



Do you like news and articles like this?

Then, get it from the **ORIGINAL** source ... **PCB UPDATE** ...  
the semi-monthly e-mail newsletter produced by **Circuits Assembly**  
and **PCD&M** and circulated to over 40,000 readers.

**[CLICK HERE TO READ THE ARTICLE YOU REQUESTED](#)**

# Solderability in a Lead-Free World

## Does lead-free solder affect solderability and soldering inspection standards?

**Q:** *We are moving toward a lead-free soldering process. We would appreciate some information with respect to solderability inspection criteria. Is there a difference between a lead-bearing and a lead-free solderability inspection acceptance standard?*

**A:** I am not aware of any difference in the solderability inspection standards for lead-free versus lead-bearing items. I am not sure whether you are interested in the solderability characteristics of your lead-free components and printed wiring boards or if you are referring to the acceptance criteria for the assembled and soldered no-lead assemblies. I will try to provide some information relative to both issues.

During the soldering process, molten solder is required to wet and bond the surfaces to be joined to create a soldered connection. The term "solderability" refers to this ability of the surfaces to be wet by the molten solder. The wetting must occur for the solder to flow and create a metallurgical bond on or between mating surfaces. Solderability is a function of the condition of the surfaces to be soldered at the time of soldering.

The IPC and EIA have developed test methods that are widely used to assess the solderability characteristics of the component leads and printed wiring board terminations to be soldered. These tests should be carried out to verify that the solderability of component leads and printed wiring board interconnects possess the required solderability characteristics to form reliable connections. Solderability verification testing may be carried out at the component supplier's plant, upon receipt into the assembly shop inventory or prior to release for assembly.

In wetting balance tests to assess solderability, lead-free alloys exhibit higher surface tension and slower wetting times than lead-bearing alloys, resulting in

slower wetting times at given temperatures in the soldering process. For this reason, higher soldering temperatures are typically encountered during soldering or solderability testing with no-lead alloys than those temperatures encountered with the lead-bearing alloys. For solderability testing, as well as production soldering, soldering temperatures 50° over the melting point of the lead-free solder alloy are common.

Keep in mind that *solderability* is not *soldering ability*! Solderability is a characteristic of the surfaces intended to be soldered. Soldering ability is the ability of a process to effectively solder components to a printed wiring assembly. Soldering ability is a function of solderability and many other factors, including joint design, board design and layout, as well as overall process capabilities and control.

The soldering process window encountered with lead-free solder alloys is often narrower than that encountered with leaded solders. The recommended soldering temperatures when using lead-free alloys are higher than those generally encountered when soldering assemblies with the eutectic tin/lead solder. Currently an ad hoc accepted temperature for the no-lead alloys appears to be 50°C above the melting temperature of the particular lead-containing solder alloy being used. However, the maximum soldering process temperature is limited by the maximum temperature to which the components and fluxes can be exposed without damage.

In addition to solderability testing, your question also appears to be concerned with the acceptance standards for assemblies soldered with lead-free alloys. Within my knowledge, industry standards for the mechanical and physical requirements of the standard soldered assemblies under discussion do not differ based on the shift to no-lead soft solder chemistry. ■

Send your process, technology or training question to lhymes@cox.net. Please type "ASK LES" in the subject line and indicate your name and company or institute affiliation. All questions may not be answered.

*Les Hymes is the owner of Les Hymes Associates, Surprise, AZ; (623) 544-4646; email: lhymes@cox.net.*

