TECHNICAL GUIDELINES ON ENVIRONMENTALLY SOUND E-WASTE MANAGEMENT

FOR COLLECTORS, COLLECTION CENTERS, TRANSPORTERS, TREATMENT FACILITIES AND FINAL DISPOSAL IN GHANA

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Technical Guidelines on Environmentally Sound E-Waste Management for Collectors, Collection Centers, Transporters, Treatment Facilities and Final Disposal in Ghana

Copies of this guidelines are available in electronic format from the website of the Environmental Protection Agency or in hard copy from the bookshop of the Agency.

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Acknowledgement

The Technical Guidelines on Environmentally Sound E-Waste Management for Collectors, Collection Centers, Transporters, Treatment Facilities and Final Disposal in Ghana have been developed by the Environmental Protection Agency (EPA).

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ABBREVIATIONS

GSA	Ghana Standards Authority
FID	Factories Inspectorate Department
EPA	Environmental Protection Agency
Hg	Mercury
FLs	Fluorescent Lamps
Pb	Lead
ULABs	Used Lead Acid Batteries
CFCs	Chlorofluorocarbons
HCFC	Hydrochlorofluorocarbon
PFCs	Perfluorocarbons
HCFC	Hydrofluorocarbons
CRT	Cathode Ray Tube
PCB	Polychlorinated Biphenyls
HFC	Hydrocarbons
BFRs	Brominated Flame Retardants
LED	Light Emitting Diode
LCD	Liquid Crystal Display
HC	Hydrocarbons

DEFINITIONS

"Agency" means the Environmental Protection Agency established under the Environmental Protection Agency Act, 1994 (Act 490);

"Analysis" means the extraction, purification, separation, identification, quantification, and reporting of polychlorinated biphenyls concentrations in the matrix of interest;

"Approved site or facility" means a site or facility authorized or permitted by the Agency for the disposal of hazardous wastes or other wastes;

"After-care of disposal site" means the after-care of a site which is still in operation as well as of a site which is no longer in operation;

"Area" means any land, marine area or air space within which the Republic exercises administrative and regulatory responsibility, as regards the protection of human health or the environment;

"Basel Convention" means the Basal Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal adopted on March 22, 1989 and entered into force on 1992;

"Carrier" means a person who transports hazardous wastes and other wastes by means of conveyance such as trucks, taxi auto, bus, airplane, train, or ship;

"Child" refers to the Act of the Parliament of the Republic of Ghana entitled "The Children's Act,

1998" (Section 1) and describes a person below the age of eighteen years.

"Collection" includes the environmentally sound mixing, bulking and sorting of wastes and interim storage at an approved site or facility for hazardous wastes and other wastes as well as waste generated in small quantities within the Republic;

"Collection center", also called "Buy Back Centre", refers to any facility where e-waste is handed over by collectors and that temporarily stores e-waste before it is transported to treatment facilities or for final disposal;

6 In accordance to the Ghana E-Waste Act 917.

"Commercial building" means an enclosed structure that is used for the selling of goods and the provision of services and is open to the public and includes, but is not limited to malls, restaurants, schools, hotels, offices, including government buildings and the like;
"Court" means a Court of competent jurisdiction;

"Disposer" means a person to whom hazardous wastes or other wastes are shipped and who carries out the disposal of the wastes;

"Distributor" means any person who is a wholesaler or retailer of electronic goods with an annual turnover of ten thousand Ghana Cedis; "electrical and electronic waste (e-waste)" means discarded electronic equipment inclusive of all components, subassemblies and consumables which are part of the product at the time of discarding;

"Energy recovery" means the use of combustible waste as a means of generating energy through direct incineration with or without other waste but with recovery of the heat;

"Environmentally sound disposal" means disposal in a manner which will project human health and the environment against the adverse effects of the hazardous wastes and other wastes;

"Environmentally sound management" means taking practicable steps to ensure that hazardous wastes or other wastes are managed in a manner which will protect human health and the environment against the adverse effects which may result from the wastes;

"Environmentally sound manner" means in a manner which will protect human health and the environment against the adverse effects which may result from hazardous wastes and other wastes;

"Equipment" means electrical and electronic equipment that is dependent on electric currents or electromagnetic fields in order to work properly, including components that can be removed from equipment and can be tested for functionality and either be subsequently directly reused or reused after repair or refurbishment;

"Exporter" means a person under the jurisdiction of the State of export who arranges for hazardous wastes or other wastes to be exported;
"Facility" means a site, building, structure, installation equipment, pipe or pipeline, well, pit, pond, lagoon, ditch, landfill, storage container, motor, vehicle, rolling stock or aircraft in which an act prohibited by this Act occurs but does not include a vessel;

"Generator" means a person whose activity produces hazardous wastes or other wastes or a person who is in possession or control of those wastes;
"Hazardous wastes" means wastes that belong to any category contained in the schedule (categories of wastes to be controlled), unless they do not possess any of the characteristics contained in the schedule (list of hazardous characteristics) and wastes that do not belong to any category contained in the schedule (categories of wastes to be controlled) but are defined as, or considered to be, hazardous wastes by the domes- tic legislation of the party of export, import or transit under the Basel Convention and material regarded as a hazardous waste in one country may not in another country be regarded as hazardous;

"Industrial facility" means a facility including factories, power generation or distribution stations or sub-stations, assembly plants, feed mills and other buildings and structures used in general industrial assembly;

"Illegal traffic" means any unauthorized transboundary movement of hazardous wastes or other wastes;

"Import" means any entry into the national territory other than entry for transit;

"Importer" means a person who, in the ordinary course of business imports electronic equipment into the Republic or arranges for hazardous waste or other wastes to be imported into the Republic;

"Law enforcement officer" includes a nominated Customs Officer, a member of the Ghana Armed Forces, a designated officer or an inspector of the Environmental Protection Agency, the Port Health Authority, the Ghana Atomic Energy Commission and personnel of other institutions authorized in writing by the Minister who shall have the same powers, authority and privileges of a

police officer;
"Management" means the collection, transport and disposal of hazardous wastes and other wastes and the after-care of disposal sites;

"Manufacturer" means any person who assembles or produces an electronic equipment in the Re- public;

"Minister" means the Minister responsible for the Environment;

"Other wastes" means wastes collected from households or residues arising from the incineration of household wastes and classified under the first schedule as categories of wastes requiring special consideration or waste that possess any of the characteristics

"Person" for purposes of liability includes (a) an owner or operator of a vessel or facility used to per- form acts identified in this Act as prohibited acts; (b) persons who by contract, agreement or other means indulges in acts identified in this Act as prohibited acts;

"Polluter-pays principle" means the principle by which the polluter bears the cost of measures to reduce pollution according to the extent of either the damage done to society or the exceeding of an acceptance level or standard of pollution;

"Polychlorinated biphenyls" means discarded materials that contain polychlorinated biphenyls or have been contaminated with polychlorinated biphenyls, that are without any safe commercial, industrial, agricultural or economic usage;

"Polychlorinated biphenyls equipment" means any equipment that contains 50ppm polychlorinated biphenyls; "polychlorinated biphenyls waste" means contaminated solvent or water, used oil and waste oil, sludges and slurries, dredged spoils, contaminated soils or sediments, by products, scraps, ballasts and capacitors, other materials contaminated with polychlorinated biphenyls as a result of spills, decommissioning and other demolition activities;

