

Standard ECMA-341

2nd Edition / December 2004

**Environmental design
considerations for ICT
& CE products**

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Brief History

The increased interest of public, institutional and government sectors and customers in product environmental information stimulated the creation of Ecma TC38 to work on the definition of product-related environmental attributes in 1995. TC38 includes experts from Information and Communication Technology (ICT) and Consumer Electronics (CE).

Following ECMA TR/70 (Product-related environmental attributes), the first edition of this Standard established a set of requirements and recommendations for the design of information and communication technology and consumer electronic products, with reduced environmental impact.

The 2nd edition of ECMA-341 takes into account the publication of the 3rd edition of ECMA TR/70, the publication of ECMA-328, the development of IEC ECD guide 114, technology evolution, recent engineering best practices, and changes in the regulatory landscape.

This Ecma Standard has been adopted by the General Assembly of December 2004.

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1 Scope

This Ecma Standard identifies design practices for Information and Communication Technology (ICT) and Consumer Electronic (CE) products with a rated voltage not exceeding 1000 V r.m.s., intended for domestic or commercial use that could reduce the environmental impact of the product. This Standard specifies requirements and recommendations for the design of commercially viable, environmentally conscious products.

Specifically, the Standard covers:

- Energy efficiency
- Material efficiency
- Consumables and batteries
- Chemical and noise emissions
- Extension of product lifetime and end of life considerations
- Substances and preparations needing special attention
- Product packaging
- Documentation

This Ecma Standard is applicable to final electrical and electronic products. Although it does not apply to individual components, component manufacturers also need to consider this Standard, to enable products manufacturers using such components to meet the requirements herein.

This Ecma Standard applies product design principles contained in international technical report ISO TR 14062. However, ISO TR 14062 contains process considerations, which are outside the scope of this Ecma Standard.

This Ecma Standard only covers criteria directly related to the environmental performance of the product. Criteria such as safety (including EMF), ergonomics and EMC, although equally important, are outside the scope of this Standard.

Through implementation of this Standard health and safety in all stages of the product life must not be compromised.

Annex A presents an example design checklist that can be used to evaluate and record environmental design features of electrical and electronic equipment.

2 Conformance

Conformance to this Ecma Standard is satisfied by all of the following:

- Meeting all of the applicable “shall” statements in Clauses 6 and 7;
- Completing a design checklist for the product (or for a given family of products);
- Stating compliance through a supplier’s declaration.

3 References

This Ecma Standard refers to the publications listed below. When Ecma published this Standard, the editions of the listed publications were valid. However, all publications are subject to revision. Therefore, designers and other parties should consider using the most recent editions.

Ecma International

ECMA-74	Measurement of Airborne Noise Emitted by Information Technology and Telecommunications Equipment, 8th edition (December 2003)
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ECMA-328 Detection and Measurement of Chemical Emissions from Electronic Equipment (June 2001)

ECMA TR/70 Product-related Environmental Attributes, 3rd edition (June 2004)

ISO

ISO 3741:1999 Acoustics -- Determination of sound power levels of noise sources using sound pressure -- Precision methods for reverberation rooms

ISO 3744:1994 Acoustics -- Determination of sound power levels of noise sources using sound pressure -- Engineering method in an essentially free field over a reflecting plane

ISO 3745:2003 Acoustics -- Determination of sound power levels of noise sources using sound pressure -- Precision methods for anechoic and hemi-anechoic rooms

ISO 7779:1999 Acoustics -- Measurement of airborne noise emitted by information technology and telecommunications equipment

ISO 11469:2000 Plastics -- Generic identification and marking of plastics products

ISO 14050:2002 Environmental Management -- Vocabulary

ISO TR 14062:2002 Environmental Management -- Integrating environmental aspects into product design and development

EU Directives & Regulations

76/769/EEC Council Directive on restrictions on the marketing and use of certain dangerous substances and preparations and its adaptations and amendments

91/338/EEC 10th amendment to 76/769/EEC (cadmium)

94/62/EEC Packaging and packaging waste

1999/45/EC Classification, packaging and labelling of dangerous preparations

1999/77/EC Adapting to technical progress for the sixth time Annex I to 76/769/EEC (asbestos)

2037/2000 Regulation (EC) No 2037/2000 on substances that deplete the ozone layer

2038/2000 Regulation (EC) No 2038/2000 amending Regulation (EC) No 2037/2000 on substances that deplete the ozone layer, as regards metered dose inhalers and medical drug pumps

2039/2000 Regulation (EC) No 2039/2000 amending Regulation (EC) No 2037/2000 on substances that deplete the ozone layer, as regards the base year for the allocation of quotas of hydrochlorofluorocarbons

2002/95/EC Restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS)

2003/2/EC Restrictions on the marketing and use of arsenic (10th adaptation to technical progress to 76/769/EEC)

2003/3/EC Restrictions on the marketing and use of "blue colourant" (12th adaptation to technical progress of 76/769/EEC)

2003/11/EC Restrictions on the marketing and use of certain dangerous substances and preparations (pentabromodiphenyl ether, octabromodiphenyl ether) (amending for the 24th time 76/769/EEC)

For full EU legislative documents please check EUR-Lex: <http://europa.eu.int/eur-lex/>

4 Definitions

For the purpose of this Standard the following definitions and those in ISO 14050 apply.

4.1 Chemical emissions

Chemical substances and particulate matter emitted from a product into the air.

4.2 Component

For the purposes of this Standard, a component has the same definition as a Part. See [4.13](#).

4.3 Consumables

User-replaceable parts or modules that are placed on the market for use in equipment. Examples of consumables are: Printer cartridges, photographic film, print paper, CD-ROMs, magnetic tape.

4.4 Electrical and electronic equipment (EEE) also known as Product

Equipment which is dependent on electric currents or electromagnetic fields in order to work properly and equipment for the generation, transfer and measurement of such currents and fields and designed for use with a voltage rating not exceeding 1 000 V for alternating current and 1 500 V for direct current.

4.5 End of life

State of a product when it is finally removed from use.

