The Institute for Interconnecting and Packaging Electronic Circuits
2215 Sanders Road • Northbrook, IL 60062-6135

IPC-TM-650
TEST METHODS MANUAL

Number **2.4.14.1**	
Subject **Solderability, Wave Solder Method**	
Date **3/79**	Revision
Originating Task Group **N/A**	

1 Scope This document is intended to provide a recommended test method, which may be used by both vendor and user to determine solderability of PWBs, with or without surface coatings, which will be soldered by wave soldering machine methods or other soldering devices.

The solderability determination is made to verify that the printed wiring fabrication processes and storage have had no adverse effect on the solderability of the PWB. This is determined by evaluating the ability of those portions of the PWB normally soldered to be wetted by a new coat of solder. Determination is judged visibly by non-destructive methods.

The standard does not specifically relate to the solderability of the walls of plated-through holes (PTHs) but may be used for that purpose.

This standard shall not be construed as a production procedure for preparing and soldering PWBs.

1.1 Definitions

1.1.1 Solderability The ability of a metal surface to be wetted by solder.

1.1.2 Wetting The formation of a relatively uniform, smooth, unbroken, and adherent film of solder to a base metal.

1.1.3 Dewetting A condition that results when the molten solder has coated the surface tested and then receded, leaving irregularly shaped mounds of solder separated by areas covered with a thin solder film; base metal is not exposed.

1.1.4 Not-Wetting A condition that results when the molten solder has coated the surface tested and then receded, leaving irregularly shaped mounds of solder separated by areas covered with a thin solder film where some areas of the base metal are exposed.

2 Applicable Documents

J-STD-003 Solderability Tests for Wave Soldered PWBs

QQ-S-571 Solder Specification

3 Test Specimens

3.1 Test Sample

3.1.1 The test sample required for this test consists of a metallic surface of the board, which is so placed that good drainage of the molten solder is possible as the sample passes over the solder wave.

3.1.2 The sample can be a planned scrap edge, a finished product, or a specially prepared specimen processed with a group of production boards, as mutually determined between vendor and user. Generally, components will not be mounted on the sample, although the sample may contain drilled and/or plated-through holes.

3.1.3 Specimens shall be fixtured, as much as is practical, so as to be representative of the production set-up.

3.1.4 Sample size shall be determined between vendor and user.

3.1.5 Sample description shall include finish (i.e., plated, refused, etc.), board thickness, and dimensional changes allowed (i.e., loss of spacing, tolerance, warpage, etc.).

4 Test Equipment/Apparatus

4.1 Soldering Machine A machine, such as a wave soldering unit or system. A machine description may be the machine manufacturer's specification sheet with or without noted exceptions as agreed to between printed board manufacturer and wave solder machine user.

4.2 Optical Equipment Inspection is generally conducted by use of the unaided eye (corrected vision glasses permitted), but on occasion either a direct or projection lens system with a maximum of 10x magnification may be used.

4.3 Materials

4.3.1 Solder The solder shall be a composition of Sn60 or Sn63, conforming to the latest revision of QQ-S-571. Other alloys may be used upon agreement between supplier and user.

4.3.2 Flux A non-activated rosin flux having a nominal composition of 25% by weight of water white gum rosin in a solvent of isopropyl alcohol (99% shall be used). The specific gravity of the flux shall be 0.843 ± 0.005 at 25°C. Other fluxes as agreed to between supplier and user may be used.

4.3.3 Flux Remover The flux remover shall be either isopropyl alcohol or other suitable solvent.

WARNING: Do not use chlorinated solvents on silicone base materials, as delamination and damage to finish may occur.

5 Procedure

5.1 Preparation

5.1.1 The PWBs shall be checked in an ''as received'' condition from the vendor and care shall be executed to prevent contamination (by grease, perspirants, etc.) of the surface to be tested.

5.1.2 The test samples are to be flux coated and preheated before proceeding with the solder application in accordance with the process agreed to by vendor and user. While fluxing may be done manually, it will generally be applied as part of the machine system.

5.2 Application

5.2.1 Wave/Machine Solder The process is to be agreed to between vendor and user. Note: Usually the manufacturing process generated by the user for wave soldering consists of a board holder, conveyor, flux applicator, preheater, solder unit, and operating instructions, which include machine settings, machine process controls on conveyor speed, conveyor incline, preheat temperature, solder temperature, fixture description, etc.

5.2.2 The solder composition shall be analyzed periodically for conformance with QQ-S-571.

5.3 Cleaning After the solder has been solidified, residual flux shall be removed from the specimens to facilitate inspection. Flux removing material shall be as specified in 4.3.2. Flux removal may be done manually or by machine.

5.4 Evaluation

5.4.1 After the sample parts have been wave soldered and thoroughly cleaned of flux, the parts shall be examined using the type of equipment specified in 4.2.

