

MILITARY SPECIFICATION

PRINTED-WIRING, FLEXIBLE AND RIGID-FLEX

This amendment forms a part of MIL-P-50884C, dated 4 May 1984, and is approved for use by all Departments and Agencies of the Department of Defense.

PAGE 1

Box at bottom of page: Delete "Commander, Naval Electronic Systems Command, ATTN: ELEX 8111, Washington, DC 20363" and substitute "Commander, Electronic Support Division AFLC, 2750 ABW/ES, Gentile AF Station, Dayton, OH 45444-4500".

PAGE 2

2.1.1. SPECIFICATIONS, MILITARY, MIL-P-116: Delete "Preservation-Packaging, Methods of" and substitute "Preservation, Methods of".

PAGE 3

2.2: Delete "IPC-S-801" and substitute "IPC-S-804". Delete "IPC-B-29/50884 - Master Drawings for Flexible and Rigid-Flex Certification Boards." Add the following new publications:

- "IPC-A-41 - Single Sided Test Specimen.
- IPC-A-42 - Double Sided Test Specimen.
- IPC-A-43 - Multilayer Test Specimen.
- IPC-A-44 - Four Layer Test Specimen.
- IPC-100001 - Universal Drilling and Profile Master Drawing.
- IPC-100041 - Single Sided Drawing.
- IPC-100042 - Double Sided Drawing.
- IPC-100043 - Multilayer Printed Board Drawings.
- IPC-100044 - Four Layer Mass-Laminated Multilayer Printed Boards."

Also, delete "3451 Church Street, Evanston, IL 60203." and substitute "7380 North Lincoln Avenue, Lincolnwood, IL 60646."

3.2. delete and substitute the following:

"3.2 Qualification. Flexible and rigid-flex printed wiring furnished under this specification shall be products which are qualified for listing on the applicable Qualified Products List at the time set for opening of bids (see 4.5 and 6.5)."

Add new 3.3.1.1 as follows:

"3.3.1.1 Cap lamination, type 4 boards. Type 4 boards with outer layers made using cap layer lamination techniques shall use materials that are in accordance with MIL-P-13949. Minimum dielectric thickness shall meet the same requirements stated in 3.3.1. Cap lamination of type 4 boards requires the same testing as specified for group A and B evaluations."

Add new 3.3.1.2 as follows:

"3.3.1.2 Foil lamination, type 4 boards. Type 4 boards with outer layers made using foil lamination techniques shall use bonding materials (prepreg) that are in accordance with 3.3.2 and copper foil in accordance with 3.3.9. Minimum dielectric thickness shall meet the same requirements stated in 3.3.1. Foil lamination of type 4 board requires the same testing as specified for groups A and B evaluations plus the peel strength surface conductor evaluation test specified in 3.6.4.1."

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3.4.3a, delete and substitute: "a. Imperfection is translucent."

3.4.4, fourth sentence, delete and substitute the following:

"The marking shall be produced by the same process used in producing the conductor pattern; or by the use of a nonconductive, permanent fungistatic ink or paint (see 3.4.7) applied to the board or to a label which is applied to the board. The label shall be a polyimide film with acrylic pressure sensitive adhesive that shall withstand solder fluxes, cleaning solvents, molten solder, and conformal coating encountered in the manufacture of printed circuit boards. Electrical pencil marking on a metallic area provided for marking purposes may also be used."

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TABLE V, delete in its entirety and substitute the following:

"TABLE V. Adhesion to printed-wiring boards.

Material	Maximum percentage of lifting
	Melting and nonmelting metals nonscribed test
Bare copper	0
Gold or nickel	5
Tin-lead plating	10
Reflowed tin-lead	10
Base laminate	0

Add new 3.6.4.1 as follows:

"3.6.4.1 Surface peel strength (foil lamination). When type 4 printed boards are tested in accordance with 4.8.4.4.1, the surface conductor shall withstand a minimum peel strength of 5 pounds per inch of width. Peel strength failures shall be handled in accordance with 4.7.1.3.4. This requirement is only applicable to boards that have surface conductors or surface mount lands. Pad only boards do not require peel strength testing."