4.6 Environment

Surroundings in which an organisation operates, including air, water, land, natural resources, flora, fauna, humans and their interrelation, from ISO 14062.

4.7 Environmental aspect

Element of an organisation' activities, products or services that can interact with the environment.

NOTE

A significant environmental aspect is an environmental aspect that has or can have a significant environmental impact. (ISO 14050)

4.8 Environmental impact

Any change to the environment whether adverse or beneficial, wholly or partially resulting from an organisation's activities, products or services. (ISO 14050)

4.9 Environmental management system

Part of the overall management system that includes organisational structure, planning activities, responsibilities, practices, procedure, processes, and resources for developing, implementing, achieving, reviewing and maintaining the environmental policy. (ISO 14050)

4.10 Hazardous substances/preparations

[Substances](#) or [preparations](#) which are explosive, oxidising, extremely flammable, highly flammable, flammable, very toxic, toxic, harmful, corrosive, irritant, carcinogenic, mutagenic, toxic to reproduction, sensitising or dangerous to the environment (as governed by existing national, regional and international legislation).

4.11 Manufacturer

The natural or legal person with responsibility for the design, development and manufacture of a product in view of its being placed on the market under their own name, regardless of whether these operations are carried out by that person themselves or on their behalf.

4.12 Module

Item of a product consisting of several parts with a function in itself (e.g. power supply unit).

4.13 Part

Any piece or object within or included with a product.

4.14 Preparations

Mixtures or solutions composed of two or more substances.

NOTE

Lead, for example, is a [Substance](#) and solder is a Preparation, which contains lead.

4.15 Recycling

The reprocessing of [EEE](#) at end of life, or its constituent materials for re-use or for other purposes.

4.16 Reuse

Any operation by which electrical and electronic equipment or their components, having reached their end of life, are used for the same purpose for which they were conceived. "Re-use" includes the continued use of electrical and electronic equipment, which is returned to collection points, distributors, recyclers or manufacturers, as well as re-use of equipment following refurbishment.

4.17 Substances

Chemical elements and their compounds in the natural state or obtained by any production process, including any additive necessary to preserve the stability of the products and any impurity deriving from the process used, but excluding any solvent which may be separated without affecting the stability of the substance or changing its composition.

4.18 Use phase

The time of a product's life between placing into service and end of life.

4.19 Waste

Any electrical or electronic equipment which the holder discards or intends to discard or is required to discard.

5 Acronyms and abbreviations

CE	Consumer Electronics
CFC	Chlorofluorocarbons
DBB	Di- μ -oxo-di-n-butyl-stanniohydroxyborane
EEE	Electrical and Electronic Equipment
EICTA	European Information & Communications Technology Industry Association
HBFC	Hydrobromofluorocarbon
HCFC	Hydrochlorofluorocarbon
ICT	Information and Communication Technology
NiMH	Nickel Metal Hydride
OctaBDE	Octabromodiphenyl ether
PBB	Polybrominated biphenyl
PBDE	Polybrominated diphenyl ether
PCB	Polychlorinated biphenyl
PCT	Polychlorinated terphenyl
PCN	Polychlorinated naphthalene

PentaBDE	Pentabromodiphenyl ether
TBT	Tributyl tin
TBTO	Tributyl tin oxide
TEPA	Tris-(aziridiny)-phosphineoxide
TPT	Triphenyl Tin
TRIS	Tri-(2,3,-dibromopropyl)-phosphate
VOC	Volatile Organic Compounds

6 Design requirements and recommendations

6.0 General considerations

Integration of environmental aspects has to be considered as early as possible in the product design and development process when opportunities still exist to make changes to improve environmental performance of the product while balancing aspects such as technical features and economic viability.

Life cycle thinking, i.e. including all stages of the product's life cycle such as manufacturing, distribution, use and end of life, has to be used to identify the relevant environmental aspects, thus helping in defining design opportunities. It is important to ensure that any emphasis on a single stage of a product's life cycle doesn't unintentionally and adversely alter the environmental impact of other stages.

Experience has shown that the best solutions are specific to the product and the organisation's characteristics. It is therefore important to find an appropriate strategy for the integration of environmental aspects in the product design and development process. With this in mind, designers of ICT and CE products should consider that:

- the use stage is the main source for environmental impact for many products (e.g. energy consumption);
- manufacturing, distribution and packaging also have an impact on the environment, and can represent opportunities for reducing environmental impact. However, designers are encouraged to take these aspects into consideration only when they can be practically influenced by the designer, and when significant improvements can be obtained.

The following requirements and recommendations have been compiled for use when designing and developing ICT and CE products as defined in the Scope of this Standard, and as far as they can be practically influenced by the designer.

6.1 Material efficiency

Material selection has an impact on the environment. When specifying materials, the designer should choose design alternatives that:

- reduce the variety of materials used;
- reduce the amount of material used and consequently the weight of the product;
- use materials that are considered to have lower environmental impact.

A designer shall also consider using recycled and renewable materials.

For replacing materials containing hazardous substances and preparations, see [6.7](#).

6.2 Energy efficiency

The use phase of EEE typically represents the time when the most energy is consumed through the product life and thus has a significant impact on the environmental performance of EEE. Therefore, product design features that increase energy efficiency or reduce energy consumption during use shall be considered.

6.2.1 Power modes & related energy efficiency measures

Power mode definitions and applied terms vary dependent on the product group. Therefore, rather than providing precise definitions of power modes in this Standard, typical modes are described in generic terms. The intent is to balance the technical complexity with the simplicity needed for ease of communication and use.

Due to the high diversity of products covered by this Standard, examples are indented to clarify the power modes and to guide the designer.

The designer shall identify specific power modes, which apply to the product under development.

The designer shall consider energy efficiency measures for the identified power modes (described in more detail in the following sections).

Designers should also identify where power is consumed with the product and which units or components can be improved to reduce overall power consumption.

6.2.2 Operational modes

Operational modes are states in which the device performs its intended duties. Usually the on-mode can be categorised by three terms.

On-maximum

Power during operation with all options applied.

