Guideline Regarding Non-Containment Management on Hazardous Substances Specified by Fujitsu Group

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1. Objectives of This Guideline

It is expected that hazardous chemical substances contained in products will be subjected to stricter legal regulations, including the RoHS Directive of Europe.

Fujitsu Group revised its Green Procurement Direction in July 2003 to classify specified hazardous substances into three categories: banned substances, substances prohibited for use in manufacturing and substances to be totally abolished, and asked suppliers, for respective categories, to ban their containment in products, to prohibit their use on manufacturing process and to work on total abolition.

As it is necessary to survey rigidly whether the specified hazardous substances are contained in products or not, in order to meet legal regulations, this guideline specifies how to manage and evaluate containment of the specified hazardous substances.

2. Scope

The guideline applies to materials, components, units, accessories, software packages, and other deliverables that make up Fujitsu Group products.

3. Definition of Terms

3.1 Containment

The specified hazardous substance is said to be contained, (i) if it is added or introduced to deliverables intentionally, or (ii) if it is included in deliverables unintentionally during manufacturing processes, except for residues or impurities.

3.2 Impurities

substances that are contained in natural materials and cannot be eliminated during processes in which they are manufactured into industrial stuffs

3.3 Materials

homogeneous materials which cannot be decomposed further more or composite materials which can be regarded as homogeneous in order to fulfill their specific functions, for which both are set or formed at particular position

3.4 Concentration

the mass of a specified hazardous substance in a material divided by the mass of the whole material

(In case of metal compounds, however, it should be the mass of the target metal element alone divided by the mass of the whole material.)

4. Non-Containment Management Principles

The basic concepts for non-containment management are as follows:

Source management: Every effort is made to eliminate the target substances via

	strict management at material level.
Traceability:	Only identified materials shall be used.
Management responsibility:	The company or person who sells or supplies the item to Fujitsu Group is responsible for verifying, by appropriate means, whether the supplied information about the contained chemical substances is correct.

5. Management Level

Concentration of contained substances is managed per material which consists of the product. Accordingly, concentration of contained substances per material must be below the maximum concentration value. In this case, material means the material which is unable to be decomposed further. Examples of management are as follows. (Refer to Figure-1.)

5.1 Examples of Materials That Should Be Managed as Different Materials

- Base metal that is a structure member or sheet metal material vs. plating coats, chromate coats, and paint coats
- Formed plastics vs. surface-printed inks or paint coats
- Metal used on printed wiring boards or LSI wirings vs. insulator resin or glass

5.2 Examples of Materials That Should Be Managed as One Material

- Alloys composed of two or more metal elements
- Plastics that is a mixture of polymer and inorganic particles or low-molecular compounds
- Glass fiber reinforced epoxy resin used as the core material for printed wiring boards
- Conductive adhesives that are composite materials including metal powder and polymer
- Inks and paints that are composite materials including colorants, shields, and polymer vehicles

6. Phases of Specified Hazardous Substance Management

Since it is unpractical to verify all materials of all products, materials that are produced from the same raw materials via the same manufacturing processes are regarded as equivalent. On the assumption that specified hazardous substances are not attached or mixed during manufacturing processes, the management at material level is normally conducted as below. If management at material level is difficult, it is permitted to manage the containment of hazardous substances based on the result of material-element analysis for manufactured items using analytical techniques with adequate sensitivity at statistically sufficient frequency.

6.1 If a material is processed to the shape of the final product during manufacturing processes that do not involve changes in element composition, its raw material is to be managed to control hazardous substance containment.

- Resin pellets prior to injection molding
- Metal plates, blocks, etc. prior to pressing/cutting

6.2 If a material is processed to the shape of the final product during manufacturing processes that involve changes in element composition, its raw material is to be managed with consideration on the composition changes to control hazardous substance containment.

- Printings, paintings, and adhesive joints
  If ink, paints, or adhesives used on these parts contain an organic solvent, water, or other volatile component, they are managed based on its dry weight resulting from the elimination of the volatile component.
- Electrodeposition coating
  Coat liquid is managed based on the quantity of the electrodeposited element contained in the coat.
- Plating
  Plating liquid is managed to ensure that the concentrations of lead, cadmium, and mercury contained in it are sufficiently low. "Sufficiently low" here means that the concentrations of lead, cadmium, and mercury contained in the plated materials are guaranteed to be lower than those specified in Chapter 7 "Concentrations That Suggest Intentional Use."
- Vapor-deposited films and sputtered films
  The target is managed with consideration on the evaporation of each substance and on the sputtering efficiency.

