This ACE Technical Document is intended for ACE representatives only. It was created to present the ACE philosophy and help further the understanding of the technical aspects of the selective soldering process when discussing ACE products with a client.

**Solder Balls and Prevention**

Many Customers experience solder balls following the selective soldering process. Solder balls can be prevented or at least reduced by understanding the causes. The most common causes are listed below in order of occurrence:

1. Generally the nozzle shape, speed of traverse and the actual contact angle can generate or mitigate solder balls.

Correction. Difficult to answer this with specific detail….. With acquired process knowledge one will learn the correct nozzle shape, contact angle and traverse speed to mitigate most solder balls.

1. Flux chemistry (brand and type) tends to influence the creation of solder balls. Generally a small amount of rosin in the flux works wonders as this helps with a clean snap back.
2. Sometimes too much flux is applied and is still wet when the solder contacts the site. The solder may engulf the flux causing the entrapped flux to vaporize essentially exploding through the solder creating the balling. This usually occurs at first contact or as the leading edge of the solder wave travels over the site (connector pins as an example). This is evident if the balls are crated just on the edges of the solder wave path, not actually where the solder contacted the board.

Correction: Reduce flux deposition, dry or pre-heat the board after fluxing, dwell the solder slightly below the first pins for 5 seconds or so to pre-heat the area, reduce the solder travel speed to allow the heat to precede the wave (essentially pre-heating the board site), use alcohol based flux rather than water based as the dry faster, reduce the solder temperature.

1. Moisture entrapment within the board. Most board materials are hydroscopic allowing moisture to become entrapped within the layers. The thicker the board the more likely for this to occur (like a backplane). The moisture actually turns to vapor as the solder contacts the site, much like having to much flux present.

Correction: You must bake out the moisture

1. The pin length and pitch combined with the wave characteristics can cause a “snap back” as the trailing edge of the solder wave releases from the pins. This action is irregular but can cause a splashing (solder balling).

Correction: If possible, trim the leads to less than the air gap between the pins. This will allow an aspect ratio of pin length to pitch more favorable to the selective soldering process…… It often helps to move the wave off center of the pins so the trailing edge of the wave snaps back also off center (staggered). This changes the dynamics of the “snap back” just enough to mitigate the solder balling.

1. The actual surface finish on the PCB can be a contributor. We have found that shinny surfaces (low surface resistance) tends to leave solder balls vs. a matt finish. Correction: To test if this is the cause, rough the surface mechanically (scotchbright or abraid). Rerun the board with out any other changes and judge accordingly.

