

## IBM Environmental Lead-Free Requirements for Purchased Electronic Components, (including Restriction on Hazardous Substances RoHS)

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**1. Scope:**

This specification defines IBM’s environmental lead-free requirements for procured RoHS compliant electronic components used in a lead-free solder system, by IBM or IBM authorized subcontractors.

**2. Applicability:**

To be applicable, this specification shall be referenced on the IBM Part Number Drawing, or applicable procurement document and shall apply to all purchases made under that Part Number by IBM, IBM’s Affiliates, or any third parties purchasing the product to IBM’s part number.

**3. Precedence:**

In case of conflict between IBM requirements, the order of precedence provisions set forth in the Applicable agreement shall apply. In the event of an inconsistency in the technical requirements, the following order of precedence shall apply:

- IBM Written Waivers ([mutually agreed in writing](#))
- IBM Part Number Drawing (or equivalent component description documentation)
- This Specification
- [IBM Specification 873444](#)
- Other IBM Specifications Referenced Industry Standards
- Supplier [Technical](#) Specifications - (including such items as: electrical performance specs, quality and reliability commitments etc.)

**4. Documents Replaced By This Specification:**

The following IBM specifications have been replaced by this specification:

IBM Specification	Specification Title
None	None

**5. Referenced Documents:**

The following documents in their current revision or successor form a part of this specification and Suppliers are required to meet all the specifications listed below. In case of conflict see Section 3 “Precedence”.

Document Number	Document Title
<a href="#">03N6596</a>	<a href="#">IBM Supplier Quality Requirements Document (SQRD)</a>
873444	Requirements for Purchased Electronic Components
46G3772	IBM Environmental Requirements for Materials, Parts and Products

Additional IBM Environmental information can be found at:

<http://www.ibm.com/ibm/environment/products/ecpp.shtml>

**6. Exceptions:**

Any exception to the requirements of this specification shall constitute a change that must be approved in writing by IBM and documented in a [Supplier Quality Document \(SQD\)](#).

**7. Additional Substances Prohibited From Use:**

The following requirements are in addition to the requirements of IBM Specification 46G3772. Items listed as [reportable substances](#) in IBM specification 46G3772 section 2.3 shall be considered “prohibited” (within the limits set forth in IBM specification 46G3772) when this specification is referenced.

**7.1 Exemptions:**

The following are some applications, relative to use in IBM Products, considered by the European Union to be exempt from these requirements. The prohibition is in place for all other applications.

- [Mercury \(Hg\) in compact fluorescent lamps not exceeding 5 mg per lamp.](#)
- [Mercury in straight fluorescent lamps for general purposes not exceeding:](#)
  - [Halophosphate 10mg](#)
  - [Triphosphate with normal lifetime 5mg](#)
  - [Triphosphate with long lifetime 8mg](#)
- [Mercury in straight fluorescent lamps for special purposes.](#)
- [Mercury in other lamps not specifically mentioned in the Annex to the RoHS Directive 2002/95/EC.](#)
- [Lead \(Pb\) in the glass of cathode ray tubes, electronic components, and fluorescent tubes](#)
- [Lead \(Pb\) as an alloying element in steel containing up to 0.35% lead by weight, aluminum containing up to 0.4% lead by weight, and as a copper alloy containing up to 4% lead by weight.](#)
- [Lead \(Pb\) in electronic ceramic parts \(e.g., piezoelectronic devices\).](#)
- [Lead \(Pb\) in high melting temperature type solders \(i.e. lead based alloys containing 85% by weight or](#)

- more lead).
- Lead (Pb) used in compliant pin connector systems.
- Lead (Pb) as a coating material for the thermal conduction module c-ring.
- Lead (Pb) and cadmium (Cd) in optical and filter glass.
- Lead (Pb) in solders consisting of more than two elements for the connection between the pins and the package of microprocessors with a lead content of more than 80% and less than 85% by weight.
- Lead (Pb) in solders to complete a viable electrical connection between semiconductor die and carrier within integrated circuit Flip Chip packages.
- Batteries
- Hexavalent chromium as an anticorrosion of the carbon steel cooling system in absorption refrigerators.
- Cadmium and its compounds in electrical contacts and cadmium plating except for applications banned under Directive 91/338/EEC amending Directive 76/769/EEC relating to restrictions on the marketing and use of certain dangerous substances and preparations.

