

METRIC
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MIL-F-49291B  
AMENDMENT 1  
12 July 1994

## MILITARY SPECIFICATION

## FIBER, OPTICAL, (METRIC) GENERAL SPECIFICATION FOR

This amendment forms a part of MIL-F-49291B, dated 21 May 1992, and is approved for use by all Departments and Agencies of the Department of Defense.

## GENERAL

Through out document change "multicode" to "Type I" and "single code" to "Type II"

## PAGE 1

1.2.1, line 2: Delete "(see 6.4.18 and 6.4.20)."

## PAGE 2

1.2.4, line 1: Delete "diameter the optical" and substitute "diameter of the optical."

## PAGE 3

2.2, ELECTRONIC INDUSTRIES ASSOCIATION (EIA): Delete:

"EIA-440 - Fiber Optic Terminology."

"EIA-455-63 - Optical Fiber Flexure Test."

## PAGE 4

3.4: Delete "(see 4.7.1)" and substitute "(see 4.4)."

## PAGE 5

3.5.1.2.3, line 1: Delete "Core ovality" and substitute "Core ovality (core noncircularity)."

3.5.1.2.5, line 1: Delete "Cladding ovality" and substitute "Cladding ovality (cladding noncircularity)."

3.5.1.2.6, line 1: Delete "Core-to-cladding offset" and substitute "Core-to-cladding offset (core/cladding concentricity)."

3.5.3, line 6: Delete "not less 1.8 N" and substitute "not less than 1.8 N."

## PAGE 6

3.6.2.1, line 1: Delete "4.7.3.3" and substitute "4.7.3.2.3."

3.6.2.1, line 4: Delete "wavelength)" and substitute "wavelength."

## PAGE 7

3.7.8: Delete.

3.7.11, line 1: Delete "with 4.8.11" and substitute "with 4.8.12."

3.8.1, line 9: Delete "part number" and substitute "PIN."

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## PAGE 8

4.1.1, line 2: Delete "inspection set" and substitute "inspections set."

4.1.1, line 8: Delete "requirements, however" and substitute "requirements; however."

4.5.2: Delete the first sentence and substitute:

"The samples shall be subjected to the qualification inspection specified in table I. Group I inspections may be performed in any order, However, Groups II and III inspections shall be performed in the order shown."

## PAGE 9

4.6, line 3: Change "(table IV)" to "(table V)."

4.6.1.2, line 1: Delete "of product" and substitute "of the quantity of product."

## PAGE 10

Table I: Delete and substitute:

"TABLE I. Qualification inspection.

Inspection	Requirement paragraph	Test paragraph	Applicable test document	Specimen length
<u>Group I</u>				
Visual and mechanical inspection	3.4, 3.5, 3.8, 3.9	4.4, 4.7.2	EIA-455-13 EIA/TIA-455-60	7 @ 1.1 km <u>1/</u>
Core diameter	3.5.1.2.1	4.7.2.1.1	EIA-455-58	<u>2/</u> , <u>4/</u> , <u>15/</u>
Mode field diameter	3.5.1.2.2	4.7.2.1.2	EIA-455-167 or EIA-455-164	<u>2/</u> , <u>5/</u> , <u>15/</u>
Core ovality	3.5.1.2.3	4.7.2.1.3	EIA-455-176	<u>2/</u> , <u>4/</u>
Cladding diameter	3.5.1.2.4	4.7.2.1.4	EIA-455-176	<u>2/</u>
Cladding ovality	3.5.1.2.5	4.7.2.1.5	EIA-455-176	<u>2/</u>
Core-to-cladding offset	3.5.1.2.6	4.7.2.1.6	EIA-455-176	<u>2/</u>
Coating diameter	3.5.1.2.7	4.7.2.1.7	EIA-455-173	<u>2/</u>
Overall coating concentricity ratio	3.5.1.2.8	4.7.2.1.8	EIA-455-173	<u>2/</u>
Fiber mass/unit length	3.5.1.3	4.7.2.4		<u>2/</u>
Attenuation rate	3.6.2			
Type I		4.7.3.2.1	EIA-455-46	<u>3/</u> , <u>14/</u> , <u>15/</u>
Type II		4.7.3.2.2	EIA-455-78	<u>3/</u> , <u>14/</u> , <u>15/</u>