6.3 Chromate Coat That May Be Subjected to Chromium Oxidation-Reduction Reactions

- Hexavalent chromium contained in an item is to be managed based on the chemical analysis of a specimen with chromate coating that is prepared using the same base material, treatment liquid, and treatment conditions as those of that item. The shape of the specimen may be different from the shape of the item.

7. Concentrations That Suggest Intentional Use

As the Green Procurement Direction specifies the maximum concentration values of certain specified hazardous substances that are unintentionally contained (as residues or impurities), intentional containment is not allowed even though the concentration is lower than the specified maximum concentration values.

Considering JIS (Japanese Industrial Standards) regulations, other authorized standards, and the generally accepted materials and manufacturing methods, it is assumed that the concentrations of impurities contained in materials that are distributed at present are sufficiently lower than those indicated in Table 1. Therefore, if the concentration of a substance exceeds the values indicated in Table 1, it is likely that the substance was intentionally added, attached, or mixed during a certain phase of the supply chain. It is necessary to identify the cause and resolve it.

Table 1. Concentrations that suggest intentional use (unit: ppm)

Material		Lead	Cadmium	Mercury	Hexavalent chromium
Base metal	Iron alloy	200	75	100	
	Aluminum alloy	100			
	Copper alloy	500			
	Other metal	200			
Metal plating coat (including lead-free solder plating)		200	75	100	
Chromate coat		500	75	100	See Chapter 8.
Solder for mounting		1000	75	100	
Resin and plastics		100	50	100	200
Paint and ink		100	50	100	200
Glass and ceramics		500	75	100	200

No particular concentration analysis method is specified. Any method is acceptable if it is verified to have both the detection limit to be equal to or lower than the concentrations shown in Table 1 and the enough accuracy for this analysis.

For your information, the following instructions are for the two analysis methods which are widely used. These analysis methods are useful, but not universal. If it is difficult to use these methods on a certain material, select a more appropriate analysis method.

7.1 Inductively Coupled Plasma-Atomic Emission Spectrometry (ICP-AES) (Conforming to JIS K0116)

- Use apparatuses and procedures which have been confirmed their detection limits, quantitative determination limits and linearity of the calibration curve with blank solution and calibration solution.
- When adjusting the specimen solution, it is necessary to dissolve the specimen completely. Undissolved residues, if remain, must be dissolved separately so that all elements are dissolved before measurement.
- Measure after elimination of interference or with expectation of error from interference, such as selecting bright line which are not affected by coexisting elements.
- Since pretreatment and other detailed analysis conditions depend on materials, determine analysis conditions and confirm the accuracy level for each material, and then take measurement.

7.2 X-ray Fluorescence Spectrometry (Conforming to JIS K0119)

- On the calibration curve method, make calibration curve using “calibration specimen” including target elements indicated in Table-1 at known concentrations and also having similar composition to the material which is to be analyzed. And for the preparation, it is necessary to confirm the detection limit, the quantitative determination limit and the accuracy level in the vicinity of the concentration indicated in Table 1.
- On the fundamental parameter method as well, make calibration curve using “calibration specimen” including target element indicated in Table-1 at known concentrations and also having similar composition to analysis target material. And for the preparation, it is necessary to confirm the detection limit, the quantitative determination limit and the accuracy level in the vicinity of the concentration indicated in Table 1.
- Not to mention to care fluctuations or noise peculiar to the apparatuses, it is necessary to confirm the effects of coexisting elements per material with a specimen containing the target substance at a known concentration. Then conduct appropriate treatment such as selecting or compensating a bright line for quantitative determination.

8. Judging Whether a Chromate Coat Contains Hexavalent Chromium

No useful analysis technology has been established to determine the concentration of hexavalent chromium in chromate coats. Therefore, conduct the following dissolution test on the specimen and judge whether hexavalent chromium is contained in the chromate coat that is formed from the combination of the base material, treatment liquid, and process conditions. If the result of the dissolution test indicates that the quantity of hexavalent chromium is equal to or less than the following quantitative determination limit, the chromate coat formed based on the above combination is judged not to contain hexavalent chromium.

[Dissolution test method for hexavalent chromium in chromate coats]

This method, which is explained below, conforms to JIS H8625 Annex 2 " Determination of chromium (VI) - Spectrometric method using 1,5-diphenylcarbazide”.

