

COMMITTEE EV-019

**DR AS/NZS 5377**

(Project ID: 100329)

# Draft for Public Comment Australian/New Zealand Standard

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**BEGINNING DATE  
FOR COMMENT:** 13 March 2012

**CLOSING DATE  
FOR COMMENT:** 15 May 2012

*Important: The procedure for public comment has changed – please read the instructions on the inside cover of this document.*

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**Collection, storage, transport and treatment of used  
electrical and electronic equipment**

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## Draft for Public Comment Australian/New Zealand Standard

The committee responsible for the issue of this draft comprised representatives of organizations interested in the subject matter of the proposed Standard. These organizations are listed on the inside back cover.

Comments are invited on the technical content, wording and general arrangement of the draft.

The method for submission of comment on this document is to register and fill in an online form via Standards Hub Website. Instructions and examples of comment submission are available on the website. . Please use the following link—

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Please place relevant clause numbers beside each comment.

Editorial matters (i.e. spelling, punctuation, grammar etc.) will be corrected before final publication.

The coordination of the requirements of this draft with those of any related Standards is of particular importance and you are invited to point out any areas where this may be necessary.

Please provide supporting reasons and suggested wording for each comment. Where you consider that specific content is too simplistic, too complex or too detailed please provide an alternative.

If the draft is acceptable without change, an acknowledgment to this effect would be appreciated.

Once you have registered and submitted you comments via the online form, your comments are automatically submitted to the committee for review.

Normally no acknowledgment of comment is sent. All comments received via the Standards Hub Website by the due date will be reviewed and considered by the relevant drafting committee. We cannot guarantee that comments submitted in other forms will be considered along with those submitted via the Standards Hub online form. Where appropriate, changes will be incorporated before the Standard is formally approved.

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**Draft for Public Comment**

STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

Committee EV-019—E-Waste

**DRAFT**

**Australian/New Zealand Standard**

Collection, storage, transport and treatment of used electrical and electronic equipment

(To be AS/NZS 5377:20XX)

Comment on the draft is invited from people and organizations concerned with this subject. It would be appreciated if those submitting comment would follow the guidelines given on the inside front cover.

***Important: The procedure for public comment has changed – please read the instructions on the inside cover of this document***

This document is a draft Australian/New Zealand Standard only and is liable to alteration in the light of comment received. It is not to be regarded as an Australian/New Zealand Standard until finally issued as such by Standards Australia/Standards New Zealand.

## PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee EV-019, E-waste.

The objective of this Standard is to provide guidance and specify requirements for the safe and environmentally sound collection, storage, transport and treatment of used electrical and electronic equipment in order to maximize reuse and material recovery; reduce or eliminate the amount of waste from this equipment going to final disposal operations such as landfill; safeguard worker health; and minimize harm to the environment.

This Standard is designed with the principles of ecological sustainable development in mind, including the precautionary principle and the principle of due diligence. Operations involved in the collection, storage, transport and treatment of electrical and electronic products, whether it be for reuse or recycling purposes, are encouraged to understand all obligations and take all reasonable and practicable steps to ensure that these products are managed in a manner that will protect human health and the environment against the adverse effects that may result from such wastes. Lack of full scientific certainty should not be used as a reason for postponing feasible measures to prevent environmental degradation or adverse health and safety effects.

This Standard recognizes that there are general laws in place regulating how to comply with occupational health and safety requirements and environmental performance. This Standard also recognizes that Australia and New Zealand are signatories to international agreements regarding the environmentally sound management of hazardous and other wastes, and elimination of pollutants. The intention is not to cut across the law, but enhance the legislation and international obligations. If there is any doubt as to a potential conflict between the law and this Standard, professional advice should be sought.

The terms 'normative' has been used in this Standard to define the application of the appendix to which it applies. A 'normative' appendix is an integral part of a Standard.

Statements expressed in mandatory terms in footnotes to tables are deemed to be requirements of this Standard.

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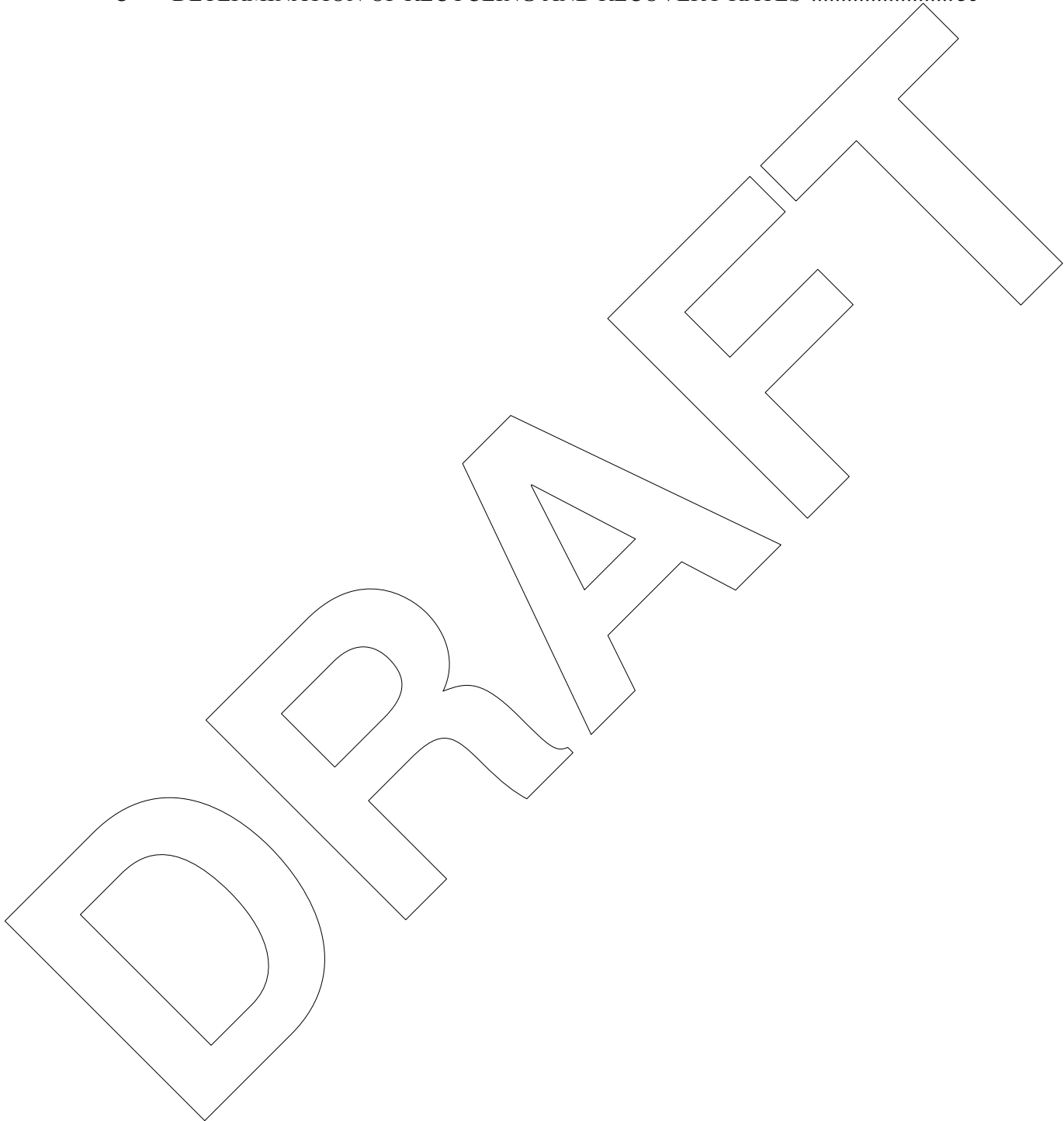
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## STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

**Australian/New Zealand Standard****Collection, storage, transport and treatment of used electrical and electronic equipment****SECTION 1 SCOPE, OBJECTIVE  
APPLICATION AND GENERAL  
REQUIREMENTS****1.1 SCOPE**

This Standard sets out principles and minimum requirements for the safe and environmentally sound collection, storage, transport and treatment of used electrical and electronic equipment in order to maximize reuse and material recovery, reduce or eliminate the amount of waste from this equipment going to final disposal operations such as landfill, safeguard worker health, and minimize harm to the environment. This Standard covers electrical and electronic equipment, as outlined in Appendix A, designed for a supply voltage not exceeding 1000 volts for alternating current and 1500 volts for direct current.

**1.2 OBJECTIVE**

The purpose of this Standard is to—

- (a) provide collection, storage, transport and recycling facility operators with requirements for handling, resource recovery and disposal of used and end-of-life electrical and electronic equipment, diverting it from landfill;
- (b) assist collection, storage, transport and recycling facility operators to develop, implement and maintain management processes; and
- (c) give confidence to parties and stakeholders of the benchmarks against which to gauge performance of collection, storage, transport and recycling facility operators.

**1.3 APPLICATION**

This Standard is intended to be used by parties involved in the collection, storage, transportation, and treatment of electrical and electronic equipment.

This Standard is intended to be read in conjunction with the relevant legal and other requirements for occupational health and safety and environmental performance.

**1.4 DEFINITIONS**

For the purpose of this Standard, the definitions below apply.

**1.4.1 Assembly**

A number of electronic components (i.e., ‘circuit elements’, ‘discrete components’, integrated circuits, etc.) connected together to perform (a) specific function(s), replaceable as an entity and normally capable of being disassembled.

**1.4.2 Collection location or collection facility**

A place designated for receiving electrical and electronic equipment in order to sort, store, and transport that equipment to storage or processing facilities.

### 1.4.3 Competent person

A person who has acquired through training, qualifications or commensurate experience, or a combination of these, knowledge and skills enabling that person to safely perform a specific task.

### 1.4.4 Component

Element of an appliance with a distinct function, which has been removed from the device as a unit.

NOTE: Typical components of electrical and electronic equipment are batteries, capacitors, printed circuit boards, cathode ray tubes (CRTs), hard disks drives, transformers, power supplies, and subassemblies.

