

# Implementation Guidelines for E-Waste (Management) Rules, 2016



**Central Pollution Control Board, Delhi**

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### 1.0 Introduction

E- Waste (Management & Handling) Rules, 2011 were notified in 2011 and had come into force since 1st May, 2012. In order to ensure effective implementation of E-Waste Rules and to clearly delineated the role of producers in EPR, MoEF & CC, Government of India in supersession of E-Waste (Management and Handling) Rules, 2011 has notified the E-Waste (Management) Rules, 2016 vide G.S.R. 338(E) dated 23.03.2016 which will be effective from 01-10-2016. These rules are applicable to every producer, consumer or bulk consumer, collection centre, dismantler and recycler of e-waste involved in the manufacture, sale, purchase and processing of electrical and electronic equipment or components specified in schedule – I of these Rules.

Two categories of electrical and electronic equipment namely (i) IT and Telecommunication Equipment and (ii.) Consumer Electricals and Electronics such as TVs, Washing Machines, Refrigerators Air Conditioners including fluorescent and other mercury containing lamps are covered under these Rules. The main feature, of these rules, is Extended Producer Responsibility (EPR).

Target based approach for implementation of EPR has been adopted in the **E-Waste (Management) Rules, 2016**, which stipulate phase wise collection target to producers for the collection of e-waste, either in number or weight, which shall be 30% of the estimated quantity of waste generation during first two year of implementation of rules followed by 40% during third and fourth years, 50% during fifth and sixth years and 70% during seventh year onwards.

The E-Waste (Management) Rules, 2016 mandate CPCB to prepare guidelines on implementation of E-Waste Rules, which includes specific guidelines for extended producer responsibility, channelisation, collection centres, storage, transportation, environmentally sound dismantling and recycling, refurbishment, and random sampling of EEE for testing of RoHS parameters. In this document all the above guidelines have been compiled except guidelines for random sampling of EEE for testing of RoHS parameters. These guidelines are given in separate sections of this document.

## **2.0 Guidelines for Implementing Extended Producer Responsibility**

Extended Producer Responsibility (EPR) is the responsibility of every producer of electrical and electronic equipment (EEE) for channelisation of e-waste to an authorised dismantler / recycler to ensure environmentally sound management of such waste. EPR authorisation is mandatory and has to be obtained by all the producers including importers, e-retailers/on-line sellers/e-bay etc. of EEE covered in E-Waste (Management) Rules, 2016. A producer can implement its EPR either through take-back system or by setting up collection centres or both for channelisation of e-waste/end of life products to authorised dismantlers/recyclers. The producers are required to have arrangements with authorised dismantlers/recyclers either individually or collectively or through a Producer Responsibility Organisation (PRO) or E-Waste Exchange system as spelt in their EPR Plan which is approved/authorised by Central Pollution Control Board (CPCB). Selling or placing of EEE in the market by any producer without EPR Authorisation shall be considered as violation of the Rules and causing damage to the environment, which shall attract provisions under E (P) Act, 1986.

### **2.1 Extended Producer Responsibility Plan (EPR- Plan)**

EPR Plan is an implementation plan of the producer where the producer gives its overall scheme to fulfil its Extended Producer Responsibility for achieving targets and details out the mechanism for collection and channelisation of e-waste generated by the producer.

The EPR plan requires estimating the quantity of E-waste generated from their end-of-life products, outlining a scheme for collection and channelization of their end-of-life products or products with same EEE code to authorised dismantlers/recyclers, estimated budget for implementing EPR, outline the scheme of creating awareness, declaration on ROHS compliance and submission of documents in this regard. Every producer should make an application seeking EPR authorisation in Form-1 of the E-Waste (M) Rules, 2016 addressed to the Member Secretary, Central Pollution Control Board. Form-1 should contain the relevant information pertaining to collection and channelization of their end-of-life products as detailed in sections 2.1.1 to 2.1.7. The Producers has liberty to revise their EPR Plan from time to time with information to CPCB. In such cases the EPR authorisation need amendments.

