

KEA

**Standard of Korea Electronics Association
KEA CE-3300**

Assessment method for materials and structure
of
electrical and electronic equipment

Standard Committee on Assessment method for materials and
structure

Establishment

Korea Electronics Association

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CONTENTS

Abstract.....	4
1. Scope.....	5
2. Cited Standard	5
3. Definitions.....	5
4. Genreal Information.....	8
4.1 General Principle for Enhancing Materiasl and Structures.....	8
4.2 Assessement strategy for material and structure enhancement.....	10
4.3 Assessment items for Materials and Structure Enhancement.....	11
5. Assessment on Materials and Structure Enhancement.....	13
5. 1 General Information	13
5.2 Assessment Method	13
6. Assessment Result	13
6.1 General Information.....	13
6.2 the Declaration of Conformity	13
6.3 Product’s Assessment Results	14
7. Annex	15

Assessment Method for Materials and Structure of Electrical and Electronic Equipments

Abstract

An environment friendly design reducing negative impact on the environment recently becomes a more important factor for manufacturers. In addition, the eco-friendly design emerges as a core factor in business operation in order to move toward “Resource Recycle Structure” in which the used products with high economic value are recycled and reused through securing easy recycling in the disposal phase. It should be pursued due to decreasing natural resources including oil.

To do this, advanced companies optimize the disassembly of their products according to components and materials which needed to be separated in the disposal phase. They also design their products’ materials to be recycled with minimum impact on the environment.

For reducing environmental impact caused by harmful substances in the product and stimulating the recycling, prevention in the design and manufacturing phases is more effective than strengthening regulation in the disposal phase. Because the design phase determines 80% ⁽¹⁾ of the environmental impact of one product’s whole process and is critical in enhancing the recycling rate, several leading companies have conducted the Environment Assessment of the product since the early 1990.

Korea also restricts harmful substances in major home electronics and tries to make it a law to ask manufactures and importers to enhance materials and structure for increasing the product’s recycling rate in the disposal phase.

This standard can be used as a tool for setting a detailed standard for electrical and electronic equipments and for the company’s eco-design guideline and detailed technology standard.

⁽¹⁾ Sustainable Product Design, Ursula Tauscher and Martin Charter, 2001

1. Scope

This standard as the Korea Electronics Association's standard (referred to as "the Standard" hereinafter) stipulates the specific environmental assessment method for materials and structure of electrical and electronic equipments.

2. Cited Standard

As the following standards are cited to this standard, these consist of or related to the standard. The standard with the indication of the year of issue is valid but the latest version can be applied in accordance with the agreement of trading parties to these cited standards.

KS C IEC 62075, **Audio/Video, Information and Communication Technology Equipment
– Environmentally Conscious Design**

IEC 62430 CD, **Environmentally Conscious Design for Electrical and Electronic
Products and systems**

KSA1006_2002, **Package-Definition**

3. Definitions

For the purposes of this standard, the following definitions shall apply.

3.1 Producer

“Producer” means manufacturers and importers providing products to the market.

Note) “Manufacturer” means natural persons or legal entity producing the products defined in this standard. “Importer” means domestically established natural persons or legal entity launching the product after importing it from the third country.

3.2 Electrical and Electronic Equipments

“Electrical and electronic equipments” means the machine and equipment running on electric currents and electromagnetic fields.

3.5 General Tool

“General tool” means general tools used for separating economically valuable components and materials from the used body before the disposal phase.

Note) electrically powered screwdriver, hexagonal wrench, pliers, wire cutter, hammer, nipper/scissors, tweezers, box screwdriver, scraper etc.

3.6 Preseparated Components and Materials

“Preseparated components and materials” means components and materials including dangerous or harmful substances affecting worker’s safety in the disposal phase.

3.7 Economically Valuable Components and Materials

“Economically valuable components and materials” means components and materials necessary to be separated from the used body for economical reasons in the disposal phase.

