

**RESPONSIBLE RECYCLING  
("R2") PRACTICES**

**For Use In**

**ACCREDITED CERTIFICATION  
PROGRAMS**

**FOR**

**ELECTRONICS RECYCLERS**

**October 30, 2008**

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# **INTRODUCTION**

This document sets forth responsible recycling (“R2”) practices for use in accredited certification programs that assess electronics recyclers’ environmental, health and safety, and security practices<sup>1</sup>.

Customers want a simple means of verifying that an electronics recycling company is forthright and responsible about how it manages used and end-of-life electronic equipment. At the same time, responsible electronics recyclers want a means of highlighting their values and performance to customers.

The purpose of this document is to take a first step in addressing this situation – to develop a commonly-accepted set of R2 practices for the electronics recycling industry. Accredited certification programs—by verifying an electronics recycler adheres to these R2 practices—will enable customers to make better informed decisions and have increased confidence that their end-of-life electronic equipment will be dealt with in a responsible manner.

The R2 practices set forth herein are not legal requirements and do not replace electronics recyclers’ legal obligations. Electronics recyclers that adhere to this set of R2 practices are doing so on a voluntary basis. If a requirement of this document conflicts with an applicable legal requirement, the recycler must adhere to the legal requirement.

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<sup>1</sup> This document has been drafted by John Lingelbach of Decisions & Agreements, LLC. Copies may be downloaded from [www.decideagree.com](http://www.decideagree.com).

# THE R2 PRACTICES

## 1. Environmental, Health, and Safety Management System

General Principle – *An R2 electronics recycler shall develop and use an Environmental, Health, and Safety Management System (EHSMS) to plan and monitor its environmental, health, and safety practices, including the activities it undertakes to conform to these R2 Practices.*

R2 Practices:

- (a) An R2 electronics recycler shall develop, document, fully implement, review at least annually, and update as needed (e.g., as products and/or technologies change) a written EHSMS that:
  - (1) Includes written goals and procedures and requires the organization to systematically manage its environmental, health, and safety matters, and
  - (2) Is based on a “Plan-Do-Check-Act”<sup>2</sup> model for continual improvement, and
  - (3) Includes sections setting forth the following:
    - (A) A policy for managing used and end-of-life electronics equipment that is based on a “reuse, recover, dispose” hierarchy of responsible management strategies and covers materials management on site and throughout the Recycling Chain (as described in Provision 2),
    - (B) A plan for complying with the environmental, health, and safety legal requirements relating to its operations, and for assuring it only exports equipment and components containing Focus Materials to countries that legally accept them (as described in Provision 3),
    - (C) An analysis of and plan – the “FM Management Plan” – for how the R2 Focus Materials (FMs) that pass through the R2 recycler’s facility or control should be properly managed, both on site and throughout the Recycling Chain (as described in Provision 5) – this can be a subsection of the section described in (A) above,
    - (D) An EHS hazards identification and assessment of on-site occupational and environmental risks (as described in Section (c) of Provision 4),
    - (E) A plan for responding to and reporting exceptional releases, accidents, spills, fires, explosions, and other out-of-the-ordinary events that pose risks to worker safety, public health, or the environment – this section should be provided to local emergency responders if appropriate or required, and

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<sup>2</sup> Elements of this model include: *Plan* – (a) Identify environmental and worker health/safety impacts, and legal and regulatory requirements; (b) Establish environmental goals, objectives and targets; (c) Plan actions that work toward achieving identified goals; (d) Plan for emergency preparedness and response; and (e) Identify management support. *Do* – (a) Establish roles and responsibilities for the EHSMS and provide adequate resources; (b) Ensure that staff are trained and capable of carrying out responsibilities; and (c) Establish a process for communicating about the EHSMS. *Check* – (a) Monitor key activities and track performance; (b) Identify and correct problems and prevent recurrence; and (c) Provide a measurement system. *Act* – (a) Conduct annual progress reviews; (b) Act to make necessary changes to the EHSMS; (c) Create and implement an action plan for continual improvement.