3.6.5.1. title: Delete "(certification)" and substitute "(qualification)".

3.6.6.1. title: Delete "(certification)" and substitute "(qualification)". At end of paragraph, add the following: "The mandrel size shall be 0.250 inch diameter."

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3.7.1. line nine: Delete "exceed one and one-half times the foil" and substitute "exceed two times the foil".

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FIGURE 4, upper right: Delete "(see 3.7.9)" and substitute "SEE NOTE 3."

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3.7.12.2. title: Delete "(type 2, 3, 4, and 5)" and substitute "(types 2, 3, and 4)". First sentence: Delete "type 2, 3, 4, or 5" and substitute "type 2, 3, or 4". Line seven: Delete "(see figure 2)" and substitute "(see figure 4)".

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4.1.1. line six: Delete "Certified suppliers shall" and substitute "Suppliers shall". Line eight: Delete "certified manufacturer" and substitute "manufacturer".

Add new paragraph 4.1.2 as follows:

"4.1.2 Responsibility for compliance. All items must meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material."

4.2b, delete and substitute: "b. Qualification inspection (see 4.5)."

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4.5, first line: Delete "Supplier's certification inspection" and substitute "Qualification inspection" (2 places).

4.5.1, last sentence, delete and substitute the following:

"Sample test specimens shall conform to the following for the type shown:

- a. Type 1: Test specimens for this type shall meet the requirements specified in master drawing IPC-100041 and artwork IPC-A-41.
- b. Type 2: Test specimens for this type shall meet the requirements specified in master drawing IPC-100042 and artwork IPC-A-42.
- c. Types 3 and 4: Test specimens for this type shall meet the requirements specified in master drawing IPC-100043 and artwork IPC-A-43.

- d. Type 5: Test specimens for this type shall meet the requirements specified in master drawing IPC-100044 and artwork IPC-A-44, except no plated thru-holes. NOTE: IPC-100001 is the Universal Drilling and Profile Master Drawing."

4.5.1.1, line five: Delete "certification" and substitute "qualification".

4.5.2, first line: Delete "Certification" and substitute "Qualification" (2 places).

4.5.3, first line: Delete "certification" and substitute "qualification" (2 places). Also, delete "Certification" and substitute "Qualification" (6 places).

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4.5.3, NOTE first line: Delete "certifying" and substitute "qualifying". Line two: Delete "Certification" and substitute "Qualification". Line three: Delete "certification" and substitute "qualification".

4.5.4, first line: Delete "certification" and substitute "qualification".

TABLE VIII, title: Delete "Supplier certification" and substitute "Qualification". Column heading: Delete "Certification". Test coupon column: Delete "Supplier certification".

TABLE VIII, Inspection column, Thermal stress (type 1), test specimen number column: Add "1".

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TABLE VIII, title: Delete "Supplier certification" and substitute "Qualification". Column heading: Delete "Certification".

Inspection column, Adhesive on land, test specimen number: Add "1, 4"; Test coupon column, types 2, 3, and 4: Add "A-1" (3 places).

Inspection column, Coverlayer wrinkles, test specimen number column: Add "1, 2, 3, 4"; Whole specimen column: Add "X".

Inspection column, Coverlayer access holes, test specimen number column: Add "1, 2, 3, 4"; Whole specimen column: Add "X".

Inspection column, Conductor edge overhang, test specimen number column: Add "1, 4"; Test coupon column, type 1, 2, 3, 4, 5: Add "A-1 or A-5" (5 places).

Inspection column, Bond strength (type 1), test specimen number column: Add "1, 4".

Inspection column, Flexibility endurance, Test coupon column, type 2, 3, 4, 5: Add "H-1" (4 places).

Inspection column, Plated-through hole, test specimen number column: Delete "1" and substitute "1, 4"; Test coupon column, type 2, 3, 4: Delete "B-3" and substitute "A-1 or A-5" (3 places).

TABLE VIII, title: Delete "Supplier certification" and substitute "Qualification". Column heading, delete "Certification".

Inspection column, Undercutting, test specimen number column: Add "1, 4"; Test coupon column, type 2, 3, 4: Add "A-1 or A-5" (3 places).