3.8 Single Materials

“Single materials” means a combined material of two non-reactive materials, a single material, or their chemical compound group.

Note) Stainless steel, Other Ferrous alloys, non-stainless steels, Aluminum & its alloys, Copper & its alloys, Magnesium & its alloys, Nickel & its alloys, Zinc & its alloys, Other Nonferrous metals and alloys, Precious metals, Ceramics / Glass, Other inorganic materials, Thermoplastics, Other Plastics & Rubber etc.

3.9 Accessibility

“Accessibility” means a design characteristic not disturbing the use of general tools and the identification of joint area when the product is disassembled.

3.10 Separation

“Separation” means a design characteristic not causing unnecessary human power and physical force and enabling pre-separated components and materials to be separated when the product is disassembled.

3.11 Recycling

“Recycling” means using components and materials for the original purpose (reusing the components) or for other ones after reprocessing them. (Excluding the treatment for the energy recovery)

3.12 Environmental Impact

“Environmental Impact” means a positive or negative environmental change an organization’s environmental aspect can bring to the component or the whole environment. [KS A ISO 14001:2004, Definition 3.7]

3.13 Housing

“Housing” means a plastic or a metal material structure surrounding the exterior of combining products and protecting functional components.

3.14 Plastic

“Plastic” as a polymer, a copolymer, a polymer blend or a polymer alloy in this standard means the same as synthetic resins.

Note) When plastic is used in filling materials, reinforced materials, plasticizer, flame retardants, they are considered as plastic.

3.15 Packaging Materials

“Packaging materials” means materials and containers protecting the product’s value and state in delivery, storage, transportation, and use.

Note) Only for unit package materials

3.16 Unit Package Materials

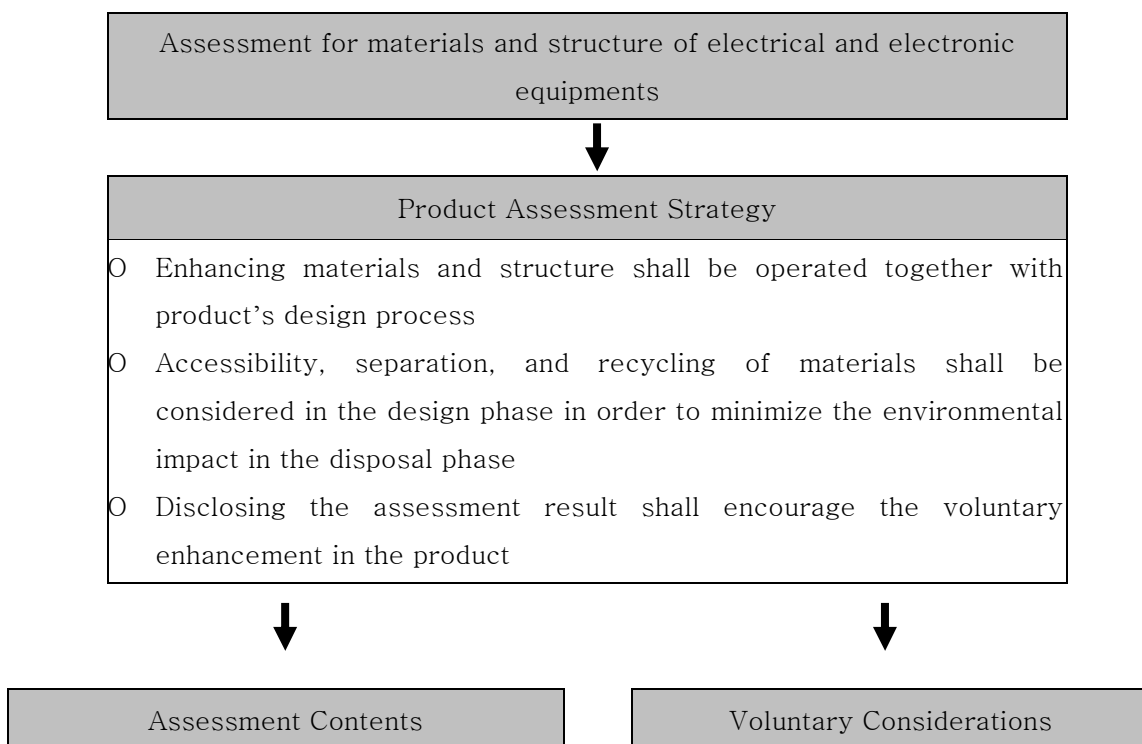
“Unit Package Materials” means proper materials / containers to raise or to protect the value of each product by unit package.