NOTE

An example for this mode would be a TV-set with maximum contrast, brightness & sound or a PC with all slots and bays populated and operating.

On-normal

Power during operation with default / standard configuration.

NOTE

An example for this mode would be the factory setting of a computer display or a printer in active/run mode.

On-idle

Power with minimum system load by user and ready to operate without delay.

NOTE

An example for this mode would be a PC running with no user initiated task consuming significant computing resources or a printer in ready/stand-by mode.

The designer

- Shall consider using low power components and design options as well as efficient power supply components such as voltage regulators and DC-DC converters to reduce the power consumption in the on modes.

The reason is that less efficient designs result in higher power dissipation in the system and related heat dissipation, which leads to increased cooling requirements. By improving the energy efficiency of these designs in the on-mode, it may become possible to apply passive cooling thereby avoiding the use of fans and the resulting additional power consumption.

NOTE

Energy efficiency improvements typically reduce costs and noise and improve serviceability.

- Shall consider identified modes (see [6.2.1](#)) when specifying the power supply. The AC-DC conversion efficiency should be high in the most used modes.

For example for typical personal computers in office use, the on-idle mode can represent up to 90% of the on-mode consumption and thus the conversion efficiency for this mode should be high. However, in many personal computers, the power supply loading is low in the on-idle mode, and hence often the conversion efficiency is low.

Another reason for a low loading and therefore reduced power supply efficiency is the inherent extendibility of a system such as a PC. As such the designer should balance extendibility vs. power consumption.

- Shall consider the true specification needs for the product. For example, over specifying the rating of the power supply can lead to an energy inefficient design.
- Shall consider the effect of the operating environment specification provided to users and installers. For example over specifying the maximum allowed ambient (room) operating temperature for large telecom, server or storage units can lead to energy inefficiencies in the room cooling systems.

6.2.3 Energy saving modes

Energy saving modes, often denoted as low power, sleep, deep sleep or stand-by, are states in which the equipment is connected to an electrical supply and is ready to resume an operational mode, within a user acceptable timeframe, through the use of remote control or another signal. In complex systems, various save modes may be present.

NOTE

Examples for energy saving modes are: sleep (e.g. stand-by/Suspend To RAM mode for computers), standby-active high mode (e.g. Set-top-Box exchanging data with an external source but not providing picture or sound to the TV), stand-by-active low mode (e.g. DVD-Recorder programmed for recording but not recording / providing picture or sound to the TV), stand-by-passive (e.g. TV not providing picture or sound, but can be switched into operational mode by the remote control).

The designer shall:

- consider practical design options to automatically switch from on mode to save modes. The save mode settings should be adjustable by the user. Other innovative solutions shall be considered;

NOTE

For example a computer monitor may activate sleep mode when the user is detected to have left the viewing area.

- consider the effect of the time to resume on the user acceptance to use the save modes extensively, for example the delay time for the first copy/print to start from save mode on a copier/printer;
- consider design options to reduce the power consumption in the energy save modes by also applying similar methods as described in the “[operational modes](#)” clause;
- inform the user of the higher power consumption if the save mode is disabled.

6.2.4 OFF modes

The modes with the lowest power consumption when the device is connected to an electrical supply. The off mode can be characterised by two terms:

Soft-Off

The equipment is switched off by the device itself or initiated by the user via remote control or command.

NOTE

Examples are printer in auto-off mode or computer after shutdown was completed.

Hard-Off

The off-power state in which the device uses zero Watt. The equipment is manually switched off with the main power switch (see fourth bullet below).

NOTE

Examples are monitors, TVs and laser printers switched off at the primary side of the power supply and thus consuming no power.

The designer

- Shall consider design options to automatically switch from save mode to off mode where practical.

- Shall consider design options to reduce the power consumption in the soft off modes to lowest values (zero Watt if feasible).
- Should place the main power switch on the product such that the user can easily reach and use it.
- Shall inform the user through documentation or other means if zero Watt in the state a user would consider hard off is not achievable.

6.2.5 No load mode

The mode in which external power supplies or chargers are connected to an electrical supply, but are not connected to electrical or electronic equipment for which they have been designed. A typical example is the mobile phone charger, which is plugged in, but the phone is not connected.

- The designer shall consider design options that reduce power consumption of no load mode to the lowest value.

6.2.6 General energy efficiency measures

All available power saving features shall be recorded and documented in the design checklist.

Information on the power consumption and, where applicable, their related power modes shall be made available to the user.

Design engineers should consider the applicable voluntary agreements aimed at improving energy efficiency of EEE e.g. EICTA voluntary agreements on energy efficiency / standby power consumption of TV, DVD player, audio and video equipment or the EU Code of Conduct for external power supplies.

Products belonging to product categories which are covered by the international ENERGY STAR® program should be compliant to the program requirements. In case this cannot be achieved, the reasons for non-compliance should be recorded in the design checklist.

The effects of the improved design decisions compared to previous designs should be quantified and communicated to product marketing. This would better enable marketing to promote products with reduced total cost of ownership through lower power consumption.

The designer should enable the most energy efficient on modes and transitions to save mode as default. If this is not possible, instructions on proper use of available energy saving controls and/or settings shall be provided to users. Instructions may be included in product user documentation in either printed or electronic form.

Software is relevant for the overall energy efficiency of a system. The designer should balance the flexibility of software running on multipurpose devices and the energy efficiency of special purpose hardware.

NOTE

Energy Star have made a number of product specifications and memoranda of understanding available here: http://www.energystar.gov/index.cfm?c=product_specs.pt_product_specs.

6.3 Consumables and batteries

6.3.1 Consumables

The designer shall consider avoidance of hazardous substances and preparations in consumables as described in 6.7.

EEE products should be designed such that the use of consumables can be optimized relative to the functionality of the product. Designers should consider incorporating the following features:

- Functions to reduce or save the use of consumables;
- Ease of replacement and maintenance of consumables.

The manufacturer should provide users with information on the proper use of consumables relative to the functionality of the EEE product and, where appropriate, end of life management of the consumables.

