



IPC-A-640A

Acceptance Requirements for Optical Fiber, Optical Cable, and Hybrid Wiring Harness Assemblies

Developed by the Fiber Optic Cable Acceptability Task Group (7-31m) of
the Product Assurance Committee (7-30) of IPC.

Supersedes:

IPC-A-640 - May 2017

Users of this publication are encouraged to participate in the
development of future revisions.

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Table of Contents

1 GENERAL	1
1.1 SCOPE	1
1.2 Purpose	1
1.3 Performance / Product Classification	2
1.3.1 Performance / Product Classification - Definitions	2
1.4 Definition of Requirements	2
1.4.1 Requirement Format (N/A/D)	2
1.4.2 Requirements Flowdown	3
1.5 Note(s) / Italicized Text	3
1.6 Commercial Off-the-Shelf (COTS)	3
1.7 Existing or Previously Approved Designs	3
1.8 Line Drawings and Illustrations	3
1.9 Measurement Units and Applications	3
1.10 Acronyms, Abbreviations, and Terms	3
1.10.1 Use of Lead	4
1.10.2 Periodic Table Elements	4
1.11 Engineering Documentation	4
1.12 Order of Precedence	4
1.12.1 Conflict	4
1.12.2 Clause References	4
1.13 Appendices A – C	4
1.14 Approval of Departures from Standards and Requirements	4
1.15 Personnel Proficiency	5
1.16 Facilities	5
1.16.1 Temperature	5
1.16.2 Humidity	5
1.16.3 Process Control & Test	5
1.16.4 Positive Pressure	5
1.16.5 Personnel Behavior	5
1.16.6 Field Assembly Operations	5
1.16.7 Foreign Object Debris (FOD) Control Plan	5
1.17 Safety	5
1.17.1 Chemicals	6
1.17.2 Epoxies/Adhesives	6
1.17.3 Toxic Products and Formulations	6
1.17.4 Protection from Bare Fibers	6
1.17.5 Eye Safety – Energized Source Concern	6
1.18 Tools and Equipment	7
1.18.1 Control	7
1.18.2 Calibration	7
1.19 Electrostatic Discharge (ESD) Protection	8
1.20 Contamination	8
1.21 Rework / Repair	8
1.22 Statistical Process Control (SPC)	8
1.23 Supply Chain Traceability	8
2 APPLICABLE DOCUMENTS	8
2.1 IPC	8
2.2 American Society of Mechanical Engineers (ASME)	9
2.3 ASTM International	9
2.4 EOS/ESD Association	9
2.5 Institute of Electrical and Electronics Engineers (IEEE)	9
2.6 International Electrotechnical Commission (IEC)	9
2.7 Laser Institute of America (LIA)	9
2.8 National Aeronautics and Space Administration (NASA)	9
2.9 National Fire Protection Association (NFPA)	9
2.10 NCSL International	9
2.11 Telecommunications Industry Association	9
2.12 United States Department of Defense (DoD)	9
2.13 UL	10
2.14 Reference	10
3 ASSEMBLY	11
3.1 Handling – Optical Fiber / Optical Cable, General Requirements	12
3.1.1 Handling - Optical Fiber / Optical Cable – Work-In-Progress	12
3.2 Optical Fiber End Preparation	13
3.2.1 Procedures – Optical Fiber Processing	13
3.3 Splicing	14
3.3.1 Fusion Splicing	14
3.3.2 Mechanical Splicing	14
3.3.3 Chemical Splicing	14
3.3.4 Environmental Seals	15
3.3.5 Location	15
3.3.6 Protection	15
3.3.7 Testing	15
3.4 Optical Fiber Cable Assemblies	15