### 1.4.5 Downstream processor

An entity that receives material from the first operator or other downstream processor for the purposes of additional processing and refining for maximum resource recovery.

### 1.4.6 Electrical and electronic equipment

Includes any equipment, device or thing, the operation of which is in some way dependent on, or designed for the generation, transfer or measurement of, an electric current and/or an electromagnetic field and designed for a supply voltage not exceeding 1000 volts for alternating current and 1500 volts for direct current.

### 1.4.7 End-of-life

Electrical and electronic equipment that is no longer suitable for use, and which is intended for disassembly and recovery of spare parts or destined for material recovery and recycling or final disposal.

### 1.4.8 Used electrical or electronic equipment (e-waste)

Electrical and electronic equipment that is considered to be waste, including all components, batteries, power supplies, subassemblies and consumables. For the purposes of this Standard, waste is any substance, material or thing that—

- (a) is to be discarded by the possessor for any reason, including a requirement to do so under the law; or
- (b) has been dumped in landfill or otherwise abandoned in the environment.

### 1.4.9 Fractions

Components which have been dismantled or treated mechanically.

### 1.4.10 Hazardous material

A substance with potential to cause harm to persons, property or the environment because of one or more of the following:

- (a) The chemical properties of the substance.
- (b) The physical properties of the substance.
- (c) The biological properties of the substance.

Without limitation to any of the above, all dangerous goods and combustible liquids are hazardous materials.

### 1.4.11 Operator

An entity or persons that engages in any of a number of activities including collection, sorting, storage, transportation, disassembly or processing of electrical and electronic equipment for the purpose of recovery, reuse or recycling.



#### 1.4.12 Point of final disposal

A point in the downstream flow of materials where the separated materials generated from the processing of end-of-life electrical and electronic equipment are physically altered from their original state and become commodities used to produce new products or become by-product waste for disposal.

A point of final disposal occurs when commodities are—

- (a) used as a raw material in the production process of new products;
- (b) used in the recovery of metal, energy and/or other resources;
- (c) used in pelletisation of plastics;
- (d) disposed of to landfill or incinerated;
- (e) processed in preparation for use as a raw material, i.e. size reduction for another process.

#### 1.4.13 Recovery

Separation or extraction of materials from used electrical and electronic equipment for further use or processing.

#### 1.4.14 Recycling

Any operation by which used electrical and electronic equipment materials are processed in some way to enable products, materials or substances to be used, whether or not for the original purpose.

#### 1.4.15 Remarket

Any action, including marketing activities, necessary to sell previously used electrical and electronic equipment or its components directly or indirectly to customers.

#### 1.4.16 Reuse

The use of used electrical and electronic equipment for the same purpose that it was originally intended to fulfil.

#### 1.4.17 Substances of concern

Materials or components making up end-of-life products that when handled or processed at a recycling facility may pose a risk to human health or the environment and therefore merit special environmental and safety controls, and may be subject to specific regulatory requirements even though they may not have posed such risks in their normal state and under normal conditions of handling.

### 1.5 GENERAL REQUIREMENTS

Legal and other requirements, including regulatory and international requirements that are directly applicable to electrical and electronic equipment, need to be identified and adhered. This includes, but is not limited to the following:

- (a) Environmental legislations.
- (b) Laws relating to the handling, storage and transport of dangerous goods, controlled wastes and hazardous wastes.
- (c) Occupational health and safety legislation.
- (d) Export licensing laws and regulations.
- (e) International treaty obligations which bind Australia or New Zealand.

Information on legal and other obligations needs to be kept up-to-date. Relevant information on legal and other requirements including regulatory and international

requirements needs to be communicated to the relevant stakeholders including its employees and contractors.

## 1.6 ORGANIZATIONAL REQUIREMENTS

### 1.6.1 Risk assessment and management

A documented risk assessment process to identify and control any potential environmental, health or safety hazards associated with the entity's operations shall be maintained. The risk assessment process shall include the following steps:

- (a) Define the responsibilities and qualifications for individuals conducting the risk assessment.
- (b) Record and monitor any potential risks associated with the materials handled and tasks undertaken, as well as the overall operations, during both normal operating conditions and potential emergency situations.
- (c) Evaluate any potential environmental, health or safety risks identified through the assessment and develop a risk mitigation plan.
- (d) Implement controls suitable to the identified risks to protect the environment and human health and safety.
- (e) Monitor the effectiveness of any implemented controls and adjust as required based on the acceptable residual risks.
- (f) Maintain a schedule to review risk assessments at least on an annual basis, or more frequently if required as a result of any significant operational, environmental or regulatory changes.
- (g) Maintain a list of products and waste materials that the organization is capable of collecting, processing, storing or otherwise handling in a safe and environmentally sound manner.

NOTE: Suitable processes can be found in AS/NZS ISO 31000.

### 1.6.2 Emergency response

An emergency response plan to prepare for and respond to emergencies including exceptional pollution releases, fires, spills, natural disasters such as storms, floods and earthquakes and medical incidents shall be implemented and maintained. The plan should have a provision to inform anyone that may be affected by an incident on the site and consider the potential response to an emergency arising offsite which may impact the site.

The response plan shall include the following:

- (a) Action to be taken, including—
  - (i) notifications required by law;
  - (ii) notifications to be made to regulatory authorities and those required by contractual arrangements; and
  - (iii) a disaster recovery plan.
- (b) Alternative collection or notice of suspension.
- (c) Alternative storage.
- (d) Alternative transport.
- (e) Recovery timeline.
- (f) Clean up or remediation methodology and validation process.
- (g) Requirements for training all responsible people.

- (h) Documentation to be made available during and after the emergency.
- (i) Review of relevant documentation to prevent reoccurrence.
- (j) Periodic testing of the effectiveness of the emergency procedure through appropriate drills or reviews.

The emergency response plan shall nominate a dedicated emergency coordinator and allocate adequate and appropriate resources to execute the emergency plan.

The emergency coordinator and any identified team members shall be competent and meet the requirements as per Clause 1.4.3.

### 1.6.3 Training

Any person(s) performing tasks that have the potential to cause an environmental or health and safety impact(s) shall be competent on the basis of appropriate education, training or commensurate experience, and the operator shall retain associated documentation.

### 1.6.4 Training material

Training materials and information shall be readily available at the workplace, or be easily accessible to workers at all times. They shall include the following as a minimum:

- (a) Technical guidance documents.
- (b) Risk assessments.
- (c) Safety statements.
- (d) Information charts.
- (e) Information tables.
- (f) Photos or examples of components of electrical and electronic equipment.
- (g) Material safety data sheets for hazardous substances.

Risks inherent but not limited to substances of concern identified in Appendix B shall be specified in this information.

## 1.7 RECEIVING, HANDLING AND STORAGE

The integrity of electrical and electronic equipment and its separate components shall be maintained during receiving, handling and storage on site, in order to avoid release of hazardous substances into air, water or soil, as a result of damage and/or leakage. Electrical and electronic equipment shall be handled and stored in a manner that—

- (a) prevents theft or vandalism;
- (b) provides protection from the elements;
- (c) prevents exposure of people on site to unsafe storage and handling conditions or hazardous substances; and
- (d) prevents damage or breakage of cathode ray tubes (CRTs), flat panel displays and equipment containing mercury containing lamps and globes and gas discharge lamps, asbestos, ceramic fibres, petroleum fluids, polychlorinated biphenyls (PCBs), batteries and refrigerant gases.

Methods of handling (i.e. loading, unloading and transport) and storage shall include the use of appropriate tools, containers and means of securing to ensure safe and effective recovery or recycling.

Electrical and electronic equipment shall not be powered unless it has been tested and tagged to indicate it is safe to power.

Electrical and electronic equipment collected prior to processing shall not be crushed, compacted, or disassembled.

### **1.8 RECORDS MANAGEMENT**

A records system that ensures all materials are accounted for throughout an operation shall be maintained.

Records to allow the traceability of electrical and electronic equipment, including but are not limited to manifests bills of lading, chain of custody documents, transport records and any other record keeping requirement outlined in this Standard, shall be accessible, identified, legible and maintained for at least five years

### **1.9 DATA SECURITY**

Responsibility for removing private or confidential data from any electrical and electronic equipment provided for recycling rests with the person who disposes of the equipment at the end-of-life. Collection locations shall prominently display advice to this effect at the collection location and in any information or advertising material.

NOTE: Where the collection location offers a service to remove private or confidential data from any electrical and electronic equipment, the responsibility of removing data should be transferred to the service provider.

### **1.10 DISPOSAL TO LANDFILL**

After the minimum processing requirements outlined in Table 1 have been met, any waste that is disposed of to landfill shall be disposed of at a waste facility that is licensed to accept the waste in accordance with the relevant regulatory requirements.

## SECTION 2 REQUIREMENTS FOR COLLECTION AND STORAGE FACILITIES

### 2.1 GENERAL

This Section specifies requirements and provides guidance to any operator of a facility at which electrical and electronic equipment is collected and or stored for the purpose of reuse, material recovery or recycling, whether or not it provides public access.

### 2.2 LICENSING

Facilities need to be authorized in accordance with the relevant legal and other requirements pertaining to the location in which the facility is situated.

### 2.3 ACCESS

Areas of collection at facilities designated for public access shall be easily accessible and kept clean, tidy and free of hazards

### 2.4 SIGNAGE AND INFORMATION

Clear signage shall be provided to communicate relevant information, including the following:

- (a) Safety warnings.
- (b) Instructions to the public.
- (c) Site access times for the public.
- (d) Details of equipment that is or is not accepted at the facility.
- (e) A warning stating that the owner of the equipment is responsible for removing any confidential or private data before the equipment is left at the facility that electrical and electronic equipment will not be returned to the owner after it has been left at the facility and the purpose for which used electrical and electronic equipment is being collected at the facility, e.g. material recovery, reuse or recycling.

Similar details should be included in advertising and/or display material used by the collection facility.