- (F) A list of the activities necessary to conform to the requirements of these R2 Practices and a list of the documentation necessary to show conformity with these requirements.
- (b) An R2 electronics recycler shall obtain a certification from an Accredited Certification Body stating that:
  - (1) Its EHSMS conforms to the requirements of this provision, and
  - (2) Its practices conform to the EHSMS and to the requirements of these R2 Practices.

## 2. **“Reuse, Recover, ...” Hierarchy of Responsible Management Strategies**

General Principle – *An R2 electronics recycler shall develop and adhere to a policy for managing used and end-of-life electronic equipment that is based on a “reuse, recover, dispose” hierarchy of responsible management strategies.*

R2 Practices:

- (a) An R2 electronics recycler shall develop in writing and adhere to a policy stating how it manages used and end-of-life electronics equipment, components, and materials – with respect to both on-site activities and the selection of downstream vendors – which is based on a hierarchy of responsible management strategies:
  - (1) Reuse – An R2 electronics recycler shall take all practical steps to direct properly functioning equipment and components to reuse unless a customer directs otherwise,
  - (2) Materials Recovery – An R2 electronics recycler shall separate as appropriate, through manual dismantling and/or mechanical processing, the materials in equipment and components that are not directed to reuse and direct them to properly-equipped materials recovery facilities when technically and economically feasible.
  - (3) Energy Recovery or Disposal – An R2 electronics recycler shall direct remaining material to properly-equipped energy recovery and/or disposal facilities in conformity with Provision 5.
- (b) This policy shall incorporate and be consistent with the Focus Material Management Plan that the R2 electronics recycler develops in accordance with Provision 5.

## 3. **Legal Requirements**

General Principle – *An R2 electronics recycler shall comply with all applicable environmental, health, and safety legal requirements and shall only export equipment and components containing FMs to countries that legally accept them.*

R2 Practices:

- (a) In order to maintain its compliance with all applicable environmental, health, and safety legal requirements and to assure it only exports equipment and components containing FMs to countries that legally accept them, an R2 electronics recycler shall develop and implement a plan covering these matters that shall be included as a section of its EHSMS.
  - (1) The plan shall identify and document the environmental, health, and safety legal requirements

that cover the recycler's operations. The recycler shall keep the plan up to date, identify (in the plan) and implement the steps necessary to comply with each requirement, document the implementation of these steps, periodically evaluate its compliance with the requirements, and take corrective action to address any issues of non-compliance.

(2) The plan also shall identify and document the legality – under the laws of the importing countries – of all international shipments of equipment, components, or materials containing FMs that have passed through the R2 recycler's facility or control<sup>3</sup>. The recycler shall identify the countries that are receiving such shipments, obtain documentation demonstrating that each non-OECD<sup>4</sup> country legally accepts such shipments, and only make such shipments to countries for which it has such documentation<sup>5</sup>. The documentation shall consist of one of the following:

(A) A copy of the relevant information from the United States Environmental Protection Agency, or

(B) Documentation<sup>6</sup> from the country's Competent Authority stating that the country legally accepts such imports, or

(C) A copy of a law or court ruling from the importing country that demonstrates the legality of the import.

#### 4. **On-Site Environment, Health, and Safety**

*General Principle – R2 electronics recycler shall utilize practices at their facilities that protect worker health and safety and the environment.*

R2 Practices:

##### General

(a) An R2 electronics recycler shall possess the expertise and technical capability to process each type of equipment, component, and material it accepts in a manner protective of worker safety, public health, and the environment.

(b) An R2 electronics recycler adheres to good housekeeping standards, including keeping all work and storage areas clean and orderly. Clean up operations for all areas of the facility should be planned, regularly implemented, and monitored.

##### Workforce and Environmental Protection

(c) An R2 electronics recycler shall conduct on an ongoing basis (e.g., as new types of materials are processed or new processes are utilized) a hazards identification and assessment of occupational and environmental risks that exist or could reasonably be expected to develop at the facility.

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<sup>3</sup> This includes shipments made by downstream vendors.

<sup>4</sup> The R2 Document makes the assumption that these shipments are legal to import into OECD countries.