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Inspection	Requirement paragraph	Test paragraph	Applicable test document	Specimen length
<u>Group I (continued)</u>				
Attenuation uniformity	3.6.2.1	4.7.3.2.3	EIA/TIA-455-59	<u>3/</u>
Numerical aperture	3.6.3	4.7.3.3	EIA/TIA-455-177	<u>2/</u> , <u>4/</u> , <u>15/</u>
Bandwidth	3.6.4	4.7.3.4	EIA-455-51	<u>3/</u> , <u>4/</u> , <u>15/</u>
Macrobend attenuation	3.6.5	4.7.3.5	EIA-455-62	<u>3/</u> , <u>15/</u>
Chromatic dispersion	3.6.6	4.7.3.6	EIA-455-175	<u>3/</u> , <u>15/</u>
Cut-off wavelength	3.6.7	4.7.3.7	EIA-455-80	<u>2/</u> , <u>5/</u> , <u>15/</u>
Transient attenuation	3.6.8	4.7.3.8	EIA-455-46	<u>4/</u> , <u>6/</u> , <u>15/</u>
<u>Group II</u>				
Tensile proof	3.5.2	4.7.2.2	EIA-455-31	4 @ 1.1 km
Nuclear radiation resistance	3.7.6	4.8.6	Appendix	<u>6/</u> , <u>11/</u>
Mechanical strippability	3.5.3	4.7.2.3	EIA/TIA-455-178	<u>7/</u>
Fluid immersion aging	3.7.5	4.8.5	EIA/TIA-455-75	<u>8/</u>
Dynamic tensile strength	3.7.10	4.8.10	EIA/TIA-455-28	<u>9/</u>
<u>Group III</u>				
Thermal shock	3.7.1	4.8.1	MIL-STD-202	3 @ 1.1 km <u>16/</u>
Temperature cycling	3.7.3	4.8.3	MIL-STD-1678	<u>10/</u>
Storage temperature	3.7.11	4.8.11		<u>10/</u>
Temperature humidity cycling	3.7.2	4.8.2	MIL-STD-1678	<u>10/</u>
Fungus resistance	3.7.7	4.8.7	MIL-STD-810	<u>12/</u>
Life aging	3.7.4	4.8.4	MIL-STD-202	<u>10/</u>
Flexure	3.7.9	4.8.9	EIA-455-65	<u>12/</u>
<u>Group IV</u>				
Thermal vacuum outgassing	3.4.2.1	4.7.2.5.1	ASTM E595	<u>13/</u>
Odor	3.4.2.2	4.7.2.5.2	NHB-8060.1	<u>13/</u>
Toxicity	3.4.2.3	4.7.2.5.3	NHB-8060.1	<u>13/</u>

1/ The visual and mechanical inspection shall only be conducted on a 2 m section of each sample unit.

2/ A specimen cut from each 1.1 km sample unit shall be used.

3/ The same 1.1 km sample units used in the visual and mechanical inspection shall be used.

4/ Type I fiber only.

5/ Type II fiber only.

6/ One 1.1 km sample unit shall be used for this test.

7/ A specimen cut from each 1.1 km tensile proof test sample unit.

8/ Two 1.1 km sample units used in the tensile proof test shall be used.

9/ Two 1.1 km sample units used in the fluid immersion aging test shall be used.

10/ The three 1.1 km sample units used in the thermal shock test shall be used.

11/ The fiber length shall be  $\geq 200$  m for residual gamma testing and  $\geq 20$  m for prompt gamma and neutron testing.

12/ A specimen cut from each 1.1 km thermal shock test sample unit.

13/ Finished material from a fiber sample.

14/ Group I tests may be performed on shipping or measurement spools. If fiber parameter tests are conducted on fiber on shipping spools and the results of any fiber parameter test is not within specification, all fiber parameter tests shall be conducted on fiber on measurement spools.

15/ Fiber parameter test.

16/ Group III environmental tests shall be conducted with each 1.1 km specimen in a loose coil."