3.5	Optical Fiber Assemblies	15	8	QUALITY ASSURANCE REQUIREMENTS – GENERAL AND VISUAL	22
3.6	Cleanliness	16	8.1	Product Class Conditions	22
3.7	Inspection	16	8.2	Inspection	23
3.8	Post-assembly Test	16	8.3	Responsibility for Inspections and Tests	23
3.9	Post-test Inspection	16	8.4	Classification of Inspections and Tests	23
3.10	Documentation	16	8.4.1	Parts, Materials and Process Controls	23
3.10.1	Traceability	16	8.4.2	Process Verification Audit	24
3.10.2	Test Data	16	8.4.3	Acceptance and Qualification Testing	24
4	INSTALLATION	16	8.4.4	Workmanship	24
4.1	General Installation Requirements	16	8.5	Visual Acceptance Criteria	29
4.1.1	Bundling (Fiber in the Wiring Harness)	16	9	QUALITY ASSURANCE REQUIREMENTS – TEST	69
4.1.2	Conduits	16	9.1	Link Loss Budget	69
4.1.3	Bend Radii	16	9.2	Test Conditions	69
4.1.4	Axial Alignment	16	9.2.1	Standard Test Conditions	69
4.1.5	Tensile Load	17	9.2.2	Extended Test Conditions	69
4.1.6	Mating	17	9.3	Safety Precautions	70
4.1.7	Torquing	17	9.3.1	Laser Service Group Definitions	70
4.1.8	Coefficient of Thermal Expansion (CTE) Issues	17	9.3.2	Laser Safety Precautions	70
4.2	Routing	17	9.3.3	Personnel Safety Precautions	70
4.3	Protection and Support	17	9.4	Acceptance and Qualification Testing	71
5	CLEANING	18	9.4.1	Receiving and Inspection	71
5.1	General Requirements	18	9.4.2	Acceptance Test	71
5.1.1	Solvents	18	9.4.3	Testing after Rework or Repair	71
5.1.2	Canned Air	19	9.4.4	Test Discrepancy/Failure	71
5.1.3	Compressed Air / Dry Nitrogen / Other Gas Media	19	9.4.5	Qualification	71
5.1.4	Wipes/Swabs	19	9.5	Inspection	72
5.2	Drying	19	9.5.1	General Requirements	72
6	DOCUMENTATION	20	9.5.2	Fiber and Cable Inspection	72
6.1	General	20	9.5.3	Optical Component Inspection	72
6.2	Data	20	10	DEFINITIONS AND ACRONYMS	73
6.3	Connector Orientation (Clocking)	20	11	TABLES	85
6.4	Connector Pin-Out	21	APPENDICES	91	
6.5	Dimensioning and Tolerance	21	Appendix A	Space / Military / HAZARDOUS Applications Requirements	93
6.6	Documentation for Maintenance/Emergency Restoration	22	Appendix B	Test Methods for the Initial Testing and Qualification of Optical Fiber, Optical Cable and Associated Devices	103
7	TAILORING	22	Appendix C	Verification and Validation Matrix	109

Tables

Table 8-1	Allowable Conditions for Fiber Connectors	25
Table 8-2	Allowable Conditions for Single-Mode Transceivers (With Internal Fiber Stubs)	26
Table 8-3	Lensed Device Acceptance Criteria	26
Table 11-1	Bend Radius	85
Table 11-2	Optical Fiber/Cable Length Measurement/Tolerance	86
Table 11-3	Magnification Aids (Power = X)	86
Table 11-4	Standard Test Conditions	87
Table 11-5	Extended Test Conditions	87
Table 11-6	Optical Power (Absolute Power and Power Loss)	87
Table 11-7	Typical Transmitter Specifications	88
Table 11-8	Comparison of LED and LD Transmitter Parameters	88
Table A1	Space / Military / Hazardous Application Requirements	93

Figures

Figure 1-1	Optical Fiber Assemblies, Cables And	1
Figure 1-2	International Laser Warning Label	6
Figure 1-3	Example of a Laser Warning Label Designed for Use in a Fiber Optic Communications Systems (FOCS)	7
Figure 3-1	Typical Fiber Optic Cable	13
Figure 5-1	Contamination (Oil and Debris)	18
Figure 5-2	Contamination (Before Cleaning)	19
Figure 5-3	Contamination (After Cleaning)	19
Figure 6-1a	Connector Orientation (Clocking) and Mating Face View (Inset) with D38999 Bulkhead Example (Arrow identifies key)	21
Figure 6-1b	Connector Orientation (Clocking), Example - APC Connector without Dust Cap	21
Figure 6-1c	Connector Orientation (Clocking), Example - LC Connector without Dust Cap	21
Figure 6-1d	Connector Orientation (Clocking), Example - MPO Connector without Dust Cap	21
Figure 8-1	End Face	25
Figure 8-2	End Face	26
Figure 8-3	End Face	26
Figure 8-4	Connector/Cable Configuration	29
Figure 8-5	Connector/Optical Fiber Configuration	29
Figure 8-6	Axial Alignment	29