Immerse a chromate-coated specimen with a surface area of 50 cm^2 in 50 ml of (A) pure water, conduct boiling extraction for 5 minutes, remove the specimen, and add (B) dilute sulfuric acid to the extract to acidify it. Then add (C) diphenyl carbazide solution and (D) buffer solution to the extract, and dilute it with pure water to make total liquid quantity 250 ml. As for this solution, measure the absorbance corresponding to 540 nm of light using an absorptiometer, and calculate the hexavalent chromium dissolution quantity per unit area from the obtained concentration of this substance. The apparatus and conditions for the absorptiometry conducted here must be such that a hexavalent chromium concentration of 2 ppb can be detected. A hexavalent chromium concentration of 2 ppb is equivalent to a dissolution quantity of 0.01 $\mu g/cm^2$.

Reference:

Surface area of specimen	(A) Pure water	(B) Dilute sulfuric acid	(C) Diphenyl carbazide solution	(D) Buffer solution	(E) Total liquid quantity (*)
50cm^2	50ml	3ml	3ml	25ml	250ml

* Dilute with pure water to make total liquid quantity 250 ml.

Judgment:

The detection limit of the above method is 0.01 μg/cm^2, which is less than the stable quantitative determination limit. Therefore hexavalent chromium is judged as not contained if its dissolution concentration is 0.1 μg/cm^2 or lower.

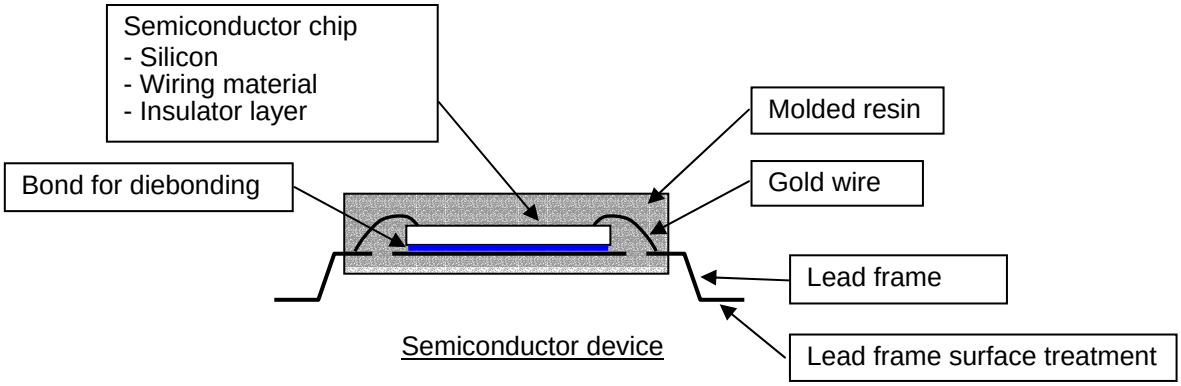
If a new analysis method that is better in technology and cost is developed, the method specified above may be switched to the new one.

9. Revision history

November 1, 2004: Version 1 created

Figure 1 Examples of materials that should be managed as different materials

(Each text box, each item in a text box as well, are regarded as different materials.)



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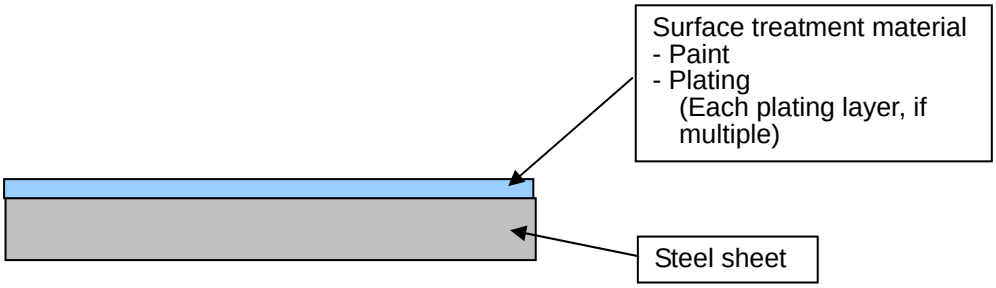
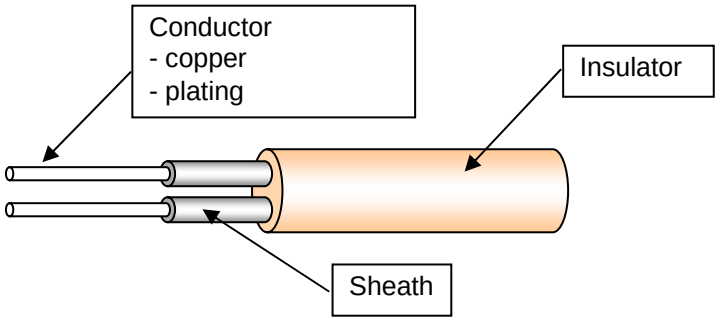


Painting and plating



Cable