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Table II: Delete and substitute:

"TABLE II. Group A inspection.

Inspection	Requirement paragraph	Test paragraph	Applicable test document
Visual and mechanical inspection	3.4, 3.5,	4.7.2	EIA-455-13
Attenuation rate	3.8, 3.9		EIA/TIA-455-60
Type I	3.6.2	4.7.3.2.1	EIA-455-46
Type II		4.7.3.2.2	EIA-455-78
Attenuation uniformity	3.6.2.1	4.7.3.2.3	EIA/TIA-455-59

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Table III: Delete "4.7.2.7" and substitute "4.7.3.7."

PAGE 13

Table V: Renumber as Table IV.

4.6.4, line 2: Delete "table IV" and substitute "table V."

4.6.4.1, line 2: Delete "table V" and substitute "table VI."

Table IV: Delete and substitute:

"TABLE V. Group C inspection.

Inspection	Requirement paragraph	Test paragraph	Applicable test document
<u>Subgroup I</u>			
Macroband attenuation	3.6.5	4.7.3.5	EIA-455-62
Temperature cycling	3.7.3	4.8.3	MIL-STD-1678
Storage temperature	3.7.11	4.8.11	
<u>Subgroup II</u>			
Thermal shock	3.7.1	4.8.1	MIL-STD-202
Temperature humidity cycling	3.7.2	4.8.2	MIL-STD-1678

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Inspection	Requirement paragraph	Test paragraph	Applicable test document
<u>Subgroup III</u>			
Nuclear radiation resistance 1/	3.7.6	4.8.6	Appendix
Life aging	3.7.4	4.8.4	MIL-STD-202
Flexure	3.7.9	4.8.9	EIA-455-65
<u>Subgroup IV</u>			
Fluid immersion aging	3.7.5	4.8.5	EIA/TIA-455-75
Dynamic tensile strength	3.7.10	4.8.10	EIA/TIA-455-28
<u>Subgroup V 2/</u>			
Thermal vacuum outgassing	3.4.2.1	4.7.2.5.1	ASTM E595
Odor	3.4.2.2	4.7.2.5.2	NHB-8060.1
Toxicity	3.4.2.3	4.7.2.5.3	NHB-8060.1

1/ Only residual gas radiation tests at the temperature of maximum change in optical transmittance during qualification testing are required.

2/ These tests may be waived by the qualifying activity."

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Table IV: Renumber as Table V.

Table V: Renumber as Table VI.

4.6.5, line 2: Delete "requirements of 3" and substitute "requirements of 3.8 and 5."

4.7.2, line 4: Delete "3.6, 3.7, and 3.8" and substitute "3.8, and 3.9."

PAGE 15

4.7.2.1.8, line 2: Delete "3.5.1.2.7" and substitute "3.5.1.2.8."

4.7.2.5.2 and 4.7.2.5.3, line 2, Change "NASA Handbook" to "NHB."

PAGE 16

4.7.3.1.1, line 2: Delete "RS-455-20" and substitute "EIA-455-20."

4.7.3.1.1, line 4: Delete "EIA-455-50" and substitute "EIA-455-50, procedure B."

4.7.3.1.1: Add the following after the third sentence:

"For Type II fibers, light launch conditions shall be as specified in EIA-455-78."

4.7.3.2.3: Add the following after the first sentence:

"Unless otherwise specified, the attenuation uniformity shall be measured at a wavelength of 1300 nm."

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4.7.3.8: Add "(see 3.6.8)" at the end of the paragraph.

4.8.2: Add the following after the first sentence:

"The subcycle shall be included in the test."

PAGE 17

4.8.3: Delete and substitute:

"4.8.3 Temperature cycling. The fibers shall be tested in accordance with the following conditions and cycle (see 3.7.3):

<u>Step</u>	<u>Temperature (°C)</u>	<u>Duration (hours)</u>
1. Maintain	Room ambient	24
2. Ramp to	-46 +0, -3	2
3. Maintain	-46 +0, -3	8
4. Ramp to	25 ±2	2
5. Maintain	25 ±2	6
6. Ramp to	+85 +3, -0	1
7. Maintain	+85 +3, -0	6
8. Ramp to	25 ±2	2
9. Maintain	25 ±2	6
10. Repeat steps 2 through 9 four additional times for a total of five cycles.		