<sup>5</sup> Recyclers that export used CRTs for reuse and CRT or mixed CRT glass for recycling also have export obligations under USEPA's CRT rule (FR: July 28, 2006 Volume 71, Number 145).

<sup>6</sup> The documentation must be in English, or otherwise comprehensible, to the R2 recycler's third-party R2 auditor.

Such risks could result from any sources, including but not limited to emissions of and/or exposure to substances<sup>7</sup>, noise, ergonomic factors, thermal stress, substandard machine guarding, cuts and abrasions, etc.. The hazards identification and assessment shall be captured in writing and incorporated as a component of the recycler's EHSMS.

- (d) An R2 electronics recycler shall manage the hazards and minimize the releases it identifies using an appropriate combination of strategies, including but not limited to (1-3 below are in order of priority, per OSHA regulations):
  - (1) Engineering controls such as (A-C below are in order of priority, per OSHA regulations):
    - (A) Substitution (e.g., replacing a toxic solvent with one less toxic),
    - (B) Isolation (e.g., automating a process to avoid employee exposure), or
    - (C) Ventilation and, if appropriate, capture (e.g., fume hood),
    - (D) Dust control, capture, and clean up, and
    - (E) Emergency shut-off systems, and
    - (F) Fire suppression systems,
  - (2) Administrative and work practice controls, including appropriate combinations of:
    - (A) Regular, documented health and safety training that covers information from the hazards assessment, as well as safe management handling, spill prevention, engineering controls, equipment safety, and use and care of personal protection equipment; with training for new hires and refresher courses for all employees that is understandable to them given language and level-of-education considerations,
    - (B) Job rotation as feasible given workforce size,
    - (C) Safe work practices,
    - (D) Medical surveillance,
    - (E) Safety meetings,
  - (3) Personal protective equipment, including respirators, protective eyewear, cut-resistant gloves, etc., as appropriate for the risks involved in the tasks being performed.
- (e) An R2 electronics recycler shall utilize monitoring and sampling protocols to provide assurances that the practices it employs are effectively and continuously managing the risks it has identified. This includes complying with all applicable Federal or State OSHA standards and PELs for sampling and/or monitoring.
- (f) An R2 electronics recycler shall treat its entire workforce, including volunteer workers, temporary workers, and anyone else performing activities under its direction, using the standard of care established pursuant to Section (d) of this provision.
- (g) An R2 electronics recycler shall designate a qualified employee or consultant to coordinate its efforts to promote worker health and safety. This individual shall be identified to all employees and two-way communication shall be encouraged between employees and this individual

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<sup>7</sup> Risks posed by exposure to substances may arise in a variety of situations – sometimes involving substances that do not under ordinary conditions pose a risk to worker safety or the environment. Such substances may include mercury, lead, beryllium, cadmium, PCBs, some phosphor compounds, certain brominated flame retardants (i.e., polybrominated biphenyls, pentabrominated diphenyl ether, and octabrominated diphenyl ether), silica dust, chlorinated or brominated dibenzodioxins and dibenzofurans, and hexavalent chromium. Special attention should be given to potential lead and cadmium exposures during the creation or handling of broken CRT glass, as well as where lead solder is melted during chip recovery.

regarding potential hazards and how best to address them.

#### Exceptional Releases

- (h) An R2 electronics recycler shall be prepared at all times to implement the plan set forth in its EHSMS for responding to and reporting exceptional releases, accidents, spills, fires, explosions, and other out-of-the-ordinary events that pose risks to worker safety, public health, or the environment.

### 5. **R2 Focus Materials**

*General Principle – An R2 electronics recycler shall manage – both on site and in the selection of downstream vendors – the R2 Focus Materials that pass through its facility or control in a manner protective of worker health and safety, public health, and the environment; and shall perform due diligence on downstream vendors to which it ships these materials.*

R2 Practices:

#### Development and Adherence to an FM Management Plan

- (a) An R2 electronics recycler shall analyze and plan how the R2 Focus Materials (FMs) that pass through its facility or control will be properly managed both on site and throughout the Recycling Chain (and include this analysis and plan as the “FM Management Plan” section of its EHSMS). The FM Management Plan shall state how the recycler and its downstream vendors shall conform to the requirements set forth in the rest of this Provision 5.