"Collector" refers to any person that collects, sorts or consolidates e-waste (as stated in Tier 1 of these guidelines);
"Used equipment" means electrical and electronic equipment that is directly reused for the purpose for which it was originally intended or presented for sale, or transported across borders for the purpose of being put back to direct reuse or sold to end consumers for such reuse and is considered waste if:

a. the equipment is destined for disposal or recycling instead of being transported with the intent of reuse or its fate is uncertain;
b. the equipment is not complete - essential parts are missing and the equipment cannot perform its essential key functions;
c. it shows a defect that materially affects its functionality and fails relevant functionality tests;
d. it shows physical damage that impairs its functionality or safety, as defined in relevant standards, and cannot be repaired at reasonable cost;
e. the protection against damage during transport, loading and unloading operations is inappropriate, for example the packaging or stacking of the load is insufficient;
f. the appearance is particularly worn or damaged, thus reducing the marketability of the item;
g. the item has among its constituent parts hazardous components that are required to be disposed of or are prohibited to be exported or prohibited for use;
h. the equipment is destined for disposal or recycling instead of reuse or its fate is uncertain;
i. there is no regular market for the equipment;
j. it is destined for disassembly to gain spare parts; or
k. the price paid for the items is significantly lower that is a value approaching $0 than would be expected from a fully functional equipment intended for re- use;

"Vessel" means a watercraft or other artificial contrivance which is used or is capable of being used as a means of transportation on water;

"Wastes" means substances or objects, which are disposed of or are intended to be disposed of or are required to be disposed of; and

"Waste electrical and electronic equipment (ewaste)" means electrical or electronic equipment that is waste, including all components, sub-assemblies and consumables which are part of the equipment at the time the equipment becomes waste

"Demagnetization Technique" means neutralizing the magnetic field or polarity of magnetic storage media such as hard disk drives, diskettes, etc., by applying an external magnetic field of opposing polarity.

"Data Overwriting" means performing a single or multiple overwriting passes to destroy the target data on all user-addressable memory locations of a drive

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For the benefit of the environment, this document has been optimized for double-sided printing.

1. Introduction

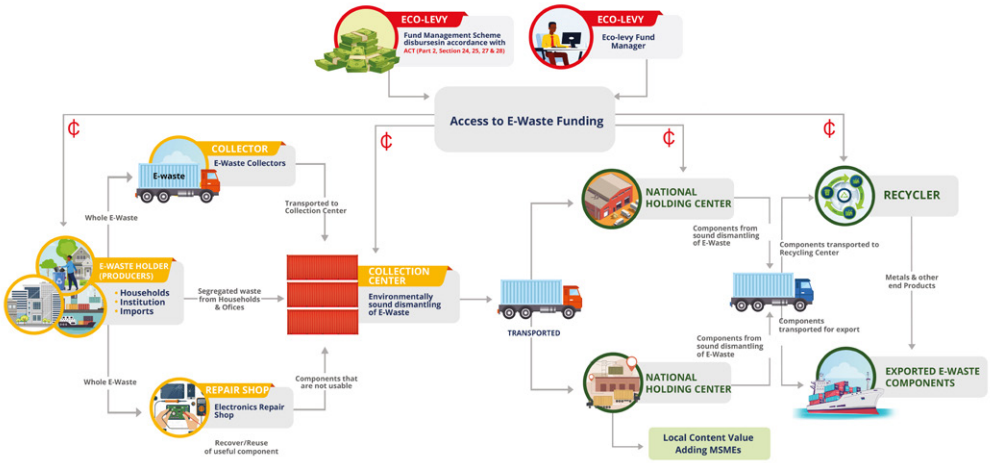
The Guidelines on Environmentally Sound E-Waste Management for Collectors, Collection Centers, Transporters, Treatment Facilities and Final Disposal in Ghana have been developed by the Environmental Protection Agency (EPA) to address the various target groups of the reverse supply chain of electronic and electric equipment becoming e-waste.

By this, the guidelines at hand specifically address the following five target groups which are categorized into tiers:

1. Collectors (Tier 1),
2. Collection Centers (Tier 2),
3. Transporters (Tier 3),
4. Treatment Facilities (Tier 4),
5. Final Disposal (Tier 5)

Below is the interphase of the various players in the national E-Waste management value chain

Figure 1.0: National Integration E-waste Management Scheme



2. General Principles

1. The following guidelines are mandatory in compliance with Act 917, Act 328 and LI 2250 with respect to every undertaking operating in the field of collection, storage, transport, treatment and final disposal of e-waste in Ghana.
2. The Guidelines are non-exhaustive for treatment processes where emissions of the following substances occur:

    a. Mercury (Hg), for example by recycling of fluorescent lamps (FLs),1

    b. Lead (Pb), for example by recycling of used lead-acid batteries (ULABs),2

    c. Ozone depleting Chlorofluorocarbons (CFCs) and Hydrochlorofluorocarbons (HCFCs)3 and highly climate relevant Perfluorocarbons (PFCs) and Hydro- fluorocarbons (HFCs), for example within the recycling process of refrigerators and air-conditioners.4, 5

For such treatment processes, additional substance specific process and management standards shall be applied.

NOTE: The special guidelines are to be developed in the future.

3. Compliance with the regulatory requirements is verified by annual audits executed by the Environmental Protection Agency (EPA), or by a competent third party. Compliant undertakings will be issued with an audit certificate by EPA.
4. The treatment facility shall ensure that there is insurance cover according to the Act 917, Part I, Section 15.
5. The treatment facility shall take necessary steps to optimize re-use of incoming e-waste.
6. Collection centers (Tier 2), transporters of e-waste (Tier 3), treatment facilities (Tier 4) and final disposers (Tier 5) shall undertake Environmental Assessment as required by LI 1652.
7. The requirements described in the following guidelines must hold for every e- waste operator, except for tier 1 operators.

1. Such as EN 50625-2-1
2. Basel Convention/UNEP 2003: Technical Guidelines for the Environmentally Sound Management of Waste Lead-acid Batteries, http://archive.basel.int/pub/techguid/tech-wasteacid.pdf
3. According to L.I. 1812: MANAGEMENT OF OZONE DEPLETING SUBSTANCES AND PRODUCTS REGULATIONS, 2005
4. Such as EN 50474; EN 50625-2-3, forthcoming
5. More information can be found at GIZ 2017: Guideline on the Manual Dismantling of Refrigerators and
6. Air Conditioners. https://www.giz.de/expertise/downloads/giz2017-en-weee.pdf

3. Guiding Principles for Collectors (Tier 1)

1. **Applicability.** These guidelines apply to any person that collects, sorts or consolidates e-waste.

2. **Registration.**

   a. A collector shall be registered with the relevant MMDAs within the locality in which they operate.

   b. A collector shall register with a collection center using the unique registration number generated at the relevant MMDA

   c. A collector shall complete and submit the relevant registration form as specified by the Agency and attach the business registration documents, Ghana card and TIN.

3. **Collection management standards**. A collector shall manage all of its collection activities in the following manner:

   a. The collection location must have a Property address and must be approved by the relevant MMDA. (property address includes Ghana Post GPS, Assembly property number, street name and QR)

   b. The collection and temporary storage location should be adequately protected against unauthorized entry and theft.

   c. All staff shall receive appropriate training provided by EPA, Department of Factories Inspectorate, and other EPA approved institutions.

   d. The collector shall follow standard health and safety requirements as regards health and safety by the use of appropriate personal protective equipment (PPE).

   e. The collector shall have the flexibility of sending collections to any collection center of choice.

4. **Materials management standards.** A collector shall manage e-waste in a way that prevents releases of gases, liquids or solid particles from any e-waste, or component, to the environment.

The Collector shall:

a. Store e-waste on an impervious surface within a structure or a transportation unit such that it is protected from precipitation. E-waste must be stored in such a way that it is not exposed to direct sunlight and rainfall.

b. Ensure that whole or fractions containing hazardous substances shall be temporarily stored in a manner that prevents dispersal of hazardous materials to the environment. Collectors can provide temporary storage of aggregated material. EPA should also provide conditions for operating such temporal storage points such as duration of storage, how it should be stored, punitive measures for non-compliance, training

c. Maintain adequate storage space and good housekeeping.

d. Transport, store and handle e-waste in a manner adequate to minimize damage.

e. Not mix e-waste with any other type of waste.

f. The collector shall be trained in sustainable material management standards

5. Prohibited activities. A collector shall not:

a. Engage in any disposal activities outside the collection centers (Tier 2);

b. Engage in any treatment activities of e-waste (such as dismantling);

c. Burn whole or components of e-waste;

d. Deliver whole or components of e-waste to a collection center that is not permitted by EPA;

e. Export whole or components of e-waste; however, a collector shall export e- waste in accordance with section 20, subsection 1 and 3 of Act 917, and LI 2250 regulation.