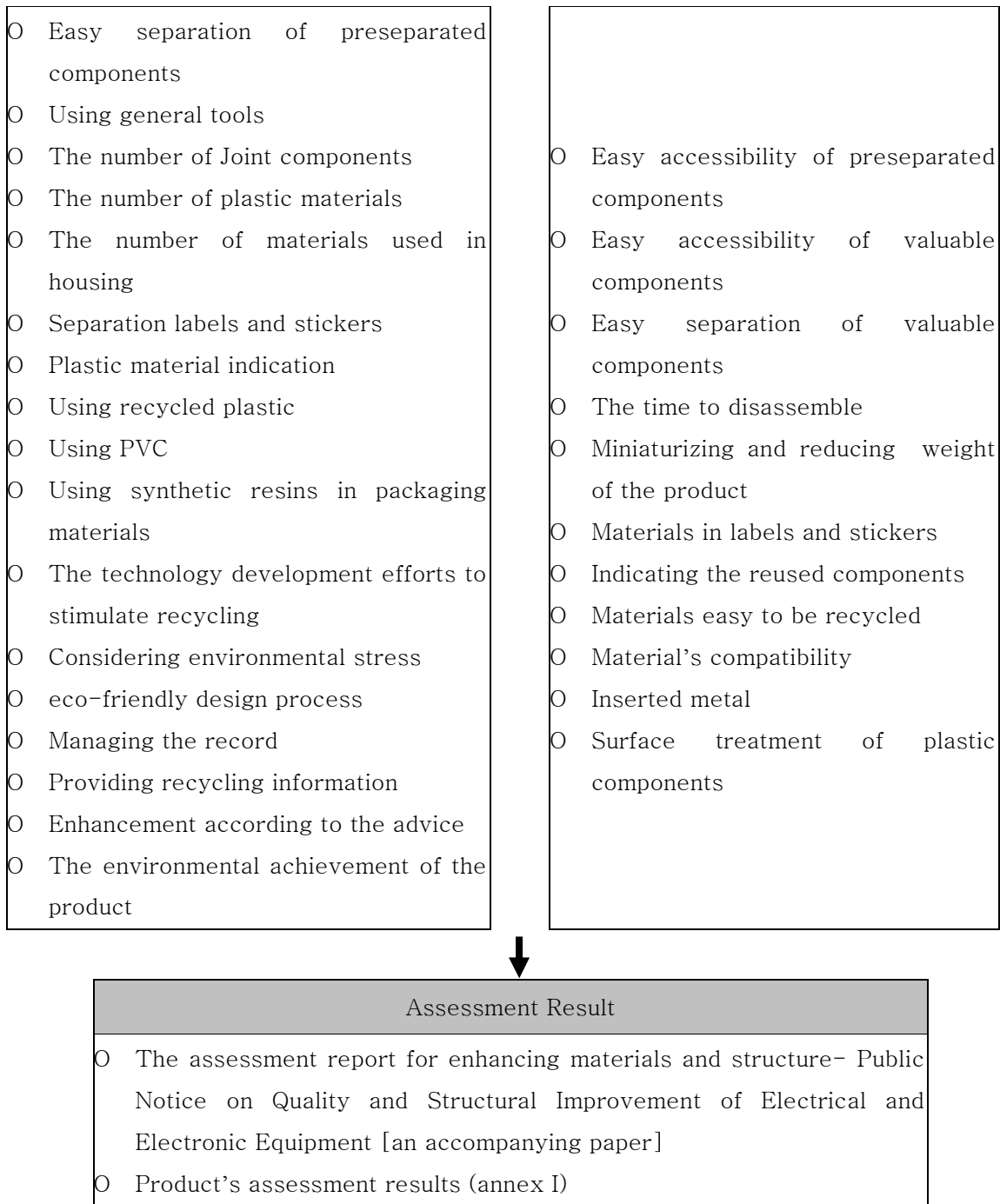
Note) Excluding accessories, fitment and components for fixing which are not necessary for the product’s function