6.3.2 Batteries

Batteries shall comply with all applicable restrictions on hazardous substances and preparations, design requirements on equipment containing batteries and all labelling requirements contained in the relevant national, regional and international legislation.

In principle batteries shall not contain more than 0,0005% (5 ppm) of mercury by weight.

Alternatives with reduced environmental impact, e.g. Li-ion, Li-Polymer and NiMH batteries shall be considered. When materials with negative environmental impact cannot be avoided (e.g. Mercury in button cells), the material and its justification shall be recorded in the design checklist.

Batteries should be easily identifiable and removable, except where the battery life span exceeds that of the product (and the equipment is reliant on continuous power supply), or when no special disposal requirements for the battery exist. In this case the product documentation shall give advice for the safe removal of the battery by qualified personnel.

Information on batteries in the product shall be made available. This information shall include details on the types of the batteries and their locations as well as proper procedures for safe removal and handling of the batteries and shall be included in product user documentation in either printed or electronic form.

Battery management features that prolong the durability of batteries shall be considered.

6.4 Emissions

6.4.1 Chemical emissions

Products should be designed such that chemical emissions during use are reduced wherever possible.

Products shall comply with all relevant regulations governing chemical emissions from products.

Chemical emissions should be evaluated for all products that are based on the electrostatic process (e.g. printer, copier, fax).

The emission rates derived from the measurements shall be made available if appropriate. For measurements [ECMA-328](#) should be followed.

6.4.2 Noise emissions

The designer should consider techniques to reduce noise emissions.

In particular, noise emissions shall be evaluated according to [ECMA-74](#) (or its equivalent ISO 7779, when available) for products covered by ECMA-74.

For products under the scope of this Standard and not covered by ISO 7779/ECMA-74, one of the basic sound power standards, ISO 3741, ISO 3744 or ISO 3745 should be referenced, and where applicable the test conditions used should be recorded.

Where appropriate the results of the emission measurement shall be made available.

Note that the additional noise from cooling systems is a frequent issue for audio and video systems and computers in home or silent office environments.

6.5 Extension of Product lifetime

Where technically and economically feasible, products should be designed to have an extended useful life and be easy to repair. Designers should consider incorporating the following features:

- use of common mechanical packages (such as covers and chassis) or common parts or components that are used for multiple models in the product family or in multiple generations of the same product, allowing for the reuse of common parts;
- use of industry standard parts that may be more easily replaced or repaired;

- use of modular components;
- re-use of components, parts and systems, whenever applicable. Parts, which may be targeted for refurbishment and reuse (e.g. in maintenance and spare parts applications) should be identified.

To encourage the extension of a product's useful life, information on available options for upgrading, expanding and repair of products shall be made available if appropriate.

NOTE 1

Specifics on design for upgradeability may need to be identified based on product categories, and/or initial cost of product. There are categories of products for which upgradeability features may not be applicable; examples are single use cameras and pocket calculators.

NOTE 2

Some of the guidelines provided in 6.6 will aid serviceability.

6.6 End of Life

Product design should facilitate reuse, recycling and proper disposal at end of life.

The following design principles, where appropriate for the expected end of life processes, shall be applied:

- easy and safe separation of parts containing hazardous substances and preparations shall be possible;
- incompatible materials (including electronic modules) connected to case/housing parts or chassis shall be easily separable;
- disassembly down to the module level (e.g. power supply, disk drive, circuit board) shall be possible using commonly available tools and all such parts shall be accessible;
- type of polymer, copolymer, polymer blends or alloys of plastic parts including additives with a weight greater than 25 g shall be indicated through a marking in conformance with ISO 11469.

NOTE 1

Safety and performance considerations may override some of the requirements mentioned above.

NOTE 2

There are categories of products for which dismantling may not be practical at end of life.

Considering the expected end of the life processing designers should:

Avoid the use of:

- non-recyclable composites and coatings;
- coatings and surface finishes on plastic parts that are difficult to recycle without downgrading;
- adhesive backed stickers or foams on plastic parts;
- metal inserts in plastic parts (unless easily removable with common tools).

Reduce the number and variety of:

- welds and adhesives;
- connections (e.g. fastener and screws);
- steps necessary for disassembly;
- tools required for disassembly;
- position changes that have to be made by the dismantler.

Do:

- use the same polymer throughout the design of a product. If this is not practical, consideration should be given to limiting the number plastic types used in the product. The compatibility

guidelines found in Annex C should be used in selecting polymers. Combinations rated Excellent or Good should be used wherever practical.

- design the product such that modules can be extracted for reuse;
- use labels and other identification marks made from the same material as the body of the products or a compatible material;
- design for ease of disassembly and therefore use snap fits or screws.

Designers should consider development of a plan for the disassembly of the product into major modules or sub assemblies and make this plan available to dismantlers. For large and complex products (e.g. rack mounted systems, servers, telephone switches etc.) these plans are especially needed. The disassembly plan could include:

- documentation of disassembly information;
- identification of potentially valuable and/or re-usable parts;
- identification of parts containing hazardous substances and preparations;
- special handling and disposal precautions.

6.7 Substances and preparations needing special attention

Reducing and/or eliminating potentially hazardous substances shall be a priority in the design of electrical and electronic products. In particular designers are advised to be aware of international, regional and national prohibitions on the use of certain hazardous substances in products in order to ensure legal compliance for products sold in targeted countries. The product must comply with all applicable legislation.

Designers shall attempt to reduce the use of substances that require special handling or disposal during the product recycling process.

Appropriate information on parts requiring special handling or disposal shall be made available to product users and recyclers.

When other hazardous substances than those that are restricted cannot be avoided, they shall be identified and an indication why they cannot be avoided shall be recorded in a design checklist.

Restrictions listed in the clauses below represent those generally accepted internationally as being inappropriate in product design. As such they do not represent an exhaustive list; only major legislation is referred to.

NOTE

There may exist some additional national legislation.