6. Transport

The guidelines in Tier 3 shall apply for collections above 200kg. Transport arrangement for collections below 200kg is at the discretion of the collector.

4. Guiding Principles for Collection Centers (Buy Back Centers) (Tier 2)

1. **Applicability.** These guidelines apply to collection centers where e-waste is temporarily stored before transported to treatment facilities (Tier 4) or for final disposal according to regulation 47 of LI 2250.
2. **Registration.**
    a. The operator of a collection center shall be registered with the relevant MMDAs within the locality in which they operate.
    b. A collection center shall register and obtain a permit from EPA by completing and submitting the required form as provided in by the Agency in line with LI 1652 and LI 2250.
3. **Satellite collection centers** may be established under a permitted collection center to ease the collection activity.
4. **A Collection center** shall register and keep records of collectors registered under them.
5. **Collection centers** shall undertake annual classification of e-waste in collaboration with the relevant center owners.
6. **Facility management standards.** A registered collection center shall manage all of their facility(ies) in the following manner:
    a. The collection location must have a Property address and must be approved by the relevant MMDA. (property address includes Ghana Post GPS, Assembly property number, street name and QR)
    b. The collection and storage location shall be adequately secured and protected against unauthorized entry and theft until transported to the registered treatment facility.

c. Infrastructure for collection centers shall meet the following minimum requirements:

   i. spacious enough to contain all the waste

   ii. have a shed for protection from direct sunlight and rainfall

   iii. restricted access to the public

   iv. the compound must be spacious enough to allow for maneuvering of vehicles

   v. the floor must have an impervious surface

   vi. Must have firefighting equipment

   vii. Must be made of material that is fire resistant

   viii. Must have emergency response measures

   ix. Must have adequate ventilation

   x. Should not be located in a flood prone area

d. All staff shall receive appropriate training provided by EPA, Department of Factories Inspectorate, and other EPA approved institutions.

e. Manage and operate the facility in accordance with documented Standard Operating Procedures that identifies and minimizes risks of pollution.

f. The facility shall have minimum procedures in place as required by Act 328, Act 490, LI 1652 and LI 2250.

7. **Materials management standards:** A registered collection center shall manage e- waste in a way that prevents releases of gases, liquids or solid particles from whole or components of e-waste to the environment and the facility shall:

   a. Erase data from all storage devices at the point of collection using methods such as demagnetization technique, Data Overwriting, etc;

   b. Store e-waste on an impervious surface within a structure or transportation unit such that it is protected from precipitation. E waste

must be stored in such a way that it is not exposed to direct sunlight and rainfall;

c. Store whole or components of e-waste containing hazardous substances in a manner that dispersal of hazardous materials to the environment are prevented. Segregate, store and label whole or components of e-waste by type e.g., lamps, cables, plastics, etc)

d. Maintain adequate storage space, ensure access for free movement to all sections of the facility and good housekeeping;

e. Transport, store and handle e-waste in a manner adequate to minimize damage.

f. Containers, pallets, or packages containing e-waste shall be clearly marked appropriately (e.g. "E-WASTE").

g. E-waste shall not be mixed with any other types of waste.

8. **Recordkeeping.** The following shall be recorded:

   a. Details of the collector

   b. The quantities of incoming and outgoing e-waste according to Annex C of LI 2250.

   c. The types of e-waste collected from covered entities (e.g. Cathode Ray Tube Television, Desktop Computer, mobile phones, etc.);

For standardization provide a template for record keeping as an annex

9. **Annual audits** shall be conducted on the facility by EPA and its agents or a third party.

10. **In case treatment activities** (e.g. depollution) are allowed by EPA under (10)b, provision should be made to capture the depollution status of the e-waste according to Annex C at the collection center before packaging and transportation.

11. **Prohibited activities**. A collection center shall not:

    a. Dispose any negative value fractions of e-waste. All unusable fractions shall be sent to a disposal facility.

    b. Engage in any treatment activities of e-waste (such as dismantling) unless permitted by EPA.

    c. Burn/incinerate whole or components of e-waste.

    d. Deliver whole e-waste or components to a facility that is not registered under LI 2250 and LI1652.

    e. Export or import e-waste unless done in accordance with section 20, sub-section 1 and 3 of Act 917 and LI 2250.

12. **Transport**

    a. A combination of push trucks, wheel barrows and tricycles may be used in the local communities to transport e-waste to satellite collection centers within the local community with the materials covered to avoid accidents and nuisance.

    b. light weight vehicles, with the materials covered to avoid accidents and nuisance may be used to transport waste from satellite collection centers to the main collection centers.

    c. Vehicles transporting e-waste are required to be disinfected and decontaminated at the collection centers in order to avoid the transfer of any hazardous material to a subsequent item the vehicle may transport.

13. **Sitting**

    a. The siting of primary collection center shall only be located in commercial and industrial areas.

    b. Satellite collection centers that are connected to a primary collection center may be sited at an approved residential, commercial and industrial area. Collection centers are only permitted in commercial areas according to the MMDA official. The EPA should look into this.

14. Prototype Collection Centres

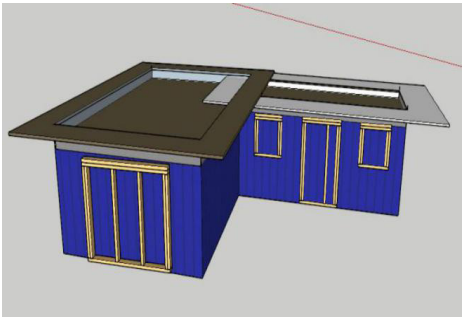
a. The underlisted are the minimum recommended prototype collection centres for adoption (but not mandatory) by proponents wishing to set up a collection centre with a minimum storage volume of ..... but not exceeding 13,800m3. In all cases, there must be washrooms and water harvesting system and the premise concrete or paved.

i. Normal warehouse: This could be block work or steel and cladding.

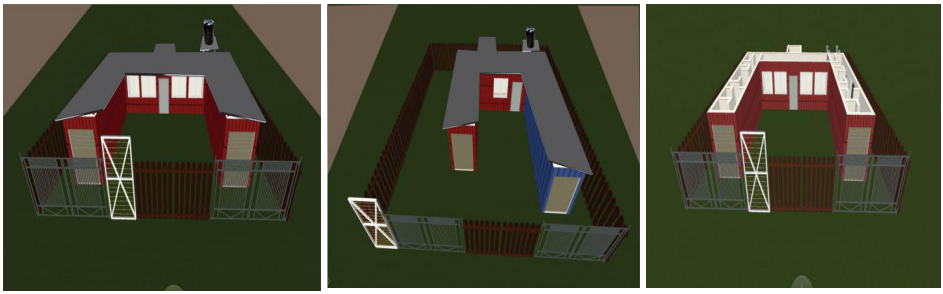
ii. Container structures: Structures must conform to Land Use and Spatial Planning Authority Act 2016, Act 925, and building code and any future amendments of these. (Refer to Annex .....for a list of requirements for land use and spatial plannimg)

PROTOTYPES SHOULD BE ANNEXED AND INCLUDE POSSIBLE DESIGNS FOR THE ROOF, LAYOUT, FLOORING, ETC FOR REFERENCE

i. Single container (20-footer or 40-footer), security light, paved/concrete yard and operating area



ii. Two (2No.) containers (20+20 footer or 20+40 footer or 40+40 footer), security light, paved/concrete yard and operating area (L-shape arrangement)



iii. Three (3No.) containers (20+20+20 footer or 20+20+40 footer or 20+40+40 footer or 40+40+40 footer), roofed and equipped with rainwater harvesting, security light, paved/concrete yard and operating area

iv. Four (4No.) containers – single storey (20+20+20+20-footer or 40+40+40+40-footer square-shape arrangement) or (20+40+20+40-footer rectangular-shape arrangement). All with washrooms at the back corners and exits at the front corners. Roofed and equipped with rainwater harvesting, security light, paved/concrete yard and operating area.

v. Eight (8No.) containers – 2-storey (20+20+20+20 square x 2 (stacking) or 40+40+40+40 square x 2 (stacking), or 20+40+20+40 rectangular x 2 (stacking). All with washrooms at the back corners and exits at the front corners. Roofed and equipped with rainwater harvesting, security light, paved/concrete yard and operating area.