### 2.5 STORAGE AND HANDLING

#### 2.5.1 General

The physical integrity of used equipment and separate components of electrical and electronic equipment shall be maintained during receiving, handling and storage on site at the facility. Electrical and electronic equipment shall be handled and stored in a manner that provides protection from—

- (a) theft and vandalism;
- (b) exposure to the elements;
- (c) exposure of people on site to hazardous substances; and
- (d) damage or breakage of CRTs, flat panel displays, equipment containing mercury containing lamps and globes and gas discharge lamps, asbestos, ceramic fibres, petroleum fluids, polychlorinated biphenyls (PCBs), batteries and refrigerant gases.

There shall be no uncontrolled tipping or overturning of containers with breakable electronic and electrical equipment and components, including but not limited to CRTs, flat

panel displays and equipment containing mercury containing lamps and globes, gas discharge lamps, asbestos, ceramic fibres, petroleum fluids, PCBs, batteries and refrigerant gases.

Methods of handling and storage shall be undertaken with appropriate tools, containers and fixings to ensure that effective recovery and recycling in accordance with this Standard is not adversely affected.

Breakable electronic and electrical equipment and components shall be packaged and loaded for transport in such a way that they are not damaged during loading and transport.

### **2.5.2 Interim storage**

Storage areas for used electrical and electronic equipment at collection facilities shall have—

- (a) impermeable surfaces; and
- (b) weatherproof coverings.

### **2.5.3 Consolidation and sorting facilities**

During collection, used electrical and electronic equipment shall not be mixed with other types of waste within the same container or receptacle.

### **2.5.4 Special requirements for handling and storing used electrical and electronic equipment**

During the handling and storage of used electrical and electronic equipment, special attention shall be given to the following:

- (a) Preventing the combustion explosion or leaking of batteries and short circuits or flows of current by insulating the electrical contacts with suitable tape and/or coverings.
- (b) Storing in containers that meet appropriate dangerous goods and UNEP guidelines, and clearly identifying the contents on the outside of the container holding cooling and freezing appliances to avoid damage to the refrigerant system.
- (c) Preventing CRT displays from imploding and/or emissions from phosphorescent coatings.
- (d) Equipment containing mercury containing lamps and globes, and smoke detectors containing hazardous components or materials.
- (e) Appliances containing oil, PCBs and other liquids to avoid spillages and other emissions.
- (f) Appliances containing gas discharge lamps to avoid breakage and
- (g) Appliances containing asbestos to avoid the release of asbestos fibres.

#### **NOTES:**

- 1 Appliances that contain gas discharge lamps include sun beds and flat panel displays.
- 2 Appliances that contain asbestos include heaters, and stoves.
- 3 Printed circuit boards that contain capacitors/transformers.

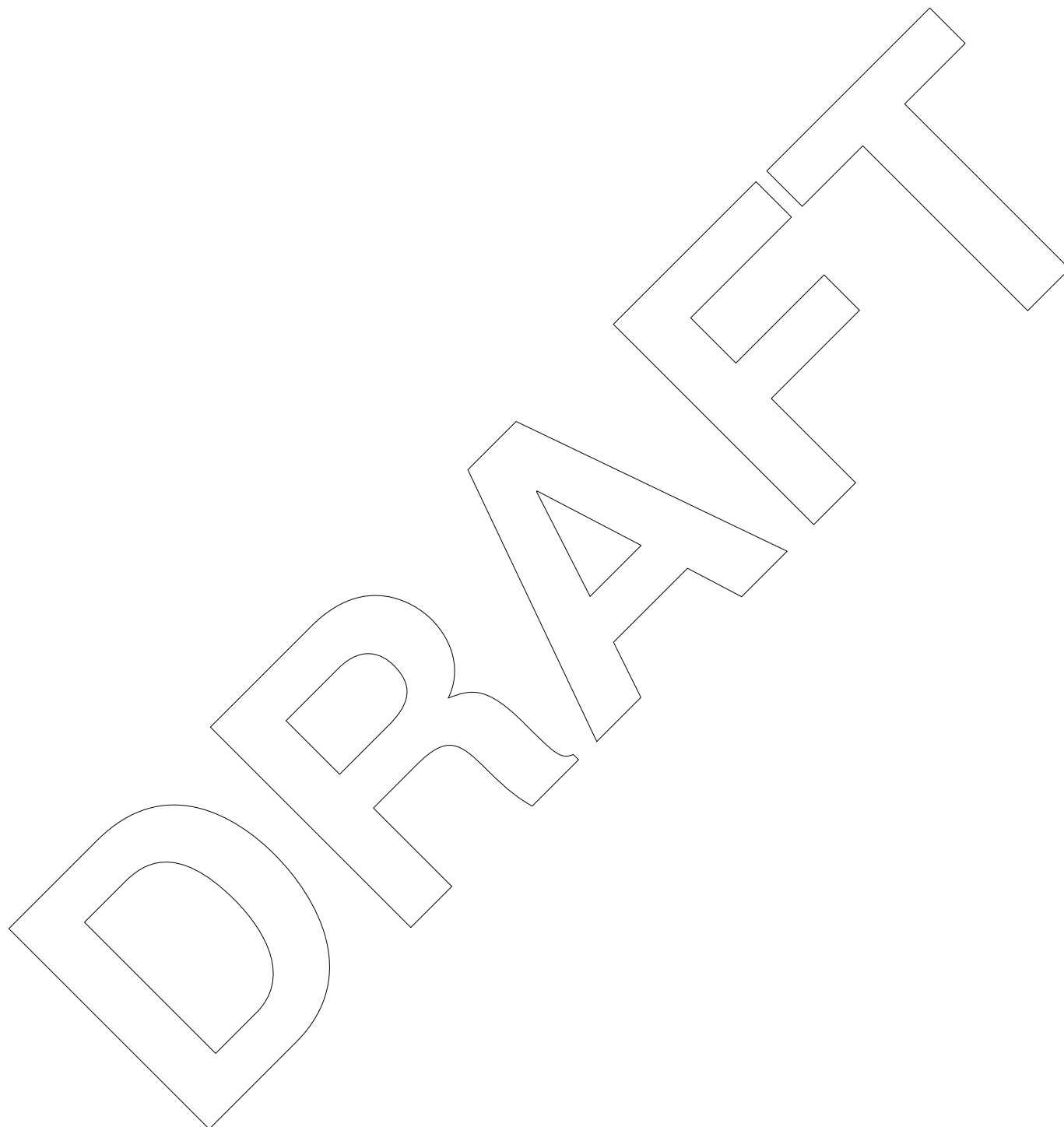
## **2.6 BROKEN OR DUMPED MATERIAL**

Collection facilities shall make arrangements in accordance with this Standard for handling, storing and disposing of used electrical and electronic equipment that is broken on-site or dumped in the immediate vicinity of the facility.

## 2.7 STOCKPILING

Electrical and electronic equipment shall be stored in accordance with Clause 2.5 of this Standard.

Collection and storage facilities need to comply with all relevant regulatory requirements.



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## SECTION 3 REUSE OF ELECTRICAL AND ELECTRONIC EQUIPMENT

### 3.1 GENERAL

This Section provides guidance for recovering equipment, assemblies, components and parts from used electrical and electronic equipment where the consumer or business utilize the domestic waste management system and do not contract directly with service providers for repair, refurbishment and remarketing of used equipment, particularly information technology equipment.

### 3.2 PREPARING FOR REUSE

Preparation for reuse comprises any operation performed to bring used electrical and electronic equipment or its components into a condition to meet the requirements of a next potential owner.

Where used electrical and electronic equipment and parts are prepared for reuse, the following requirements shall be met:

- (a) Policies shall be implemented to exploit the potential for reuse, and sustainable processes for repair and refurbishment.
- (b) Reusable items shall be separated from other forms of used electrical and electronic equipment and collected, handled, labelled and stored so as to identify and maintain functionality and physical integrity.
- (c) Reusable items shall be stored in weatherproof facilities or containers.
- (d) Relevant safety, environmental, and legislative requirements needs to be complied with in accordance with Clause 14.54 of this Standard.
- (e) Documentation to confirm that the items are for reuse shall be maintained.

### 3.3 HARVESTING OF REUSABLE EQUIPMENT

Operators preparing electrical and electronic equipment for reuse shall—

- (a) have a written procedure showing their reuse process;
- (b) have implemented risk assessment and management system(s) for processing electrical and electronic equipment for reuse in accordance with the requirements in Clause 1.6 of this Standard;
- (c) only dismantle, process and prepare used equipment to their level of expertise and training;
- (d) remove, where practicable, all distinguishing marks from machines that would link the equipment back to the disposer;
- (e) keep records of the asset type and total weight of used assemblies and parts entering and leaving the facility to support mass balance accounting and reporting;
- (f) have a procedure to track used equipment through the process at the facility. This tracking system should enable mass balance (total volume) accounting as a whole for the facility, detailing quantity received into the facility, quantity diverted for reuse and of residual waste sent for material recover, recycling or disposal;
- (g) provide clear labelling of equipment which indicates whether it is refurbished, upgraded and/or repaired and safe for use;



- (h) where feasible, remove all remaining data and existing software with security cleansing services;
- (i) only install software that is licensed for use on the equipment;
- (j) provide secure, weatherproof infrastructure and trained personnel for the testing of reusable equipment.

Operators of repair and refurbishment facilities recovering, disposing of and recharging ozone depleting or synthetic greenhouse gases from refrigerant appliances shall—

- (i) hold relevant licenses and ensure personnel are competent, and qualified for the respective duties;
- (ii) work within the relevant guidelines for handling refrigerants.

Work shall only be carried out by a competent person. Where necessary operators should adhere to the most recent version of relevant electrical safety Standards: AS/NZS 3760; AS/NZS 3800; AS/NZS 5761; AS/NZS 5762; and AS/NZS 4701.

### **3.4 HARVESTING REUSABLE ASSEMBLIES, COMPONENTS AND PARTS**

Operators preparing used assemblies, components and parts for reuse from electrical and electronic equipment shall do so in accordance with Clause 3.3.