Figure 8-7	Cable Alignment/Bend Radius	30
Figure 8-8	Fiber Alignment/Bend Radius	30
Figure 8-9	Protection Cap (Dust Cap)	31
Figure 8-10	Identification/Marker	31
Figure 8-11	Scuff Marks	32
Figure 8-12	Pistoning (Fiber)	32
Figure 8-13	Routing	33
Figure 8-14	Shrinkage (Outer Jacket)	33
Figure 8-15	Multimode (Left) and Single-Mode (Right) Fiber Ends	33
Figure 8-16	Edge Chips	34
Figure 8-17	Hackle	34
Figure 8-18	Scratches	35
Figure 8-19	Crash (Shattered Fiber)	35
Figure 8-20	Crack (Surface)	36
Figure 8-21	Crack, Surface (Side View)	36
Figure 8-22	Crack (Subsurface)	37
Figure 8-23	Necking	37
Figure 8-24	Lip	38
Figure 8-25	Lip (Side View)	38
Figure 8-26	Spiral Cleave	38
Figure 8-27	Breakdown / Roll-Off	39
Figure 8-28	Breakdown / Roll-Off (Side View)	39
Figure 8-29	Concave Core	40
Figure 8-30	Convex Core	40
Figure 8-31	Improper Strip Length	41
Figure 8-32	Kinking (Fiber)	41
Figure 8-33	Light Leakage (Fiber)	42
Figure 8-34	Buffer Shrinkage (Fiber)	42
Figure 8-35	Connector/Fiber Configuration	42
Figure 8-36	End Face View (Multimode Fiber)	43
Figure 8-37	End Face, Magnified Image (200X)	44
Figure 8-38	Scratches – Multiple Sizes, Cladding/ Core Zone (Large Scratch - Cladding Zone; Small Scratches	44
Figure 8-39	Scratch - Cladding and Core Zones	45
Figure 8-40	Scratches – Multiple Sizes, Cladding/Core Zone	46
Figure 8-41	Core Damage	47
Figure 8-42	Crash	47
Figure 8-43	Coarse Finish (Polish/Handling)	48
Figure 8-44	Contamination Particles and Fibers Located in Contact Zone	48

Figure 8-45	Severe Chipping and Pitting in Cladding Zone, Extending into Core Zone	49	Figure 8-66	Surface Distortion (Fusion Splice)	59
Figure 8-46	Particle Located in Core Zone	49	Figure 8-67	Alcohol Residue	60
Figure 8-47	Multiple Particles Located In Cladding Zone	50	Figure 8-68	Angular Misalignment of Fibers (Fusion Splice)	60
Figure 8-48	Oil/Liquid Residue	50	Figure 8-69	Boundary Layer/Diffraction Zone (Fusion Splice)	61
Figure 8-49	Crash (Severe Cladding and Core Damage).....	51	Figure 8-70	Bubbles (Fusion Splice)	61
Figure 8-50	Surface Cracks and Chips Extending into Core Zone.....	51	Figure 8-71	Core Mismatch (Fusion Splice)	62
Figure 8-51	Contamination / Voids / Cavities in the Adhesive Zone	52	Figure 8-72	Lateral Offset (Misalignment) of Fibers (Fusion Splice)	62
Figure 8-52	Multiple Particles Located in Cladding Zone	52	Figure 8-73	Mechanical Splice (Assembled).....	63
Figure 8-53	Multifiber Termination, Fiber Contamination.....	53	Figure 8-74	Bubbles in Index-Matching Gel (Mechanical Splice)	63
Figure 8-54	Adhesive Residue	53	Figure 8-75	Fiber End Face Separation (Mechanical Splice)	63
Figure 8-55	Example of a Lensed and Fiber Stub Device	54	Figure 8-76	Splice Closure/Protector	64
Figure 8-56	Lens End Face View (10X Magnification) ..	54	Figure 8-77	Butterfly Splice Closure/Protector	64
Figure 8-57	Fiber Stub End Face (10X Magnification) ..	55	Figure 8-78	Heat Shrink Splice Closure/Protector (Assembled Fusion Splice).....	64
Figure 8-58	Fiber Stub End Face (200X magnification) ..	55	Figure 8-79	Strength Member	65
Figure 8-59	Crack Across Viewing Area and Lens ..	56	Figure 8-80	Strength Member (Protruding Fibers) ..	65
Figure 8-60	Crash (Severe Surface Abrasion)	56	Figure 8-81	Strain-Relief Device (Boot)	66
Figure 8-61	Crash (Severe Chipping).....	57	Figure 8-82	Missing Strain-Relief Boot.....	66
Figure 8-62	Contamination.....	57	Figure 8-83	Improperly Installed Strain-Relief Boot ..	67
Figure 8-63	Scratch	55	Figure 8-84	Example of Undamaged Insulation Jacket ..	67
Figure 8-64	Chemical Splice (Assembled).....	58	Figure 8-85	Acceptable Mechanical/ Thermal Damage	67
Figure 8-65	Fusion Splice	59	Figure 8-86	Unacceptable Mechanical/ Thermal Damage	67

