

Everett BU: OPERATING PROCEDURE	
Document: PWB Procurement Specifications ISO 9001/13485 & AS9100	Document Number: 221-008 Revision: L

<b>Document Cover Page</b>	
Process Owner	Department Leader

Revision History					
Change Originator	Reason for Change	Old Rev	New Rev	CO #	Date
Chris Klingerman	Update 5.0 General Provisions # 7. Adding "Buyer email will spell out requirements"	G	H	3797	5/29/2020
Ed Lucas	6.7.1 Acceptance Criteria Add Bullet: When 2 boards per panel, CFT PM or engineer may determine to accept lots when X-outs per panel is greater than 0.  Update ATS to EVT, Creation, Everett BU	H	J	4595	1/11/2023
Hamid Farsad	Removed the requirement of marking the fiducial of an X-out board. In Section 6.1 added the board material requirement	J	K	4617	1/31/2023
Jami Lentz	Update template	K	L	5175	10-5-2023

This copy is uncontrolled unless otherwise stamped in red ink.
00-001G Procedure Template

Everett BU: OPERATING PROCEDURE		
Document: PWB Procurement Specifications ISO 9001/13485 & AS9100	Document Number: Revision: L	221-008

## PURPOSE

The purpose of this procedure is to provide the necessary information to specify boards procured for use at EVT. These requirements are intended to ensure the receipt of high-quality Printed Circuit Boards (PCBs) for production. This specification must be used for procurement of all PCBs in conjunction with other customer specifications.

Questions from the PCB Manufacturer are expected to be presented to Supplier Management for resolution and before fabrication proceeds.

## 2.0 SCOPE

This document specifies the procurement requirements for PCBs by EVT.

Special requirements or exemptions to the requirements of this document will be noted on any applicable Purchase order or customer specific documentation.

## 3.0 DEFINITIONS

EVT	Creation Everett BU
SMOBC	Solder Mask Over Bare Copper
HASL	Hot Air Solder Level
LPI	Liquid Photo Imageable
RoHS	Restriction of Hazardous Substances
Customer	Original party that engaged EVT BU to procure PWBs on their behalf

## 4.0 REFERENCES & APPLICABLE DOCUMENTS

The Following Documents form a part of this procedure:	
IPC-A-600	Acceptability of Printed Boards
IPC-TM-650	Test Method Manual Method 2.4.22 Bow and Twist
IPC-SM-840	Qualifications and performance of Permanent Polymer Coating (Solder Mask) for Printed Boards
IPC-2221	Generic Standards for Printed Board Design
IPC-2222	Sectional Design Standards for Rigid Organic Printed Boards
IPC-2223	Sectional Design Standards for Flexible Printed Boards
IPC 6011	Generic Performance Specification for Printed Boards
IPC 6012	Quality and Performance Specifications for Rigid Printed Boards

This copy is uncontrolled unless otherwise stamped in red ink.

00-001G Procedure Template

Creation Everett BU: OPERATING PROCEDURE	
Document: PWB Procurement Specifications ISO 9001/13485 & AS9100	NUMBER: 221-008 REVISION: L

## 5.0 GENERAL PROVISIONS

1. Prior to being placed on EVT Key Supplier List, the supplier should pass a qualification process (as defined by EVT Supplier Quality Engineering) and submit a letter or E-mail to EVT agreeing to comply with this document's specifications.
2. Failure to comply with this document may result in rejection of the supplied material at the supplier's expense (including the labor and material charges of the processed boards) and removal of the supplier from EVT Key Supplier List.
3. When the supplier accepts a purchase order, such acceptance constitutes an agreement that the PCBs are built per this specification, the provided master drawing, board fabrication drawing, drill file, artwork, Gerber files, applicable IPC specifications, and any other specifications that are supplied by EVT or specified on the purchase order.
4. If the board manufacturer is not able to meet any of the requirements of this specification (or other specifications associated with the board), the manufacturer should contact EVT Supplier Management.
  - Supplier Management may either elect to move the production to another board manufacturer or work with engineering to process the request.
  - Supplier Management informs the manufacturer of the status of the request and whether the request has been approved or rejected.
  - If the request is approved, Supplier Management will send a copy of the deviation to the requestor and to EVT Receiving Inspection.

**NOTE: Unless otherwise specified; the deviation(s), when granted, are issued on a case-by-case basis for each individual date code and are not transferable to other boards, products, or date codes without written approval from EVT Engineering. In addition, EVT requests that every deviation request file be named according to the "PO # / Part #" for ease of filing.**

In case of a conflict between various documents please contact EVT Engineering for clarifications.