2.1.1 **Estimation of E-Waste Generation** - E-waste generated by producer for a specific EEE category code is to be estimated on the basis of quantity (number or weight) of EEE placed in the market in the previous years and taking into consideration the average life of the equipment. Such estimate should be carried out using the following method;

The generation of e-waste from end of life products:

E-waste generation (weight or number) in the financial year 'x – y' = Sales in the financial year '(x-z) - (y-z)'

where, 'x – y' = financial year in which generation is estimated, and

z= average life span of EEE (Examples are given at **Annexure - I**)

**Average life of the EEE to be used in the above formula is given below:**

Sr. No.	Categories of electrical and electronic equipment	EEE Code	Average Life
i.	<b>Information technology and telecommunication equipment</b>		
	Centralized data processing:	ITEW1	
	Mainframe		10 Years
	Minicomputer		5 Years
	Personal Computing: Personal Computers (Central Processing Unit with input and output devices)	ITEW2	6 Years
	Personal Computing: Laptop Computers(Central Processing Unit with input and output devices)	ITEW3	5 Years
	Personal Computing: Notebook Computers	ITEW4	5 Years
	Personal Computing: Notepad Computers	ITEW5	5 Years
	Printers including cartridges	ITEW6	10 Years
	Copying equipment	ITEW7	8 Years
	Electrical and electronic typewriters	ITEW8	5 Years
	User terminals and systems	ITEW9	6 Years
	Facsimile	ITEW10	10 Years
	Telex	ITEW11	5 Years
	Telephones	ITEW12	9 Years
	Pay telephones	ITEW13	9 Years
Cordless telephones	ITEW14	9 Years	
Cellular telephones	ITEW15		
Feature phones		7 Years	
Smart phones		5 Years	
Answering systems	ITEW16	5 Years	
ii.	<b>Consumer electrical and electronics:</b>		

Sr. No.	Categories of electrical and electronic equipment	EEE Code	Average Life
	Television sets (including sets based on (Liquid Crystal Display and Light Emitting Diode technology)	CEEW1	9 Years
	Refrigerator	CEEW2	10 Years
	Washing Machine	CCEW3	9 Years
	Air-conditioners excluding centralized air conditioning plants	CCEW4	10 Years
	Fluorescent and other Mercury containing lamps	CEEW5	2 Years

**2.1.2 Estimation of Target for Collection** – the target for collection of E-Waste shall be based on estimated generation calculated for each EEE code for a specific financial year as specified above. E-Waste collection target for the financial year 2016 – 2017 would be 15% of the estimated E-waste generation, and for the year 2017 – 2018, the collection target would be 30%. These targets would increase to 40 % for next 2 financial years between 2018 – 2020, 50% for the financial years between 2020 - 2022 and 70% of the estimated E-waste generation for the financial years 2022 – 2023 onwards. Here it may be observed that collection targets would be applicable depending on life of the product given in above table and accordingly, if a producer enters the business in the year 2016 - 2017 for item code ITEW7(copying equipment), the collection targets for which would be applicable from the year 2021-22 at 50% collection target.

**2.1.3 Details of Extended Producer Responsibility Plan** – Producers should submit their own EPR plans appended to Form-1 for seeking EPR authorization. Producers may submit multiple options and schemes for channelization of E-Waste and such scheme should be described with a brief write-up along with a schematic flow chart/diagram of E-waste movement. The options and schemes for E-Waste channelization may comprise the following;

- Details of scheme/incentive for returning of e-waste by consumers /bulk consumers whether through dealers or buy-back arrangements or take-back systems or exchange scheme for channelization of e-waste.
- If producer is opting to manage its EPR responsibility through PRO, then details of PRO's organisational structure and system of collection and channelisation to the authorised dismantlers/recyclers of e-waste.

- If e-waste exchange is part of channelisation then the details thereof.
- If producer is opting for 'deposit refund scheme' (DRS) or exchange scheme for collection and channelisation of e-waste, then the details of mode of refund of the deposited amount taken from the consumer or bulk consumer at the time of sale has to be specified along with interest that becomes due at the prevalent rate for the period of the deposit at the time of take-back of the end-of life products.
- Producers of item code: CEEW5 (fluorescent and other mercury containing lamp) may provide list of waste deposition centre or collection points financed by them as per their obligation under rule 17 (1) of the Solid Waste Management Rules 2016 for channelizing such wastes to recyclers or TSDFs.

2.1.4 **Collection and Storage plan** - Information pertaining to collection and storage should be appended to Form-1. It should be ensured that collection and storage of E-waste is managed as per the guidelines for 'collection and storage of e-waste' as given in section 3.0 of this document.

**Channelization Plan** - Form-1 should provide information pertaining to channelization. The following points should be considered in planning a system for E-Waste channelisation;

- make assessment of potential collection of e-waste, area or region wise.
- take help of any professional agency like Producer Responsibility Organisation (PRO) and e-waste exchange.
- identify authorised dismantlers/recyclers for channelisation of quantum of e-waste assessed above. Assess the capacity and capability of each identified authorised dismantlers/recyclers to ensure environmentally sound management of e-waste channelised to them.

