temperature range 2 except it shall be performed as follows for the operating temperature range of -55°C to $+165^{\circ}\text{C}$. The high exposure temperature shall be $165^{\circ}\text{C} +5^{\circ}\text{C}$, -0°C . Specimens shall be tested in accordance with TIA-455-4 for the duration of 1,000 hours at the high exposure temperature. A visual inspection performed after the temperature life test for both temperature range 1 and temperature range 2 shall include inspection for the requirements specified under colorant.

Thermal shock: Applicable except for temperature range 2 perform at the operating temperature extremes. For temperature range 2, the change in optical transmittance shall be performed both during and after the test with the during test measurements performed towards the end of each high temperature plateau (soak) and each low temperature plateau (soak).

Weathering: Not applicable.

Fluid immersion (temperature range 2 only): Not applicable for temperature range 1. Applicable for temperature range 2 except that specimens and flat extruded jacket material strips shall be exposed to the fluids at the temperatures specified in [MIL-STD-1678-3](#) table 3409-AI for temperature range 2. Specimens and flat extruded jacket material strips shall be maintained at ambient conditions for a minimum of 4 hours prior to fluid testing. After immersion, all specimens and flat extruded jacket material strips shall be removed, blotted and suspended as specified in 4.7.6.9 of [MIL-PRF-85045](#) prior to inspection. After testing, each specimen and flat extruded jacket material dumbbell shall be visually examined for conformance to the inspection requirements.

Vibration (temperature range 2 only): Not applicable for temperature range 1. Applicable for temperature range 2. Specimens shall be tested for random vibration in accordance with 5.3.c of [MIL-STD-1678-3](#) measurement 3201. Optical discontinuities shall be measured during the test. A minimum of four specimens shall be monitored for optical discontinuity. The change in optical transmittance shall be monitored after the test. The specimens shall be visually examined after the test. The requirement for optical discontinuity shall be met during the test and the requirement for the change in optical transmittance shall be met after the test.

Shock (temperature range 2 only): Not applicable for temperature range 1. Applicable for temperature range 2. specimens shall be tested both in accordance with [MIL-DTL-901](#), grade A, class I implementing the restrictions and using the test fixtures specified in measurement 3202 of [MIL-STD-1678-3](#) and in accordance with [TIA-455-14](#), test condition D implementing the further guidance and, as applicable the fixtures, as specified in measurement 3202 of [MIL-STD-1678-3](#). Optical discontinuities shall be measured during the test. A minimum of four specimens shall be monitored for discontinuity. The change in optical transmittance shall be monitored after the test. The specimens shall be visually examined after the test. The requirement for optical discontinuity shall be met during the test and the requirement for the change in optical transmittance shall be met after the test.

Flame extinguishing and smoke generation: Not applicable.

Flaming smoke generation: The maximum specific optical density, D_m , shall be less than 225 when tested in the flaming condition in accordance with [ASTM E662](#). The size and configuration of the test specimen shall conform to the 76- by 76-mm (3- by 3-inch) square specified in ASTM E662. The thickness of the test specimen shall be 2 mm (0.08 inches). The specimen shall be constructed by laying 76-mm (3-inch) lengths of OFCC adjacent to one another to form a 76-mm (3-inch) strip. Wire or cable clamps may be used to permanently hold the OFCC lengths in place. Longer OFCC lengths may be used if the top or bottom clamps are used to hold the OFCCs. If top or bottom clamps are used, the length of OFCC exposed outside of the clamp(s) shall be 76 mm (3 inches).

Continuous flame (temperature range 2 only): Flame spread factor, F_s shall be less than or equal to 2.75 and the heat evolution factor, Q shall be less than or equal to 6 when testing is performed in accordance with [ASTM-E-162](#). The thickness of the specimen shall be 2 mm (.08 inch). The specimen shall be constructed by laying 305 mm (12 inch) lengths of cable adjacent to one another to form a 457 mm (18 inch) strip. Wire or cable clamps may be used to permanently hold the cable lengths in place. Longer cable lengths may be used if the top or bottom clamps are used to hold the cables. If top or bottom clamps are used, the length of cable exposed outside of the clamp(s) shall be 305 mm (12 inches).