#### Removal of FMs

- (b) Prior to shredding, materials recovery, energy recovery, incineration, or land disposal of equipment or components, FMs (as well as toner and toner cartridges) shall be removed using safe and effective mechanical processing or manual dismantling, with two exceptions:
  - (1) Items containing mercury if they are too small to remove safely at reasonable cost, and workers are protected from the risks posed by the mercury during and subsequent to any processing or manual dismantling of the equipment containing it, and the equipment and components containing such items are sent to materials recovery facilities that are properly licensed to receive, and that utilize technology designed to safely and effectively manage, equipment or components containing such mercury-containing items.
  - (2) CRTs, batteries, and circuit boards contained in equipment or components destined for materials recovery need not be removed prior to shredding and/or materials recovery if the shredding and/or materials recovery occurs in facilities that are properly licensed to receive, and that utilize technology designed to safely and effectively manage, equipment or components containing these FMs.



### Processing, Recovery, and Treatment of FMs

- (c) An R2 electronics recycler shall send removed FMs to processing, recovery, or treatment facilities that are properly licensed to receive, and that utilize technology designed to safely and effectively manage, the FMs. This shall include:
- (1) For items containing mercury – mercury retorting,
  - (2) For circuit boards – removal of batteries and mercury and then smelting for metals recovery, and
  - (3) For items containing PCBs – technology specifically designed for PCB destruction and licensed under the Toxic Substances Control Act and/or any other applicable law.
  - (4) Toner and toner cartridges, though not an FM, shall be recycled through the OEM or other qualified toner recycler unless it is not economically feasible.

### Energy Recovery, Incineration, and Land Disposal of FMs

- (d) An R2 electronics recycler shall not utilize energy recovery, incineration, or land disposal as a management strategy for FMs or equipment and components containing FMs<sup>8</sup>. However, if circumstances beyond the control of the R2 recycler disrupt its normal management of an FM, it may consider these technologies to the extent allowed under applicable law.

### Selection and Ongoing Due Diligence of Downstream Vendors for FMs

- (e) For shipments of removed FMs, and shipments of equipment and components containing FMs, an R2 electronics recycler shall select downstream vendors that possess and conform to:
- (1) The R2 recycler's FM Management Plan (developed in accordance with and including the requirements set forth in Sections (b) - (d) above),
  - (2) A documented environmental, health, and safety management system,
  - (3) A list of its environmental permits and copies of each,
  - (4) This Section (e) of Provision 5, thereby establishing that each vendor in the Recycling Chain conforms to these subsections (1) – (7),
  - (5) Provision 6 (Reuse),
  - (6) The exporting requirements of Provision 3 (a) (2), and
  - (7) Provision 7 (Tracking Throughput).
- (f) An R2 electronics recycler shall confirm, through audits or other similarly effective means that each downstream vendor in the Recycling Chain to which Section (e) applies continues to conform to the requirements of Section (e) for as long as it receives FMs directly or indirectly from the R2 recycler.

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<sup>8</sup> Unless applicable law requires the use of one of these technologies (e.g., thermal destruction of PCBs).

## 6. **Reusable Equipment and Components**

General Principle: *An R2 electronics recycler shall refurbish as needed, properly test, and adequately package equipment and components going to reuse.*

R2 Practices:

- (a) An R2 electronics recycler shall not allow equipment or components to be sold or donated for reuse if contrary to commercial agreements.
- (b) An R2 electronics recycler shall, with respect to equipment and components it ships downstream:
  - (1) Label and sort each shipment in a manner sufficient to track throughput in conformity with Provision 7.
  - (2) Handle and package shipments in conformity with Provision 12.
- (c) An R2 electronics recycler, prior to shipping equipment and components (except equipment and components that are new and in their original packaging) that contain FMs and that will be reused as is or repaired, refurbished, or remanufactured, shall:
  - (1) Utilize effective testing methods to confirm that the Key Functions of the equipment or components are working properly, or
  - (2) Determine that the recipient vendor is a certified R2 electronics recycler, or
  - (3) Confirm through an appropriate combination of contractual agreements, detailed materials tracking and recordkeeping, and auditing that:
    - (A) The equipment or components meet the specifications of the recipient vendor, and
    - (B) The recipient vendor sells the equipment or components for reuse, with their Key Functions functioning properly, and
    - (C) The recipient vendor manages all residual FMs resulting from refurbishing operations in a manner that conforms to the R2 Practices.
- (d) An R2 electronics recycler need not conform to Section (c) for shipments of less than 15 units that either are going to a new vendor as a sample for purposes of evaluation of whether to purchase larger quantities for refurbishment or that are being sold with a practical return policy to an end user. This Section (d) does not apply to multiple sales or shipments within a proximate timeframe to the same entity.
- (e) An R2 electronics recycler need not conform to the downstream requirements of Provision 5 for shipments that satisfy the requirements of Section (c) or (d), or are new and in their original packaging.
- (f) An R2 electronics recycler need not conform to the exporting requirements of Provision 3 (a) (2) for shipments that satisfy either the functionality requirement of Section (c) (1) or the requirements of Section (d), or are new and in their original packaging.

## 7. **Tracking Throughput**

General Principle – *An R2 electronics recycler shall maintain business records sufficient to demonstrate the material flow of equipment, components, and materials that pass through its facility.*

R2 Practices:

- (a) An R2 electronics recycler shall maintain for at least three years commercial contracts, bills of lading, or other commercially-accepted documentation for all transfers of equipment, components, and materials into and out of its facility, as well as for any brokering transactions.

## 8. **Data Destruction**

General Principle – *An R2 electronics recycler shall employ generally-accepted data destruction procedures.*

R2 Practices:

- (a) An R2 electronics recycler shall sanitize, purge, or destroy data on hard drives and other data storage devices (the National Institute of Standards and Technology's (NIST's) Guidelines for Media Sanitation – Special Publication 800-88 88<sup>9</sup> lists categories of devices which need sanitization consideration), unless otherwise requested in writing by the customer. The R2 electronics recycler shall adhere to the data sanitization, purging, or destruction practices described in the NIST Guidelines for Media Sanitation: Special Publication 800-88 or another current generally-accepted standard, or be certified by a generally-accepted certification program.
- (b) An R2 electronics recycler shall document their data destruction procedures.
- (c) Employees involved in data destruction shall receive appropriate training on a regular basis.
- (d) Data destruction processes shall be reviewed and validated by an independent party on a periodic basis.

## 9. **Storage**

General Principle – *An R2 electronics recycler shall store items and materials that may cause risk to worker health or safety or the environment if inappropriately stored, and equipment and components going to reuse, in an appropriate manner.*

- (a) An R2 electronics recycler shall store items removed pursuant to Provision 5, and equipment and components destined for reuse, in a manner that:
  - (1) Protects them from adverse atmospheric conditions and floods and, as warranted, includes a catchment system, and
  - (2) Is secure from unauthorized entrance, and
  - (3) Is in clearly labeled containers and/or storage areas.

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<sup>9</sup> See [http://csrc.nist.gov/publications/nistpubs/800-88/NISTSP800-88\\_rev1.pdf](http://csrc.nist.gov/publications/nistpubs/800-88/NISTSP800-88_rev1.pdf)

## 10. **Facility Security**

General Principle – *An R2 electronics recycler shall employ facility security measures appropriate for the equipment they handle and customers they serve.*

### R2 Practices:

- (a) An R2 electronics recycler shall maintain a security program that controls access to all or parts of the facility in a manner and to a degree appropriate given the type of equipment handled and the needs of the customers served.