2.1.5 **Collection Centres** – Producers shall specify details of their own collections centres or the collection centres with which they have agreement. Following details on collection centres should be provided in Form-1 if the collection centres are part of their channelisation;

- details of collection centres such as address and name(s) of the entity (producer, group of producers, refurbisher, recyclers or dismantlers) who are operating the collection centres in tabular form.

- The number of collection centres should be proportionate and justifiable with the estimated generation for channelization of e-waste. These collections centres or collection points should have facilities as specified in section 4.0 of this document.

**2.1.6 Dismantlers & Recyclers** – Details such as name, location, processing capacity and contact details of the authorised dismantling /recycling facilities, which are part of channelisation of E-waste of the producer should be provided in a separate table to Form-1. The details provided above should be commensurate and justifiable with the quantum of e-waste estimated as per section 2.1.2 of this document.

**2.1.7 Treatment, Storage, Disposal Facilities (TSDFs)** – In case there are no recyclers available for recycling of end-of-life EEE item code: CEEW5 (fluorescent and other mercury containing lamps), then the producers should provide list of Treatment Storage and Disposal Facilities with whom they have agreement.

## **2.2 Documents required with Form-1**

Every producer of EEE listed in Schedule-I has to apply in Form-1 address to the Member Secretary, CPCB for seeking EPR Authorisation within a period of ninety (90) days starting from 01/10/2016. In case of renewal of EPR Authorisation, the application to CPCB has to be made before one hundred and twenty (120) days of its expiry. The following documents are required to be submitted along with Form-1:

- Documents related to EPR plan as envisaged in sections 2.1.
- Details of proposed awareness programmes and allied initiatives.
- Estimated budget earmarked for Extended Producer Responsibility (EPR)
- Copies of agreement document with dealers, collection centres, dismantlers, recyclers, treatment, storage and disposal facilities (TSDFs) etc.
- Self-declaration for compliance of RoHS as per the format given at Annexure – II.
- The technical documents (supplier declaration- description of product, document for materials, parts, and/or sub-assemblies and analytical test result) as an evidence that the reduction of hazardous substance (RoHS) provisions are complied by the product based on standard EN 50581 of EU as at Annexure - III



- Copy of the permissions/licences from the relevant ministry/department for marketing various products or for doing the business as given below:
  - i. TIN details
  - ii. PAN details
  - iii. Incorporation certificate
  - iv. Copy IEC in case of importers
- Copy of authorisation issued by the SPCBs/PCCs earlier under E-Waste (Management & Handling) Rules, 2011 in case of those producers who are operating in the country prior to 01-10-2016.

### 3.0 Guidelines for Collection and Storage of E-Waste

- After assessing their requirement of collection of e-waste, producers may device a collection mechanism which may include take-back through dealers, collection centres or directly through authorised dismantlers/recyclers.
- For collection of e-waste producer may take help of any professional agency like Producer Responsibility Organisation (PRO)/e-waste exchange. Producer may manage a system directly for collection of e-waste by involving relevant stakeholders such as consumer, bulk consumer, informal sector, resident associations, retailers and dealers, etc.
- Producers may also have an arrangement of collection of e-waste from individual consumers and bulk consumers as well.
- The producers may publicize their collection system which may include details of their collection points, bins and collection vans linked to collection centres, take-back system, deposit refund scheme, e-waste exchange, retailers/dealers and PRO etc. for making collection system effective and workable.
- If take - back system is being provided, then it should be accessible to any citizen located anywhere in the country and may be provided through retailers/dealers or through service centres.
- The producers may provide consumer/ bulk consumer following details of take-back system:
  - (i) Link of their web site where information pertaining to take-back system is available
  - (ii) Toll free number to be available during working hours (10 A.M. to 6 P.M.) for consumers / bulk consumers.
  - (iii) Phone number/mobile numbers of grievance redressal in case, toll free number is not working
  - (iv) Details of their dealers, retailers, collection points/bins/pick up vans linked to collection centres for depositing of e-waste by the consumer/bulk consumers if they are part of the take-back system
  - (v) Details of any incentive scheme for consumers / bulk consumers for returning of e-waste
  - (vi) Details of authorised dismantlers/recyclers who can take-back e-waste on behalf of the producer if dismantlers/recyclers are part of take-back system
- Producers may maintain data base of consumers while selling EEE so that consumers/ bulk consumers can be approached for collection of e-waste / end of life products.