4. General Information

4.1 General Principle for Enhancing Materials and Structures

The purpose of enhancing the materials and structure of electrical and electronic equipments is minimizing the environmental impact with promoting the effective use of natural resources through recycling, reusing and treating in the disposal phase. Also, the product’s characteristics shall be well reflected in selecting an assessment strategy, a method, and a model scope because of its short design period.





Picture 1. Assessment system for material and structure of electrical and electronic equipments

The standard for selecting assessment items in enhancing materials and structure is selected to be applied to all products. Because the method presenting detailed assessment standards with each product's characteristics takes long time, it is excluded. This way intends to encourage producers to consider the environmental assessment of

their product in the design phase before they launch their products on the market.

Taking into account assessment items which shall be reflected in design and technology development, this method divides the items for the company to consider them voluntarily in its design. After the self-assessment, the result shall meet the eco-friendly requirements of the interested group.

4.2 Assessment strategy for material and structure enhancement

The assessment strategy for materials and structure enhancement of electrical and electronic equipments has to be conducted in order to optimize the product's environmental achievement as well as to meet its function and economic value as a prevention approach for boosting the recycle of waste electrical and electronic equipments.

- a) Generally, environmental impact shall be less in the whole process by the assessment of materials and structure enhancement.
- b) Specific and quantified assessment criteria shall be necessary to guarantee the product's environmental achievement.
- c) The product's enhancement in materials and structure shall not have a major negative impact on the product's function and reliability from the user's point of view.
- d) The product's enhancement in materials and structure shall be pursued without causing excessive cost and administrative burden on producers.
- e) For the product's enhancement in materials and structure to be implemented in the design phase, eco-friendly product design requirements shall be established.
- f) The product's assessment result can be released with the Declaration of Conformity in which the interested group such as users, recyclists and producers shall be easily accessible to the result.

4.3 Assessment Items for Materials and Structure Enhancement

Assessment items for materials and structure enhancement such as management system integration, accessibility/ separation, and the design considering material recycling shall be evaluated in accordance with assessment items of table 1. Taking into account materials, manufacturing process, recycling process, equipment and technology development, assessment items shall be revised in the future. (For example: the annex II)

Table 1. Material and structure enhancement items and criteria

Item	Contents	Criteria
Design considering easy separation	easy separation of components	Easy separation of components - components and materials(preseparated components and materials) including dangerous or harmful substances affecting worker's safety in the disposal phase, components and materials with economic value or recycled components and materials
	Use of general tool	general tools used for separating economically valuable components and materials from the used body
	joint type	Minimizing joint types to make it easy to separate preseparated components and materials from the body
Design considering material recycling	Plastic material types	Minimizing plastic types used in the housing
	Separation of labels and stickers	Separating labels and stickers with different materials on the housing (Excluding labels and stickers that can be closely related to the safety of users and important considerations in the usage)
	Plastic material indication	The plastic used in the product(more than 25g in weight or more than 200mm ² in areas of the flat component)shall follow the material indication in accordance with ISO KS M 11469 (Only the abbreviation used in the plastic material indication shall be in accordance with ISO1043-1~4. Also, cell phone

