APEX EXPO IPC

2019 IPC Hand Soldering and Rework World Championship Process Evaluation Information

The Operator evaluation sheet for the World Championship competition has 20 items listed that are a possible 60 points toward the total score. These items are used to prompt the judges to monitor and evaluate the competitor for good practices during the operation. These practices are not strict criteria found in an IPC document, but rather have been found to be best practices through years of operation and observation. While the IPC documents do not generally list criteria for methods of soldering, for the purpose of the competition, the judges will be monitoring the techniques and practices used during the rework and assembly process.

The following list is a brief explanation of each item and the some (not necessarily all) of the things for which the judges will be watching.

1 – ESD Violation: Failure to use wrist straps, failure to verify the connection between the ESD mat and the drain wire, placement of the board on or near non-ESD safe items.

2 – Destructive component removal: Cutting or breaking leads to remove the component, Excessive component damage on surface mount components after removal, etc.

3 – Incorrect settings (Temperature, air volume…): Iron settings should start around 315° C [600° F] for most soldering operations. It can be adjusted if necessary, but the lowest functional temperature should be selected. Air volume for any rework tools should be sufficient to transfer the heat through convection without moving the components.

4 – Lifting De-soldering tip – Not clearing nozzle: The vacuum of the de-soldering device should be continued for a short period after the tip has been lifted away from the assembly. Continuing the vacuum pulls the removed solder further into the collection chamber and reduces nozzle blockage.

5 – Improper/no tinning of removal tip – A tinned tip transfers heat more effectively. The tinning in the correct area (on the bottom edge for some tools, the inside edge for others, etc.) places the molten solder in the correct position for a good heat-bridge.

6 – Removed component not on heat resistant surface – To avoid damage to persons, tools, or work areas components that have been removed from an assembly need to be allowed to cool on a heat resistant or heat dissipative surface.

7 – Cleaning lands by dragging solder wick – The solder wick heats and attracts the

molten solder away from the lands. Dragging the wick exposes the lands to increased side force. Heat and side force can combine to damage the lands or the substrate.

8 – Dip Component remove/soldering not using alternating lead technique – A dip component has many leads in two rows. If the leads are soldering one after another, straight down one side of the component, the heat from the soldering operation of one lead does not have time to dissipate before the addition of heat to the next lead. This can concentrate the heat in the component and the board. Concentrated heat for longer times can cause board or component damage. Solder a lead and then skip to the other side of the component or move two leads down the row before soldering the next lead. Then after reaching the end of the row, return and solder the remaining leads.

9 – Component mot removed/extra component removed – A rework and an assembly have specific components that need to be removed or placed. Removing the wrong component or more components than is necessary wastes time, money, and exposed the boards and components to unnecessary heat or damage.

10 – No land preparation – After a component is removed, the solder remaining on the board has been heated at least two or more times (one during initial placement, one during the removal, and more if the component was reworked or moved previously). The multi-heat cycles of the solder degrades the structure of the solder and reduces the reliability of a soldered connection. Remove all old solder from a land and clean the area before placing a new component with fresh solder.

11 – Wrong tip size – Proper tip selection is critical to an efficient rework or assembly. A tip that is too large can damage the surrounding substrate or components. A tip that is too small can delay the efficient heat transfer into the soldered connection. This can cause the component and board to remain at higher temperatures to too long.

12 – Unused tip not stored – Tips are hot. The designers of the soldering stations provide proper spots for the tips to be stored so that they cool in a position where they will not damage other items and are less likely to injure an operator.

13 – Iron Not Tinned before placing in holder – A hot soldering iron oxidizes very quickly, especially when using Pb-Free solder. By tinning the tip, the solder on the tip oxidizes. When the tip is used again, the old solder is cleaned off the tip by a brass wipe or damp sponge. This leaves the iron clean and functional for a longer life.

14 – Clipped leads uncontrolled –Uncontrolled leads fly away from the clipped lead at a high speed. It is difficult or impossible to know where the lead will land. The lead may get onto another assembly and cause a short circuit. It is also possible that the lead could land on another operator and possibly injure that person. Even with eye protection, it is still possible for a small lead to fly up or in from the side or top of the

eye protection.

15 – Lead soldered then clipped (No reflow) – The IPC-A-610 and J-STD-001 for class 3 state that clipping a lead and then not reflowing the lead is a defect condition. When a lead is clipped there is some shock sent through the lead. It's possible that the solder connection could have a microfracture that will grow. This will eventually cause the failure of the circuit. All leads that are clipped after soldering must be reflowed to remove any cracks formed by the clipping.

16 – Unnecessary rework – There is an old proverb, "If it is not broken, do not try to fix it…". When a soldered connection or component placement meets the acceptable criteria, do not attempt to rework the item to make it look, "Pretty". Ugly is not a defect.

17 – Soldering both sides of the board – On a single component lead, applying solder from one side of the board, then turning the board over and applying solder from the other side of the board is a poor practice. As the solder flows through the board it pushes flux and contaminants toward the destination side of the connection. If solder is then applied from the opposite side of the same connection, the flux, contamination or even moisture will be trapped inside the hold of the board. This may cause corrosion and eventually failure of the component.

18 – Transfer soldering – Applying solder to a soldering iron tip, then placing that heated solder onto a component may be a first step in a process. However, leaving that transferred solder as the final connection leaves the solder joint with an insufficient intermetallic connection. The solder joint will be less reliable and more prone to failure.

19 – Wrong Wire stripper die size – Using a stripping die size that is too small can cause scrapes, nicks, or other damage to a wire. Using to large a die size will leave the insulation on the wire.

20 – Wire not tinned before soldering – Both the IPC-A-610 and the J-STD-001 have criteria for class 3 that says a wire that is not tinned before soldered attachment (Other than mesh splices) is a defect condition. Tinning binds the wire strands into a single unit. This bound, single unit is stronger that individual wires alone. Tinning also ensures that the wire is solderable before it is attached to a terminal or placed into a through hole. Finally, the coating of solder on the wire aids in the final connection. Solder solders to solder better than solder solders to other metals.