- Every Producer, collection centre, dealer, dismantler, recycler and refurbisher may store the e-waste for a period not exceeding one hundred and eighty (180) days and shall maintain a record of collection, sale, transfer and storage of wastes and make these records available for inspection. The period of storage of one hundred and eighty (180) days may be extended by the concerned SPCBs/PCCs up to three hundred and sixty-five (365) days in case the e-waste needs to be specifically stored for research development of a process for its recycling or reuse.
- Storage of end of life products may be done in a manner which does not lead to breakage of these products and safe to workers handling such products.
- During storage of e-waste care may be taken:
  - (i) To avoid damage to refrigerators and air-conditioner so as to prevent release of refrigerant gases such as CFC, HFS, HCFC etc. and to prevent spillage of oils (mineral or synthetic oil) and other emissions.
  - (ii) To avoid damage to Cathode Ray Tube
  - (iii) To avoid damage to fluorescent and other mercury containing lamps
  - (iv) To avoid damage to equipment containing asbestos or ceramic fibres to avoid release of asbestos or ceramic fibres in the environment.
- After collection of fluorescent and other mercury containing lamps, it should be sent only to a recycler or to a TSDF in case no recycler is available.
- Loading, transportation, unloading and storage of E-Waste / end of life products should be carried out in such a way that its end use such as re-use after refurbishing or recycling or recovery is unaffected.
- The storage area should have fire protection system in place.

#### **4.0 Guidelines for Collection Centre**

- Collection centre or collection points are part of E-waste channelisation, and can be established by producers, refurbishers, dismantlers and recyclers. Collection Centre may collect and store e-waste, on behalf of producer / dismantler / recycler /refurbisher and transfer the same to authorised dismantlers / recyclers.
- Only those collection centres may operate which are specified in EPR-Authorisation of the producers including the collection centres established by dismantlers / recyclers / refurbishers and having agreement with Producers.
- If the collection centres are operating on behalf of many producers, then all such producers should provide this information in their EPR application.
- Collection centres have to collect e-waste on behalf of producers including those arising from orphaned products. Collection centres established by producers can be managed by their PRO or dismantler and recycler having agreement with producers.
- The collection points/bins can be at designated places where e-waste can be collected from residential areas, office complexes, commercial complexes, retail outlets, customer care stores, educational and research institutions, resident welfare associations (RWAs). These collection points have to be part of producer's collection and channelisation plan.
- Mobile collection vans can be used for door to door collection of e-waste from institutions/ individuals/small enterprises and such vans shall be linked to collection centres, and if provided by producers, shall be part of their EPR Plan.
- Material from collection centres should be send only to the authorised dismantlers and Recyclers except in case of used Fluorescent and other mercury containing lamps, which can be sent to TSDF in case recyclers are not available.

#### **4.1 Facilities at Collection Centres**

- Collection Centre should have weighing equipment for weighing each delivery received by it and maintain a record in this regard.
- Loading, transportation and unloading, storage 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 particularly care should be taken for Cathode Ray Tubes (CRT), LCD/LED/Plasma TV, Refrigerator, Air Conditioners and fluorescent and other mercury containing lamps so as to avoid breakage.

- Cathode Ray Tubes (CRT), LCD / LED / Plasma TV and fluorescent and other mercury containing lamps should be stored either in containers or stored in stable manner to avoid damage or breakage.
- The storage capacity of any collection centre should commensurate with volume of operations (weight and numbers) and category of E-waste. Space needed for storage of different category of e-waste is given below:

(i) ITEW1 to ITEW6	- 4.0 m <sup>3</sup> /tonne
(ii) Monitors (CRT)	- 5.0 m <sup>3</sup> /tonne
(iii) ITEW7 to ITEW10	- 5.0 m <sup>3</sup> /tonne
(iv) ITEW11 to ITEW14	- 3.0 m <sup>3</sup> /tonne
(v) ITEW15	- 1.0 m <sup>3</sup> /tonne
(vi) ITEW16	- 3.0 m <sup>3</sup> /tonne
(vii) CEEW1	- 6.5 m <sup>3</sup> /tonne
(viii) CEEW2	- 10.0 m <sup>3</sup> /tonne
(ix) CEEW3	- 7.5 m <sup>3</sup> /tonne
(x) CEEW4	- 6.0 m <sup>3</sup> /tonne
(xi) CEEW5	- 1.0 m <sup>3</sup> /tonne

- Collection Centre should store e-waste product category wise.
- Collection Centre should maintain the records of E-Waste collected and account the same to respective producers.
- The collection centre where refrigerator and air conditioners are also stored 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 of hazardous waste to TSDFs.
- Covered shed/spaces have to be used for storage of E-Waste.
- Collection Centre should necessarily have adequate fire-fighting arrangement, escape route, for emergency exit.