5. Guiding Principles for Transporters (Tier 3). Reflects also to Tier 01 restricted to 200Kg max load.

1. **Applicability.** These guidelines apply to an entity that transports e-waste (in accordance with Regulation 56 of LI2250) from a collection point to a recycler, between collection centers (from a collector to collector), or from a recycler to a recycler (between treatment facilities). Transporters of Tier 1 are exempted from the following requirements; however, requirements of Tier 1 apply.
2. **Capacity Building for Collection Center**. Appropriate quantities to transport.
3. **Registration.** A transporter shall register with EPA or other relevant authorities (such as district assemblies).
4. **Transboundary movement:** The transporter of transboundary e-waste shall comply with relevant provisions of LI 2250 and other international conventions. Only in steps till processing facilities are in place in Ghana.
5. **Re-use.** The transporter shall ensure that collected e-waste is transported in a way that does not limit the potential for re-use purposes. Closed Ct and Trucks. Also sealing to protect the transporter. Example: In case e-waste seems to be suitable for re-use, they shall not be trans- ported in a manner that they are likely to be damaged.
6. **Transport Capacities.**
    a. The transporter shall ensure that the transport capacities comply with the road traffic regulation of Ghana. Regulation have to be amended they are not up to HW Standards
    b. All transporters shall receive appropriate training approved by EPA and FID. Plus, special training for the driver.
7. **Materials management standards.** A registered transporter shall manage e- waste in a way that prevents releases of except gases, liquids or solid particles from it or components of e-waste to the environment.

8. **Registered transporters shall:**

   a. Ensure that all fractions containing hazardous substances are stored in a manner that prevents dispersal of hazardous materials to the environment. Applicable for Collection Center.

   b. Develop Standard Operating Procedures (SOP) for transport and handling of e-waste including remedies for emergencies. Develop Emergency procedures equal to fuel transportation ADR System

   c. Transport e-waste in a transportation unit that that is purposely prescribed. Ct, closed trucks of different load capacities.

   d. Transport reusable electric and electronic devices in a transportation unit that is purposely prescribed. Closed Vans of max 500 kg load capacity.

   e. Alert other road users and notify appropriate authorities for clean-up in case of an accident. ADR.

   f. E-waste shall not be mixed with any other materials.

9. **Recordkeeping requirements.**

   a. The transporter shall retain a copy of the way bill at all times.

   b. The transporter shall keep records in accordance with LI 2250.

Note: If e-waste is transported, the Ghana Waste Manifest also requires records on the types and quantities of e-waste transported (e.g. Cathode Ray Tube Television, Desktop Computer etc.) in accordance with the template in Annex C. Responsibility of the Collection Center.

10. **Prohibited activities. A transporter shall not:**

   a. Dispose of any e-waste; whole or components;

   b. Engage in any treatment activities of e-waste (such as dismantling);

   c. Burn/incinerate whole or components of e-waste;

d. Deliver e-waste or components to a facility that is not registered under this guideline;

e. Transfer e-waste whole or components in case of malfunctioning of vehicle to unregistered vehicles without notifying EPA.

6. Guiding Principles for Treatment Facilities (Recyclers) (Tier 4)

1. **Applicability.** These guidelines apply to treatment facilities (section 57) that dismantle (section 49), recycle (section 50), prepare for re-use or repair/refurbish (section 46) and recover (section 58) electrical and electronic waste (e-waste) operating under LI 2250.

2. **Registration and assessment:**

   i. A treatment facility shall register with EPA by completing the relevant form and with other relevant authorities. The recovery and treatment facility shall only be permitted in industrial areas. However, manual dismantling, repairs or refurbishing may be permitted and sited in mixed-use and commercial areas.

   ii. The assessment of treatment or recovery and dismantling facilities shall be placed at the Environmental Impact Assessment (EIA) and Preliminary Environmental Assessment (PEA) level respectively; whilst small manual dismantling, repairs or refurbishing shall be assessed at the registration level.

3. **Facility management standards.**
   a. Management Principles

i. The treatment facility shall ensure that a management system is in place for all activities in the fields of health, safety, environment and quality.

ii. The treatment operator shall demonstrate continual improvement of their activities by a review and management process. This management process shall be updated or revised as changes occur to the activities of the operator and evaluated in order to monitor its effectiveness.

iii. The treatment operator shall establish and maintain a procedure in order to identify legal requirements that are applicable to the environmental, health and safety aspects of all activities, services and processes undertaken at the facility.

Note: Within a conformity assessment audit it could be checked if all relevant laws and further legal requirements are available on-site and that all relevant persons are familiar with them.

iv. The treatment operator shall demonstrate that confidential and personal data stored in the permanent memory of received IT-Equipment is destroyed e.g. by physical destruction of the memory or through secure data.

Example: To fully ensure that the data will not be accessible anymore, it would be necessary to physically destroy a magnetic hard disc drive by drilling a hole in it.

b. Technical and Infrastructural Pre-Conditions

i. The treatment operator shall possess infrastructure, in terms of size, technologies installed, and characteristics of the operations, that is suitable for the activities performed on site. Suitability of the site shall be assessed by a risk management process for all tasks performed on site and include the identification of hazards, the assessment of risk and, where appropriate, the elimination or reduction of the risk, and documentation of the process.

Example: The treatment operator must know the relevant health & safety and environmental risks and shall demonstrate appropriate risk mitigation measures. For example, the risk of being injured by falling e-waste components from high piles can be reduced by sufficient storage space, as well as structures (e.g. shelves, walls) to prevent such hazards.

ii. This risk assessment shall include among others the identification of those locations and activities that require the use of personal protective equipment and procedures to be followed.

iii. Treatment facilities including storage areas shall be designed, organized and maintained to provide safe access to and egress from the site.

iv. Treatment facilities should be adequately protected against unauthorized entry and theft.

v. Weatherproof covering shall be required for the areas where:

- whole equipment and/or components are intended for preparation for re-use are stored and/or prepared for re-use, or;
- e-waste and fractions thereof that can cause emissions that are hazardous to human health and the environment is stored and/or treated. These fractions are further specified in ANNEX B.
- the following components, mercury containing components, batteries, printed circuit boards, toner cartridges, asbestos and components which contain asbestos, cathode ray tubes, gas discharge lamps, components containing refractory ceramic fibers and components containing radioactive substances, insulation foam from dismantled refrigerators (see also section I. ii, p. 21).

Note: Especially gas discharge lamps shall not be exposed to direct sunlight.

vi. The operator shall ensure that the treatment facility where the e-waste is treated shall have the following properties:

- impervious floor,
- appropriate fire precautions.