**7.2 Additional Requirements:**

See IBM specification 873444 for additional requirements including: Solderability, Solderable Finishes and solder process compatibility.

**8. Clarifications Regarding Memory DIMMS and Other Subassemblies:**

Subassemblies include but are not limited to the following: memory DIMMs, crystal oscillator modules, real-time clock modules, fiber optic transceivers, BGA packages (with decoupling capacitors, resistors etc.) and passive components with internal subassemblies.

All components soldered to a subassembly must meet the requirements of this specification.

**8.1 Printed Circuit Board (PCB) Requirements:**

Except for the specific exemptions listed in Section 7.1, printed circuit boards must not contain lead (Pb) in amounts greater than those shown in Table 3 of IBM specification 46G3772. The acceptable finishes listed below must also pass further IBM standard qualifications outside the scope of this specification. IBM designed cards using the finishes listed below, except Organic Solder Preservatives require approval from IBM Printed Circuit Board (PCB) Procurement Engineering.

**Acceptable Materials for Printed Circuit Boards**

<b>Finish</b>	<b>Notes</b>
80/20 Palladium-Nickel (PdNi) with gold (Au) flash	
Palladium-Nickel (PdNi) without gold (Au) flash	
Fused or Reflowed 100% Tin (Sn) or Tin (Sn) Alloys	Acceptable without additional mitigation. Alloying elements include silver (Ag), bismuth (Bi), copper (Cu), zinc (Zn), and nickel (Ni).
Tin over nickel underlay (Sn/Ni)	applications require 1.0 micron minimum nickel (Ni) thickness. Nickel (Ni) films with less than 1.0 micron thickness requires IBM Development Engineering approval.

	Both bright and matte tins are acceptable with Nickel (Ni) underlay.
Annealed Tin (Sn) (matte, bright, or alloyed) over copper (Cu) base metal	Annealing temperature must be greater than 120°C for one hour or more. Annealing must occur within two weeks after plating. Anneal is not required if lead/pin pitch is > 1mm.
Tin (Sn) over Alloy 42 (Fe/Ni) base metal, with or without Copper (Cu) underlay.	Annealing is not required.
Tin alloy: Tin-Bismuth (SnBi) Nominal Bismuth (Bi) concentration: 2 - 4%. Total Bismuth (Bi) range: 1 - 5%.	All other Bismuth (Bi) contents require IBM approval. Acceptable over copper, nickel, and Alloy 42 (FeNi).
Tin alloy: Tin-Silver (SnAg). Minimum Silver (Ag) concentration: 1%	All other silver (Ag) contents require IBM approval. Acceptable over copper, nickel, and Alloy 42 (FeNi)
Tin alloy Tin-Copper (SnCu) annealed over a copper (Cu) base metal and Tin-copper (SnCu) over Nickel (Ni) underlay	Tin-copper (SnCu) over Copper (not annealed), and Tin-copper (SnCu) over Alloy 42 (FeNi) are not unconditionally acceptable as a finish. Requires IBM Development Engineering approval.
Noble Metals: Gold (Au)	For printed circuit boards (PCBs) immersion Gold (Au) over electroless nickel is approved. Film thickness is determined by application.
Noble Metals: Silver (Ag)	All silver (Ag) finishes require IBM Development Engineering approval. Immersion silver (Ag) has been approved for PCBs.
Immersion Tin	Does not require additional mitigation. Has been approved for PCBs. Requires approval based on test data (NEMI)
Organic Solder Preservatives (OSPs)	Preferred, for example benzotriazole (BTA). For PCBs only. Entek has been approved
HASL (Hot Air Solder Leveled) Tin or Tin Alloy	For PCBs only, essentially the equivalent of fused or reflowed tin.
Nickel (Ni)	Unconditionally acceptable for non-soldered surfaces, generally very difficult to solder.
Immersion Silver	Requires approval from IBM PCB Procurement Engineering
Electroless Nickel Immersion Gold	Requires approval from IBM PCB Procurement Engineering.
Electrolytic Nickel with noble metal over plate	Requires approval from IBM PCB Procurement Engineering