Paint susceptibility: Not applicable.

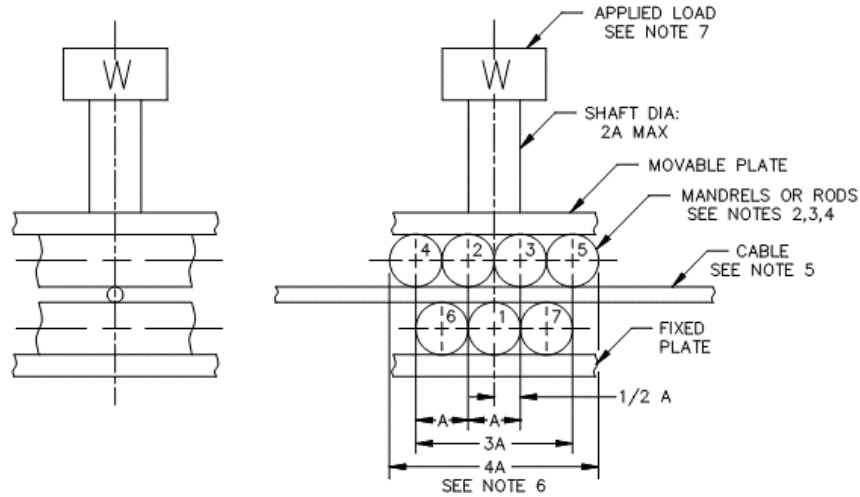
Chemical properties:

Acid gas generation: Applicable.

Halogen content (temperature range 1 only): < 0.2 percent.

Toxicity index: Applicable.

Thermal vacuum outgassing (temperature range 2 only): Applicable for nonmetallic materials only.



NOTES:

1. Material (plates, mandrels, shaft): Metal.
2. Dimensions: A = mandrel diameter.
3. Mandrels 1, 2 and 3: primary applied loading members.
4. Mandrels 4, 5, 6 and 7: stability members.
5. Cable placed at centerline of applied load.
6. When load is applied, top mandrels shall fit into spacing between lower mandrels (as shown on figure with centerlines). Guide pins or other means can be used to ensure this alignment.
7. Weight, W is the applied load. Preference is to apply the load from a controlled device such as a tensile test machine or press.

FIGURE 2. Serpentine cable bend test fixture.

Qualification and Conformance inspection: See table II.

TABLE II. Qualification and conformance inspection.