Example: Weatherproof cover can be a roof and surrounding walls to prevent e-waste from sunlight and rainfall. Also important is a concrete floor that can be properly cleaned and that is protected against the entry of floodwater in the event of heavy rainfalls.

c. Training

i. All persons at the treatment facility shall be made familiar with the environmental, health and safety policy of the facility.

ii. All training staff shall receive appropriate training provided by EPA, Department of Factories Inspectorate (DFI), or by an accredited institution.

iii. Additionally, employees shall be made familiar with the environmental, health and safety policy of the facility by in-house trainings.

iv. In-house as well as EPA certified training shall include emergency response planning, occupational health and safety measures, and training for the relevant operations performed on site. The effectiveness and suitability of training shall be checked regularly. Training programs shall be delivered at a level suitable to the trainee in form, manner and language.

v. Where the risk assessment has identified the need for personal protective equipment (PPE) training in the proper use of that PPE shall be provided.

Examples: For e-waste dismantling safety boots, safety glasses and work gloves are essential.

vi. Accordingly, training personnel shall have a certificate by EPA or other approved institution.

d. Monitoring

i. The treatment facility shall record the origin of each consignment of e- waste accepted at the treatment facility.

ii. The treatment facility shall record the downstream treatment of e- waste and fractions thereof until end-of-waste status is reached or until the e-waste is prepared for re-use, recycled, recovered, or disposed of.

iii. The treatment facility shall maintain the following records from the out- put fractions resulting from the treatment process according to the tem- plate in Annex C.

iv. Furthermore, the treatment facility shall collect and file the disposal certificates of the e-waste receiving companies that treat the negative value fractions.

e. Storage and Handling

i. E-waste should be stored according to categories and

in their natural position.

ii. Locations that store e-waste prior to treatment shall have:

- Effective and efficient impermeable surfaces to prevent ground water and soil contamination;
- The provision of spillage collection facilities relevant to the type of e-waste stored
- Where appropriate, decanters and cleanser-degreasers, and weatherproof covering for appropriate areas, so there are no emissions which give rise to an adverse environmental impact.
- Where containers are used for storage of equipment and fractions and these have led to pollutant dispersion, the affected containers shall be cleaned and decontaminated prior to their re-use, recycling or disposal.

iii. The treatment facility shall possess infrastructure, in terms of size, technologies installed, and characteristics of the operations, that is suit- able for the activities performed on site. This holds particularly with regards to:

- Overall sheltered storage space of the facility,
- Appropriate working space for workers for dismantling,
- Appropriate possibilities to sort and store fractions.
- Appropriate changing rooms fitted with lockers.
- Suitable sanitary facilities and washrooms.
- Technical Requirements

iv. E-waste 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.

Example: Gas discharge lamps shall be handled with due care to prevent breakage resulting in the emission of mercury.

v. During handling and storage attention shall be given but not limited to:

- Temperature exchange equipment (to avoid damage to the temperature exchange system), as well as unnecessary damage to the insulation material of such equipment)

Example: The compressor and cooling circuit of a refrigerator or air conditioner is a temperature exchange system that shall not be destroyed in an uncontrolled manner. Fridge foams should be stored appropriately to avoid inflammation.

- CRT equipment (to avoid implosion and/or emissions of fluorescent coatings);
- Gas discharge lamps, appliances containing gas discharge lamps;
- Appliances containing mercury switches (to avoid breakage resulting in the release of mercury);
- Smoke detectors (as they may contain radioactive components);
- Appliances containing oil and other fluids within an internal circuit, or capacitors containing mineral or synthetic oil (to avoid spillages and other emissions);
- Appliances containing asbestos or ceramic fibers (to avoid release of asbestos or ceramic fibers);
- Photovoltaic panels (to prevent injury from broken glass and electrocution.
- Lead-acid batteries or devices containing lead-acid batteries (to pre- vent emissions of acid and lead particles)
- Lithium-Ion batteries (to prevent overheating and ignition that can cause the outbreak of fires)

f. Receiving of e-waste at treatment facility

i. The treatment facility shall weigh and record each delivery that is received at the facility;

ii. Incoming and outgoing e-waste volumes shall be classified and recorded according to Annex C.

g. Handling of e-waste

i. All handling of e-waste, including the loading, unloading and transport, shall be carried out using appropriate tools, containers and fixings to avoid damage where there is the potential for preparation for re-use or the risk of hazardous substances being emitted.

ii. Uncontrolled tipping of containers with CRT equipment, flat panel display equipment, temperature exchange equipment, and gas discharge lamps and equipment containing gas discharge lamps shall not be permitted.

Example: If the cooling circuit of a refrigerator is destroyed by uncontrolled tipping, refrigerants can leak in an uncontrolled manner. This shall be avoided.

iii. E-waste shall not be handled in a way that subsequent preparation for re-use, depollution or recovery is adversely affected.

Example: If a Flat-Panel TV could be suitable for re-use it is important not to damage the screen, cables or plugs.

iv. CRT equipment, flat panel display equipment, temperature exchange equipment, and gas discharge lamps shall be placed in containers or stacked in a stable manner to prevent damage or breakage.

v. The treatment process to separate material streams shall be documented. Removed substances, mixtures and components (and fractions containing those substances, mixtures and components) shall be kept separate and shall be clearly and identifiable labelled (as stated in section 13, subsection 3(a)) of Act 917.

h. Storage of e-waste prior to treatment

i. The maximum volume of e-waste stored by the treatment facility shall not exceed the storage capacity of the storage facility at the plant. E- waste shall not be stored at the vagaries of the weather.

ii. Where the storage capacity at the treatment facility is exceeded, an alternative suitable warehouse (on site or off site) shall be acquired for storage. The EPA shall be notified within 24 hours of receipt of the e waste in the alternative warehouse.

iii. Additional temporary storage can be granted for e-waste fractions that cannot be managed in an environmentally sound manner in Ghana and which require large-volume shipments to environmentally sound facilities in other countries. Such exemptions can only be granted by EPA and require a written application, including the corresponding justification.

i. Depollution

i. There shall be standard procedures to identify e-waste which are known to contain substances, mixtures and/or components listed in Annex B.

ii. All identified substances, mixtures and components, as listed in Annex B, shall be removed in accordance with the procedures listed in Annex A, EPA Regulations and International Best Practice.

Example: Incoming e-waste is thoroughly screened for substances, mixtures and/or components listed in Annex B. Accordingly, the identified de- vices shall be sorted out and treated in a separate waste stream.

This includes CRT-TVs, gas discharge lamps and batteries (see Annex B).

iii. Depollution shall not damage or destroy components in a way that hazardous substances are released to the environment or distributed to fractions, unless subsequent treatment to remove or render harmless the hazardous substances is carried out. Where release to the environment is possible the fraction containing the

hazardous substances shall be contained and/or sealed prior to treatment. The subsequent treatment mentioned above may be performed at the treatment operator's location or another location. Where the subsequent treatment is not performed at the treatment operator's location, the e-waste thus transferred shall be accompanied by information on depollution already undertaken.

Example: Gas discharge lamps commonly contain mercury and need to be de-gassed appropriately. They shall not be damaged so that mercury is emitted to the environment.

iv. If it is uncertain whether e-waste contains substances, mixtures or components as listed in Annex B, it shall be treated as though it does contain those substances, mixtures or components.

j. Depollution monitoring

i. Monitoring of depollution performance is an important criterion to facilitate continuous improvement of the treatment process.

ii. Where appropriate (see ANNEX B) treatment operators shall carry out monitoring of depollution performance in accordance withthe mass- balance methodology that establishes a mass balance between incoming and outgoing streams.

iii. Provision should be made to capture the depollution status of the e- waste according to Annex C at the collection center before packaging and transportation (pelleting, shrink wrapping and labelling).

k. Treatment of non-depolluted e-waste and fractions

i. Except as specified below, e-waste and fractions containing hazardous substances, hazardous mixtures, or hazardous components shall be treated separately from other waste. It is permitted to treat e-waste and fractions containing hazardousmsubstances, hazardous mixtures, or hazardous components with other hazardous waste if:

- the mixing operation is carried out by a treatment facility

which has obtained a permit from the relevant authorities for this activity; and

- the mixing operation does not adversely affect human health, safety, or the environment as determined by review of the relevant risk assessment;
- the mixing process does not create an additional hazardous waste stream.

ii. If non depolluted e-waste and fractions are treated by a downstream treatment facility, this treatment facility shall be informed in accompanying documents of the potential presence of hazardous material.

iii. The downstream treatment facility shall be informed of the need for the non-depolluted e-waste or fractions to be depolluted in compliance with the objectives of these regardless of the hazardous or non- hazardous nature.

l. Storage of fractions

i. All fractions containing hazardous substances shall be stored in a manner that prevents dispersal of hazardous materials to the environment.

ii. Weatherproof covering shall be provided for storage locations for all e- waste fractions (especially hazardous fractions according to Act 917 and LI 2250).

iii. Containers used for the storage of fractions containing hazardous sub- stances shall be cleaned and decontaminated prior to their re-use, recycling or disposal.