### **5.0 Guidelines for Transportation of E-Waste**

- The sender of E-Waste, that may be a producer, manufacturer, recyclers, dismantler, bulk-consumer, refurbisher and collection centre should identify transporter or make arrangements for a transporting e-waste in such a manner that environmental consequences of hazards associated with its transport could be kept at minimum.
- Transport of E-Waste should be carried out as per the manifest system as per the provisions made in rule 19 of the E-Waste (M) Rules, 2016 and the transporter will be required to carry a document (three copies) as per form 6 of the rules provided by the sender. The responsibility of safe transportation of E-waste shall be with the sender of E-Waste.
- Fluorescent and other mercury containing lamps may be transported to TSDF in the cases where no recyclers of CFL are available
- The manufacturers and recyclers while transporting waste generated from manufacturing or recycling destined for final disposal to a treatment, storage and disposal facility will follow the provisions under Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016.

## 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 take-back 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 e-waste 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/HFCs 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 disassembled 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 SO<sub>2</sub>. 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 mercury-contaminated 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/m<sup>3</sup> (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 Guidelines for Refurbisher**

- Refurbishment means repairing of used electrical and electronic equipment and it should be carried out in such a way that there should not be any damage to health and environment.
- A refurbisher has to obtain consent to establish under the Water (Prevention and Control of Pollution) Act, 1974, (25 of 1974) and the Air (Prevention and Control of Pollution) Act, 1981 (21 of 1981) from the concerned State Pollution Control Board/Pollution Control Committee.
- A refurbisher has to obtain certificate of registration and proof of installed capacity from District Industries Centre or any other government agency authorised in this regard;
- A refurbisher has to obtain one-time authorization from concerned State Pollution Control Board/Pollution Control Committee.
- A refurbisher should have system to manage leakage of coolant/refrigerant gases and compressor oils from used electrical and electronic equipment during refurbishing operations.
- The refurbishing area should be ventilated and have proper dust control equipment.
- De-dusting system over refurbishment tables should be provided
- Any e-waste generated during refurbishment should be collected separately and sent to collection centre /authorised recycler. In case of refurbisher not having own collection centre, the e-waste so generated may be channelized to an authorised recycler.
- The premise for refurbishing should fulfil the following requirements:
  - (i) Water proof roofing and impermeable surfaces
  - (ii) As a general rule a refurbisher of capacity of 1 Ton per day shall require a minimum of 150 square meters' area for refurbishing, temporary storage of e waste generated and space for refurbished EEE
- If refurbisher opts to sell refurbished EEE then he is required to seek EPR authorisation from CPCB. In no circumstances, the refurbisher shall sell any refurbished EEE without having EPR authorization.



## **9.0 Guidelines for Consumers and Bulk Consumers**

### **9.1 Consumers:**

- The Consumers should channelised their e-waste through collection centre or dealer of authorised producer or dismantler or recycler or through the designated take back service provider of the producer to authorised dismantler/recycler.
- The consumer should not throw e-waste in municipal bins.
- The consumers shall ensure that they do not throw end of life fluorescent and other mercury containing lamp in the municipal bin but hands them over (in a properly packed form) to take back system / collection and channelisation system of producer or to a collection centre of an authorised recycler who is part of producer channelisation system.
- The end of life intact fluorescent and other mercury containing lamp may be stored either in the same boxes in which new lamps are brought or other boxes of similar size. They should be sorted upright. The due precaution may be taken while packing more than one used lamp, so as not to cause the possibility of breakage during the storage and transpiration.

### **9.2 Bulk Consumers:**

- The bulk consumers may ensure that e waste generated by them is handed over only to producer take back system or to authorised dismantler/recycler who is part of producers take back/channelisation system.
- The bulk consumers should ensure that used lamps are not disposed in the municipal bin but handed over (in a properly packed form) to take back system / collection and channelisation system of producer or to a collection centre of an authorised recycler who is part of producer channelisation system.
- The bulk consumers must create special type of disposal bins (suitable for the purpose) at site for depositing the end of life intact fluorescent and other mercury containing lamp only. The management of the institute may issue necessary instructions, to ensure this, to staff and workers handling such lamps.
- The end of life intact fluorescent and other mercury containing lamp, as collected above, may be stored either in the same boxes in which new lamps are brought or other boxes of similar size. They should be stored upright. The due precaution may be taken while packing more than one used lamps, so as not to cause the possibility of breakage during the storage and transportation.