### **3.5 LEGAL COMPLIANCE AND EXPORT OF USED EQUIPMENT, ASSEMBLIES, COMPONENTS AND PARTS FOR REUSE**

Used electrical and electronic equipment, assemblies, components and parts to be sent overseas may be considered hazardous waste and subject to the relevant international obligations and regulations. The operator negotiating resale of the used equipment, assemblies, components and parts overseas shall—

- (a) obtain documentation from the overseas organization/s that they meet the requirements of this Standard;
- (b) obtain documentation of the acquirer's reuse process and proposed recipients; and secure a documented contract of sale with the overseas buyer that outlines among other things, an agreement on reuse;
- (c) ensure that items are labelled to identify their intended reuse and packaged to protect against damage in transit and to reach the final destination capable of reuse; and
- (d) have documentation verifying that equipment is functional before exporting.

### **3.6 RESIDUAL WASTE FROM REUSE ACTIVITIES**

Facilities preparing used electrical and electronic equipment and components for reuse shall—

- (a) ensure that all equipment, components and materials that are not reused shall be dealt with in accordance with the requirements of this Standard; and
- (b) ensure that all parts and consumables replaced during repair and refurbishment that contain hazardous substances shall be dealt with in accordance with the requirements in this Standard.

## SECTION 4 REQUIREMENTS FOR TRANSPORTATION

### 4.1 GENERAL

This Section specifies requirements and provides guidance for the transport of electrical and electronic equipment for reuse, recovery or recycling, whether it is domestically or for export purposes.

Transporters of used electrical or electronic waste need to comply with all licensing requirements under local legislation. Some components of used electrical and electronic wastes are regulated as traceable waste, hazardous waste and/or prescribed industrial waste.

### 4.2 OBJECTIVES OF TRANSPORTING USED ELECTRICAL AND ELECTRONIC EQUIPMENT

Operators transporting electrical and electronic equipment, whether for recovery or recycling purposes should—

- (a) eliminate or manage health and safety risks;
- (b) have collections which minimize the number of vehicle movements. If collecting for recycling only, the aim is to decrease the kilometres driven for each unit recovered. However, the collector should avoid the unnecessary stockpiling of wastes; and
- (c) minimize damage or breakage of CRTs or flat panel displays or equipment containing mercury containing lamps and globes, asbestos, ceramic fibres, petroleum fluids, (PCBs), batteries and refrigerant gases.

### 4.3 GENERAL TRANSPORTATION REQUIREMENTS

The following items should be considered when transporting electrical and electronic equipment for reuse or recycling purposes:

- (a) Staff are appropriately trained and licensed under relevant regulation.
- (b) Appropriate lifting, handling and transportation equipment is used and in compliance with relevant regulatory requirements.
- (c) Storage and handling is undertaken in accordance with Clause 2.5 of this Standard.

### 4.4 DOMESTIC TRANSPORTATION

All used electrical and electronic equipment needs to be transported in accordance with relevant transportation and dangerous good regulations.

Documentation shall be maintained if the material is classified as traceable waste, hazardous waste or prescribed industrial waste.

### 4.5 EXPORT REQUIREMENTS

All permits under relevant regulations for the exportation of used electrical and electronic equipment need to be obtained before the goods are exported.

Used electrical and electronic equipment shall be exported in accordance with international transfer and transportation requirements, including packing requirements.

#### 4.6 IMPORT REQUIREMENTS

All permits for the importation of used electrical and electronic equipment need to be gained before the goods are imported.

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## SECTION 5 REQUIREMENTS FOR THE TREATMENT

### 5.1 GENERAL

This Section specifies requirements and provides guidance on the processing of electrical and electronic equipment, assemblies or components for material recovery or recycling.

### 5.2 PROCESSING AND HANDLING

All used electrical and electronic equipment shall be handled and stored with due care in order to avoid release of hazardous substances into air, water, or soil, as a result of damage and/or leakage.

The resources embodied in used electrical and electronic equipment may be recovered using manual, mechanical, chemical or heat processes provided the operation is in compliance with relevant regulations, including permits.

Facilities employing mechanical material processing and separation activities shall be equipped with the following:

- (a) A dust collection system/apparatus engineered to reduce to within accepted legal or other requirement levels—
  - (i) environmental emission; and
  - (ii) worker exposure to hazardous emissions and particulate matter.
- (b) An emergency shut-off system.
- (c) Adequate fire suppression equipment for the size/type of facility.
- (d) Other safety/environmental control equipment identified in the plan arising from the risk assessment.

If mechanical processing of any component is deemed through the risk assessment to pose an environmental or health and safety risk, the component shall be removed prior to mechanical processing. The following items at least shall be removed before processing:

- (i) Mercury containing lamps and globes.
- (ii) Gas discharge lamps.
- (iii) Ink and toner cartridges.
- (iv) Batteries.
- (v) Components containing refractory ceramic fibres.
- (vi) Petroleum products.
- (vii) Asbestos.
- (viii) Components containing refrigerant.
- (ix) Components containing beryllium.
- (x) Components containing PCBs.

Substances of concern and ink and toner cartridges shall be kept separate to ensure integrity and traceability of the material stream.

Equipment, components, metal and/or plastic fractions from mechanical processing from which hazardous substances might disperse to the environment shall be stored under cover or in a manner that prevents dispersal to the environment.

Landfill, energy recovery or incineration shall not be used as standard practice for ultimate disposal, unless the practice can be shown to be the most environmentally sound solution.

Separated materials shall be managed in accordance with Table 1.

Substances of concern shall be managed in accordance with Appendix B.

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**TABLE 1**  
**MINIMUM ACCEPTABLE PROCESSING, END-USE AND METHOD OF DISPOSAL FOR**  
**USED ELECTRICAL AND ELECTRONIC EQUIPMENT**

<b>Product or material</b>	<b>Minimum acceptable end-use</b>	<b>Minimum acceptable processing application</b>	<b>Not acceptable processing application</b>
Batteries	<ul style="list-style-type: none"> <li>• Metal recovery</li> <li>• Plastic recovery (ULABS)</li> <li>• Acid recovery (ULABS)</li> </ul>	<ul style="list-style-type: none"> <li>• Extract from whole units</li> <li>• Manual or mechanical processing</li> <li>• Pyrometallurgy or hydrometallurgy</li> </ul>	<ul style="list-style-type: none"> <li>• Landfill</li> <li>• Unregulated or unlicensed incineration</li> <li>• Exporting for the purpose of recycling and/or disposal without the appropriate permit under the relevant regulation</li> </ul>
CRT, LCD, LED and rear projection lamps	<ul style="list-style-type: none"> <li>• Glass product manufacturing, including production of new CRT</li> <li>• Lead recovery</li> <li>• Metal recovery</li> <li>• Phosphorescent recovery</li> </ul>	<ul style="list-style-type: none"> <li>• Mechanical cutting</li> <li>• Phosphorescent coating removed from CRT glass<sup>a</sup></li> <li>• Mercury removal and distillation</li> <li>• Crushing glass with required dust collection and operator protection.</li> <li>• Glass refounding</li> <li>• Lead smelting<sup>b</sup></li> </ul>	<ul style="list-style-type: none"> <li>• Landfill</li> <li>• Unregulated or unlicensed incineration</li> <li>• Exporting for the purpose of recycling and/or disposal without the appropriate permit under the relevant regulation</li> </ul>
Printed circuit boards	<ul style="list-style-type: none"> <li>• Metal recovery</li> </ul>	<ul style="list-style-type: none"> <li>• Manual processing</li> <li>• Mechanical processing with dust collection and operator protection.</li> <li>• Processing complete boards using pyrometallurgy or hydrometallurgy processes</li> </ul>	<ul style="list-style-type: none"> <li>• Landfill</li> <li>• Unregulated or unlicensed incineration</li> <li>• Exporting for the purpose of recycling and/or disposal without the appropriate permit under the relevant regulation</li> </ul>
Cable and Wires	<ul style="list-style-type: none"> <li>• Metal recovery</li> </ul>	<ul style="list-style-type: none"> <li>• Manual or mechanical processing</li> <li>• Pyrometallurgy or hydrometallurgy</li> </ul>	<ul style="list-style-type: none"> <li>• Landfill</li> <li>• Incineration</li> </ul>
Components containing polychlorinated biphenyls (PCB)s		<ul style="list-style-type: none"> <li>• Separated</li> <li>• Treatment and transposition by operator authorized under relevant regulation</li> </ul>	<ul style="list-style-type: none"> <li>• Landfill</li> <li>• Unregulated or unlicensed incineration</li> <li>• Exporting for the purpose of recycling and/or disposal without the appropriate permit under the relevant regulation</li> </ul>