6.7.1 General limitations

The product shall not contain (higher concentrations as specified in the sample references):

- Asbestos [EU 76/769/EEC (1999/77/EC)];
- Ozone Depleting Substances: Chlorofluorocarbons (CFC), hydrobromofluorocarbons (HBFC), hydrochlorofluorocarbons (HCFC), Halons, carbontetrachloride, 1,1,1-trichloroethane, bromochloromethane [EU : Regulation (EC) No. 2037/2000, 2038/2000, 2039/2000];
- PCB, PCT, monomethyltetrachlorodiphenylmethane (Ugilec 141), monomethyldichlorodiphenylmethane (Ugilec 121 or 21), monomethyldibromodiphenylmethane (DBBT) [EU 76/769/EEC];
- Mercury – with the exception of discharge lamps that require mercury for proper operation [Netherlands decree on Product Containing Mercury, 1998 Environmentally Hazardous Substances Act];
- PCN, TPT, TBT, TBTO [Japanese Law No.117 of Oct.16, Year-Showa-48 (1973) – Chemical Substance Control Law];

- DBB [EU 76/769/EEC];
- PentaBDE, OctaBDE [EU 76/769/EEC (2003/11/EC)];
- From July 2006: Lead, cadmium, mercury, hexavalent chromium, PBB, PBDE as defined in Directive 2002/95/EC (commonly named RoHS directive) including a detailed list of exemptions. The latter will be updated by the EU commission and reviewed every 4 years.

6.7.2 Limitations on plastic mechanical parts and housings

In addition to the limitation of 6.7.1, plastic parts shall not contain:

- Cadmium or cadmium compounds [EU 76/769/EEC (91/338/EEC)];
- Short chain chloroparaffins [Dutch decree 478 3.11.1999, Norwegian regulation relating to restrictions on the use of certain dangerous chemicals 20.12.2002];
- Lead or lead compounds [Danish Statutory Order No. 1012 of 13 November 2000 on Prohibition of Import and Marketing of Products Containing Lead].

6.7.3 Limitations on paints, coatings or colouring agents

Paints, coatings or colouring agents shall not contain:

- Cadmium or cadmium compounds [EU 76/769/EEC];
- Lead or lead compounds [Danish Statutory Order No. 1012 of 13 November 2000 on Prohibition of Import and Marketing of Products Containing Lead].

6.7.4 Others

- Regulations concerning textiles and leather with direct skin contact:
 - TRIS, TEPA [EU 76/769/EEC];
 - AZO colourants that split aromatic amines specified in [EU 76/769/EEC (2003/3/EC)];
 - Hexavalent chromium [German Food and Commodities Law (LMBG)].
- Regulations concerning wood:
 - Arsenic as a wood preservation treatment [EU 76/769/EEC (2003/2/EC)];
 - Mercury for preservation of wood [EU 76/769/EEC];
 - Pentachlorophenol and derivatives [EU 76/769/EEC].
- Benzene in toys [EU 76/769/EEC];
- Nickel for articles coming into direct and prolonged contact with skin [EU 76/769/EEC].

6.8 Product Packaging

Packaging material selection has an impact on the environment. When specifying materials, the designer should choose design alternatives that:

- reduce the variety of materials used;
- reduce the amount of material used and consequently the weight and size of the package;
- use materials that are considered to have lower environmental impact;
- use recycled materials;
- use renewable materials.

As a minimum requirement the designer shall ensure compliance to international, regional and national regulations, concerning:

- a) restrictions on hazardous substances and preparations such as defined in the EU Directive 94/62/EEC (requiring that the sum of the concentrations of lead, cadmium, mercury, chromium-VI does not exceed 100 ppm by weight);

b) recyclability such as reuse, material recovery, energy recovery or organic recovery.

In addition the designer should ensure appropriate marking (material content) of packaging materials (e.g. according to ISO 11469).

NOTE

For products placed on the market in the European Union, essential requirements of the 94/62/EC directive shall be applied (e.g. by applying standard EN 13427).

7 Documentation

Information for consumers/users on how to install, use, maintain and, where applicable, dispose of the product shall be provided in an appropriate manner - especially as it pertains to the environmental characteristics of the product.

[Clause 6](#) of this Standard requires certain product environmental characteristics to be made available to product users. It is recommended that such information be provided in a format according to [ECMA TR/70](#).

All information required to be provided by the manufacturer may be provided in printed or electronic format as deemed appropriate by the manufacturer.

8 Design checklist for designers

The design checklist is intended solely for use of the designer.

The designer needs to evaluate a considerable number of environmental aspects.

Annex A provides guidance in the form of an example checklist, which may be used to evaluate and record the requirements and recommendations according to this Standard during the design and/or redesign process. This is a generic checklist and not every item on the checklist is applicable to every product and/or product group.

It is recognised that there is a wide range of ICT and CE products. For this reason it is not possible to provide a unique checklist for every type of ICT and CE product or family (group) of products. Designers shall generate a design checklist based on the design requirements of this Standard and through other reference material and technical reports that will accurately reflect their specific products or family of products.

Annex A (informative)

Design Guidance and Design for Environment Checklist

Designing a product for optimum environmental performance requires the careful consideration of a number of different environmental aspects along with other product criteria such as functional performance, long-term reliability, safety, and cost competitiveness. In many instances, the designer must evaluate complex tradeoffs among these various criteria to provide a product that is both useful to consumers and protective of the environment.

This informative Annex provides a checklist of both environmental requirements and recommendations derived from Clauses 6 and 7 of this Standard. The purpose of this checklist is to assist designers in the consideration of environmental aspects of their design and to help document, in a Design for Environment Checklist, the specific environmental design attributes that were incorporated into a given electrical and electronic product.

It is important to recognize that few products will be able to incorporate all of the design attributes discussed in this Annex, or even included in a manufacturer's own design checklist. Due to the large number of different types of electrical and electronic equipment and their varying design characteristics, it is not possible to develop a single checklist that will be appropriate for all products. Consequently, manufacturers should develop checklists appropriate to their particular product types providing only those environmental characteristics applicable to their product(s). For this reason, this checklist is offered primarily as a template.