		material indication standard is more than 5g)
	Using recycled plastic	Using recycled plastics in the product's plastics (Only recycled materials in the manufacturing process is excluded)
	Using PVC	Disposing PVC used in the product's housing
	Using synthetic resins in package materials	Reducing synthetic resins used in package materials
Management System	Technology development efforts to trigger recycling	continuous efforts to establish related infrastructures for collecting and recycling the product environmentally
	Eco-friendly design process	Establishing the product's development process with environmental aspect covering easy separation and recycling
	Considering environmental stress	Conducting eco-friendly product development covering environmental stress caused by the product
	Managing the record	Establishing the managing system for recording and restoring eco-friendly product development activities
	Providing recycling information	Establishing the inside system to provide the product's recycling information when recyclists and other interested groups ask it
	Enhancing activities based on the advice	Reviewing recyclists' advice and requirements on the product's materials and structure and reflecting them in design
Other	Product's	Other characteristics of eco-friendly design in the

	environmental enhancement	assessment model
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5. Assessment on Materials and Structure Enhancement

5.1 General Information

The assessment on the product's materials and structure enhancement shall be conducted in the design phase because it contributes to reducing environmental impact and natural resource use.

Because this assessment intends to enhance the environmental aspect in the disposal phase, "Trade-off" at each step of the whole eco-friendly design process shall be considered.

5.2 Assessment Method

Assessment contents and assessment criteria in the annex I are applied to assessment method. Additional data proving the each item's result can be presented in a way that the company chooses.

6. Assessment Result

6.1 General Information

The assessment result on enhancing the materials and structure of electrical and electronic equipments is used to lead the company to voluntarily reflect it in the design process as the way of the Declaration of Conformity.

6.2 The Declaration of Conformity

Producers can release the assessment on materials and structure enhancement in the way of the Declaration of Conformity after assessing the product's design process in the standard certification phase.

6.3 Product's Assessment Results

- a) product's assessment results shall be presented with the annex I and assessment paper on materials and structure[accompanying paper] in Public Notice on Quality and Structural Improvement of Electrical and Electronic Equipment (Ministry of the Environment Public Notice No.2008-17, Ministry of Knowledge Economy Public Notice No.2008-7). Related contents shall be documented and managed.

- b) The assessment result on enhancing materials and structure shall include the annex I with written assessment criteria and assessment results as well as evidence

Annex I: Assessment on Material and Structure Enhancement

The assessment on material and structure enhancement shall consider the following assessment contents and criteria.

1. Design Considering Easy Separation

contents	Assessment Criteria	Assessment result
Easy separation	Does the design consider the following factor? The easy separation of components-components and materials(preseparated components and materials) including dangerous or harmful substances affecting worker's safety in the disposal phase, components and materials with economic value or recycled components and materials	<input type="checkbox"/> Yes ----- <input type="checkbox"/> No
Use of general tool	Is it possible to use only general tools when economically valuable components and materials are separated from the used body? * In case of NO- please fill the name of a used tool and the reason for using it.	<input type="checkbox"/> Yes ----- <input type="checkbox"/> No <input type="checkbox"/> the name of a used tool
Joint type	Does the design consider minimizing joint types to make it easy to separate preseparated components and materials from the body? * Mark the used joint type	a) bolt () b) screw () c) nut () d) pin () e) washer () f) rivet () g) snap fit () h) pressure welding, soldeing & brazing, fusion welding ()

		<p>i) Natural based organic adhesives ()</p> <p>j) Synthetic based organic adhesives ()</p> <p>k) other ()</p>
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2. Design with Material Recycling