6. Board penalization, breakaway tab specifications, and other board features (i.e. tooling holes, fiducials, etc.) are obtained from EVT Engineering with a copy to EVT Supplier Management prior to start of the board fabrication process. If this information is not specified, the supplier must contact EVT Supplier Management to obtain the required specifications. The supplier may provide suggestions and submit them to EVT for approval.
7. It is the supplier's responsibility to provide the complete working panelized Gerber files (in electronic format) to EVT Engineering for approval with a copy to EVT Supplier Management prior to fabrication of the boards. This requirement also applies to any revision to the PCB that changes the Gerber files.
8. The supplier must assure that all boards are free of fingerprints, oil, dirt, corrosion, corrosive material, salts or any other chemicals or foreign materials or defects that may impact the life (including shelf life), solderability, or appearance of the board. The supplier certifies to EVT that each shipment of PCB's meets the specified requirements including IPC ionic contamination limits.

This copy is uncontrolled unless otherwise stamped in red ink.
--

00-001G_Procedure Template
----------------------------

Creation Everett BU: OPERATING PROCEDURE	
<b>Document: PWB Procurement Specifications</b> ISO 9001/13485 & AS9100	NUMBER: 221-008  REVISION: L

## 6.0 MATERIAL REQUIREMENTS

By shipping the PCBs, the manufacturer acknowledges that:

1. Printed circuit boards (including solder mask and the ink used for board marking) are compatible with electronics' manufacturing processes.
2. RoHS boards must be compatible with RoHS manufacturing processes including higher (than Sn-Pb) processing temperatures.

### 6.1 Laminate:

- The laminate must meet or exceed UL94V-0 rating for flammability. Normally this logo is etched on the board as part of manufacturer's logo, date code, etc. If PCBs are not marked accordingly a Certification of Compliance (CofC) will be supplied with the shipment.
- Board material must meet the requirements specified in board fabrication file, drill and trim file, and the Gerber files. Unless otherwise specified, base laminate must be FR-4 copper clad glass epoxy laminate.
- Tg = 135°C for SnPb processed PCB's. Unless PCBs are specified as lead-free or RoHS compliant this is the minimum standard.
- Tg = 150°C minimum for lead-free or RoHS compliant PCB's unless specified otherwise. Fabricators are expected to question any PCB they deem to be under specified.
- The copper foil must meet IPC-A-600 requirements.
- Copper foil thickness must be per the printed circuit board's specification. Unless otherwise specified the preferred foil thickness is ½ Oz (per in<sup>2</sup>).

### 6.2 Solder Mask:

- Solder mask must comply with IPC-A-6012 requirements, meeting the requirements of IPC-SM-840 Class T, and IPC-A-600. Solder masks must be compatible with "no-clean" and "lead-free" processes.
- The circuitry of the PCB must be covered with solder mask over bare copper (SMOBC).
- Solder masks must be liquid photo imageable (LPI).
- LPI solder mask must be matte finish unless approved by EVT Engineering.
- Color should be green unless otherwise specified by the customer.
- Solder mask (including bleed out) may abut the pad but may not encroach onto the top surface of the pad or interfere with soldering the entire pad. Exception to this rule is the solder mask defined pads.

### 6.3 Surface Finish:

EVT prefers the following PCB surface finishes:

- ENIG (Electroless Nickel / Immersion Gold)
- HASL (Hot air solder level)
- Immersion silver, Immersion tin, and OSP (organic solderability preserver) are acceptable when specified by the customer.
- The surface finish of the PCB must be per the PCBs specification. If the surface finish is not properly specified in the board fabrication files or the purchase order or is not one of EVT' preferred surface finishes, the PCB manufacturer must request.
- clarification from EVT Engineering with a copy to EVT Supplier Management prior to fabrication.

This copy is uncontrolled unless otherwise stamped in red ink.

00-001G\_Procedure\_Template

## Creation Everett BU: OPERATING PROCEDURE

**Document: PWB Procurement Specifications**  
ISO 9001/13485 & AS9100

NUMBER: 221-008

REVISION: L

- Gold must be plated over nickel for assemblies requiring gold finish (ENIG). Gold and nickel plating must meet the requirements of IPC-6012 for areas that require soldering.
- For HASL boards, the solder (per QQ-S-571) must be deposited on external pads and on barrels of plated through holes/vias per IPC-6012. For tin-lead boards, the minimum solder thickness at the “knee” of the plated through hole is .00005”.
- The surface coating thickness must meet the requirements of the latest revision of IPC-6012 specification.
- Unless otherwise specified, all holes and vias shall be copper flash plated through and over plated with tin-lead plating, ENIG, or with as specified surface finish. For tin-lead boards the minimum average copper thickness is 0.0008 inch. For lead-free boards, the absolute minimum thickness is 0.001 inches with 0.0012 as an average minimum.