Acceptance Requirements for Optical Fiber, Optical Cable, and Hybrid Wiring Harness Assemblies

1 GENERAL

1.1 SCOPE This standard provides acceptance requirements and technical insight that have been removed from acceptance standards for cable and wire harness assemblies incorporating optical fiber, optical cable and hybrid wiring technology. Reference materials listed in this text are among those considered as required reading. The User is encouraged to obtain all relevant reference materials, as this document cannot (nor can any single document) cover every material, process, environment, performance, or safety aspect that affect a given design.

1.2 Purpose This standard is intended to provide information on design and acceptance requirements for optical fiber, optical cable, hybrid wiring harness assemblies and fiber optic communications systems (FOCS) to the extent that they can be applied to the broad spectrum of optical cable and wiring harness design.

Neither this document nor its Appendices provide detailed procedures for the test, acceptance, commissioning and /or maintenance of FOCS.

This document is intended for use by the design engineer, manufacturing engineer, quality engineer or other individual(s) responsible for tailoring specific requirements of this document to the applicable performance class.

- a. This document defines acceptability criteria and limits for "New/Beginning of Life" hardware. It is not the intent of this document to establish or define "In Service" acceptance criteria to address performance or reliability issues caused by aging or use. However, the acceptability criteria and limits that are detailed in this document may be considered to be wide enough to be applicable to the more common hardware degradation conditions caused by aging/use. Use of these criteria for acceptance of "In Service" hardware conditions **shall [D1D2D3]** be as agreed between User and Supplier (AABUS).
- b. It is not the intent of this document to exclude any alternate documents or processes that meet or exceed the baseline requirements established by this document. Use of alternate documents or processes **shall [D1D2D3]** require review and prior approval of the User.
- c. For purposes of this document:
 - 1) The Designer is the design agent for the User.
 - 2) The User is the individual, organization, company, contractually designated authority, or agency responsible for the procurement or design of electrical/electronic/electromechanical (EEE) hardware, and having the authority to define the class of product and any variation or restrictions to the requirements of this document (e.g., the originator/custodian of the contract detailing these requirements). The User is considered the Design Authority.
 - 3) The Supplier is considered the individual, organization or company which provides the Manufacturer (assembler) components (e.g., electrical, electronic, electromechanical, mechanical, printed boards) and/or materials (e.g., solder, flux, cleaning agents).
 - 4) The Manufacturer is considered the entity that provides a service or product to the User.

Note: In some instances, the Manufacturer may also be considered the Supplier to the User.