4. Releases. The treatment facility shall put in place and operationalize an Emergency Response Plan in accordance with Act 328, Act 490 and Act 917.

5. **Decommissioning plan.** A treatment facility shall develop a written decommissioning plan for the proper closure of the facility. The decommissioning plan shall comply with the requirements of LI 1652 and other relevant legislations and shall include the following:

a. An estimate of the maximum inventory of e-waste ever on-site over the active life of the facility and a detailed description of the methods to be used during closure, including, but not limited to methods for removing, transporting, treating, storing or disposing of e-waste;

b. A detailed description of the steps needed to remove or decontaminate all harmful residues and contaminated containment system components, equipment, structures, and soils during closure including, but not limited to, procedures for cleaning equipment and removing contaminated soils, methods for sampling and testing surrounding soils, and criteria for determining the extent of decontamination.

6. **Recordkeeping and reporting requirements.** The following shall be reported to

EPA annually:

a. The types of e-waste managed;

b. The quantities of incoming and outgoing e-waste as well as e waste in storage according to Annex C of this regulation.

7. **Prohibited activities**. A treatment facility shall not:

   a. Accept any e-waste it has not been permitted to treat.

   b. Dispose any e-waste inappropriately. A treatment facility shall initiate a shipment of parts to a facility that is permitted or certified to accept those materials and that is registered under Act 917 or internationally.

   c. Transfer any e-waste to an unregistered collector, collection center, transporter or treatment facility.

7. Guiding Principles for Final Disposal of certain hazardous fractions (Tier 5)

1. **Applicability.** The following requirements apply to disposal at landfills, incineration and other technologies approved by EPA.
2. **Registration.** Owners and operators of disposal sites shall be licensed by Ghana EPA and the MMDA (Local Authorities).
3. **Scope of e-waste** that should be disposed off
    a. No whole e-waste should not be disposed without recycling
    b. Rigid and PU Foams shall be disposed off by incineration
    c. Plastic forms that don't have facilities for recycling in the country can be incinerated.
    d. Metal components that cannot be recycled shall be placed in a designated cell in the landfill site.
    e. Liquids and powders shall be stabilized before landfilling.
4. **Facility management.**
    a. Incineration and landfill facilities shall be registered and permit obtained in accordance with LI 1652.
    b. The disposal site shall be managed in accordance with these guideline, the guidelines for landfill management, the LI2250 and other relevant legislations.
    c. Disposal should be done in specialized cells or sections in a licensed landfill site.
    d. Owners and operators should be trained by competent institutions in collaboration with EPA with regards to technical knowledge and understanding of the hazardous nature of e-waste.
    e. The disposer shall issue a certificate to the owner of the waste.
    f. The facility shall put in place appropriate pollution control measures/ systems to ensure compliance with EPA requirement.

g. The owner of the waste shall ensure the facility has a valid permit to handle type of waste being received.

h. Annual audits of the facility shall be conducted by EPA or any independent certified auditor.

5. **Record keeping.** Disposers shall keep a record of the amounts and categories of e-waste according to Annex C and the LI 2250, which EPA may access upon request or during inspection of e-waste handling facilities.

6. **Transportation**

a. Covered trucks with the appropriate signs shall be used to transport e-waste to a disposal site.

b. Drivers and accompanying workers shall be trained and equipped with the appropriate PPEs for safe transportation.

c. No liquid or powdered substances shall be transported without prior stabilization.

7. **Prohibitions**

a. E-waste shall not be mixed with other waste for landfilling;

b. Burying outside the landfill and open burning is strictly prohibited. As contaminants from buried materials may easily leach into the soil and pollute both soil and groundwater resources and emissions from burnt material may lead to considerable air pollution.

c. The disposal site is strictly out of bound to all unauthorized persons especially for children.

d. Only components of e-waste that cannot be recycled or treated both in country and outside the country should be disposed of.

8. **Categorization of Disposal Sites**

a. Classification shall be based on the potential to pollute

b. Incinerators: An Incinerator shall be sited, constructed and operated in accordance with the LI2250 and any other relevant Law.

Categories	Range (ton/year)
A	0 – 500
B	501 – 1,500
C	1,501 – 3000
D	3001– 5000
E	> 5000

c. Landfill Site Charges should be reasonable to encourage the establishment of such facilities.

A.1. ANNEX A: DEPOLLUTION

Introduction

This annex refers to Chapter 6; depollution, and gives additional information about substances, mixtures, and components to be removed from e-waste according to Annex B (Materials and components of e-waste requiring selective treatment).

Substances, mixtures and components shall be removed such that they are contained as an identifiable stream or identifiable part of a stream by the end of the treatment process. A substance, mixture or component is identifiable if it can be monitored to prove environmentally safe treatment. As a consequence of this interpretation of the phrase "have to be removed" two different categories are distinguished in this annex:

1. The following shall be removed as a distinct step during the treatment process and prior to size reduction and separation unless the treatment technology captures the materials and components identified in Annex B in an identifiable stream such that it is not released to the environment:
    a. capacitors containing polychlorinated biphenyls (PCB),
    b. cathode ray tubes, gas discharge lamps,
    c. volatile fluorocarbons and
    d. volatile hydrocarbons contained in a refrigeration system,
    e. batteries which are accessible in the equipment without using tools,
    f. toner cartridges;
    g. and components containing asbestos, mercury, refractory ceramic fibers, and radioactive substances (see Annex B).

2. The following shall be removed as an identifiable (part of a) stream during the treatment process:
    a. batteries which are not accessible in the equipment without using tools,
    b. printed circuit boards,
    c. plastics containing brominated flame retardants,

d. volatile fluorocarbons and volatile hydrocarbons other than those contained in a refrigeration system,

e. liquid crystal displays, external electric cables and electrolyte capacitors (> 25 mm or proportionately similar volume) containing substances of concern.

A.1.1. Capacitors

The following capacitors shall be removed from separately collected e-waste:

a. polychlorinated biphenyls (PCB) containing capacitors;

b. electrolytic capacitors containing substances of concern (height > 25 mm, diameter > 25 mm or proportionately similar volume).

If the treatment operator is not capable of identifying the capacitors described above, then they shall remove and consider all such capacitors as though they contained PCBs and/or are electrolytic capacitors containing substances of concern.

NOTE: As it can be difficult to tell whether capacitors contain PCBs it is suggested to screen all capacitors with a diameter > 25mm as below. Capacitors meeting one of the criteria below do not need to undergo separate treatment as they are presumed to be free of PCBs:

1. if it is evident that the capacitor was manufactured after 1986 or they come from appliances produced after 1987;
2. if they are declared and/or labelled as being free of PCBs.

Capacitors do not need to be removed from e-waste if there is evidence to show that the presence of PCBs or substances of concern contained in electrolytic capacitors can be discounted where certain identifiable conditions apply. The evidence is only considered acceptable if it is contained in a report that utilizes statistically and scientifically accepted methods and has been issued by an independent body accepted by the relevant nation- al competent authority.