## ABBREVIATIONS

BFR	-	Brominated Flame Retardant
CCC	-	Common Collection Centre
CFC	-	Chloro Fluro Carbon
CFL	-	Compact Fluorescent Lamp
CPCB	-	Central Pollution Control Board
CRT	-	Cathode Ray Tube
CTE	-	Consent to Establish
CTO	-	Consent to Operate
DRS	-	Deposit Refund Scheme
EEE	-	Electrical Electronic Equipment
EoL	-	End of Life
EPR	-	Extended Producer Responsibility
EST	-	Environmentally Sound Technology
HCFC	-	Hydro Chloro Fluro Carbon
HW (M)	-	Hazardous Waste (Management)
IT & TE	-	Information Technology & Telecommunication Equipment
IEC	-	Importer/ Exporter Code
LCD	-	Liquid Crystal Display
LED	-	Light Emitting Diode
MoEF& CC	-	Ministry of Environment, Forest and Climate Change
MT	-	Metric Ton
NGOs	-	Non-Governmental Organisation
PAN	-	Permanent Account Number
PCB	-	Printed Circuit Board
PCBs	-	Polychlorinated Biphenyls
PCC	-	Pollution Control Committees
PCTs	-	Polychlorinated Terphenyls
PRO	-	Producer Responsibility Organization
PWB	-	Printed Wire Board
RoHS	-	Reduction of Hazardous Substances
RWAs	-	Resident Welfare Associations
SPCB	-	State Pollution Control Board
TIN	-	Taxpayer Identification Number
TSDF	-	Treatment, Storage & Disposal Facility
TV	-	Television

**REFERENCES:**

1. CPCB's guidelines for Environmentally Sound Management of E-waste
2. CPCB's guidelines for Implementation of E-waste Rules 2011
3. CPCB's guidelines for environmentally sound mercury management in fluorescent lamp sector
4. Department of electronics and information Technology's (DeitY) SOP's for dismantler and Recycler
5. UNU-IAS E-Waste Statics, Guidelines on classification, reporting and indicators
6. Estimation of outflows of e-waste in India by Shri R.K. Mittal and Shri Maheshwar Dwivedy
7. An Investigation into E-waste flows in India by Shri R.K. Mittal and Shri Maheshwar Dwivedy
8. Forecasting e-waste amounts in India - by Shri Sirajuddin Ahmed, Ms. Rashmi Makkar, Shri Anubhav Sharma (Department of civil Engineering, Jamia Millia Islamia, Delhi)
9. UNEP Report - E-Waste volume II (E-waste Management Manual)

### **Example for Calculation of E-waste Generation**

E-waste generation (weight or number) in the financial year 'x – y'

= Sales in the financial year '(x-z) - (y-z)'

'x – y' = financial year in which generation estimated,

z= average life span of EEE)

#### **For example**

For financial year 2016 -17,

**x - y = 2016 -17 (April 2016 to March 2017)**

If EEE, for which generation is to be estimated, is **ITEW 15**

**means cellular phones that is either smart phone or feature phones** then

z= 5 years or z = 7 years as from the table in chapter 2.1

1. The estimated generation of end of life **ITEW 15 – smart phone** in the FY 2016-17

= Sales in the (FY year 2016-5 – 2017-5)

= Sales in the financial year 2011-12

**or**

2. The estimated generation of end of life **ITEW 15 – feature phone** in the FY 2016-17

= Sales in the (FY year 2016-7 – 2017-7) either in terms of weight or number

= Sales in the financial year 2009-10 in terms of weight or number

❖ Therefore, generation of end of life of **smart phone in the FY 2016-17** = Sales in the financial year 2011 – 12 either in terms of weight or number

❖ Similarly, generation of end of life of **feature phone** = Sales in the financial year 2009-2010 either in terms of weight or number

3. Also during financial year 2016 -17 the collection target is to be for the period October, 2016 to March 2017 (six months) so generation calculation should also be on pro-rata basis and accordingly target may be estimated

4. For financial year 2017 - 18 and subsequent financial year, the generation of end of life should be calculated as given in the example above.

**Annexure – II**

Date:

**Self-Declaration Form  
(As per E-Waste (Management) Rules, 2016)**

**Producer Details:**

S.No.	Required Information	Details
1.	Company Name with Complete Address from where business/sale in the entire country is being managed:	
2.	Name of Authorised Person Email: Telephone: Fax: Mobile Number: Complete Postal Address:	
3.	Brand name (if any):	

**Self-Declaration for Compliance of  
Reduction in the use of Hazardous Substances (RoHS)  
(As per E-Waste (Management) Rules, 2016)**

We \_\_\_\_\_ being the Producer as per E-Waste (Management) Rules, 2016, hereby declare that all the EEE, being offered for sale in the country by our company and covered in the Schedule – I of the E-Waste (Management) Rules, 2016 and listed at enclosure - A comply with the sub rule (1) of the Rule 16 of the above said Rule.