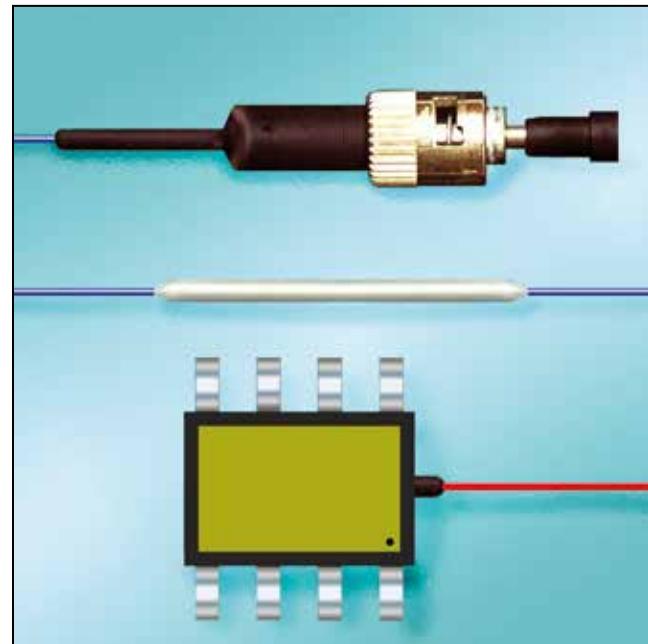


Figure 1-1 Optical Fiber Assemblies, Cables And Wiring Harnesses Connector, Splice and Transmitter
Image credit: NASA

1.3 Performance / Product Classification This document recognizes that optical wiring harnesses and cable assemblies are subject to classifications by intended end-item use. Three general end-product classes have been established to reflect differences in producibility, complexity, functional performance requirements and verification (inspection / test) frequency.

- a. It should be recognized that there may be requirement overlaps between performance / product classifications.
- b. The User is responsible for defining the performance / product classification.
- c. The contract **shall** **[D1D2D3]** specify the performance / product classification required, whether compliance to any of the Appendices is required and indicate any exceptions to specific parameters where appropriate.

1.3.1 Performance / Product Classification – Definitions

CLASS 1 – General Electronic Products

Includes products suitable for applications where the major requirement is function of the completed assembly.

CLASS 2 – Dedicated Service Electronic Products

Includes products where continued performance and extended life is required and for which uninterrupted service is desired but not critical. Typically, the end-use environment would not cause failures.

CLASS 3 – High-Performance/Harsh-Environment Electronic Products

Includes products for which continued high performance or performance-on-demand is critical, equipment downtime cannot be tolerated, end-use environment may be uncommonly harsh and the equipment must function when required, such as life support or other critical systems.

Space / Military / Hazardous Applications

Includes products from Class 3, with additional considerations for unique materials requirements (e.g., flammability, outgassing), exposure to extreme operational conditions (e.g., vibration and thermal cycling, shock, gravitational-loading), and extreme or sensitive operational environments (e.g., oil and gas exploration, petrochemical, food, pharmaceutical). Space / Military / Hazardous Application deviations to IPC-A-640A requirements are defined and listed in Appendix A, “Space / Military / Hazardous Applications Requirements.”

1.4 Definition of Requirements The imperative form of action verbs are used throughout this document to identify acceptance requirements that may require compliance, depending upon the Performance Classification of the hardware.

- a. **SHALL / SHALL NOT** – The words **shall** or **shall not** are used whenever a requirement is intended to express a provision that is mandatory.
 - 1) To assist the users of this standard (e.g., User, Manufacturer, Designer), the action verbs **shall** and **shall not** are displayed in **bolded text**.
 - 2) Deviation from a **shall** or **shall not** requirement for a particular Performance Class may be considered if sufficient technical rationale/objective evidence (OE) is supplied to the User to justify the exception.
- b. **SHOULD / SHOULD NOT** – The words “should” or “should not” are used whenever a requirement is intended to express a provision that is non-mandatory, and which reflects general industry practice and/or procedure. The words “should” or “should not” are displayed in **unbolded text**.

1.4.1 Requirement Format (N/A/D)

To assist the User, each requirement is identified by its Performance Classification (x1x2x3) and applicability, where “x” represents:

N = No requirement has been established for this Class

A = Acceptable

D = Defect

Examples:

- **[N1N2D3]** is Requirement Not Established Class 1 or 2, Defect Class 3
- **[N1D2D3]** is Requirement Not Established Class 1, Defect Classes 2 and 3
- **[N1A2D3]** is Requirement Not Established Class 1, Acceptable Class 2, Defect Class 3
- **[A1A2D3]** is Acceptable Classes 1 and 2, Defect Class 3
- **[D1D2D3]** is Defect for all Classes.
- A defect for a Class 1 product means that the characteristic is also a defect for Class 2 product and Class 3 product.
- A defect for a Class 2 product means that the characteristic is also a defect for a Class 3 product but may not be a defect for a Class 1 product where less demanding criteria may apply.