6.0 Guidelines for Environmentally Sound Dismantling of E-Waste

6.1 Dismantler

 Any person or organisation or registered society or a designated agency or a company or an association can engage in dismantling of e-waste into their components by obtaining authorisation from the respective SPCBs/PCCs. Dismantlers may set up their collection

centre, details of which shall be entered in their authorisation. These collection centres shall

not require separate authorisation.

 A dismantler shall be connected to either Producers or PRO or e-waste exchange or takeback

system or authorised recycler.

 A dismantler has to obtain consent to establish from SPCBs/PCCs under the Water

(Prevention and Control of Pollution) Act, 1974 and the Air (Prevention and Control of

Pollution) Act, 1981

 A dismantler has to obtain consent to operate from SPCBs/PCCs under the Water

(Prevention and Control of Pollution) Act, 1974 and the Air (Prevention and Control of

Pollution) Act, 1981

 A dismantler has to obtain authorisation from SPCBs/PCCs under E Waste (Management)

Rules, 2016, provided that any person authorised/registered under the provisions of the

Hazardous Wastes (Management, Handling and Transboundary Movements) Rules, 2008,

and the E-waste (Management & Handling) Rules, 2011 prior to the date of coming into force

of these rules shall not be required to make an application for authorisation till the period of

expiry of such authorisation/registration.

 A dismantler should have weigh bridge and other appropriate weighing equipment for

weighing each delivery received by it and maintain a record in this regard.

 The unloading of e-waste/end of life products should be carried out in such a way that there

should not be any damage to health, environment and to the product itself. Unloading of

Cathode Ray Tubes (CRT), LCD / LED / Plasma TV, refrigerator, air conditioners and

fluorescent and other mercury containing lamps should be carried out under supervision in

such a way to avoid breakage.

 A dismantler should have facilities for destroying or permanently deleting data stored in the

memory of end of life products (Hard Disk, Telephones, Mobile phones) either through

hammering or through data eraser.

6.2 Dismantling Process

Dismantling operation is essentially manual operation for segregating various components/ parts

and sending them to respective users/ recyclers.Directly usable components can be sent only to an

authorised refurbisher. The other parts can be sent to recyclers having valid CTO / authorised ewaste

recyclers depending upon the nature of the part. For example, steel or aluminium part which

contains no hazardous constituents can be sent to respective recyclers. Other parts which may

contain hazardous constituents have to be sent to authorised e-waste recyclers.

Dismantlers may perform the following operations

(i) De-dusting

(ii) Manual dismantling

Dismantling operation shall comprise of physical separation and segregation after opening

the electrical and electronic equipment into the component by manual operations.

Dismantler may use screwdrivers, wrenches, pliers, wire cutters, tongs and hammers etc. for

dismantling. The dismantled components should be sent to authorised e-waste recyclers

or recyclers having valid consent to operate (CTO).

- Manual dismantling operations should be carried out over the dismantling table with space

de-dusting system so as to maintain desirable work zone air quality as per the factories

Act as amended from time to time. The de dusting system should consist of suction hoods

over dismantling table connected with a cyclone, bag filter and venting through a chimney

of three-meter height above roof level.

- Collection boxes should be placed near dismantling table for keeping the dismantled

components.

- The workers involved in dismantling operation should have appropriate equipment such as

screwdrivers, wrenches, pliers, wire cutters, tongs and hammers etc. for dismantling the

e-waste.

- During dismantling operations, the workers should use proper personal protective equipment

such as goggles, masks, gloves, helmet and gumboot etc.

- The following dismantled items and components must be removed from end of life products

and stored in a safe manner for transportation to recyclers:

(i) Batteries

(ii) Printed Circuit Boards (PCBs) of EEE

(iii) Toner cartridges

(iv) Plastic

(v) External Electrical Cables

- Volume/Size reduction may be carried out after dismantling operations for the parts like

steel/aluminium/plastic, for ease of transportation. Dismantled and segregated plastic from

e-waste shall only be given to registered plastic recyclers having registration under Plastic

Waste (Management) Rules, 2016.

During the volume/size reduction of dismantled steel/aluminium/plastic parts, the dismantlers

should have arrangement for dust and noise controls. These operations should be under

acoustic enclosure for noise reduction.

Dismantlers shall not carry out shredding / crushing / fine grinding/wet grinding/ enrichment

operations and gravity/ magnetic/density/eddy current separation of printing circuit board

or the components attached with the circuit board.

Dismantlers shall not be permitted for dismantling of fluorescent and other mercury

containing lamps, CRT / LCD / Plasma TV.

Dismantlers shall not be permitted for chemical leaching or heating process or melting the

material.

In case of dismantling refrigerators and air conditioners, only skilled manpower having

required tools and personal protective equipment (PPEs) must be deployed to manually

separate compressors. Prior to dismantling the compressors, adequate facilities should be

provided for collection of coolant/refrigerant gases and compressor oil.

Dismantled circuit boards, capacitors, batteries, capacitors containing PCBs (Polychlorinated

biphenyls) or PCTs (Polychlorinated terphenyls) etc. shall not be stored in open.