A.0 General Considerations

Life Cycle thinking design strategy implemented in the organisation

- Yes
 No

A.1 Material efficiency

The variety of materials used in the product has been reduced.

- Yes, describe briefly _____
 No

The amount of material used in the product has been reduced.

- Yes, describe briefly _____
 No

The product contains materials that are considered to have lower environmental impact.

- Yes, describe briefly _____
 No

The product contains recycled materials.

- Yes
 No

The product uses renewable materials.

- Yes describe briefly _____
- No

A.2 Energy efficiency

A.2.1 Power modes and related energy efficiency measures

Ease of use as related to the selection and operation of power saving features was considered and implemented.

- Yes, considered and implemented;
describe briefly: _____
- Yes, considered but not implemented;
specify reason(s): _____
- Not applicable
- No

List specific power modes that apply to the product.

Detail significant power consumption modules and plans to reduce their consumption.

A.2.2 Operational Modes

Note actions taken to use low power components and design options.

Note actions taken to improve the energy efficiency of power supply components.

Note actions taken to ensure the AC-DC conversion efficiency is highest in the most used power mode.

Note actions taken to ensure over specification of items such as the power supply has not taken place.

Detail analysis undertaken to ensure operating characteristics such as room temperature have not been over specified.

A.2.3 Energy Saving Modes

Note design actions taken to automatically switch from on mode to save modes.

Note design actions taken to reduce the time taken for the product to switch from save mode to active mode.

List actions taken to reduce energy consumption in save mode similar to those taken in A.2.2 above.

A.2.4 Off Modes

Note design options taken to automatically switch from save mode to off mode.

Note design options taken to reduce energy consumption in soft off mode.

Note options considered in the placing of the power switch to make it more user accessible.

In Hard-Off mode, is the power consumed zero Watts?

() Yes

() No. If no, what actions have been taken to inform the user of this?

A.2.5 No Load Modes

List design options taken to reduce the power consumption of the no load mode to the lowest possible.

A.2.6 General Energy Efficiency measures

List any power saving features of this product here that have not been noted elsewhere.

Information on power consumption in all relevant power modes has been made available to product users.

- Yes, list sources
 - Manufacturer Environmental Product Declaration
 - Product Specification Document
 - Product User Manual (Hard Copy)
 - Product User Manual (Soft Copy)
 - Product Labels or Packaging
 - Product Packaging Insert
 - Internet. Provide URL _____
 - Other. Describe. _____
- Not applicable
- No

Applicable voluntary agreements aimed at improving energy efficiency of EEE products were considered and recommendations met.

- Yes, considered and recommendations met;
describe briefly:

- Yes, considered but recommendations not met;
specify
reason(s): _____
- Not applicable
- No

The product is compliant to the requirements of the international ENERGY STAR[®] program.

- Yes, according version _____
- Not applicable
- No; give reason(s) for non-compliance.

The effects of improved energy design features have been quantified and communicated to marketing.

- Yes
- No/Not applicable

Default setting is set to the most energy efficient on modes and/or transitions to save mode.

- Yes
- No

Information on proper use of available energy saving controls and/or settings is available to product users.

- Yes, list sources
 - Product User Manual (Hard Copy)
 - Product User Manual (Soft Copy)
 - Product or Packaging Labels
 - Product Packaging Insert
 - Internet. Provide URL. _____
 - Other. Describe. _____
- Not Applicable
- No

A.3 Consumables and batteries

A.3.1 Consumables

The avoidance of hazardous substances and preparations in consumables has been considered.

- Yes
- Not Applicable (no consumables)
- No

The product has been designed such that the use of consumables associated with the product can be optimised relative to the functionality of the product.

- Yes
- Not Applicable (no consumables)
- No

Information on the proper use of consumables associated with the product has been provided to the user.

- Yes, list sources (all that apply):
 - Manufacturer Environmental Product Declaration
 - Product User Manual (Hard Copy)
 - Product User Manual (Soft Copy)
 - Product Service Manual
 - Internet. Provide URL. _____
 - Other. Describe. _____
- Not Applicable (No consumables)
- No

A.3.2 Batteries

All batteries in the product comply with applicable restrictions on hazardous substances and preparations contained in relevant national, regional and international legislation.

- Yes
- Not Applicable (no batteries)
- No

All batteries in the product are labelled according to requirements of relevant regional, national or international legislation.

- Yes
- Not Applicable (no batteries)
- No

All batteries do not exceed a mercury concentration of 5 ppm by weight.

- Yes No. If no provide reason(s) why mercury cannot be avoided:

Consideration has been given to batteries with reduced environmental impact.

- Yes; specify type of batteries considered (check all that apply).
 - Li-Ion
 - Li-Polymer
 - NiMH
 - Other; describe

- Not Applicable (no batteries)
- No; specify reason(s)

The product has batteries containing materials regarded as detrimental to the environment that cannot be avoided.

- No
- Not Applicable (no batteries)
- Yes
 - Identify batteries

Where reported

Reason(s) why material(s) cannot be avoided

All batteries and assemblies containing batteries are easily identifiable and removable.

- Yes
 - Not Applicable (no batteries)
 - No; specify reason(s):
 - batteries are not intended to be removed until the end of life stage and equipment reliant on continuous power supply / no special disposal requirement
 - other
-

Information on proper procedures for removal and safe handling of batteries is available in product user documentation.

- Yes, list sources
 - Manufacturer Environmental Product Declaration
 - Product User Manual (Hard Copy)
 - Product User Manual (Soft Copy)
 - Product Service Manual
 - Product Labels
 - Internet. Provide URL
-

Other: describe.

- Not Applicable (no batteries)
 - No; give reason(s)
-

For NOT easily removable batteries: Advice on service outlets for exchange of non-removable batteries (during product life) is provided in the product documentation.

- Yes
- Not Applicable (no batteries and/or accumulators)
- No

Information on type and location is available in the appropriate product documentation.

- Yes
 - type of battery
-

location

- Not Applicable (no non-removable batteries)
- No

Battery management features that help to prolong battery and/or accumulator life have been considered and implemented.