**6.4 Solderability:**

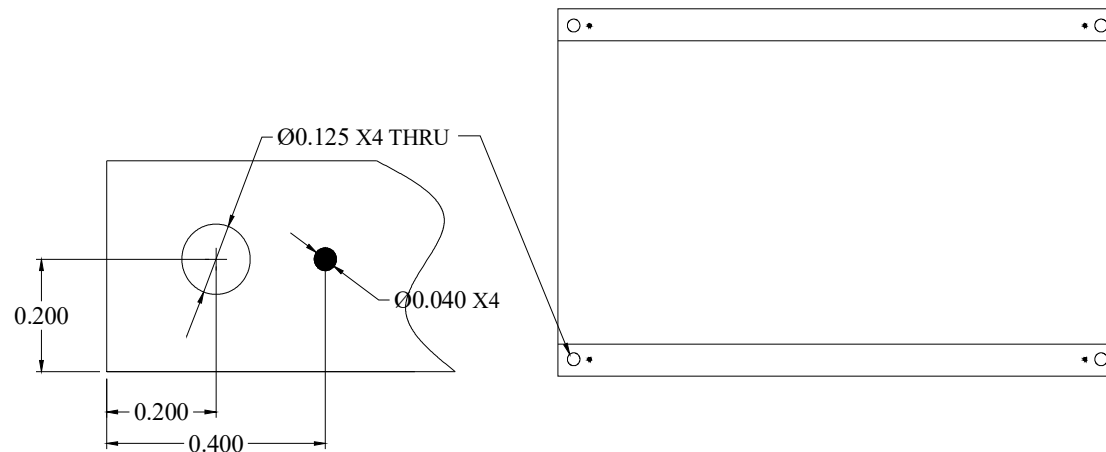
All PCBs shall meet the solderability requirements of IPC-J-STD-003 (method C) at the time of shipment. Testing is recommended to be done by the supplier on at least one sample of each lot and each date code.

**6.5 Cleanliness:**

Cleanliness testing must be conducted per IPC-6012 specifications. The supplier must be able to provide proof of compliance upon request.

**6.6 Fiducial marking:**

- The panel breakaway tabs should have fiducial markings (.040” dia), with mask clearance twice the fiducial diameter, one near each of 3 corners.



Unit: Inch

Drawing not to scale

This copy is uncontrolled unless otherwise stamped in red ink.

00-001G\_Procedure Template

## Creation Everett BU: OPERATING PROCEDURE

**Document: PWB Procurement Specifications**  
ISO 9001/13485 & AS9100

NUMBER: 221-008

REVISION: L

**6.7 X-out panels****6.7.1 Acceptance Criteria**

Panels with X-out boards are acceptable, provided they meet the following requirements:

- Panels with X-out boards are packaged separately from the rest of the lot and the package is clearly marked with part number and "X-Out".
- Maximum X-out boards per lot: 5%
- Maximum X-out boards per panel meet the following:

Boards per panel	Max. Acceptable X-out boards per panel
2 – 5	0
6 – 10	1
10 - up	10% or up to 5 boards per panel (whichever is less)

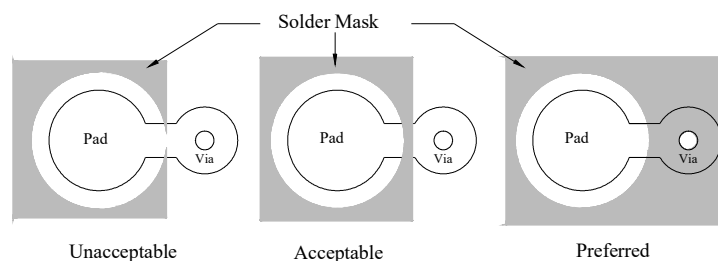
- When 2 boards per panel, CFT PM or engineer may determine to accept lots when X-outs per panel is greater than 0.

**6.7.2 X-out marking requirements.**

- The contrasting ink that is used to mark the boards must not be water soluble or ionic in nature.
- Contrasting permanent ink, preferably black, must be used to mark the "X-out" boards.
  - **Board:** A large X shall be placed on both sides of the "X-out" board.

**6.8 General requirements:**

- Solder mask must be present between all pads. When process capabilities prohibit meeting this requirement the fabricator should contact EVT Engineering with a copy to EVT Supplier Management requesting a deviation.
- The vias under BGAs must be covered with a solder mask to prevent the solder from traveling from pads into the vias and to prevent bridging between pads.