Group	Qualification inspection	Requirement paragraph	Test paragraph	Cable length <u>1/</u> , <u>2/</u> , <u>3/</u> , <u>4/</u>	Qualification temperature range 1	Qualification temperature range 2	Conformance inspection
I	Visual & mechanical inspection	3.4,3.9,3.10	4.7.2	3 samples, 0.5 km each <u>5/</u>	X	X	A
	Attenuation rate	3.5.1	4.7.4.1	3 samples, 0.5 km each <u>6/</u>	X	X	A
	Point discontinuity	<u>7/</u>	<u>7/</u>	3 samples, 0.5 km each <u>6/</u>	X	X	
II	Electromagnetic effects	3.7.16	4.7.6.16	1 sample, 6 m <u>22/</u>		X	
	Jacket red light transparency	<u>7/</u>	<u>7/</u>	1 sample, 1 m <u>22/</u>	X	X	
III	Temperature cycling	<u>7/</u>	<u>7/</u>	2 samples, 0.5 km each <u>6/</u> (1 on reel, 1 off)	X	X	C
	Temperature cycling with mandrel	<u>7/</u>	<u>7/</u>	2 samples, 0.5 km each <u>8/</u> (1 on reel, 1 off)		X	
	Temperature humidity cycling	3.7.3	4.7.6.3	2 samples, 0.5 km each <u>8/</u>	X	X	C
	Storage temperature	3.7.4	4.7.6.4	2 samples, 0.5 km each <u>8/</u>	X		
	Low temperature flexibility (cold bend)	3.6.3	4.7.5.3	2 specimens, 8 m each <u>9/</u>	X	X	B
	Cyclic flexing	3.6.4	4.7.5.4	6 specimens, 5 m each <u>10/</u> (2 specimens at each temp)	X	X	
	Crush	3.6.5	4.7.5.5	2 specimens, 5 m each <u>9/</u>	X	X	
	Cable twist-bending	<u>7/</u>	<u>7/</u>	6 specimens, 5 m each <u>10/</u> (3 specimens for each temperature)	X	X	C
	Impact	3.6.8	4.7.5.8	2 specimens, 5 m each <u>9/</u>		X	C
	Altitude immersion	3.7.5	4.7.6.5	1 specimen, 0.46 km <u>20/</u>		X	
	Temperature life (Life aging)	<u>7/</u>	<u>7/</u>	2 specimens, 300 m each <u>9/</u>	X	X	C
	Tensile loading and elongation	3.6.1	4.7.5.1	2 specimens, 300 m each <u>11/</u>	X	X	C
	Operating tensile loading	3.6.1.1	4.7.5.1.1	2 specimens, 300 m each <u>12/</u>	X	X	C
	Freezing water immersion (ice crush)	3.7.7	4.7.6.7	2 specimens, 30 m each <u>9/</u>		X	
	Fungus resistance	3.8.4	4.8.4	2 specimens, 0.5 m each <u>9/</u>	X	X	
	Cable element removability	3.6.18	4.7.5.18	2 specimens, 0.5 m each <u>9/</u>	X	X	C
	Flammability (60 degree angle)	3.7.12.1	4.7.6.12.1	2 specimens, 6 m each <u>9/</u>	X	X	C

See notes at end of table.

TABLE II. Qualification and conformance inspection – continued.