**Authorizing Signatory  
(Name/Signature/Seal)**

Date:

Enclosed: Enclosure A

**Enclosure – A**

<b>S. No.</b>	<b>Product Category &amp; Code* (as per Schedule I of E-Waste (M) Rules, 2016)</b>	<b>Product name**</b>	<b>Model No.**</b>	<b>Weight of Product (kgs) or Numbers</b>	<b>Date of placing on market (In case of import, date of entry in the country)</b>	<b>Compliance with RoHS Yes/No/Partial</b>	<b>RoHS Information provided on product information booklet Yes/No</b>	<b>In case Product is imported from other country, name of the country where product is manufactured</b>

\*\*Add additional rows for products and models

**Authorizing Signatory  
(Name/Signature/Seal)**

**Date:**

**Technical Documents for RoHS(EN 50581 of EU)**

1. General description of the product
2. Documents for materials, parts and/or sub-assemblies
3. Supplier declarations (covering specific material, part and/or sub-assembly, or a specific range of materials, part and/or sub-assemblies) and/or contractual agreement, such as:
  - (i) Supplier declarations, confirming that the restricted substance content of the material, part, or sub-assembly is within the permitted levels and identifying any exemptions that have been applied
  - (ii) Signed contracts confirming that the producer's specification for the maximum content of restricted substances in a material, part, or sub-assembly is fulfilled.
4. Material Declarations:
  - (i) Material declarations providing information on specific substance content and identifying any exemptions that have been applied.

and/or
5. Analytical test results:
  - (i) Analytical test results using the methods described or referenced in EN 62321

## Annexure – IV

## GENERAL STANDARDS FOR DISCHARGE OF ENVIRONMENTAL POLLUTIONS: - EFFULENTS

S.No.	Parameter	Standards			
		Inland surface water	Public Sewers	Land for irrigation	Marine coastal areas
1	2			3	4
		(a)	(b)	(c)	(d)
1.	Colour and odour	Not desirable	---	Not desirable	Not desirable
2.	Suspended solids mg/l, Max.	100	600	200	(a) For process waste water- 100 (b) For cooling water effluent 10 percent above total suspended matter or influent.
3.	Particulate size of suspended solids	Shall pass 850 Micron IS Sieve	--	--	(a) Floatable solids, Max. 3 mm. Settle able solids, Max. 850 microns.
4.	pH Value	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0
5.	Temperature	Shall not exceed 5°C above the receiving water temperature	---	---	Shall not exceed 5°C above the receiving water temperature
6.	Oil and grease mg/l Max.	10	20	10	20
7.	Total residual chlorine mg/l Max	1.0	---	--	1.0
8.	Ammonical nitrogen (as N), mg/l Max.	50	50	--	50
9.	Total Kjeldahl Nitrogen (as NH <sub>3</sub> ) mg/l, Max.	100	--	--	100
10.	Free ammonia (as NH <sub>3</sub> ) mg/l, Max.	5.0	--	--	5.0
11.	Biochemical Oxygen demand <sup>1</sup> [3 days at 27°C] mg/l max.	30	350	100	100
12.	Chemical Oxygen Demand, mg/l, Max.	250	--	--	250
13.	Arsenic (as As), mg/l, Max.	0.2	0.2	0.2	0.2
14.	Mercury (as Hg), mg/l, Max.	0.01	0.01	--	0.01



S.No.	Parameter	Standards			
		Inland surface water	Public Sewers	Land for irrigation	Marine coastal areas
1	2			3	4
		(a)	(b)	(c)	(d)
15.	Lead (as Pb) mg/l, max.	0.1	1.0	--	2.0
16.	Cadmium (as Cd) mg/l, Max.	2.0	1.0	--	2.0
17.	Hexavalent chromium (as Cr+6), mg/l max.	0.1	2.0	--	1.0
18.	Total Chromium (as Cr.) mg/l, max.	2.0	2.0	--	2.0
19.	Copper (as Cu) mg/l, Max.	3.0	3.0	--	3.0
20.	Zinc (As Zn.) mg/l, Max.	5.0	15	--	15
21.	Selenium (as Se.) mg/l Max.	0.05	0.05	--	0.05
22.	Nickel (as Ni) mg/l, Max.	3.0	3.0	--	5.0
23.	Cyanide (as CN) mg/l Max.	0.2	2.0	0.2	0.2
24.	Fluoride (as F) mg/l Max.	2.0	15	--	15
25.	Dissolved phosphates (as P), mg/l Max.	5.0	--	--	--
26.	Sulphide (as S) mg/l Max.	2.0	--	--	5.0
27.	Phenolic compounds (as C <sub>6</sub> H <sub>5</sub> OH) mg/l, Max.	1.0	5.0	--	5.0
28.	Radioactive Materials:				
	(a) Alpha emitter micro curie/ml.	10 <sup>-7</sup>	10 <sup>-7</sup>	10 <sup>-8</sup>	10 <sup>-7</sup>
	(b) Beta emitter micro curie/ml.	10 <sup>-6</sup>	10 <sup>-6</sup>	10 <sup>-7</sup>	10 <sup>-6</sup>
29.	Bio-assay test	90% survival of fish after 96 hours in 100% effluent	90% survival of fish after 96 hours in 100% effluent	90% survival of fish after 96 hours in 100% effluent	90% survival of fish after 96 hours in 100% effluent
30.	Manganese (as Mn)	2 mg/l	2 mg/l	--	2 mg/l
31.	Iron (as Fe)	3 mg/l	3 mg/l	--	3 mg/l
32.	Vanadium (as V)	0.2 mg/l	0.2 mg/l	--	0.2 mg/l