A.1.2. Printed circuit boards

Printed circuit boards with an area greater than 10 cm2 shall be removed from separately collected e-waste.

Consideration should be given to potential hazards from printed circuit boards.

NOTE 1: During mechanical processing of printed circuit boards there can be a risk of diffuse emission to the environment and contamination of workplaces with dust and heavy metals. In addition, mechanical processing (e.g. shredding) of printed circuit boards often leads to losses of valuable materials. Therefore, it is recommended to re- duce mechanical processing as far as possible.

NOTE 2: Printed circuit boards can contain lead, tin, antimony, chromium, beryllium ox- ide and cadmium. Plastic parts mounted on the printed circuit board can contain restricted brominated flame retardants.

NOTE 3: Printed circuit boards occur in a wide range of electronic appliances and also in the electronic parts of large and small household appliances, tools, toys, sport equipment, and medical devices.

A.1.3. Gas discharge lamps and components containing mercury

Gas discharge lamps and components containing mercury shall be removed before any treatment process that can cause damage to the item, or shall be treated in such a way that the mercury can be removed and monitored to prove environmentally safe treatment.

NOTE 1: Mercury tilt switches or vapor pressure switches can be found in 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.

NOTE 2: Straight fluorescent lamps, compact fluorescent lamps, fluorescent lamps, high intensity discharge lamps - including pressure sodium lamps and metal halide lamps, and low-pressure sodium lamps contain mercury.

A.1.4. Batteries and accumulators

Batteries shall be removed from e-waste before any treatment process that can cause damage to them.

Special precautions and safety measures shall be in place for the treatment of e-waste, which may contain lithium batteries and for operations involving used lithium batteries, and for fractions containing lithium batteries.

Lithium batteries shall be protected to prevent exposure to excessive heat, water, or any crushing or physical damage during handling, sorting, and storage.

A.1.5. Plastics

1. Plastics fractions without brominated flame retardants (BFRs)
   Plastic fractions extracted from waste streams consisting of temperature exchange equipment which contains volatile fluorocarbons or volatile hydrocarbons (e.g. refrigerators and freezers) and large household appliances shall be deemed free of BFRs and may be recycled.

2. Plastic streams containing brominated flame retardants

   a. General
   Plastic fractions from other appliances than those detailed in this Annex A, section 6 (1) shall be deemed to contain brominated flame retardants except if there is evidence to the contrary i.e. if it is contained in a report that utilizes statistically and scientifically accepted methods and has been issued by an independent body.

   The evidence of absence of restricted BFRs shall also be considered acceptable if it is contained in a report that utilizes statistically and scientifically accepted methods and has been issued by an independent body.

b. Treatment requirements for plastics containing brominated flame retardants

Plastic fractions containing any BFRs shall be segregated from plastic fractions that do not contain BFRs and the resulting fractions shall be treated according to the appropriate legislation. Any plastic fraction that is not separated as above shall be considered as a BFR fraction and shall be managed accordingly.

A.1.6. Volatile fluorocarbons and volatile hydrocarbons

E-waste containing either volatile fluorocarbons or volatile hydrocarbons shall be sorted to a separate e-waste stream and treated.

The substance in the refrigeration system is identified on the compressor. Substances shall be recovered using specialist equipment that can also guarantee the extraction of the gas from oil. Recovered substances shall be stored according to type until they are handed over to EPA for final destruction/ export for final destruction. Special pre-cautions and training shall be in place regarding flammable substances.

Note 1: If the refrigeration circuit has been tampered with, the refrigerant might be different than indicated and could be flammable.

Note 2: Volatile fluorocarbons or volatile hydrocarbons are also contained in the circulation system of heat pump tumble driers.

Volatile fluorocarbons or volatile hydrocarbons can also be found in insulating foam of refrigerators and freezers or water boilers. During manual dismantling, foam shall be dismantled carefully and stored in the dry, preferably in bags. It has to be treated in a specialist treatment plant where the substances can be recovered.

A.1.7. Asbestos

Waste and components that contain asbestos shall be removed as an identifiable stream from the remaining e-waste stream. This shall occur before any treatment process that can cause damage to such waste and components.

Handling shall avoid any emissions of asbestos fibers. Waste and components that contains asbestos shall be sealed with an impermeable covering and clearly marked with the related asbestos danger label.

NOTE: Asbestos is not commonly found in e-waste and is mostly present in a limited number of quite old appliances such as old radiators.

A.1.8. Components containing radioactive substances

Treatment facilities shall have a procedure in place to monitor for the presence of radio- active materials in waste and components.

Waste and components that contain radioactive substances (see Annex B) shall be re- moved as an identifiable stream from the remaining e-waste stream. This shall occur before any treatment process that can cause damage to such waste and components.

NOTE: Radioactive substances are not commonly found in e-waste. Exemptions: Some smoke detectors and medical equipment (x-ray machines).

A.2. ANNEX B: MATERIALS AND COMPONENTS OF E-WASTE REQUIRING SELECTIVE TREATMENT

A.2.1. Removal and collection

As a minimum the following substances, mixtures and components have to be removed from any separately collected e-waste:

- polychlorinated biphenyls (PCB) containing capacitors
- mercury containing components, such as switches or backlighting lamps,
- batteries,
- printed circuit boards of mobile phones generally, and of other devices if the surface of the printed circuit board is greater than 10 square centimeters,
- toner cartridges, liquid and pasty, as well as color toner,
- plastic containing brominated flame retardants,
- asbestos waste and components which contain asbestos,
- cathode ray tubes,
- chlorofluorocarbons (CFC), hydrochlorofluorocarbons (HCFC) or hydrofluorocarbons (HFC), hydrocarbons (HC),
- gas discharge lamps,
- liquid crystal displays (together with their casing where appropriate) of a surface greater than 100 square centimeters and all those back-lighted with gas dis- charge lamps,
- external electric cables,
- components containing refractory ceramic fibers,
- components containing radioactive substances,
- electrolyte capacitors containing substances of concern (height > 25 mm, diameter > 25 mm or proportionately similar volume)

A.2.2. Treatment

The following components of e-waste that is separately collected have to be treated as indicated:

- cathode ray tubes: the fluorescent coating has to be removed,
- equipment containing gases (CFCs, HCFCs, HFCs or HCs or volatile fluorocarbons/hydrocarbons) that are ozone-depleting or have a global warming potential (GWP) above 15, such as those contained in foams and refrigeration circuits: the gases must be properly extracted and properly treated,gas discharge lamps: the mercury shall be removed,
- lead-acid batteries: Acid shall be removed and captured. The acid has to be filtered to remove lead particles, and either neutralized or converted into a non- hazardous commodity such as gypsum.

A.2.3. Re-use and recycling of components

Taking into account environmental considerations and the desirability of preparation for re-use and recycling, points 1 and 2 shall be applied in such a way that environmentally sound preparation for re-use and recycling of components or whole appliances is not hindered.

A.3. ANNEX C: RECORD OF INPUTS AND OUTPUTS FOR COLLECTION POINTS PER MONTH

The Type of Equipment shall be recorded according to the following categories:

1. Temperature exchange equipment

   Refrigerators, Freezers, Equipment which automatically delivers cold products, Air conditioning equipment, Dehumidifying equipment, Heat pumps, Radiators containing oil and other temperature exchange equipment using fluids other than water for the temperature exchange.

2. Screens, monitors, and equipment containing screens having a surface greater than 100 cm2

   Screens, Televisions, LCD photo frames, Monitors, Laptops, Notebooks.

3. Lamps

   Straight fluorescent lamps, Compact fluorescent lamps, Fluorescent lamps, High intensity discharge lamps – including pressure sodium lamps and metal halide lamps, low pressure sodium lamps, LED.