Contents	Assessment Criteria	Result
The number of material types	How many plastic types are used in the plastic housing components with more than 25g? (For cell phone, Only plastic housing with more than 5g is the standard.)	() unit
Use of labels and stickers	Is it possible to separate the labels and stickers with different materials on the housing? (Excluding labels and stickers that can be closely related to the safety of users and important considerations in the usage)	() Yes ----- () No ----- () Corresponding nil
Plastic material indication	Does the plastic components used in the product (More than 25g in weight or more than 200 mm ² in areas of the flat component) follow the material indication in accordance with ISO KS M 11469? (Only the abbreviation used in the plastic material indication shall be in accordance with ISO1043-1~4. Also, cell phone material indication standard is more than 5g) (Excluding only the case of causing problems in exterior design or function)	() Yes ----- () No
Using recycled plastic	How much recycled plastics are used compared to the product's gross weight? (Only recycled materials in the manufacturing process is excluded) Recycled plastic use rate(%)= the amount of recycled plastic in use/ the total plastic weight of the product	() %
Using recyclable plastic	Does it dispose all PVC used in plastic parts over 25g? (but, PCB assembly and electrical cables are excluded)	() Yes ----- () No

Using synthetic resins in package materials	<p>How much synthetic resins are used compared to the total package weight?</p> <p>The ratio of used synthetic resins(%)= the total amount of synthetic resins/ the total weight of package</p> <p>(Only the total amount of synthetic resins equals the total weight of synthetic resins used in each package. The total package weight equals the combined weight of each package.)</p>	() %

3. Management System

Item	Contents	Criteria
Technology development efforts to trigger recycling	Are there continuous efforts to establish related infrastructures for collecting and recycling the product environmentally?	<input type="checkbox"/> Yes ----- <input type="checkbox"/> No ----- <input type="checkbox"/> Corresponding nil
Eco-friendly design process	Is there an inside process encouraging the product development considering environmental items such as easy separation and recycling?	<input type="checkbox"/> Yes ----- <input type="checkbox"/> No ----- <input type="checkbox"/> Corresponding nil
Considering environmental stress	Does it consider environmental stress caused by the product in developing eco-friendly products?	<input type="checkbox"/> Yes ----- <input type="checkbox"/> No ----- <input type="checkbox"/> Corresponding nil
Managing record	Is it equipped with an inside system for recording and restoring the result of eco-friendly product development activities mentioned above?	<input type="checkbox"/> Yes ----- <input type="checkbox"/> No ----- <input type="checkbox"/> Corresponding nil
Providing recycling information	Is it equipped with an inside system for providing the product's recycling information when recyclists and other interested groups ask it?	<input type="checkbox"/> Yes ----- <input type="checkbox"/> No ----- <input type="checkbox"/> Corresponding nil
Enhancing activities based on the advice	Does it review recyclists' advice and requirements on the product's materials and structure and reflect them in design when recyclists ask them?	<input type="checkbox"/> Yes ----- <input type="checkbox"/> No ----- <input type="checkbox"/> no request

4. Other

Item	Contents	Criteria
Product's environmental enhancement	Is there any eco-friendly characteristics excepting the items discussed above?	<input type="checkbox"/> Yes <input type="checkbox"/> Corresponding contents ----- <input type="checkbox"/> No

Annex II: Voluntarily Considering Items for Enhancing Materials and Structure.

The following needs to be considered for the diversity of materials and structure, for the technology development based on the different items and functions of electrical and electronic equipment, and for the recycling technology development even though it is not included in the assessment items on material and structure enhancement.

1. The Design Considering Structure Enhancement

Considering factors	Details
Easy separation of valuable components	Design that enables easy separation of recyclable and economically valuable components and materials from the body in the disposal phase
Disassembling time	Minimizing the time to disassemble pre-separated components and materials and recyclable and economically valuable components and materials
Easy access to pre-separated components	Design that has easy access to the components and materials(pre-separated components and materials) including dangerous or harmful substances affecting worker's safety in the disposal phase and the components and materials with economic value or recycled components and materials
Easy access to valuable components	Design that enables easy separation of recyclable and economically valuable components and materials from the body in the disposal phase
Less weight of the product	Choosing the material that can reduce the amount of used materials and the recycling cost compared to the product with the same function and item
Miniaturizing the product	Compared to the product with the same function and item, it is required to miniaturize the product for the efficiency in product's package, storage, delivery and disposal process.
Unifying the package materials	Choosing the minimum number of package material types for enhancing the recycle of used package materials