*(continued)*

**TABLE 1** (continued)

Product or material	Minimum acceptable end-use	Minimum acceptable processing application	Not acceptable processing application
Components containing petroleum products such as oil, hydraulic fluid and large quantities of lubricant		<ul style="list-style-type: none"> <li>• Separated</li> <li>• Recycled in accordance with under relevant regulation</li> </ul>	<ul style="list-style-type: none"> <li>• Unregulated or unlicensed incineration</li> <li>• Landfill</li> </ul>
Components with radioactive materials		<ul style="list-style-type: none"> <li>• Separated</li> <li>• Marked with the related danger label for further treatment and transposition by operator authorised under relevant regulation</li> </ul>	<ul style="list-style-type: none"> <li>• Treatment or disposal without the appropriate permit under the relevant regulation</li> </ul>
Components containing engineered materials such as asbestos		<ul style="list-style-type: none"> <li>• Separated</li> <li>• Sealed with an impermeable covering and clearly marked with the relevant asbestos danger label for further treatment and transposition by operator authorized under relevant regulation</li> </ul>	<ul style="list-style-type: none"> <li>• Treatment or disposal without the appropriate permit under the relevant regulation</li> </ul>
Ferrous and Non-ferrous Metals	<ul style="list-style-type: none"> <li>• Metal recovery</li> </ul>	<ul style="list-style-type: none"> <li>• Manual or mechanical processing</li> <li>• Foundry</li> </ul>	<ul style="list-style-type: none"> <li>• Landfill</li> <li>• Unregulated or unlicensed incineration</li> </ul>
Heat exchange units and other components containing refrigerant with ozone depleting and synthetic greenhouse gasses – e.g. CFCs <sup>c</sup> , HCFC <sup>d</sup> , HFC <sup>e</sup> and HC <sup>f</sup>	<ul style="list-style-type: none"> <li>• Material Recovery</li> </ul>	<ul style="list-style-type: none"> <li>• Separated</li> <li>• Removal of CFCs<sup>a</sup>, HCFC<sup>b</sup>, HFC<sup>c</sup> and HC<sup>d</sup> by operator authorized under relevant regulation</li> </ul>	<ul style="list-style-type: none"> <li>• Treatment without the appropriate permit under the relevant regulation</li> <li>• Landfill</li> </ul>
Ink and toner cartridges	<ul style="list-style-type: none"> <li>• Materials recovery with zero waste to landfill</li> </ul>	<ul style="list-style-type: none"> <li>• Manual or mechanical processing</li> <li>• Waste to energy (some components only)</li> </ul>	<ul style="list-style-type: none"> <li>• Unregulated or unlicensed incineration</li> <li>• Landfill</li> <li>• Exporting for the purpose of recycling and/or disposal without the appropriate permit under the relevant regulation</li> </ul>

(continued)

**TABLE 1** (continued)

<b>Product or material</b>	<b>Minimum acceptable end-use</b>	<b>Minimum acceptable processing application</b>	<b>Not acceptable processing application</b>
Mercury containing lamps and globes switches and other devices	<ul style="list-style-type: none"> <li>• Extract from whole units</li> <li>• Mercury recovery</li> </ul>	<ul style="list-style-type: none"> <li>• Manual or mechanical processing</li> <li>• Mercury distillation</li> </ul>	<ul style="list-style-type: none"> <li>• Landfill</li> <li>• Incineration</li> <li>• Exporting for the purpose of recycling and/or disposal without the appropriate permit under the relevant regulation</li> </ul>
Plastics	<ul style="list-style-type: none"> <li>• Plastic recovery</li> <li>• Energy Recovery</li> <li>• Depolymerization</li> <li>• Pelletising</li> </ul>	<ul style="list-style-type: none"> <li>• Manual or mechanical processing</li> <li>• Waste to energy</li> <li>• Thermal depolymerisation</li> <li>• Any other requirements as determined under relevant regulation or government policy</li> </ul>	<ul style="list-style-type: none"> <li>• Use in food or toy applications if containing brominated flame retardants</li> <li>• Incineration or depolymerisation without proper controls to ensure Persistent Organic Pollutants (POPs) are within regulated limits</li> <li>• Any other requirements as determined under relevant regulation or government policy</li> </ul>
Packaging	<ul style="list-style-type: none"> <li>• Material Recovery</li> <li>• Recovery of cardboard, plastics, timber and polystyrene</li> </ul>	<ul style="list-style-type: none"> <li>• Mechanical or chemical processing</li> </ul>	<ul style="list-style-type: none"> <li>• Landfill</li> <li>• Incineration</li> </ul>
Printer and copier drums containing selenium or arsenic photoconductor films		<ul style="list-style-type: none"> <li>• Separation</li> <li>• Disposed at hazardous waste sites</li> </ul>	<ul style="list-style-type: none"> <li>• Incineration</li> <li>• Exporting for the purpose of recycling and/or disposal without the appropriate permit under the relevant regulation</li> </ul>

<sup>a</sup> Exception shall only be allowed when CRT or uncleaned CRT glass is used as a flux in smelters which have the capacity to recycle lead

<sup>b</sup> An emission filtration system shall be installed in a smelting plant which meets requirements under relevant regulation

<sup>c</sup> Chlorofluorocarbons

<sup>d</sup> hydrochlorofluorocarbons

<sup>e</sup> chydrofluorocarbons

<sup>f</sup> hydrocarbons



### 5.3 TRACEABILITY

The weight and flow and handling of materials and components from used electrical and electronic equipment shall be reported from receipt at the facility to final disposition downstream.

The downstream flow shall be tracked through each downstream processor to the point of final disposal, including details of how goods are processed at each point, the percentage recovered and the percentage of processed materials sent to each downstream processor and recovered by each downstream processor.

### 5.4 DOWNSTREAM PROCESSORS AND SUPPLIER MANAGEMENT

A documented process to evaluate and select downstream processors, including their ability to provide data and ensure proper handling to the point of final disposal shall be maintained.

The process shall include annual audits by the operator or an independent auditor to assess the environmental, health and safety impacts of the operation of suppliers who are immediately downstream.

### 5.5 RECYCLING AND RECOVERY RECORD MANAGEMENT

Processing facilities shall maintain records sufficient to conduct a mass balance of the operation, demonstrating that mass (inputs) equals mass (outputs) + losses in process in accordance with Appendix C.

*Example*

$$A + X - Y = B$$

where

- A = beginning unprocessed inventory
- X = incoming inventory over the period
- Y = outgoing inventory over the period
- B = end unprocessed inventory

The results shall be recorded at least annually.

Reporting shall include the requirements under Clause 5.4.

## APPENDIX A

## ITEMS DESIGNATED AS ELECTRICAL AND ELECTRONIC EQUIPMENT

(Normative)

11 categories of electrical and electronic equipment are covered by this Standard.

**A1 LARGE HOUSEHOLD APPLIANCES**

The following items are considered large household appliances:

- (a) Large cooling appliances.
- (b) Refrigerators.
- (c) Freezers.
- (d) Other large appliances for refrigeration and storage of food.

NOTE: The above products were identified as having special requirements e.g. de-gassing, detection at storage locations, and recovery of gas facilities available, related to the following refrigeration Standards:

- (a) Ozone Protection and Synthetic Greenhouse Gas Management Act 1989.
- (b) Ozone Protection and Synthetic Greenhouse Gas Management Regulations 1995—In particular Regulation 135 identifies many relevant and non-relevant standards.
- (c) Refrigerant handling Code of Practice 2007. Part 1—Self-contained low charge systems.
- (d) Ozone Layer Protection Act 1996 (NZ).
- (e) Ozone Layer Protection Regulations (NZ).
- (e) Washing machines.
- (f) Clothes dryers.
- (g) Dish washing machines.
- (h) Cookers/ovens.
- (i) Electric stoves.
- (j) Electric hot plates.
- (k) Microwaves.
- (l) Other large appliances used for cooking and other processing of food.
- (m) Electric heating appliances.
- (n) Electric radiators.
- (o) Other large appliances for heating rooms, beds, seating furniture.
- (p) Electric fans.
- (q) Air conditioner appliances.
- (r) Other fanning, exhaust ventilation and conditioning equipment.

**A2 SMALL HOUSEHOLD APPLIANCES**

The following items are considered small household appliances:

- (a) Vacuum cleaners.
- (b) Carpet sweepers.

- (c) Other appliances for cleaning.
- (d) Appliances for hair cutting, hair drying, brushing teeth, shaving, massage and other body care appliances.
- (e) Appliances for sewing, knitting, weaving and other processing of textiles.
- (f) Irons and other appliances for ironing, mangling and other care of clothing.
- (g) Appliances for the preparation and cooking of food.
- (h) Fryers.
- (i) Grinders, coffee machines, and equipment for opening or sealing containers or packages.
- (j) Electric knives.
- (k) Clocks, watches and equipment for the purpose of measuring, indicating or registering time.
- (l) Scales.

### **A3 INFORMATION TECHNOLOGY AND TELECOMMUNICATIONS EQUIPMENT**

The following items are considered information technology and telecommunications equipment:

- (a) Server computers, including midrange and mainframe servers.
- (b) Personal computers, including, desktop and all mobile computing devices.
- (c) Computer displays, including cathode ray tubes (CRTs) monitors, and flat panel screens.
- (d) Imaging equipment for printing, copying, mailing, faxing and scanning.
- (e) Computer peripherals including keyboards, mice, portable speakers, modems and routers, web cameras, portable play and storage devices, external power supplies and computer parts.
- (f) Automatic data processing machines.
- (g) Networking equipment (wired and wireless).
- (h) Power supply accessories (e.g. uninterruptible power supplies, filters, and surge protectors).
- (i) Test equipment of all types (e.g. oscilloscopes and meters).
- (j) Electrical and electronic typewriters.
- (k) Devices for the collection, storage, processing, presentation or communication of information by electronic means.
- (l) User terminals and systems, including retail store and point of sale (POS) machines, calculators and self-service kiosks.
- (m) Phones and related accessories.
- (n) Answering systems and other products or equipment for transmitting sound, images or other information by telecommunications.

#### **A4 TELECOMMUNICATION CARRIER AND COMMERCIAL EQUIPMENT**

The following items are considered information technology and telecommunications equipment:

- (a) Exchange equipment (e.g. switches, routers, and multiplexing equipment).
- (b) Network equipment (e.g. distribution amplifiers).
- (c) Cellular network base station equipment.
- (d) Building automation and surveillance equipment of all types.
- (e) Sound amplification and public address systems.

#### **A5 CONSUMER EQUIPMENT**

- (a) Radio sets.
- (b) Television sets.
- (c) Video cameras.
- (d) Video recorders.
- (e) Hi-Fi recorders.
- (f) Audio amplifiers.
- (g) Musical instruments.
- (h) Other products or equipment for the purpose of recording or reproducing sound or images, including signals or other technologies for the distribution of sound and image other than by telecommunications.

