

## **SUMMARY OF TOPICS**

***The following changes in requirements to the Standard for Printed-Wiring Boards, UL 796, are being proposed:***

- 1. Clarification of the PWB constructions covered under UL 796***
- 2. Clarification of the term Cladding***
- 3. Addition of a definition for Hybrid Printed Wiring Board***
- 4. Clarification of the term Industrial Laminate***
- 5. Clarification of the term Sample***
- 6. Clarification of the term Type***
- 7. Addition of requirement for sample stabilization period***
- 8. Clarification of low energy circuits requirement***
- 9. Clarification of metal clad bond/delamination requirement***
- 10. Clarification of direct support requirement***
- 11. Clarification of conductor weight range requirement***
- 12. Clarification of maximum area diameter conductors section***
- 13. Revision of solder limit section***
- 14. Add reference to coatings used for functions other than solder mask***
- 15. Correct reference to singlelayer in Section 16***
- 16. Clarification of multilayer direct support requirements***
- 17. Reorganization of Sections 28 and 30***
- 18. Clarification of Delamination test***
- 19. Clarification of edge conductor criteria in Section 22***
- 20. Addition of an alternate method for determining bond strength force***

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**21. Addition of marking elements location****STP BALLOTS AND ALL COMMENTS DUE: November 5, 2018**

For your convenience in review, proposed additions to existing requirements are shown underlined and proposed deletions are shown ~~lined-out~~.

**1. Clarification of the PWB constructions covered under UL 796****RATIONALE**

Proposal submitted by: Crystal Vanderpan, UL LLC

UL proposes to update the scope of UL 796 to clarify the flex PWB requirements. The intent of the proposal is for clarification and to reflect current practice.

It is the opinion of the proposal submitter that this proposal contains a construction requirement revision or clarification.

**PROPOSAL**

1.4 ~~These requirements do not apply to flexible, flex-to-install, rigid, Flexible material constructions and multilayer rigid flex composite interconnect constructions with and without stiffener and adhesive materials as flexible materials interconnect constructions (FMIC's) for use as components in devices or appliances — that are covered by~~ shall be investigated in accordance with the Standard for Flexible Materials Interconnect Constructions, UL 796F.

**2. Clarification of the term Cladding****RATIONALE**

Proposal submitted by: Crystal Vanderpan, UL LLC

UL proposes to update the definition of Cladding to include additional detail regarding the conductor layer. The intent of the proposal is for clarification and to reflect current practice.

It is the opinion of the proposal submitter that this proposal contains a construction requirement revision or clarification.

**PROPOSAL**

2.16 CLADDING – A deposited or plated metallic layer or laminated foil used for its protective and/or electrical properties. See Conductive Foil.

**3. Addition of a definition for Hybrid Printed Wiring Board****RATIONALE**

Proposal submitted by: Crystal Vanderpan, UL LLC

UL proposes to add a new definition for Hybrid PWBs for the purpose of describing multilayer boards. The intent of the proposal is for clarification and to reflect current practice.

It is the opinion of the proposal submitter that this proposal contains a construction requirement revision or clarification.

## PROPOSAL

2.76.1 HYBRID PRINTED WIRING BOARD – A multilayer board comprised of various combinations of dissimilar base materials and/or bonding layers.

### 4. Clarification of the term Industrial Laminate

#### RATIONALE

Proposal submitted by: Crystal Vanderpan, UL LLC

UL proposes to update the definition of Industrial Laminate to include additional detail regarding the reinforcement and resin. The intent of the proposal is for clarification and to reflect current practice

It is the opinion of the proposal submitter that this proposal contains a construction requirement revision or clarification.

## PROPOSAL

2.79 INDUSTRIAL LAMINATE – Insulating material consisting of reinforcement fibrous material such as cellulose paper, cotton, woven glass, random laid glass mat or other fibers impregnated or coated with a resin binder and laminated under pressure and high temperature. See Base Material.

### 5. Clarification of the term Sample

#### RATIONALE

Proposal submitted by: Crystal Vanderpan, UL LLC

UL proposes to update the definition for Sample to include production board or formed coupons used for investigations. The intent of the proposal is for clarification and to reflect current practice.

It is the opinion of the proposal submitter that this proposal contains a construction requirement revision or clarification.

## PROPOSAL

2.124 SAMPLE – A complete or portion of production board, or a coupon formed by the board entire production process incorporating specific construction features to be used as a test vehicle. A test vehicle which may be a production printed wiring board, or a portion thereof, or a coupon.

### 6. Clarification of the term Type

#### RATIONALE

Proposal submitted by: Crystal Vanderpan, UL LLC

UL proposes to update the definition for Type to reference the model or product specifically. The intent of the proposal is for clarification and to reflect current practice.

It is the opinion of the proposal submitter that this proposal contains a construction requirement revision or clarification.

## PROPOSAL

2.140 TYPE – A unique model or product designation arbitrarily assigned to a board by the fabricator. See Markings, Section 33.

### 7. Addition of requirement for sample stabilization period

## RATIONALE

Proposal submitted by: Crystal Vanderpan, UL LLC

UL proposes to harmonize the stabilization period requirements prior to testing with the other material standard, the Standard for Polymeric Materials – Short Term Property Evaluations, UL 746A, as well as the Standard Practice for Conditioning Plastics for Testing, ASTM D618, and the Standard for Plastics – Standard Atmospheres for Conditioning and Testing, ISO 291. UL 746A requires 88 hours for the stabilization period due to the possibility of testing samples greater than 7 mm in thickness. The PWB samples tested are less than 7 mm in thickness, and therefore the stabilization time period can be 40 hours. Please note that this change is being proposed for all of the standards covered by STPs 796 and 796F.