Dismantlers should have adequate facilities for managing leakage of compressor oils,

coolant/refrigerant gases such as CFCs/HCFCs and mercury from end of life fluorescent

and other mercury containing lamp etc. Spills involving broken Fluorescent lamps, Oils

spills should first be contained to prevent spread of the material to other areas. This may

involve the use of dry sand, proprietary booms / absorbent pads, stabilizing chemicals etc.

for subsequent transfer to hazardous waste TSDFs.

The premise for dismantling operation should fulfil the following requirements:

a) Water proof roofing and impermeable surfaces.

b) Storage space for dissembled spare parts.

c) Separate containers for storage of batteries, capacitors containing PCBs

(Polychlorinated biphenyls) or PCTs (Polychlorinated terphenyls)

6.3 Space requirement for Dismantlers

A dismantler needs space for storage of electrical and electronic equipment up to 180 days, for

process of dismantling and volume reduction and space for storage of dismantled and segregated

material and free space for movement and office/ administration and other utilities. It is estimated

that a minimum of 300 square meter area for a dismantling capacity of 1T/day is required for storage

of raw material, segregated material, dismantling operations and office/ administration & other

utilities.

7.0 Guidelines for Environmentally Sound Recycling of E-Waste

7.1 Recycler

As per these rules any person who is engaged in recycling and reprocessing of waste

electrical and electronic equipment or assemblies or their component is a recycler. Recyclers

may set up their collection centres, details of which shall be entered in their authorisation.

These collection centres shall not require separate authorisation. Recyclers can obtain raw

material such as waste electrical and electronic assemblies or components or used

components from producers/PRO/e-waste exchange/dismantlers and consumers / bulk

consumers.

 The Product of recyclers has to be sent or sold to users or other recyclers having valid CTO

from SPCBs/PCCs. Any hazardous waste generated during the recycling processing will be

sent to TSDF'

 A recycler should be part of producer's channelisation system.

 A recycler has to obtain consent to establish from SPCBs/PCCs under the Water (Prevention

and Control of Pollution) Act, 1974 and the Air (Prevention and Control of Pollution) Act,

1981

 A recycler has to obtain consent to operate from SPCBs/PCCs under the Water (Prevention

and Control of Pollution) Act, 1974 and the Air (Prevention and Control of Pollution) Act,

1981

 A recycler has to obtain authorisation from SPCBs/PCCs under E Waste (Management)

Rules, 2016, provided that any person authorised/registered under the provisions of the

Hazardous Wastes (Management, Handling and Transboundary Movements) Rules, 2008,

and the E-waste (Management & Handling) Rules, 2011 prior to the date of coming into force

of these rules shall not be required to make an application for authorisation till the period of

expiry of such authorisation/registration.

 A recycler should have weigh bridge and other appropriate weighing equipment for weighing

each delivery received by it and maintain a record in this regard.

 The unloading of end of life product should be carried out in such a way that there should not

be any damage to health, environment and to the product itself. Unloading of Cathode Ray

Tubes (CRT), LCD/LED/Plasma TV, Refrigerator, Air Conditioners and fluorescent and other

mercury containing lamps should be carried out under supervision in such a way to avoid

breakage.

 A recycler should have facilities for destroying or permanently deleting data stored in the

memory of end of life products (Hard Disk, Telephones, Mobile phones) either through

shredding or grinding or through data eraser.

7.2 Recycling Process

 The functions of the recyclers include dismantling along with recovery operation. There shall

be no restriction on degree of operations that can be permitted for recyclers provided they

have requisite facilities. The following processes should be employed by recyclers:

(i) Manual / semi- automatic / automatic dismantling operations

(ii) Shredding / crushing / fine grinding/wet grinding/ enrichment operations, gravity/

magnetic/density/eddy current separation

(iii) Pyro metallurgical operations - Smelting furnace

(iv) Hydro metallurgical operations

(v) Electro-metallurgical operations

(vi) Chemical leaching

(vii) CRT/LCD/Plasma processing

(viii) Toner cartridge recycling

(ix) Melting, casting, moulding operations (for metals and plastics)

 A recycling facility may accept e-waste and even those electrical and electronic assemblies

or components not listed in Schedule- I for recycling, provided that they do not contain any

radioactive materials and same shall be declared while taking the authorisation from

concerned SPCBs/PCCs;

 The recycling facilities shall comply with the requirements as specified for dismantlers in the

guidelines for dismantling in section 6.0.

 A recycling facility shall install adequate wastewater treatment facilities for process

wastewater and air pollution control equipment (off gas treatment, wet/alkaline/packed bed

scrubber and carbon filters) depending on type of operations undertaken.

 De dusting equipment such as suction hood shall be installed where manual dismantling is

carried out.

 Fume hoods connected with bag dust collectors followed wet (chemical) scrubbers and

carbon filters shall be installed for control of fugitive emissions from furnaces or reactor.

 Noise control arrangement for equipment like crusher, grinder and shredder needs to be

provided.