## 11. **Insurance, Closure Plan, and Financial Responsibility**

General Principle – *An R2 electronics recycler shall possess insurance that is adequate to cover the potential risks and liabilities associated with the nature and size of the company's operations, and shall have adequate legal and financial assurances in place for the proper closure of its facilities.*

### R2 Practices:

- (a) An R2 electronics recycler shall possess adequate Comprehensive or Commercial General Liability Insurance including coverage for bodily injury, property damage, pollutant releases, accidents and other emergencies.
- (b) An R2 electronics recycler shall develop and keep current a written plan and a sufficient financial instrument that assures proper closure of the facility and assures against abandonment of any electronics recycling products, components, or materials.

## 12. **Transport**

General Principle – *An R2 electronics recycler shall transport all equipment, components, and materials using entities that have the necessary regulatory authorizations and in a manner protective of public health and the environment.*

### R2 Practices:

- (a) An R2 electronics recycler ensures that all equipment, components, and materials to be transported are packaged appropriately in light of the risk they could pose during transportation to public health or the environment and the level of care warranted by their intended use.
- (b) An R2 electronics recycler obtains written documentation or a third-party certification indicating that their transporters have all the necessary regulatory authorizations and no significant violations of relevant legal requirements during the past 3 years.

### 13. Recordkeeping

General Principle – *An R2 electronics recycler shall maintain the documentation necessary for an auditor to assess its conformity to the requirements of this document.*

R2 Practices:

- (a) An R2 electronics recycler shall maintain in a single location each piece of documentation necessary to show conformity to each requirement of this document.

# **DEFINITIONS**

## **Accredited Certification Body**

An “accredited certification body” is accredited under ISO Guide 66 or ISO/IEC Standard 17021:2006 to certify electronics recyclers to the R2 Practices.

## **Downstream Vendors**

“Downstream vendors” include any entity to which a recycler transfers used or end-of-life electronic equipment, components, or materials including reuse, refurbishing, demanufacturing, processing, materials recovery, energy recovery, incineration, and disposal facilities.

## **Electronic Equipment**

“Electronic equipment”, also referred to as “equipment and components”, includes computers and peripheral equipment – central processing units (CPU’s), monitors, printers, keyboards, scanners, storage devices, servers, networking systems; copiers; fax machines; imaging systems; printing systems; telephones; televisions; video cassette recorders; camcorders; digital cameras; control boxes; stereo systems; compact disc players, radios, cell phones; pagers; personal digital assistants (PDAs); calculators; organizers; and game systems and their accessories. It furthermore includes any other or new (future) types of equipment that are designed primarily to store or convey information electronically, and any new accessories to such equipment.

## **Key Functions**

“Key Functions” are the originally-intended functions of a unit of equipment or component, or a subset thereof, that will satisfactorily serve the purpose(s) of someone who will reuse the unit.

## **R2 Focus Materials**

“R2 Focus Materials”, also referred to as “FMs”, are materials in end-of-life electronic equipment that warrant greater care during recycling, refurbishing, materials recovery, energy recovery, incineration, and/or disposal due to their toxicity or other potential adverse worker health and safety, public health, or environmental effects that can arise if the materials are managed without appropriate safeguards.

The following are R2 Focus Materials:

- (1) Items containing polychlorinated biphenyls (PCBs),
- (2) Items containing mercury,
- (3) CRTs and CRT glass,
- (4) Batteries
- (5) Whole and shredded circuit boards, except for whole and shredded circuit boards that do not contain lead solder, and have undergone safe and effective mechanical processing, or manual dismantling, to remove mercury and batteries.

Equipment, components, or materials (whole or shredded) that have undergone safe and effective mechanical processing or manual dismantling to remove FMs, yet still retain de minimus amounts of FMs, are not subject to the R2 requirements that are triggered by the presence of FMs.

### **Recycling Chain**

“Recycling Chain” refers to all the downstream vendors that handle end-of-life equipment, components, or materials that pass through an R2 electronics recycler’s facility or control. It includes, but does not extend beyond materials recovery facilities such as smelters. For equipment and components that are sold or donated for reuse, it does not extend beyond the entity that conforms with Provision 6 (c) or (d).

### **Recyclers**

“Recyclers” includes but need not be limited to electronics resellers, refurbishers, recyclers, demanufacturers, asset recoverers, brokers, as well as leasing companies that engage in these activities.