Group	Qualification inspection	Requirement paragraph	Test paragraph	Cable length <u>1/</u> , <u>2/</u> , <u>3/</u> , <u>4/</u>	Qualification temperature range 1	Qualification temperature range 2	Conformance inspection
IV	Thermal shock	3.7.2	4.7.6.2	1 specimen, 0.49 km each <u>6/</u> (on reel)	X	X	
	Fluid immersion	<u>7/</u>	<u>7/</u>	1 specimen, 1 m <u>13/</u> and 3 flat extruded jacket material strips <u>17/</u> for each specified fluid		X	C
	Jacket self-adhesion or blocking	3.7.11	4.7.6.11	1 specimen, 30 m <u>13/</u>	X	X	
	Vibration	<u>7/</u>	<u>7/</u>	4 specimens, 30 m each <u>13/</u>		X	
	Shock	<u>7/</u>	<u>7/</u>	4 specimens, 30 m each <u>13/</u>		X	
	Dynamic bend	3.6.2	4.7.5.2	1 specimen, 150 m <u>14/</u>	X	X	B
	Corner bend	3.6.9	4.7.5.9	2 specimens, 5 m each <u>15/</u>	X	X	
	Kink resistance	<u>7/</u>	<u>7/</u>	2 specimens, 1 m each <u>15/</u>	X	X	
	Cable clamp	<u>7/</u>	<u>7/</u>	2 specimens, 1 m each <u>21/</u>		X	
	Serpentine cable bend	<u>7/</u>	<u>7/</u>	2 specimens, 1 m each <u>21/</u>		X	
V	Dripping	3.6.13	4.7.5.13	1 sample, 30 cm <u>13/</u>		X	
	Cable jacket tear strength	3.6.14	4.7.5.14	5 flat extruded jacket material strips <u>16/</u>	X	X	C
	Cable jacket mechanical strippability	<u>7/</u>	<u>7/</u>	1 specimen <u>15/</u> , <u>23/</u>		X	
	Cable jacket material tensile strength and elongation	3.6.15	4.7.5.15	5 specimens <u>17/</u>	X	X	
	Cable abrasion resistance, cable-to-cable	3.6.16	4.7.5.16.2	2 specimens, 2 m each <u>14/</u>		X	C
	Cable shrinkage	3.6.17	4.7.5.17	3 specimens, 0.5 m <u>15/</u>	X	X	C
	Durability of identification marking	3.6.19	4.7.5.19	3 specimens, 2 m each <u>15/</u>		X	
	Flaming smoke generation	<u>7/</u>	<u>7/</u>	1 specimen, 3 m <u>18/</u> , <u>19/</u>	X	X	C
	Continuous flame	<u>7/</u>	<u>7/</u>	1 specimen, 70 m <u>19/</u> , <u>24/</u>		X	C
	Wicking	3.7.10	4.7.6.10	2 specimens, 2 m each <u>15/</u>		X	C
	Cable strain relief pullout force	<u>7/</u>	<u>7/</u>	5 specimens, 2 m each <u>15/</u>	X	X	
VI	Acid gas generation	3.8.1	4.8.1	1 specimen 1 m <u>19/</u>	X	X	C
	Halogen content	3.8.2	4.8.2	1 specimen, 1m <u>19/</u>	X		C
	Toxicity index	3.8.3	4.8.3	1 specimen, 1 m <u>19/</u>	X	X	C
	Thermal vacuum outgassing	3.3.6.1	4.8.5.1	1 specimen, 1 m <u>19/</u>		X	C

See notes at end of table.

TABLE II. Qualification and conformance inspection - Continued.

NOTES:

- 1/ Tolerance on 0.5-km length shall be ± 5 percent, provided that results are normalized to 1 km.
- 2/ Tolerance on shorter lengths shall be ± 5 percent.
- 3/ A sample shall be the initial 0.5-km cable length.
- 4/ A specimen shall be a cable length that is cut from the initial 0.5-km cable length (i.e., the sample) or is cut from a longer previous cut length (i.e., cut from a longer specimen).
- 5/ The visual and mechanical inspection shall only be conducted on a 2-m section of each sample.
- 6/ The same samples as used in the visual and mechanical inspection shall be used.
- 7/ As stated under the applicable tests in this specification sheet.
- 8/ The same samples as used in the temperature cycling test shall be used.
- 9/ A specimen cut from each sample used in the temperature cycling test shall be used.
- 10/ Three specimens cut from each sample used in the temperature cycling test shall be used.
- 11/ A specimen cut from each specimen used in the temperature life test shall be used.
- 12/ The same specimen as used in the tensile loading and elongation test shall be used.
- 13/ A specimen cut from the specimen used in the thermal shock test shall be used.
- 14/ A specimen cut from the specimen used in the thermal shock test or one of the specimens used in the tensile loading and elongation test shall be used.
- 15/ Specimens cut from the specimen used in the thermal shock test shall be used.
- 16/ Flat extruded jacket material strips (i.e., strips of flat extruded material with the same composition of the cable jacket and of sufficient dimensions in which dumbbells can be cut) prepared as specified in 4.7.5.14 cited method and obtained from flat extruded material that underwent the thermal shock test shall be used.
- 17/ Flat extruded jacket material as specified in 4.7.5.15 shall be used in this test.
- 18/ Use 76-mm (3-inch) lengths of cable adjacent to one another to form a 76-mm (3-inch) strip.
For a 2-mm (0.08-inch) diameter cable, an approximate length of 3 m shall be used.
- 19/ A specimen cut from one of the samples used in the temperature cycling test or specimen used in the thermal shock test shall be used.
- 20/ One of the samples used in the temperature cycling test shall be used.
- 21/ The same specimens as used in the kink resistance test shall be used.
- 22/ A specimen cut from one of the visual and mechanical inspection test samples shall be used.
- 23/ Sufficient length to obtain 5 stripping trials shall be used.
- 24/ Use 305 mm (12 inch) lengths of cable adjacent to one another to form a 457 mm (18 inch) strip. For a 2 mm (0.08 inch) diameter cable, an approximate length of 69 m is needed.