5.4.2 The criteria for acceptable solderability is a relatively uniform adhering coating of solder, which covers a minimum of 95% of the surface being tested. The balance of the surface may contain only small pinholes, dewetted areas, and rough spots, provided such defects are not concentrated in one area. For less critical applications, a smaller percent coverage may be determined by vendor and user. Solder build up or drainage on circuit areas where the circuit leaves the solder wave is acceptable. The PTH wall portion shall be partly wetted with solder, but need not be filled with solder.

5.4.3 A width of approximately 3.15 mm from the edge of each test specimen should not be evaluated.

5.4.4 Aids to Evaluation As an aid to evaluation of the test results, see Figure 1. This aid is to be used primarily to illustrate types of defects, rather than determine the percentage of area covered.

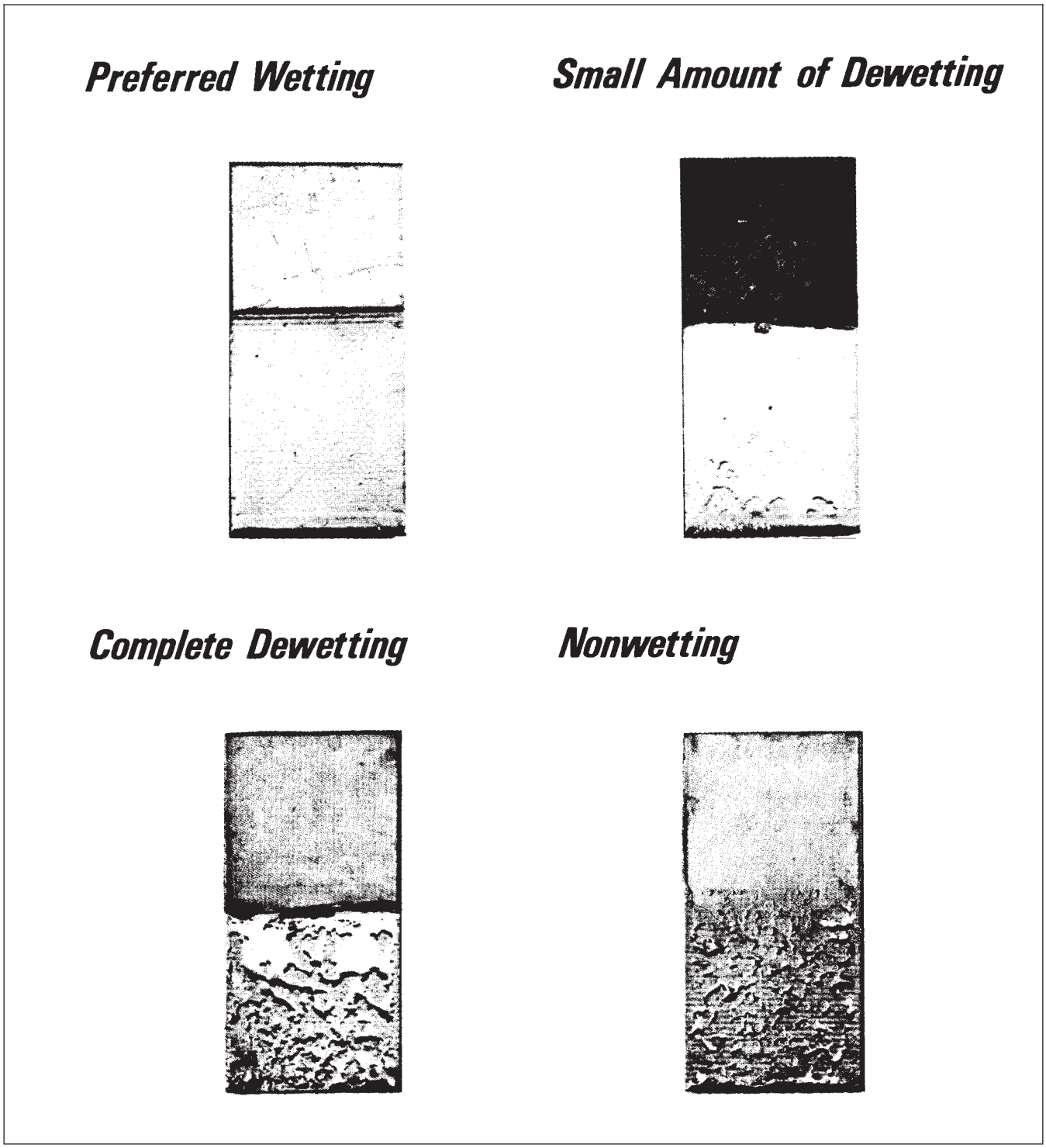

Figure 1 Types of Defects