## PROPOSAL

4.1.1 Prior to all tests, subject all samples to a stabilization period in accordance with the Standard Practice for Conditioning Plastics for Testing, ASTM D618 and the Standard for Plastics – Standard Atmospheres for Conditioning and Testing, ISO 291, for a minimum of 40 hours at 23 ±2°C and 50 ±10 percent RH.

4.2 During the test, Unless otherwise specified in the individual test method, the standard atmospheric conditions surrounding the sample for a minimum of 40 hours prior to and during the test shall be 25°C ±10°C (77°F ±18°F) and 50 ±10 percent relative humidity, unless otherwise specified in the individual test method.

### 8. Clarification of low energy circuits requirement

## RATIONALE

Proposal submitted by: Crystal Vanderpan, UL LLC

UL proposes to update paragraph 7.3 to reference all materials in the PWB construction and not limited to base material only for clarification and to reflect current practice. The dash listed in the first sentence of the paragraph for PWBs shall be removed for term consistency.

It is the opinion of the proposal submitter that this proposal contains a construction requirement revision or clarification.

## PROPOSAL

7.3 When a printed-wiring board is intended for connection only in low-energy circuits, in which the risk of electric shock or injury to persons is not involved, compliance of the base material printed wiring board shall, as a minimum, be determined by flammability testing (see Section 25, Flammability).

## 9. Clarification of metal clad bond/delamination requirement

### RATIONALE

Proposal submitted by: Crystal Vanderpan, UL LLC

UL proposes to rearrange the sentence structure of the base materials paragraph 9.2.1 for clarification and to reflect current practice.

It is the opinion of the proposal submitter that this proposal contains a construction requirement revision or clarification.

### PROPOSAL

9.2.1 The base material(s) and conductor(s) of the printed wiring board shall comply with the Bond Strength, Section 26, and Delamination and Blistering, Section 27, between the base material and the conductor cladding metal after Thermal Shock, Section 24, in accordance with the desired ratings.

## 10. Clarification of direct support requirement

### RATIONALE

Proposal submitted by: Crystal Vanderpan, UL LLC

UL proposes to update direct support paragraph 9.3.1 to clarify boards that need DSR and/or CTI ratings also require an MOT rating. The intent of the proposal is for clarification and to reflect current practice.

It is the opinion of the proposal submitter that this proposal contains a construction requirement revision or clarification.

### PROPOSAL

9.3.1 A printed wiring board ~~identified by the markings required in 33.9 for the~~ intended for direct support of current carrying parts and/or CTI ratings at 120 V rms or less and 15 A or less; shall have an acceptable maximum operating temperature rating for the end use product application. In a direct support PWB, each material in the build-up construction all materials, when used as a dielectric barrier and/or substrate for conductors, ~~or the build-up construction,~~ shall comply with the performance profile test requirements in Table 9.3.

## 11. Clarification of conductor weight range requirement

### RATIONALE

Proposal submitted by: Crystal Vanderpan, UL LLC

UL proposes to update the conductor reference in paragraph 10.6.1 from copper foil to any cladding material based on the increased use of alternate conductor material types. The intent of the proposal is for clarification and to reflect current practice.

It is the opinion of the proposal submitter that this proposal contains a construction requirement revision or clarification.

## PROPOSAL

10.6.1 Representative samples shall be investigated for each copper foil cladding material, minimum and maximum weight range or and each cladding process for the base material. ~~See 10.6.2.~~

### 12. Clarification of maximum area diameter conductors section

## RATIONALE

Proposal submitted by: Crystal Vanderpan, UL LLC

UL proposes to add the term maximum area diameter to paragraph 10.9 to match up with the board parameter certification. No changes are being made to the evaluation process. The intent of the proposal is for clarification and to reflect current practice.

It is the opinion of the proposal submitter that this proposal contains a construction requirement revision or clarification.

## PROPOSAL

### 10.9 Maximum unpierced conductor area (Maximum area diameter)

### 13. Revision of solder limit section

## RATIONALE

Proposal submitted by: Crystal Vanderpan, UL LLC

UL proposes to add the solder limit definition back into the standard to alleviate confusion. No changes are being made to the evaluation process. The intent of the proposal is for clarification and to reflect current practice. This includes updating the terminology from thermal shock to thermal stress to reflect industry terminology.

## PROPOSAL

7.4 A printed\_wiring board requiring a maximum operating temperature (MOT) rating shall be investigated for thermal shock stress (Section 24), bond strength (Section 26), delamination and blistering (Section 27), conductive paste adhesion (Section 30) and dissimilar material thermal cycling (Section 28) if applicable based on the PWB construction, materials and end-use product application.

7.5 A printed\_wiring board requiring a flammability rating shall be investigated for thermal shock stress (Section 24) and flammability testing (Section 25) if applicable based on the PWB construction, materials, and end-use product application.

9.2.1 The printed\_wiring board shall comply with the Bond Strength, Section 26, and Delamination and Blistering, Section 27, between the base material and the conductor cladding metal after Thermal Shock Stress, Section 24.