This copy is uncontrolled unless otherwise stamped in red ink.

00-001G\_Procedure Template

Creation Everett BU: OPERATING PROCEDURE	
Document: PWB Procurement Specifications ISO 9001/13485 & AS9100	NUMBER: 221-008 REVISION: L

## 7.0 ELECTRICAL AND MECHANICAL SPECIFICATIONS

By shipping the PCB', the manufacturer acknowledges that:

1. Internal conductors, external conductors, and edge spacing of boards (including boards with breakaway tabs) meet the requirements of IPC-6012.
2. Unless otherwise specified, all PCB's pass the electrical and connectivity testing prior to shipment to EVT. Bare board testing is conducted in accordance with IPC-6012.
3. Component legend ink is electrically non-conductive and permanent. Markings are placed adjacent to the component locations and not on the component mounting pads.
4. Markings meet the requirements of IPC-4101 and IPC-2221.
5. When possible, markings are to be located such that they do not get obstructed by mounted components, vias, test pads, or other features on the board.
6. PCB part number and revision must be marked on the boards.
7. Date codes, trademarks, or manufacturer's name may be part of the PCB legend artwork and printed in ink or etched in copper. If a UL mark is required, the first option is that it should be etched in copper; the second option is to add it to the legend.
8. PCB's workmanship is in accordance with IPC-A-600, unless otherwise noted.
9. PCB's meet the requirements of IPC-6012.
10. Board flatness (bow and twist) are measured per IPC-TM-650 method 2.4.22 and meets the requirements of IPC-A-600 specifications.
11. Delamination and other defects are limited as per IPC-A-600 specifications.
12. Fiducials in the Fabrication Specifications, global or local, have a mask opening larger than the diameter of the fiducials (typically twice the diameter of the fiducial as a minimum) and the field between them is free of masking, copper or traces, or silk screen markings (including inner layers).
13. When available the board supplier should provide a Design For Manufacturing (DFM) report to EVT on how well the board layout meets the requirements of this document and other industry standard design guidelines and good practices principles. The report should be sent with the finished (full panel) Gerber files noted above.

## 8.0 SHIPPING REQUIREMENTS

By shipping the PCB's, the manufacturer acknowledges that:

1. Boards and panels are wrapped and packaged to protect the boards against damage during shipping.
2. Flex assemblies are packed in flat vacuum sealed packages. They should be packaged such that they remain flat when received at EVT.
3. Plastic bags and material used to package the boards are free of oils, silicon mold release, foreign substance, corrosive material, salt, grease, fingerprint, uncured material, flux residue, or any material that may impact the life (long term and shelf life) or solderability of the boards.
4. Boards and panels are protected and packaged to prevent board damage during shipping or transportation.
5. Boards or panels with allowable "X-outs" are segregated, packaged separately, and marked per specification.

This copy is uncontrolled unless otherwise stamped in red ink.

00-001G\_Procedure\_Template

Creation Everett BU: OPERATING PROCEDURE	
<b>Document: PWB Procurement Specifications</b> ISO 9001/13485 & AS9100	NUMBER: 221-008  REVISION: L

6. At least one panel per production lot is included at no cost in the shipment and marked as "solder sample" accordingly.

## 9.0 CERTIFICATE OF COMPLIANCE

The certificate of compliance must reference the board part number, date-code, quantity, and its revision. The following certifications may be required, per information contained in the Gerber data or fabrication files, for each production run: Electrical testing, Plating thickness in the holes, Cleanliness (ionic contamination), and if soldering samples are not provided Solderability. If the PCBs are specified RoHS compliant, then certification as to RoHS compliance must be provided.

## 10.0 FIRST ARTICLE REQUIREMENTS

A First Article board or panel will be required by EVT for the first production run for inspection and/or testing. First Article boards or panels are shipped with the production lot unless specified otherwise by EVT.

In any shipment the fabricator may provide to EVT "solder sample" boards or panels to be used in setting up or evaluating the various processes at EVT. These boards or panels are to be marked as "solder samples" and packaged separately. These boards or panels are assumed to be non-functional rejected stock, which allows the fabricator to provide for this purpose: boards or panels from their production fallout that are otherwise suitable for use in the assembly process setup.

## 11.0 PREVISION

If board fabrication or workmanship issues result in assemblies failing EVT Quality standards or the requirements of this document, the board supplier may be held accountable for material and labor costs incurred by EVT including the costs associated with the failure analysis efforts.

This copy is uncontrolled unless otherwise stamped in red ink.
--

00-001G_Procedure_Template
----------------------------