#### **A6 ELECTRICAL AND ELECTRONIC TOOLS (WITH THE EXCEPTION OF LARGE-SCALE STATIONARY INDUSTRIAL TOOLS)**

The following items are considered electrical and electronic tools (with the exception of large-scale stationary industrial tools):

- (a) Drills.
- (b) Saws.
- (c) Sewing machines.
- (d) Equipment for turning, milling, sanding, grinding, sawing, cutting, shearing, drilling, making holes, punching, folding, bending or similar processing of wood, metal and other materials.
- (e) Tools for riveting, nailing or screwing or removing rivets, nails, screws or similar uses.
- (f) Tools for welding, soldering and other similar uses.
- (g) Equipment for spraying, spreading, dispersing or other treatment of liquid or gaseous substances by other means.
- (h) Tools for mowing or other gardening activities.

## A7 TOYS, LEISURE AND SPORTS EQUIPMENT

The following items are considered toys, leisure and sports equipment:

- (a) Electric trains or car racing sets.
- (b) Hand-held video game consoles.
- (c) Video games.
- (d) Computers for sporting activities such as biking, diving, running and rowing.
- (e) Sports equipment with electric or electronic components.
- (f) Coin slot machines.

## A8 AUTOMATIC DISPENSERS

The following items are considered automatic dispensers:

- (a) Automatic dispensers for hot drinks.
- (b) Automatic dispensers for bottles or cans.
- (c) Automatic dispensers for solid products.
- (d) Automatic dispensers for money.
- (e) All appliances which deliver automatically all kind of products.

## A9 LIGHTING EQUIPMENT

The following items are considered lighting equipment:

- (a) Luminaires for fluorescent lamps with the exception of luminaires in households.
- (b) Straight fluorescent lamps.
- (c) Compact fluorescent lamps.
- (d) High intensity discharge lamps, including pressure sodium lamps and metal halide lamps.
- (e) Low pressure sodium lamps.
- (f) Other lighting or equipment for the purpose of spreading or controlling light with the exception of filament bulbs.

NOTE: Some of this equipment is covered by existing arrangements such as the FluoroCycle scheme. FluoroCycle is a national voluntary scheme that aims to increase recycling of mercury-containing lamps and globes. FluoroCycle is targeted at the commercial and public lighting sectors, who account for approximately 90% of lighting waste.

FluoroCycle covers the following:

- (a) Straight fluorescent lamps.
- (b) Compact fluorescent lamps.
- (c) High intensity discharge lamps.

FluoroCycle is a voluntary scheme.

Under FluoroCycle, an operator must become a signatory and agree that they are licensed under applicable legislation to process waste mercury containing lamps and globes and extract their mercury content for reuse in other products.

### **A10 MEDICAL DEVICES (WITH THE EXCEPTION OF ALL IMPLANTED AND INFECTED PRODUCTS)**

The following items are considered medical devices (with the exception of all implanted and infected products):

- (a) Radiotherapy equipment.
- (b) Cardiology.
- (c) Dialysis.
- (d) Pulmonary ventilators.
- (e) Nuclear medicine.
- (f) Laboratory equipment for in-vitro diagnosis.
- (g) Analysers.
- (h) Freezers.
- (i) Fertilization tests.
- (j) Other appliances for detecting, preventing, monitoring, treating or alleviating illness, injury or disability.

### **A11 MONITORING AND CONTROL INSTRUMENTS**

The following items are considered monitoring and control instruments:

- (a) Smoke detectors.
- (b) Heating regulators.
- (c) Thermostats.
- (d) Measuring, weighing or adjusting appliances for households or laboratories.
- (e) Other monitoring and control instruments used in industrial installations (e.g. in control panels).

APPENDIX B  
MINIMUM ACCEPTABLE PROCESSING, END USE AND  
METHOD OF DISPOSAL FOR USED ELECTRICAL  
AND ELECTRONIC EQUIPMENT

(Normative)

## B1 INTRODUCTION

This Appendix specifies requirements and gives additional information about hazardous substances and components and their removal from used electrical and electronic equipment as identified in Table 1. The examples in this text concerning the types of hazardous substances in different types of used electrical and electronic equipment are non-exhaustive.

Substances, preparations and components may be removed manually, mechanically, chemically or metallurgically with the result that hazardous substances, preparations, and components are contained as an identifiable stream or identifiable part of a stream at the end of the treatment process. A substance, preparation or component is identifiable if it can be monitored to prove environmentally safe treatment. As a consequence of this interpretation of the phrase, two different categories are distinguished as follows:

- (a) Substances, preparations and components that have to be removed as a first step in the treatment process.

NOTE: Examples of substances, preparations and components that will have to be removed as a first step may include external batteries (batteries readily accessible in an appliance), capacitors, mercury switches, beryllium oxide components, asbestos and ceramic fibre parts.

- (b) Substances, preparations and components that have to be removed as an identifiable stream during the treatment process.

NOTE: Examples of substances, preparations and components that have to be removed as an identifiable (part of a) stream in the next steps of the treatment process may include: plastics containing brominated flame retardants, printed circuit boards, and internal batteries (batteries which are internal to an appliance and not intended for replacement by the consumer).

## B2 CAPACITORS

The following components shall be removed from separately collected used electrical and electronic equipment:

- (a) Capacitors containing polychlorinated biphenyls (PCB).  
(b) Capacitors containing mineral or synthetic oil.  
(c) Electrolyte capacitors containing substances of concern (either height > 25 mm, or diameter > 25 mm, or proportionately similar volume).

NOTE: Capacitors containing (PCBs) are capacitors for which the dielectric is a sheet of paper soaked with PCB oil placed between aluminium conductors. Modern capacitors use ceramic, plastics and special silicate minerals as dielectric material.

All capacitors that are not clearly identified as PCB free shall be assumed to contain PCBs or suspected of containing PCBs. Capacitors can only be considered as free of PCBs, if one of the following criteria is fulfilled:

- (i) They have been produced after 1986 or they come from appliances produced after 1987.  
(ii) They are declared and labelled as PCB free.

- (iii) They are declared as PCB free in documents provided by the manufacturer.
- (iv) Their conductors are polarized and marked + and – (electrolyte capacitors).

NOTE: Electrolytic capacitors are special constructions, not containing PCBs, but a liquid as the anode and aluminium (or tantalum) as the cathode conductor. The dielectric layer is a metal oxide layer on the surface of the plates, built up by an electrochemical reaction between the liquid and mostly aluminium. Electrolytic capacitors are always polarized (marked + and –). Common liquids are inorganic and organic acids and a wide range of additives are used. Electrolytic capacitors offer very high capacitance and are widely used for power-supply conditioning.

If an operator is not capable of differentiating between the capacitors described in Paragraph B2.1 and other types of capacitor, then all capacitors shall be removed.

NOTE: Capacitors may be found in household appliances for example: washing machines, temperature exchange equipment, dishwashers, fume extraction hoods, tumble dryers and drying hoods, microwave stoves, ballasts of lamp equipment, copying equipment, power supply units, ballast units of low voltage systems, and many other electronic components such as screens.

### **B3 COMPONENTS CONTAINING MERCURY**

Components containing mercury, such as switches or backlight lamps (including rear projection lamps) shall be removed from separately collected used electrical and electronic equipment.

Switches containing mercury shall be removed as a first step in the treatment process.

NOTE: Mercury switches allow or interrupt the flow of electric current in an electrical circuit in a manner that is dependent on the physical position of the switch and the physical characteristics of the mercury. This technology was used only before 1985, for example, in mercury tilt switches or in relays (air gap switches).

Mercury switches are not always easy to identify. In vapour pressure switches or tilt switches mercury is often visible in a glass capsule; however, switches in an electronic surrounding (also called relay switches) are often encased and the metallic mercury is not visible; sometimes the switches are marked with 'Mercury', 'Hg', 'HG' or 'MC' on the casing.

Mercury tilt switches or vapour pressure switches may be found in old boilers, washing machines, chest freezers, irons, coffee machines and old telephone installations. Mercury containing relay switches were used in old high quality electronic and sophisticated monitoring equipment.

### **B4 BATTERIES AND ACCUMULATORS**

Batteries shall be removed from separately collected e-waste. Batteries shall be part of an identifiable stream in accordance with Paragraph B1.2 of this document.

NOTE: When removing batteries from used electrical and electronic equipment, it is possible to remove external batteries in the first steps of treatment, and internal and button type cell batteries in subsequent treatment steps. External batteries are those that are readily accessible in the appliance and internal batteries are those batteries which are not intended for replacement by the consumer.

Certain primary (disposable) and rechargeable batteries (accumulators) may contain hazardous materials such as cadmium, mercury and lead. Even very small coin cell batteries can contain a significant amount of mercury.

In general, appliances containing batteries include all portable consumer electronics and cordless and/or rechargeable household appliances such as vacuum cleaners, hair cutters, electronic toothbrushes, shavers, clocks, watches, scales, laptop computers, notebook computers, notepad computers, pocket and desk calculators, mobile phones, radios, video cameras, drills and other cordless and/or rechargeable tools, many electric toys, video game consoles and video games, portable electric sports equipment, smoke detectors, heating regulators, thermostats and other control and monitoring equipment.

Precautions and safety measures shall be in place for operations involving used lithium batteries and for commingled batteries if any lithium battery is present.



Exposure of lithium batteries to heat, humidity, sunlight or water along with any crushing or physical damage shall be avoided during handling, sorting, storage, and transport. Lithium batteries shall be removed, without damage, during the first step of the treatment process.

NOTE: Special attention should be paid to lithium-ion battery (marked Li-ion or LIB). Lithium ion batteries are a family of rechargeable battery with large capacity and often used in modern portable electronics like mobile phones. Chemistry and safety characteristics vary across lithium-ion types. Lithium batteries may rupture, ignite or explode when exposed to high temperature, prolonged sunlight, integrity of the device is compromised, or when exposed to water or humidity.

It is advisable to store lithium-based batteries in a separate area away from any other waste stream (solid or liquid).

Emergency response equipment specific to the risks inherent to lithium (Class D rated fire extinguisher, and personal protective equipment) shall be available at all sites where lithium batteries are handled, stored or may be physically damaged. All employees involved in handling lithium batteries shall be informed about the risk and trained to fight a lithium battery fire.

NOTE: Using powdered copper metal is preferred for fires involving lithium and lithium alloys. It is the only known lithium fire fighting agent which will cling to a vertical surface thus making it the preferred agent on three dimensional and flowing fires.