Change in optical transmittance shall be measured during and after the test."

4.8.8: Delete.

4.8.9: Add "(see 3.7.9)" at the end of the paragraph.

4.8.10, line 2: Delete "an minimum" and substitute "a minimum."

4.8.11: Delete.

4.8.12: Delete and substitute:

"4.8.12 Storage temperature. The fibers shall be tested in accordance with the following conditions and procedure (see 3.7.11):

<u>Step</u>	<u>Temperature (°C)</u>	<u>Duration (hours)</u>
1. Maintain	Room ambient	3
2. Ramp to	low storage temperature -0, +3	1.5
3. Maintain	low storage temperature -0, +3	120
4. Ramp to	25 ±2	1.5
5. Maintain	25 ±2	3
6. Ramp to	high storage temperature +0, -3	1
7. Maintain	high storage temperature +0, -3	120
8. Ramp to	25 ±2	1
9. Maintain	25 ±2	3

Change in optical transmittance shall be measured before and after each 120 hour temperature plateau."

PAGE 18

5.3, line 1: Delete "Federal Supply Code for Manufacturers" and substitute "the manufacturer's Commercial and Government Entity (CAGE) code."

5.3, line 3: Delete "specification sheet number" and substitute "PIN."

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6.3, lines 10 and 13, change "EQ" to "ELS."

## PAGE 20

6.4.4, line 3: Delete "(see figure 1)."

6.5: Delete "Serial number" and substitute "Two or three digit alpha-numeric."

## PAGE 21

20. Delete "This section is not applicable to this appendix." and add "20.1 Non-Government publications. The following document forms a part of this appendix to the extent specified herein. Unless otherwise specified, the issue of the document which is listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issue of the document not listed in the DODISS is the issue of the document cited in the solicitation (see 6.2)."

## ELECTRONICS INDUSTRIES ASSOCIATION (EIA)

EIA-455-57 - Optical Fiber End Preparation and Examination."

30.1.1.3, line 2: Delete "second."

30.1.2: Delete the last sentence and substitute:

"For Type I fiber, wavelengths of  $850 \pm 10$  nm and  $1300 \pm 10$  nm shall be used unless otherwise specified. For Type II fiber, wavelengths of  $1310 \pm 10$  nm and  $1550 \pm 10$  nm shall be used unless otherwise specified."

## PAGE 22

30.1.5, line 9: Delete "used to hold it" and substitute "used to hold it."

## PAGE 26

40.5, line 3: Delete "specimen, day" and substitute "specimen day."

40.5.1, line 2: Change "sued" to "used" and change "at" to "as".

50.1, line 5: Delete "than" and change "sued" to "used".

## PAGE 27

50.6, line 3: Delete "FOTP-57, "Fiber End and Fiber Bundle Terminus Preparation". and replace with EIA-455-57 (FOTP-57)."

50.9.1, replace "FOTP-46 (RS-455-46)" with "EIA-455-46 (FOTP-46)" and "FOTP-20 (RS-455-20)" with "EIA-455-20 (FOTP-20)."

## PAGE 28

50.14, line 2: Delete "50 rads (Si) second" and substitute "50 rads (Si) per second."

50.15, line 3: Delete "of approximately 1 ns" and substitute the following:

"with a duration  $\leq 1$  ns. The intent of this test is to measure the effect of neutron radiation. The effect of gamma radiation shall be minimized."

60.2: Delete "where  $P_b$ " and substitute "where  $P_o$ ."

60.3: In the equation delete " $P_A/P_B$ " and substitute  $P_A/P_B$ .

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CONCLUDING MATERIAL

Custodians:

Army - CR  
Navy - EC  
Air Force - 85  
NASA - NA

Review Activities:

Army - AR, AV, MI, SC  
Navy - EC, OS  
Air Force - 11, 13, 99  
DLA - ES

Preparing Activity:

Army - CR

Agent:

DLA - ES

(Project 6010-0040)