- Yes, considered and implemented
- Yes, considered but not implemented
- Not Applicable (no batteries)
- No; give reason(s) _____

A.4 Emissions

A.4.1 Chemical Emissions

Product has been designed such that chemical emissions are reduced wherever possible.

- Yes
- Not Applicable (product is not based on electrostatic process)
- No

Product complies with all relevant regulations governing chemical emissions from products.

- Yes
- Not Applicable (product does not consume supplies)
- No
- No relevant regulations available

For a product based on the electrostatic process, chemical emissions (Ozone and VOC) and dust emissions have been evaluated.

- Yes
- Not Applicable (product is not based on electrostatic process)
- No

For a product based on the electrostatic process, emissions measurements have been completed in accordance with Standard ECMA-328.

- Yes
- Not Applicable (product does not consume supplies)
- No

Results of the emissions measurement(s) have been made available to product users.

- Yes, list sources
 - Manufacturer Environmental Product Declaration
 - Product User Manual (Hard Copy)
 - Product User Manual (Soft Copy)
 - Product Service Manual
 - Internet. Provide URL

 Other: describe.

- Not Applicable (product does not consume supplies)
- No; give reason(s) _____

A.4.2 Noise Emissions

Noise emissions have been evaluated according to ECMA-74.

- Yes
- No
- Other – describe
- Not applicable

For products outside the scope of ECMA-74, ISO 3741, 3744 or 3745 has been used.

- Yes
- No
- Not applicable

Results of noise emissions measurement are available.

- Yes
- No
- Not applicable

A.5 Extension of Product Lifetime

The product contains common mechanical packages (such as covers and chassis) or common parts or components that are used for multiple models in the product family or in multiple generations of the same product.

- Yes, describe.

- Not applicable
- No

The product contains industry standard parts.

- Yes, list

- No
- Not applicable

The product contains modular components.

- Yes, list.

- Not applicable
- No

The product contains reused components and/or parts.

- Yes, list.

- Not applicable
- No

The product contains parts targeted for refurbishment and reuse in maintenance and spare parts applications.

Yes, list.

Not applicable

No

A.6 End of Life

Separation of parts containing hazardous substances and preparations is possible.

Yes

No

Not applicable

Incompatible materials (including electronic modules) connected to case/housing parts or chassis are easily separable.

Yes

No

Not applicable

The product can be disassembled down to the module level using commonly available tools.

Yes

No, list all special tools required for disassembly.

All plastic parts with weight greater than 25 g are marked with the type of polymer, copolymer, polymer blends or alloys in conformance with ISO 11469.

Yes

No

Not applicable

The following design choices have been avoided.

Incompatible coatings on major plastic parts

Coatings and surface finishes on plastic parts that are difficult to recycle without downgrading

Adhesive backed stickers or foams on plastic parts

Metal inserts in plastic parts

The following aspects have been considered and their number and variety reduced.

Welds and Adhesives

Connections (e.g. Fasteners and screws)

Steps necessary for disassembly

tools required for disassembly

position changes that have to be made by the dismantler

The following design choices have been included.

the same polymer is used throughout the design of a product.

If this is not practical, the number of plastic types used in the product has been reduced

Yes

No

The compatibility guidelines found in Annex C has been used in selecting polymers

Yes

No

The product has been designed such that modules can be extracted for reuse

Labels and other identification marks are made from the same material as the body of the products or a compatible material

Snap fits or screws are used to aid disassembly

A plan for the disassembly of the product into major modules or sub assemblies has been created and made available to dismantlers.

Yes

No

A.7 Substances and preparations needing special attention

A.7.0 Content in products

The product complies with the applicable international, regional and national prohibitions on the use of certain hazardous substances and preparations.

Yes, list

Not applicable

No

Use of substances that require special handling or disposal during the recycling process has been reduced or eliminated.

Yes, eliminated;

Yes, reduced; list

Not applicable

No

Appropriate information on parts requiring special handling or disposal has been made available to users and recyclers.

- Yes
- No
- Not applicable

Hazardous substances other than those restricted are used in this product.

Yes – List the substances and give rationale for their use

No

A.7.1 General limitations

The product does NOT/ does contain the following substances.

- | | | |
|--|---------------------------------------|--|
| <input type="checkbox"/> Does not contain | <input type="checkbox"/> Does contain | Asbestos |
| <input type="checkbox"/> Does not contain | <input type="checkbox"/> Does contain | Ozone Depleting Substances: |
| Chlorofluorocarbons (CFC), hydrobromofluorocarbons (HBFC), hydrochlorofluorocarbons (HCFC), Halons, carbontetrachloride, 1,1,1-trichloroethane, bromochloromethane | | |
| <input type="checkbox"/> Does not contain | <input type="checkbox"/> Does contain | PCB, PCT, |
| monomethyltetrachlorodiphenylmethane (Ugilec 141), monomethyldichlorodiphenylmethane (Ugilec 121 or 21), monomethyldibromodiphenylmethane (DBBT) | | |
| <input type="checkbox"/> Does not contain | <input type="checkbox"/> Does contain | PCN |
| <input type="checkbox"/> Does not contain | <input type="checkbox"/> Does contain | tin organic compounds: TPT, TBT, TBTO, DBB |
| <input type="checkbox"/> Does not contain | <input type="checkbox"/> Does contain | PentaBDE, OctaBDE |
| <input type="checkbox"/> Does not contain | <input type="checkbox"/> Does contain | PCN |
| <input type="checkbox"/> Does not contain | <input type="checkbox"/> Does contain | Mercury (exception: discharge lamps) |
| Additional from July 2006 (except exemptions made in RoHS Directive): | | |
| <input type="checkbox"/> Does not contain | <input type="checkbox"/> Does contain | Lead |
| <input type="checkbox"/> Does not contain | <input type="checkbox"/> Does contain | Cadmium |
| <input type="checkbox"/> Does not contain | <input type="checkbox"/> Does contain | Hexavalent chromium |
| <input type="checkbox"/> Does not contain | <input type="checkbox"/> Does contain | PBB, PBDE |

Substances recorded to be restricted in the clauses above are present in the product.