2. Design Considering Material Recycling

Considering factors	Details
Materials used in labels and stickers	The label on the housing uses a compatible or same material to the one on the body
The indication of used components	Components that can be reused are displayed in an easy way
Easily recyclable materials	Separated components uses recyclable materials for increasing the recycling rate
compatible materials	For increasing the recycling rate, the plastic compatibility is considered when separated plastic components use different materials.
Metal insertion	Plastic metal insertions are avoidable.
Surface treatment of plastic components	Coating and painting plastic components are avoidable.

Annex III: Preseparated Component Item

The range of preseparated components and materials in the assessment on material and structure enhancement is as follows:

- Polychlorinated biphenyls (PCB) containing capacitors
- Mercury containing components, such as switches or backlighting lamps
- Batteries
- Printed circuit boards for cell phones
- Printed circuit boards for PCs
- Printed circuit boards of other devices if the surface of the printed circuit board is greater than 10 cm²
- Plastic containing brominated flame retardants
- Asbestos waste and components which contain asbestos
- Cathode ray tubes
- CFC or HCFC, HFC, HC
- Gas discharge lamps
- LCD (together with their casing where appropriate) of a surface greater than 100 cm² and all those back-lighted with gas discharge lamps
- External electric cables
- Components containing radioactive substances
- Electrolyte capacitors (height >25mm, diameter > 25mm, or proportionately similar volume)

Annex IV: Thermoplastic Resin Compatibility

		Excess component																			
Mixture component		ABS	ASA	PA	PBT	PBT+ PC	PC	PC+ ABS	PC+ PBT	PE	PET	PMMA	POM	PP	PPO	PPE+ PS	PS	PVC	SAN	TPU	
	ABS	+	+	@	+	+	+	+	+	@	@	+	@	@	@	@	@	@	+	+	+
	ASA	+	+	@	+	+	+	+	+	@	@	+	@	@	@	@	@	@	+	+	+
	PA	@	@	+	@	@				@	@	@	@	@		@	@			@	+
	PBT	+	+	@	+	+	+	+	+	@	@	@	@	@	@	@	@			+	@
	PBT+ PC	+	+	@	+	+	+	+	+	@	@	@		@	@	@	@			+	+
	PC	+	+		+	+	+	+	+	@	+	+		@	@	@	@			+	@
	PC+ ABS	+	+	@	+	+	+	+	+	@	+	+	@	@	@	@	@			+	+
	PC+ PBT	+	+		+	+	+	+	+	@	+	+	@	@	@	@	@			+	+
	PE			@			@			+					+		@		@		@
	PET	+	+	@	+	+	+	+	+	@	+	@	@	@	@	@	@	@	@	@	@
	PMMA	+	+	@			+	+	+	@	@	+	@	@	@	@	@	@	@	@	@
	POM	@	@	@	@	@				@	@		+	@	@	@	@	@	@	@	@
	PP			@						@				+		@			@		@
	PPE	@	@	@	@	@	@	@	@	@	@	@	@	@	@	+	+	+		@	@
	PPE+ PS	@	@	+	@	@	@	@	@	@	@	@	@	@	@	+	+	+		@	@
	PS	@	@	@	@	@	@	@	@	@	@	@	@	@	@	@	+	+	@	@	@
	PVC	+	+							@		+	+	@		@	@	@	+	+	+
	SAN	+	+	@	+	+	+	+	+	@	@	+	@	@	@	@	@	@	+	+	@
	TPU	+	+	+		+	+	+	+	@	+	+	+	+	@	@	@	@	+	+	+

- + High compatibility in the wide range of alloy
- @ Limited compatibility in the small amount of excess component
- Incompatibility