Inspection column, Flexible material, test specimen number column: Add "1, 4"; Test coupon column, type 2, 3, 4: Add "A-1 or A-5" (3 places).

Inspection column, Laminate voids, test specimen number column: Add "1, 4"; Test coupon column, type 2, 3, 4, 5: Add "A-1 or A-5" (4 places).

Inspection column, Lifted lands (as received), test specimen number column: Add "1, 4"; Test coupon column, type 2, 3, 4: Add "A-1" (3 places).

Inspection column, Lifted lands, test specimen number column: Add "1, 4"; Test coupon column, 1, 2, 3, 4: Add "B-3, A-2, A-2, A-2".

TABLE VIII, title: Delete "Supplier certification" and substitute "Qualification". Column heading: Delete "Certification"

Inspection column, Moisture and insulation resistance, test coupon column, type 1, 2, 3, 4, 5: Delete "E-5" and substitute "E-3" (5 places).

Inspection column, Dielectric withstanding voltage, test coupon column, type 1, 2, 3, 4, 5: Delete "E-5" and substitute "E-3".

Inspection column, Continuity, test specimen number column: Add "2".

Inspection column, Insulation resistance, test specimen number column: Add "2"; Test coupon column, type 2, 3, 4, 5: Add "E-1" (4 places).

Inspection column: Delete "Adhesive on land" and all applicable information.

Inspection column: Delete "Coverlayer wrinkles" and all applicable information.

Inspection column: Delete "Coverlayer access" and all applicable information.

Inspection column: Delete "Flexible material" and all applicable information.

Inspection column: Delete "Laminate voids" and all applicable information.

Inspection column: Delete "Lifted lands" and all applicable information.

Footnote 3/, after "submitted": Add "and used for flexibility endurance."

Footnote 4/, delete and substitute: "4/ See MIL-STD-2118."

4.5.5: Delete "certification" and substitute "qualification" (4 places).

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4.5.5b, last line: Delete "certification" and substitute "qualification".

4.5.5c: Delete "certification" and substitute "qualification" (2 places). Line six: Delete "30 days" and substitute "60 days"; also, delete "interval shall" and substitute "interval may". Line eight: Delete "certifying" and substitute "qualifying". Line twelve: Delete "recertify" and substitute "requalify".

4.5.5d: Delete "certification" and substitute "qualification".

Add new subparagraph 4.5.5e as follows:

"e. The manufacturer shall requalify every 36 months. The extent of qualification specified in 4.5.3 shall apply."

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TABLE XI, inspection column: Delete "Surface imperfection 3.4.3" and substitute "Subsurface imperfections 3.4.3".

Inspection column: Delete "Marking (missing and legibility)" and substitute "Marking".

Requirement paragraph column: Delete "3.4.4" and substitute "3.3.14". Method paragraph column: Delete "4.8.2.4" and substitute "4.8.4.8".

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TABLE XI, Inspection column, Continuity, Production board column: Delete "7/" and substitute "X".

Inspection column, Insulation resistance, Production board column: Delete "10/" and substitute "X 9/".

Footnote 8/, second sentence: Delete in its entirety.

Footnote 8/, third sentence: Delete "Type 2" and substitute "Types 1, 2, and 5".

Footnote 9/: After "and 2" add "an AQL of 2.5 percent defective".

Footnote 11/, delete and substitute: "11/ See MIL-STD-2118."

TABLE XII, inspection column: Delete "Marking ink" and all applicable information.

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TABLE XII, footnote 3/: Delete "See figures 17, 19, and 22." and substitute "See MIL-STD-2118."

TABLE XIII, inspection column, flexibility endurance: After "2/" add "4/".

Footnote 3/, delete and substitute "See MIL-STD-2118."

Add footnote 4/ as follows: "4/ A type 1 specimen or board shall be used for flexibility endurance."

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Add new paragraph 4.7.2 as follows:

"4.7.2 Inspection of packaging. The sampling and inspection of the preservation and interior pack marking shall be in accordance with the groups A and B quality conformance inspection requirements of MIL-P-116. The sampling and inspection of the packing shall be in accordance with the quality assurance provisions of the applicable container specification. Inspection of marking for shipment and storage shall be in accordance with the marking requirements of MIL-STD-129."