- No
- Yes;

provide reason(s) why material(s) cannot be avoided: _____

A.7.2 Limitations on plastic parts, mechanical parts and housings

The plastic parts for the product do NOT/ do contain the following substances.

- | | | |
|---|-------------------------------------|------------------------------|
| <input type="checkbox"/> Do not contain | <input type="checkbox"/> Do contain | Cadmium or cadmium compounds |
| <input type="checkbox"/> Do not contain | <input type="checkbox"/> Do contain | Short chain chloroparaffins |
| <input type="checkbox"/> Do not contain | <input type="checkbox"/> Do contain | Lead or lead compounds |

Substances recorded to be restricted in the clauses above are present in the product.

- No
 Yes;

provide reason(s) why material(s) cannot be avoided: _____

A.7.3 Limitations on paints, coatings or colouring agents

The paints, coatings or colouring agents for the product do NOT / do contain the following substances.

- | | | |
|---|-------------------------------------|------------------------------|
| <input type="checkbox"/> Do not contain | <input type="checkbox"/> Do contain | Cadmium or cadmium compounds |
| <input type="checkbox"/> Do not contain | <input type="checkbox"/> Do contain | Lead or lead compounds |

Substances recorded to be restricted in the clauses above are present in the product.

- No
 Yes;

provide reason(s) why material(s) cannot be avoided: _____

A.7.4 Limitations on other parts/products

Textiles and leather coming into direct contact with the skin do NOT / do contain the following substances.

- | | | |
|---|-------------------------------------|---|
| <input type="checkbox"/> Do not contain | <input type="checkbox"/> Do contain | TRIS, TEPA, PBB |
| <input type="checkbox"/> Do not contain | <input type="checkbox"/> Do contain | AZO colourants that split aromatic amines |
| <input type="checkbox"/> Do not contain | <input type="checkbox"/> Do contain | Hexavalent chromium |

Wood parts/products do NOT / do contain the following substances.

- | | | |
|---|-------------------------------------|--|
| <input type="checkbox"/> Do not contain | <input type="checkbox"/> Do contain | Arsenic as a wood preservation treatment |
| <input type="checkbox"/> Do not contain | <input type="checkbox"/> Do contain | Mercury for preservation of wood |
| <input type="checkbox"/> Do not contain | <input type="checkbox"/> Do contain | Pentachlorophenol and derivatives |

Toys do NOT / do contain the following substances.

- | | | |
|---|-------------------------------------|---------|
| <input type="checkbox"/> Do not contain | <input type="checkbox"/> Do contain | Benzene |
|---|-------------------------------------|---------|

Articles coming into direct and prolonged contact with the skin do NOT / do contain the following substances.

- | | | |
|---|-------------------------------------|--------|
| <input type="checkbox"/> Do not contain | <input type="checkbox"/> Do contain | Nickel |
|---|-------------------------------------|--------|

Substances recorded to be restricted in the clauses above are present in the product.

No

Yes;

provide reason(s) why material(s) cannot be avoided: _____

A.8 Packaging

The variety of packaging materials used has been reduced.

Yes, describe briefly _____

No

The amount of packaging materials used has been reduced.

Yes, describe briefly _____

No

The used packaging materials are considered to have lower environmental impact.

Yes, describe briefly _____

No

The packaging was manufactured using recycled materials.

Yes

No

The packaging was manufactured using renewable materials.

Yes describe briefly _____

No

The packaging complies with the applicable international, regional and national regulations.

Yes, list

No

The packaging materials have an appropriate marking (e.g. according to ISO 11469).

Yes, list applied standard

No

provide reason(s) why packaging material(s) cannot be marked: _____



A.9 Documentation

Instructions for consumers/users on how to install, use, maintain and, where applicable, dispose of the product is provided – especially as it pertains to the environmental characteristics of the product.

- Yes, list sources
 - Product Specification Document
 - Manufacturer Environmental Product Declaration
 - Product User Manual (Hard Copy)
 - Product User Manual (Soft Copy)
 - Product Labels or Packaging
 - Product Packaging Insert
 - Internet. Provide URL. _____
 - Other. Describe. _____
- No

All applicable product environmental information to be made available to product users is provided according to ECMA TR/70.

- Yes
- No



Annex B (informative)

Bibliography

The following information is provided as an initial source of documents, related to this Standard. It cannot be regarded as a complete list of legislation related to the content of this Standard.

ISO

- | | |
|--------------|--|
| ISO Guide 64 | Guide for the inclusion of environmental aspects in product standards |
| ISO 14001 | Environmental management systems - Specification with guidance for use |

IEC

- | | |
|--------------------|---|
| IEC GUIDE 109:2003 | Environmental aspects - Inclusion in electrotechnical product standards |
| IEC Guide 109 | Environmental aspects - Inclusion in electro technical product standards:
Annex C - Guidance on Design for Environment (DFE) principles for electro technical industry |
| IEC Guide 114 | Draft ECD Guide Environmentally conscious design - Integrating environmental aspects into design and development of electrotechnical products |

EU Directives

- | | |
|-------------------------|---|
| EU Directive 67/548/EEC | Classification, packaging and labelling of dangerous substances |
| EU Directive 88/379/EEC | Classification, packaging and labelling of dangerous preparations |






Annex C (informative)

Plastics compatibility guide

The following table was taken out of the plastics handbook (original reference Table 5.3, on page 632):
H. Saechtling, Kunststoffaschenbuch, Carl Hanser Verlag, München, 1998 (27. edition)

Designers should verify identified compatibilities and recheck them with the plastic vendors. The listed polymers have many different characteristics depending on the used additives which need a thorough analysis of the suggested compatibility on the material level especially when they are not marked to be compatible. Therefore further analysis may be necessary.

Legend for the table:

	Good compatibility over a wide range of mixtures
	Limited compatibility for small excess component amounts
	Incompatible

Compatibility of various thermoplastics (according to Rink et. al.)

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