S.No.	Parameter	Standards			
		Inland surface water	Public Sewers	Land for irrigation	Marine coastal areas
1	2	(a)	(b)	3	4
		(a)	(b)	(c)	(d)
33.	Nitrate Nitrogen	10 mg/l	--	--	20 mg/l

## NATIONAL AMBIENT AIR QUALITY STANDARDS

Sl. No.	Pollutant	Time Weighted Average	Concentration in Ambient Air		
			Industrial, Residential, Rural and Other Area	Ecologically Sensitive Area (notified by Central Government)	Methods of Measurement
(1)	(2)	(3)	(4)	(5)	(6)
1	Sulphur Dioxide (SO <sub>2</sub> ), µg/m <sup>3</sup>	Annual * 24 hours** -	50 80	20 80	- Improved West and Geake - Ultraviolet Fluorescence
2	Nitrogen Dioxide (NO <sub>2</sub> ), µg/m <sup>3</sup>	Annual * 24 hours**	40 80	30 80	- Modified Jacob & Hochheiser (Na- arsenite) - Chemiluminescence
3	Particulate Matter (size less than 10 µg/m <sup>3</sup> ) or PM <sub>10</sub> µg/m <sup>3</sup>	Annual * 24 hours**	60 100	60 100	- Gravimetric - TOEM - Beta Attenuation
4	Particulate Matter (size less than 2.5µm) or PM <sub>2.5</sub> µg/m <sup>3</sup>	Annual * 24 hours**	40 60	40 60	- Gravimetric - TOEM - Beta attenuation
5	Ozone (O <sub>3</sub> ) µg/m <sup>3</sup>	8 hours ** 1 Hour**	100 180	100 180	- UV photometric - Chemiluminescence - Chemical Method
6	Lead (Pb) µg/m <sup>3</sup>	Annual * 24 hours**	0.50 1.0	0.50 1.0	- AAs/ICP method after sampling on EPM 2000 or equivalent filter paper - ED-XRF using Teflon filter
7	Carbon Monoxide (CO) mg/m <sup>3</sup>	8 hours** 1 hour**	02 04	02 04	- Non Dispersive Infra-Red (NDIR) - Spectroscopy
8	Ammonia (NH <sub>3</sub> ) µg/m <sup>3</sup>	Annual * 24 hours**	100 400	100 400	- Chemiluminescence - Indophenol blue method
9	Benzene (C <sub>6</sub> H <sub>6</sub> ) µg/m <sup>3</sup>	Annual *	05	05	- Gas chromatography based continuous analyzer - Adsorption and Desorption followed by GC analysis
10	Benzo (a) Pyrene (Bap)- Particulate phase only, ng/m <sup>3</sup>	Annual *	01	01	- Solvent extraction followed by HPCL/GC analysis
11	Arsenic (As), ng/m <sup>3</sup>	Annual *	06	06	- AAS/ICP method after sampling on EPM 2000 or equivalent filter paper
12	Nickel (Ni), ng/m <sup>3</sup>	Annual *	20	20	- AAS/ICP method after sampling on EPM 2000 or equivalent filter paper

\*Annual arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform intervals.

\*\* 24 hourly or 08 hourly or 01 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. 2% of the time, they may exceed the limits but not on two consecutive days of monitoring.

Note. – Whenever and wherever monitoring results on two consecutive days of monitoring exceed the limits specified above for the respective category, it shall be considered adequate reason to institute regular or continuous monitoring and further investigation.