Qualification by similarity:

Similarity for temperature range 1 single mode and multimode. Manufacturers who are qualified under this specification sheet for the temperature range 1 loose tube cable with single mode fiber (M85045/37-1) and whose temperature range 1 loose tube cable with multimode fiber passes the tests and inspections specified in table III as specified herein, are qualified under this specification sheet for the temperature range 1 loose tube cable with multimode fiber (M85045/37-2). 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 single mode optical fiber to multimode optical fiber. Testing may be performed on a single length of cable, with a minimum length of 0.5 km.

TABLE III. Qualification and conformance by similarity for M85045/37-1 cable (when qualified to M85045/37-2 cable).

Group	Qualification inspection	Qualification inspection M85045/37-2 <u>1/, 2/</u>	Conformance inspection M85045/37-2 <u>1/, 2/</u>
I	Visual and mechanical	X	A
	Attenuation rate	X	A
III	Temperature cycling	X	C
	Low temperature flexibility (cold bend)	X	B
IV	Thermal shock	X	---
	Kink resistance	X	---
V	Flaming smoke generation	X	C

Notes:

- 1/ Where manufacturers are qualified for M85045/37-2 and are pursuing qualification for M85045/37-1
- 2/ Testing may be performed on either one or two lengths of cable, each with a minimum length of 0.5 km. Test order shall 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.

Similarity for temperature range 2 single mode and multimode. Manufacturers who are qualified under this specification sheet for the temperature range 2 loose tube cable with multimode fiber (M85045/37-3) and whose temperature range 2 loose tube cable with single mode fiber passes the tests and inspections specified in table IV as specified herein, shall be qualified under this specification sheet for the temperature range 2 loose tube cable single mode fiber (M85045/37-4). This qualification by similarity shall be applicable if the only difference between the previously qualified cable and the cable under test is that the optical fiber has been changed from multimode optical fiber to single mode optical fiber. Testing may be performed on a single length of cable, with a minimum length of 0.5 km.

TABLE IV. Qualification and conformance by similarity for M85045/37-4 cable (when qualified to (M85045/37-3 cable).

Group	Qualification inspection	Qualification inspection M85045/37-4 <u>1/</u> , <u>2/</u>	Conformance inspection M85045/37-4 <u>1/</u> , <u>2/</u>
I	Visual and mechanical	X	A
	Attenuation rate	X	A
III	Temperature cycling	X	C
	Temperature humidity cycling	X	C
	Cyclic flexing	X	
IV	Thermal shock	X	

Notes:

- 1/ Where manufacturers are qualified for M85045/37-3 and is pursuing qualification for M85045/37-4.
- 2/ Testing may be performed on either one or two lengths of cable, each with a minimum length of 0.5 km. Test order shall 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.

Similarity for temperature range 1 cable with multiple subunit cables. Manufacturers who produce products for M85045/34 or M85045/35 and this specification sheet for the temperature range 1 with 12 loose fiber cable and whose product to this specification sheet passes the tests and inspections specified in [table V](#), are qualified under this specification sheet for the temperature range 1 with 12 loose fiber cable. This qualification by similarity shall be applicable if the product produced to this specification sheet was used in the production of the already qualified product under M85045/34 or M85045/35. Testing may be performed on a single length of cable, with a minimum length of 0.5 km.