## **B5 PRINTED CIRCUIT BOARDS**

Printed circuit boards shall be removed from separately collected used electrical and electronic equipment if the surface of the printed circuit board is greater than 10 square centimetres.

NOTE: The elements of lead, tin, antimony, chromium, beryllium oxide and cadmium on the printed circuit board, restricted brominated flame retardants in the plastic part of the printed circuit board, and bromine in the plastic parts should be considered for further treatment. During mechanical processing of printed circuit boards, there is a risk of diffuse emission to the environment and contamination of workplaces with dust and heavy metals.

Printed circuit boards occur in a wide range of electronic and electrical equipment including appliances, tools, toys, sports equipment and medical devices.

## **B6 PLASTICS CONTAINING CERTAIN TYPES OF BROMINATED FLAME RETARDANTS**

Plastic containing brominated flame retardants shall be removed from any separately collected used electrical and electronic equipment in accordance with Paragraph B1.2.

The downstream monitoring and auditing shall trace plastics fractions until the end of waste status is reached. The plastic recycling operator shall comply with relevant product legislation for its plastics fractions from used electrical and electronic equipment to the end-of-waste status. Plastics that do not comply with relevant product legislation shall be treated as waste or be disposed of in accordance with relevant regulation.

NOTE: For plastic fractions from heat exchange equipment and large non-cooling household appliances, monitoring of compliance with relevant product legislation of the end-of-waste status is not required.

For all other categories, the downstream monitoring and verification in accordance with Paragraph 5.4 should be fulfilled.

## **B7 VOLATILE FLUOROCARBONS AND VOLATILE HYDROCARBONS**

Chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs) or hydrofluorocarbons (HFCs), and hydrocarbons (HCs) shall be extracted from separately collected used electrical and electronic equipment.

Appliances containing one or more of the substances mentioned in Paragraph B7 shall be sorted to a separate used electrical and electronic equipment stream and sent to specialized treatment facilities.

NOTE: Appliances which commonly contain volatile fluorocarbons and volatile hydrocarbons include refrigerators, freezers, heat pump tumble dryers, de-humidifiers and portable air conditioners of the type commonly found in private households.

Insulation shall be removed from water boilers insulated with foam containing one or more of the substances mentioned in Paragraph B7 as an expanding agent. The removed foam shall be disposed of in incineration plants with related permissions, or by other authorized methods destroying the dangerous substances mentioned in Paragraph B7.

## **B8 ASBESTOS**

Asbestos waste and components which contain asbestos shall be removed from separately collected used electrical and electronic equipment as a first step in the treatment process.

NOTE: Asbestos is a mineral which occurs as a white or slightly grey fibre and has been used in electronic appliances as an insulation material and as a fire-retardant because of its fibre strength and heat resistant properties. When asbestos containing appliances are damaged or disturbed by repair, treatment or demolition activities, microscopic fibres become airborne and may be inhaled into the lungs where they may cause significant health problems.

Appliances or components containing asbestos shall be separated from other appliances. Handling shall avoid any emission of asbestos fibres. Used electrical and electronic equipment that contains asbestos shall be sealed with an impermeable covering and clearly marked with the related asbestos danger label.

Asbestos shall only be removed, transported and disposed of with appropriate authorization.

NOTE: Appliances which may contain asbestos include: stoves, electric heating systems, electric storage heaters, toasters and hair dryers.

## **B9 COMPONENTS CONTAINING RADIOACTIVE SUBSTANCES**

Components containing radioactive substances shall be removed from any separately collected used electrical and electronic equipment as a first step in the treatment process.

Treatment facilities shall be monitored for radioactive materials in used electrical and electronic equipment in accordance with the relevant regulations.

The requirements in this Paragraph may be fulfilled using specialized monitors to detect radioactive materials or components containing radioactive substances or, as a minimum, only employees trained to identify appliances containing radioactive units shall carry out sorting and checking of the incoming used electrical and electronic equipment stream.

NOTE: Units containing radioactive materials or components are generally marked with the radioactive danger label. Appliances or components contain radioactive substances include smoke detectors, medical devices and laboratory equipment.

Components containing radioactive substances shall be prepared for further treatment by operators that have appropriate authorization, in accordance with relevant legal or other requirements.

## **B10 CATHODE RAY TUBES (CRTs)**

Exception to this Paragraph is possible where CRTs or uncleaned CRT glass is used as a flux in smelters which have the capability to recycle or recover lead.

CRTs or CRT glass shall be separated from the rest of the CRT display appliance.

Dismantling, crushing or compacting of CRT display appliances prior to treatment shall not be permitted.

When appliances with broken and unbroken CRTs can be separated at the collection facility, those with unbroken CRTs can be stored without any special requirements.

During all treatment operations, care shall be taken to prevent uncontrolled emission of phosphorescent and other coatings and glass dust into the air to prevent health and environmental damage. Phosphorescent and other coatings and glass dust shall not contaminate the breathing zone of treatment facility operators. Occupational exposure limits shall be met at all times.

Dry crushing, shredding, splitting and cleaning of CRTs or CRT display appliances shall be carried out in an environment with effective dust exhausting connected to an efficient air filtration system. The filtration class of the air filtration system shall assure that emission limits are complied with at all times.

If wet crushing, shredding, splitting and cleaning of CRTs or CRT display appliances are carried out during treatment, the water used in the technology shall be kept in a closed loop. Technological water shall not be released to any sewage water system.

If crushing, shredding, splitting or cleaning of CRTs or CRT display appliances is carried out by the treatment operator, a regular monitoring program for airborne dust in the inner working environment shall be established at the treatment plant. Such a program shall follow the relevant regulatory requirements.

All operator personnel shall be regularly informed about health and safety risks related to the treatment processes of CRT display appliances.

NOTE: In particular the physical hazards of cutting by CRT cullet and toxic hazard of heavy metal content in phosphorous coatings should be pointed out.

Removed phosphorescent coatings shall be considered as a hazardous waste and handled in accordance with relevant regulatory requirements.

Treatment operations shall avoid contamination of components and fractions of CRT display appliances by phosphorescent.

During the cleaning process phosphorescent coatings shall be removed from CRT glass.

## **B11 FLAT PANEL DISPLAYS**

Collection, handling and transport of flat panel displays shall be performed in a way that does not affect the integrity of the displays. Flat panel displays shall not be crushed or compacted prior to treatment.

If treatment technology requires separation of different types of flat panel display, employees shall be qualified and trained in the appropriate methods to carry out sorting tasks.

Substances and components contained in flat panel displays shall be removed in accordance with this Appendix.

The treatment of flat panel displays shall consider the different types of displays, the fractions and components thereof, and the specific requirements for—

- (a) Mercury;
- (b) phosphorescent coatings; and
- (c) indium tin oxide (ITO).

Before treatment of flat panel displays which contain cold cathode fluorescent lamps CCFL backlights, mercury shall be removed from backlight lamps.

CCFL backlights broken before or during manual dismantling shall be stored and transported in closed containers in order to avoid mercury emissions. Such containers shall be stored in places that are not exposed to heat.

All CCFL backlights removed during manual dismantling, whether broken or not broken, shall be treated in special treatment plants for lamps or sent for appropriate disposal in accordance with legal or other requirements.

Flat panel displays and fractions shall be sent to treatment facilities that guarantee recovery or disposal of the phosphorescent coatings and glass.

Mechanical treatment of flat panel displays shall be carried out in a dedicated treatment facility that can document that no contamination occurs with other treated streams.

## **B12 OTHER COMPONENTS**

The following hazardous substances and components shall be removed as a first step in the treatment process, in accordance with Paragraph B1: toner cartridges and drums, liquid and pasty, as well as colour toner from printer equipment, lamps, components containing refractory ceramic fibres, and oil.

The following components may be removed as an identifiable (part of a) stream in the next steps of the treatment process in accordance with Paragraph B1.

- (a) Flat panel modules of a surface area greater than 100 square centimetres in any electronic appliance.
- (b) CRTs.
- (c) External electric cables.

Diffuse emissions and dust explosions of hazardous materials shall be avoided. If recycling, or recovery of materials is not foreseen, these hazardous materials shall be destroyed by incineration or disposed of in authorized landfills licensed to receive hazardous waste.

## APPENDIX C DETERMINATION OF RECYCLING AND RECOVERY RATES

(Normative)

### C1 GENERAL

This Appendix relates to Clause 5.5 and lays down the rules for the determination and calculation of recycling and recovery rates, based on batch or annual results. It aims to report treatment results, following and covering the whole treatment chain, including the classification of the use of final fractions and components in technologies (model classifications).

### C2 PRINCIPLES

The process of determining the recycling and recovery rates starts with the untreated used electrical and electronic equipment and ends when the end-of-waste status for fractions is achieved or with the final recovery or disposal of fractions, produced by treatment of the equipment. Therefore the whole treatment and processing chain of used electrical and electronic equipment shall be considered.

The determination of the recycling and recovery rates shall be based on the input/output analysis of every single step within the treatment chain. This input/output analysis encompasses the following elements:

- (a) Weight and description of the input material.
- (b) Description of the treatment technology.
- (c) Yield of the output fractions according to batch results or equivalent methods.
- (d) Further treatment and processing of the fractions.
- (e) Composition data of final fractions.

The determination of the recycling and recovery rates shall follow all fractions until final technologies are reached, including the following:

- (i) For fractions that have reached the end-of-waste status, only composition data and the possible final technology shall be provided.
- (ii) Fractions with less than 2 weight percent impurities may be considered as pure fractions and the main component may be given as 100 percent composition. In case of non-pure fractions the shares of components shall be provided.
- (iii) For pure metallic fractions the final acceptor may be described as 'world market' and the technology may be estimated with the relevant smelter.
- (iv) For final fractions being forwarded for disposal no composition data is required.