4. Large equipment

   Washing machines, Clothes dryers, Dish washing machines, Cookers, Electric stoves, Electric hot plates, Luminaires, Equipment reproducing sound or images, Musical equipment (excluding pipe organs installed in churches), Appliances for knitting and weaving, Large computer-mainframes, Large printing machines, Copying equipment, Large coin slot machines, Large medical devices, Large monitoring and control instruments, Large appliances which automatically deliver products and money, Photovoltaic panels.

5. Small equipment

   Vacuum cleaners, Carpet sweepers, Appliances for sewing, Luminaires, Microwaves, Ventilation equipment, Irons, Toasters, Electric knives, Electric kettles, Clocks and Watches, Electric shavers, Scales, Appliances for hair and body care, Calculators, Radio sets, Video cameras, Video recorders, Hi-fi equipment, Musical instruments, Equipment reproducing sound or images, Electrical and electronic toys, Sports equipment, Computers for

biking, diving, running, rowing, etc., Smoke detectors, Heating regulators, Thermostats, Small Electrical and electronic tools, Small medical devices, Small Monitoring and control instruments, Small Appliances which automatically deliver products, Small equipment with integrated photovoltaic panels.

6. Small IT and telecommunication equipment (no external dimension more than 50 cm)

   Mobile phones, GPS, Pocket calculators, Routers, Personal computers, Printers, Telephones.

Incoming E-Waste per Category			
E-Waste Category	**Mass in [kg] / month**	**Origin**	**Date**
⁘	⁘	⁘	⁘

Outgoing E-Waste per Category			
E-Waste Category	**Mass in [kg] / month**	**Destination**	**Date**
⁘	⁘	⁘	⁘

Record of Inputs and Output of Hazardous Fractions of the Treatment Facility per year

The Type of Equipment shall be recorded according to the following categories:

1. CRT-tubes
2. Batteries (Mixed Batteries, Lead-Acid Batteries, Lithium-Ion Batteries)
3. Capacitors
4. Printer Cartridges
5. LCD-Displays
6. Hg-Containing Lamps
7. Flame-Retardant Plastics
8. Volatile Fluorocarbons

Input Fractions			
Hazardous Fraction	**Mass in [t]/year**	**Origin**	**Date**
⁘	⁘	⁘	⁘
Output Fractions			
Hazardous Fraction	**Mass in [t]/year**	**Destina-tion**	**Date**
⁘	⁘	⁘	⁘

PROPOSED CODE OF CONDUCT FOR E-WASTE COLLECTORS

General Definition:

For the purpose of this document,

"**E-Waste**": means discarded electronics equipment inclusive of all components, subassemblies and consumables which are part of the product at the time of discarding;

The "**collector"**: Is any person(s) that collects, sorts or consolidates e- waste (as stated in Tier 1 of the guidelines);

1.0 INTRODUCTION

According to the World Health Organization (WHO), health risk may result from direct contact with toxic materials that leach from e-waste. These include chemicals such as lead, cadmium, brominated flame retardants or polychlorinated biphenyls (PCBs) among others. The Inhalation of the toxic fumes and the accumulation of chemicals in soil, water and food does not only put human population in danger but also land and sea animals and the environment at large.

For sound management of the E-waste sector in Ghana, the guidelines by the Environmental Protection Agency (EPA) addresses five (5) target groups: Collectors, Collection Centers, Transporters, Treatment Facilities and Final Disposal.

Considering the presence of potentially harmful chemicals in e-waste and the collection process being the first point of entry into the e-waste economy, it is important to develop Codes of Conduct to guide the operations of these collectors.

The collectors are mostly youthful and constitute majority of the workforce in the e-waste trade. They are the actors who execute door to door collections of used electrical and electronic equipment (EEE) from private homes, institutions, dump sites and transfer stations. Some of these collectors also directly engage in prohibited activities such as dismantling and recovery of metals including

the burning of cables and wires to extract copper, hence the need to regulate their operations.

2.0 RULES OF CONDUCT FOR WASTE COLLECTORS

This code of conduct has been developed in accordance with the National Solid Waste Management Strategy for Ghana and the Technical Guidelines on Environmentally Sound E-Waste Management for collectors in the e-waste value chain.

It constitutes rules for regulating the conduct of collectors in the e-waste industry.

2.1 General Definition

2.1.1 Conduct

Conduct in this context is behavior, attitudes and character exhibited by collectors in the e-waste value chain. The standards of conduct generally required of any e-waste collector would be comportment, integrity, fairness, honesty and above all to safeguard public health and prevent the release of gases and other pollutants into the environment.

2.1.2 Misconduct

Any act or omission by an e-waste collector which contravenes established guidelines, enactment, procedures rules and regulations relating to e-waste management which is otherwise prejudicial to best practices likely to affect public health and the environment.

2.2 Registration

The collectors must register with appropriate Metropolitan Municipal and District Assemblies (MMDAs), or other relevant bodies specified in the technical guidelines.

2.3 Working Hours

Door to door e-waste collectors must work between the hours of 6am to 6pm except for collectors engaged in approved dumpsites that operate in the night.

2.4 Conveyances

Push trucks, wheelbarrows, motor kings and tricycle etc. designed in a manner as to keep e-waste in an enclosure to avoid accidents, direct sunlight, rainfall and nuisance are required for use.

2.5 Personal Protective Equipment

Appropriate Personal Protective Equipment shall be used to protect the collector from toxic fumes and other harmful chemicals as well as injuries.

2.6 Storage

Collectors are to ensure that whole or fractions that contain hazardous materials are temporarily stored in a manner that prevents spillage or dispersal of hazardous substances into the environment before they are moved on to the collection center.

2.7 Prohibited activities.

A collector shall not:

a. Accumulate, store or keep e-waste in any residential area.

b. Transport e-waste in a passenger vehicle or truck used for carting food items.

c. Engage in disposal activities outside the collection centers.

d. Engage in any treatment activities of e-waste (such as dismantling).

e. Burn whole or components of e-waste.

f. Deliver whole or components of e-waste to a collection center that is not permitted by EPA and the MMDAs.

g. Export whole or components of e-waste; however, a collector may be allowed to export e-waste in accordance with section 20, subsection 1 and 3 of Act 917, and LI 2250 regulation.

3.0 PROCEDURES FOR ENFORCING VIOLATIONS OF THIS CODE

3.1 Classification of violation

Any breach or non-observance in any section or part thereof of the aforementioned rules and regulations by an electronic waste collector constitute a misconduct for which he or she shall be liable to sanctions. In this section misconduct is classified as either minor or major.

The sanctions for the various categories of misconduct shall be as follows:

3.1a CATEGORY "A" - Sanctions for minor misconduct

Warning or reprimand in writing for record purposes. The classified minor acts are clearly spelt out in numbers (2.2, 2.3, 2.4, 2.5, and 2.6) of this code

3.1b CATEGORY "B" - Sanctions for major misconducts

Two-week suspension for first offenders, repeated breach one month suspension and debarment when same is repeated for the third time. The classified major acts are indicated in the following numbers of the code of conduct 2.7 (a, b, c, d, e, and f).

3.2 Criminal offences

Any electronic waste collector who is involved in any criminal offence such as stealing, dealing in narcotic during the discharge of their operational duties shall be reported to the police

4.0 DUTY TO REPORT VIOLATION OF THIS CODE

No offender or third party shall retaliate against any e-waste collector who reports violation of this code if that report is made in good faith.

5.0 CODE OF CONDUCT DECLARATION.

I hereby acknowledge receipt of my copy of the code of conduct which has been written in plain language and explained to me.

I understand that violation on my part can result in serious health and environmental consequences that have legal implications and could lead to debarment of my operations as an electronics waste collector in the MMDAs.

Name.....

Signature.....

Date.....

ENVIRONMENTAL PROTECTION AGENCY, GHANA

Technical Guidelines on Environmentally Sound E-Waste Management for Collectors, Collection Centers, Transporters, Treatment Facilities and Final Disposal in Ghana

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