TABLE V. Qualification and conformance by similarity for M85045/37 temperature range 1 cable once qualify to M85045/34 or M85045/35.

Group	Qualification inspection	Qualification inspection M85045/37-01 <u>1/</u> , <u>2/</u>	Conformance inspection M85045/37-01 <u>1/</u> , <u>2/</u>	Qualification inspection M85045/37-02 <u>2/</u> , <u>4/</u>	Conformance inspection M85045/37-02 <u>2/</u> , <u>4/</u>
I	Visual and mechanical	X	A	X	A
	Attenuation rate	X	A	X	A
III	Temperature cycling	X	C	X	C
	Low temperature flexibility (cold bend)	X	B	X	B
IV	Thermal shock	X	--	X	--
	Kink resistance	X	--	X	--
V	Flaming smoke generation	X <u>3/</u>	C <u>3/</u>	X <u>3/</u>	C <u>3/</u>

NOTES:

- 1/ Where manufacturers are qualified for M85045/34-01P or M85045/35-01P and are pursuing qualification for M85045/37-01.
- 2/ Testing may be performed on either one or two lengths of cable, each with a minimum length of 0.5 km. Test order shall 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.
- 3/ This qualification or conformance test shall be required for only one of the PINs in this specification sheet under the provision that the same cable jacket compound (including color) is used for both M85045/37-01 and M85045/37-02.
- 4/ Where manufacturers are qualified for M85045/34-02P or M85045/35-02P and is pursuing qualification for M85045/37-02.

Intended use:

This cable is intended for use between fiber optic switches (backbone cables) and in cable runs to end user equipment (cable drops), jumper cordage, and pigtails terminated in 12 fiber MT ferrules (and inserted into both backplane and circular connectors). This cable is intended for use inside of protected enclosures (such as convoluted tubing or cable wrap) and cable harnesses and is not intended for installation in the overheads or cableways outside protective enclosures. Also, this cable is intended for use as a core component where multiple loose tube cables are housed within an outer jacket (i.e., a multiple loose tube fiber optic cable). A multiple loose tube fiber optic cable is used when the affixed connector insert contains multiple MT ferrules and used for high density cabling applications where cable ends are joined by fusion splicing.

Application restriction. Cable produced under this specification sheet with the 50/125 micron optical fiber (i.e., M85045/37-3) is not for use on Navy shipboard applications.

Bandwidth measurements (multimode cables only). For this cable construction, the bandwidth is measured as part of the requirements of the optical fiber to be cabled. The bandwidth value does not change once the optical fiber is cabled. Since the bandwidth is provided as one of the cable measured parameters, the acceptable bandwidth for the optical fiber used in this cable (and by extension, the cable) is provided for informational purposes.

For cable with MM 62.5/125 micron fiber: ≥ 200 MHz-km at 850 ± 20 nm, ≥ 500 MHz-km at 1300 ± 20 nm for cable with MM fiber.

For cable with MM 50/125 micron fiber: ≥ 1500 MHz-km at 850 ± 20 nm, ≥ 500 MHz-km at 1300 ± 20 nm for cable with MM fiber.

Restricted bandwidth for cable with MM 50/125 micron fiber: ≥ 4700 MHz-km at 850 ± 20 nm.

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

MIL-PRF-29504	MIL-STD-1678-1	SAE AS33671	TIA-455-78
MIL-PRF-49291/6	MIL-STD-1678-3	SAE AS90387	TIA-455-178
MIL-PRF-49291/7	MIL-STD-1678-4	TIA-455-3	TIA-598
MIL-PRF-49291/11	MIL-STD-2042	TIA-455-4	
MIL-PRF-49291/12	ASTM E162	TIA-455-6	
MIL-DTL-901	ASTM E662	TIA-455-15	

CONCLUDING MATERIAL

Custodians:
Navy - SH
Air Force - 85
DLA - CC

Preparing activity:
DLA - CC

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Review activity:
Navy - AS

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