4.8.1, line six: Delete "3 diopters (approximately 3/4X)" and substitute "4X".

4.8.2.6: Delete "IPC-S-801" and substitute "IPC-S-804".

PAGE 34

4.8.3.3: Delete "and 4.8.5.1".

PAGE 37

* Add new 4.8.4.4.1 as follows:

"4.8.4.4.1 Surface peel strength (foil lamination)(see 3.6.4.1). The peel strength shall be inspected in accordance with IPC-TM-650, method 2.4.8. For quality conformance testing the specimen shall consist of conductors that provide a minimum test length of 2 inches (50 mm) and a conductor width of 0.125 inch (3.3 mm); see IPC-TM-650, section 5.8.3. This coupon can be placed in the border of the panel or elsewhere as space is available. This coupon is not described in MIL-STD-2118. The test frequency shall be once per month. Ten peel strength specimens shall be selected from two different production lots; coupon traceability shall be maintained. Plated tin-lead, solder coating, or other plated metallic resist shall be chemically removed prior to test, or shall be prevented from being deposited during manufacturing. The test specimen shall not be coated with any organic coating for test. Peel strength readings shall be averaged, discarding invalid results in accordance with IPC-TM-650 section 1.7."

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4.8.4.8: Delete "Method 215A" and substitute "method 215".

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4.8.6.1, line three, after Method 2.6.3: Add ", class 3".

PAGE 41

4.8.6.4, third sentence: Delete in its entirety.

PAGE 44

6.1.1h.: Delete "preservation-packaging" and substitute "preservation".

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* 6.3.1c: Delete "EI Dupont Company, Incorporated, 'Ion Chaser™.'" and substitute "Zero Systems, Incorporated, 'Zero Ion™, Model ZI-100.'".

* Add new 6.3.1d as follows:

"d. Westek, ICOM 5000^{cm}".

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* TABLE XIV, delete in its entirety and substitute:

"TABLE XIV. Equivalence factors.

Method	Ohm-cm (x10 ⁶)	Equivalence factors	Equivalents of sodium chloride	
			Micrograms per square inch	Micrograms per square cm
Resistivity of solvent extract	2	1.00	10.06	1.56
Omega meter ^{cm} <u>1/</u>	2	1.39	14.00	2.20
Ionograph ^{cm}	2	2.01	20.00	3.10
Zero ion ^{cm}	2	3.68	37.00	5.80
ICOM 5000 ^{cm}	2	2.20	22.00	3.40

1/ Model 200, 300, 400, or 600."

6.5. delete and substitute the following:

"6.5 Qualification. With respect to products requiring qualification, awards will be made only for products which are at the time set for opening of bids, qualified for inclusion in the applicable qualified products list whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. The activity responsible for the qualified products list is Commander, Electronic Support Division AFLC, 2750 ABW/ES, Gentile AF Station, Dayton, OH 45444-4500; however, information pertaining to qualification of products may be obtained from the Defense Electronics Supply Center (DESC-E), Dayton, Ohio 45444."

6.5.1: Delete in its entirety.

Add new paragraph 6.6.2 as follows:

"6.6.2 MIL-P-50884 printed-wiring board. A MIL-P-50884 printed-wiring board is a flexible or rigid-flex printed-wiring board produced by a manufacturer listed on the Qualified Products List (QPL) and comes from a lot which has been subjected to, and passed all quality conformance inspections."

* Concluding material, under preparing activity: Delete "Navy - EC" and substitute "Air Force - 85".

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APPENDIX: Delete in its entirety.

The margins of this amendment are marked with an asterisk to indicate where changes (additions, modifications, corrections, deletions) from the previous amendment were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous amendment.

CONCLUDING MATERIAL

Custodians:

Army - ER
Navy - EC
Air Force - 85

Review activities.

Army - AR, MI
Navy - OS, SH
Air Force - 11, 16, 99
DLA - ES

User activities:

Navy - AS, CG, MC
Air Force - 19

Preparing activity:

Air Force - 85

Agent:

DLA - ES

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