### C3 CALCULATION

The recycling and recovery rates shall be calculated—

- (a) as the percentage of the total of all output fractions, classified as prepared for re-use and recycling in proportion to the total of the input amount of non-treated appliances (recycling rate);

- (b) as the percentage of the total of all output fractions, classified as prepared for re-use, recycling and other material recovery or other recovery in proportion to the total of the input amount of non-treated appliances (recovery); and
- (c) in accordance with the classification given in Paragraph C5.

**C4 DOCUMENTATION**

An understandable and well structured document about the determination of the recycling and recovery rates, comprising the following elements shall be made available:

- (a) A flow chart showing the whole processing chain with names of fractions, yields and technologies, as provided in the following example (Figure C4).

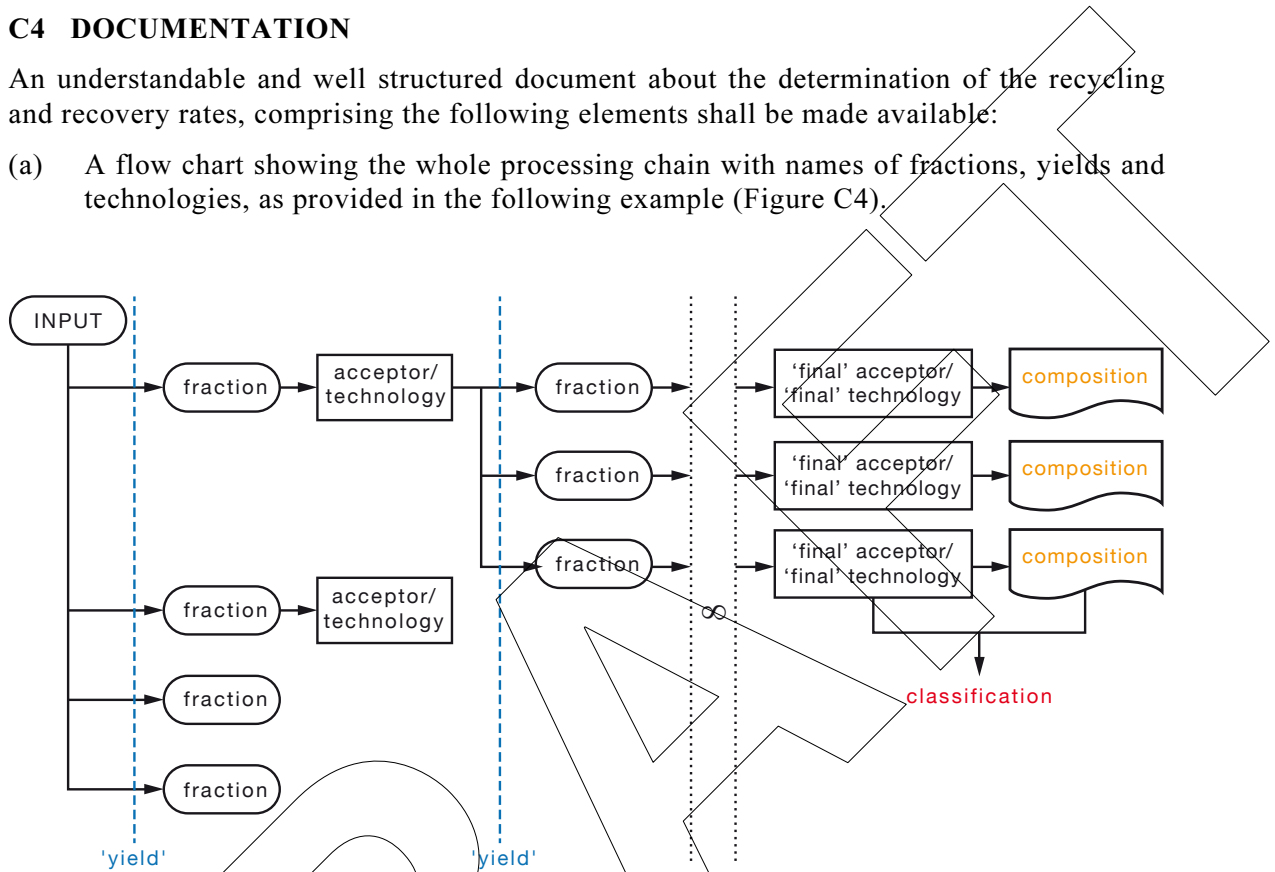


FIGURE C4 PROCESS CHAIN

- (b) A complete list of data sources, reliable and updated.
- (c) A detailed calculation which is traceable and based on the flow chart.

The determination of the recycling and recovery rates shall be completed and updated at least once every year, but also following any changes within the processing chain which may influence the recycling and recovery rates. The documents and records relating to this process shall be stored for five years.

**C5 CLASSIFICATION MODEL**

The options for classification are as follows:

- (a) Prep RUE: Prepared for re-use equipment—This includes whole appliances prepared for re-use.
- (b) Prep RUC: Prepared for re-use components—This includes components compared for re-use.
- (c) R: Recycling.
- (d) OMR: Other material recovery like backfilling.
- (e) ER: Energy recovery.
- (f) TD: Thermal disposal.

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(g) LD: Landfill disposal.

In the following table the method of classification of the use of the components or fractions in final technologies is provided:

Components/fractions	Use in final technology	Classification	Examples

In order to classify the use of a component or a fraction in a final technology step as 'feedstock substitution', the following requirements shall be met:

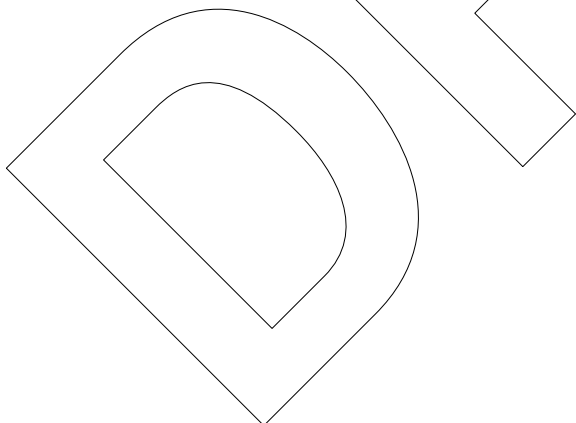
- (i) Waste fractions added during the process shall be described by type of waste fraction and share of input amounts used in daily routine under the product descriptions and/or process descriptions.
- (ii) A leachate test shall demonstrate, in accordance with relevant legislation and its transposition that the test meets requirements laid down by the relevant authorities.
- (iii) An approval that product requirements (for example the physical stability of the product without adding the waste fractions) are also met by adding the type and proportion of waste fractions given in the product or process description shall be provided.

To classify the use of a component or fraction in a final technology step as a 'slag forming fraction', the necessary input amount of a slag forming raw material shall be documented.

If this requirement is not fulfilled, only the input amount of a slag forming raw material shall be classified as a 'slag forming component', and for the remaining material the classification term 'no use' shall be chosen from the 'use in final technology' descriptors.

All uses of components/fractions in technologies described in the examples in Paragraph C5 as 'special' technologies shall be approved by an independent study.

NOTE: An example of an independent study approving the special use of components/fractions may be, for example, on the quantity of plastics used as a reducing agent or for fuel substitution.



## BIBLIOGRAPHY

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- 3 AS/NZS 5761, *In-service safety inspection and testing—Second-hand equipment prior to sale.*
- 4 AS/NZS 5762, *In-service safety inspection and testing—Repaired electrical equipment.*
- 5 AS/NZS 4701, *Requirements for domestic electrical appliances and equipment for reconditioning or parts recycling.*
- 6 AS/NZS ISO 31000, *Risk management—Principles and guidelines.*
- 7 *Ozone Protection and Synthetic Greenhouse Gas Management Act 1989.*
- 8 *Ozone Protection and Synthetic Greenhouse Gas Management Regulations 1995—In particular Regulation 135 identifies many relevant and non-relevant standards.*
- 9 *Refrigerant handling Code of Practice 2007. Part 1—Self-contained low charge systems.*
- 10 *Ozone Layer Protection Act 1996 (NZ).*
- 11 *Ozone Layer Protection Regulations (NZ).*

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\*\*\* END OF DRAFT \*\*\*



## PREPARATION OF JOINT AUSTRALIAN/NEW ZEALAND STANDARDS

Joint Australian/New Zealand Standards are prepared by a consensus process involving representatives nominated by organizations in both countries drawn from all major interests associated with the subject. Australian/New Zealand Standards may be derived from existing industry Standards, from established international Standards and practices or may be developed within a Standards Australia, Standards New Zealand or joint technical committee.

During the development process, Australian/New Zealand Standards are made available in draft form at all sales offices and through affiliated overseas bodies in order that all interests concerned with the application of a proposed Standard are given the opportunity to submit views on the requirements to be included.

The following interests are represented on the committee responsible for this draft Australian/ New Zealand Standard:

Airconditioning & Refrigeration Equipment Manufacturers Association of Australia  
Association of Accredited Certification Bodies  
Australian Council of Recyclers  
Australian Industry Group  
Australian Information Industry Association  
Australian Local Government Association  
Australian Mobile Telecommunications Association  
Community Recycling Network  
Consumer Electronics Suppliers Association  
Consumers Federation of Australia  
Department of Sustainability, Environment, Water, Population and Communities  
EPA South Australia  
JAS-ANZ  
Local Government New Zealand  
Ministry for the Environment New Zealand  
Office of Environment and Heritage, Department of Premier and Cabinet  
Product Stewardship Australia  
QLD Department of Environment and Resource  
Scrap Metal Recycling Association of New Zealand  
The Eday New Zealand Trust  
Total Environment Centre Inc  
Waste Contractors and Recyclers Association of NSW  
Waste Management Association of Australia  
WorkCover New South Wales

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Standards Australia is an independent company, limited by guarantee, which prepares and publishes most of the voluntary technical and commercial standards used in Australia. These standards are developed through an open process of consultation and consensus, in which all interested parties are invited to participate. Through a Memorandum of Understanding with the Commonwealth government, Standards Australia is recognized as Australia's peak national standards body.

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