 The discharges from the facility shall comply with general standards under E (P) Act, 1986

for discharge of wastewater. Discharge standard are at Annexure IV

 In case of air emissions, the unit shall comply with emission norms prescribed under Air

(Prevention and Control of Pollution) Act, 1981. In case of furnace, a minimum stack height

of 30 meter shall be installed depending on emission rate of SO2. Emission Standards are at

Annexure V.

 The workers involved in recycling operations shall use proper personal protective equipment

such as goggles, masks, gloves, helmet and gumboot etc.

 Adequate facilities for onsite collection and storage of bag filter residues, floor cleaning dust

and other hazardous material shall be provided and sent to secure landfill by obtaining

membership of TSDF.

 The CRT / LCD / Plasma TV should be processed only at a recycler's facility.

 For recycling of CRT monitor and TVs care should be taken to contain release of harmful

substances. The steps for processing of CRT are as below:

(i) CRT monitors and TVs should be manually removed from plastic/ wooden casing. The

CRT should be split into funnel and panel glass using different splitting technology such

as Ni-Chrome hot wire cutting, Diamond wire method or Diamond saw separation in a

closed chamber under low vacuum conditions (650 mm of Hg).

(ii) The funnel section is then lifted off from the panel glass section and the internal metal

gasket is removed for facilitating the removal of internal phosphor coating.

(iii) The internal phosphor coating from the inner side of panel glass is removed by using an

abrasive wire brush with suction arrangement under low pressure as given above at (i).

The extracted air is cleaned through high efficiency bag-filter system and collected in

appropriate labelled containers and then disposed at an authorised TSDF.

(iv) Manual shredding, cutting, and segregation operations for CRTs should be carried out in

low vacuum (650 mm of Hg) chambers where the dust is extracted through cyclones,

bag filters, ID fan and a suitable chimney.

(v) Segregated CRTs can also be shredded in mechanical/automatic shredding machines

connected with dust control systems. The mixed shredded glass is separated into leaded

glass and glass cullet using electro-magnetic field or by density separation.

 For LCD and Plasma TV a recycler should have sealed vacuum dismantling platform for

dismantling of LCD / Plasma panels. The LCD / Plasma TV should be dismantled piece by

piece, starting with the removal of the plastic backing shell, printed circuit boards, aluminium or

steel frame, screen, PET plastics, LCD Panel and backlight. The metal frame, wire, other

metallic material and plastic backing cabinet may be sent to recyclers with valid CTO. Printed

Circuit Board and LCD panel may be recycled or in case recycling facility is not available then

sent to respective authorised recycling facility.

 The user of the products obtained in the recycler facility should be identified and an

agreement may be entered with them for selling of the products obtained in these recycling

facilities. This is for tracking the product of recycling, to ascertain where the products are

going.

 Recovery of resource and particularly of precious metals present in the e-waste should be

given importance.

 For fluorescent and other mercury containing lamp recycling, the unit shall have at least

following systems:

(i) Mechanical feeding system.

(ii) Mercury spill collection system.

(iii) Lamp Crushing System, under vacuum, for separation of mercury-contaminated phosphor powder & mercury vapors from other crushed components, so as not to cause release of any pollutant, including mercury vapor.

(iv) System for segregation of mercury vapour from the phosphor powder through a distillation system for separation & recovery of mercury.

(v) Air pollution control system (APCS) which shall include HEPA (High Efficiency Particulate Arrestor) filter system or activated carbon filter system or any other equivalent efficient system for separation/ removal of mercury vapor from mercurycontaminated phosphor powder'

(vi) Arrangement for disposal of mercury contaminated filter pads to TSDF.

(vii) On line mercury monitoring system, to have check on emission of mercury, which has to be in compliance to the consented norms.

 The fluorescent and other mercury containing lamp recycling unit shall have following obligations:

(i) The emission outlet shall comply with the norms for mercury prescribed in the consent document. The norm for mercury emission is 0.2 mg/m3 (Normal) as prescribed under E (P) Act, 1986 for mercury emission from other category of industries.

(ii) For discharge of effluent the limit for mercury as (Hg) should be less than equal to 0.01mg /liter as prescribed under E (P) Act, 1986.

(iii) The unit shall have trained / skilled manpower to handle hazardous substances such as mercury mixed phosphor in respect of treatment/recycling.

(iv) The unit shall dispose all the unrecoverable wastes from the treatment site, to a TSDF

(v) The unit shall maintain record of used fluorescent and other mercury containing lamp

collected & recycled, recovery of mercury and other components. It shall, also,

maintain the records pertaining to the generation, storage, transport and disposal of the

wastes generated in the process.

(vi) The unit shall take up ambient air quality monitoring, particularly, in reference to

mercury levels with a frequency of once in a month through a recognized laboratory, for

third party verification.

7.3 Space requirement for Recyclers

As a general rule a recycler of capacity of 1 Ton per day shall require a minimum of 500 square

meters area. Authorisation to recyclers may be preferred if they have minimum operational capacity

of 5 MT/day with an area of about 2500 square meter.

8.0 Gui