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**Sub : Draft Guidelines on "Pre-processing and Co-processing of Hazardous and other Wastes in Cement Plants as per H&OW(M&TBM) Rules, 2016.**

Draft Guidelines for pre-processing and co-processing of hazardous and other wastes in cement plants as per Hazardous and Other Wastes (Management and Trans-Boundary Movement) Rules, 2016 has been prepared by CPCB. Copy of the same is hereby annexed for information and comments of concerned stakeholders. The comments / suggestions may be provided by 10.02.2017 to CPCB in hard copy as well as soft copy by e-mail to [nkgupta.cpcb@nic.in](mailto:nkgupta.cpcb@nic.in) / [nkgpcb@hotmail.com](mailto:nkgpcb@hotmail.com) / [ankur.cpcb@nic.in](mailto:ankur.cpcb@nic.in)

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**Draft Guidelines for Pre-processing and Co-processing of  
Hazardous and Other Wastes in Cement Plants as per  
H&OW(M&TBM) Rules 2016**



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## 1.0 Background:

Recently notified Rules on management of Hazardous and Other Wastes, outlines the hierarchy of wastes management, wherein, prevention, minimization, reuse, recycling, recovery, utilisation including pre-processing & co-processing was envisaged prior to considering the option of disposal through incineration or secured landfilling.

Substantial fractions of the industrial, commercial, domestic and other wastes contain materials that have the potential for use as an alternative raw material or as a supplementary fuel for energy recovery. The current waste generation scenario in India is as follows.

- About 7.4 Million tonnes of hazardous wastes is annually generated in India, out of which around 3.98 Million tonnes is recyclable and can be used for resource or energy recovery.
- About 65 Mio TPA of MSW is generated in the country which contains about 15-20 % of non-recyclable Segregated Combustible Fraction (SCF) which can be utilized for energy recovery.
- About 200 million tonnes of non-hazardous wastes of industrial origin also gets generated in the country such as fly-ash, pyro-metallurgical slags, sludge from WTPs, dried sewage sludge, Plastic & other packaging materials, date expired and off-specification FMCGs materials and food & kindred products, used pneumatic tyres, etc. having potential for resource or energy recovery.
- Large quantity of agro-wastes that do not have potential to be used as cattle feed etc.

Environmentally sound utilization of wastes for resource or energy recovery can be practiced in various industrial processes, however utilization by co-processing in cement Kiln is considered as an effective and sustainable option. There is dual benefit in co-processing of wastes in cement kilns, in terms of utilizing the waste as a supplementary fuel as well as an alternative raw material

The production of cement in India is about 300 Million Tons per annum, for which estimated coal and raw material (Lime stone, Iron ore, Clay, Bauxite etc.) requirement are 50 Million Tons per annum and 450 Million Tons per annum, respectively. The country, therefore, has vast potential to utilize large quantum of wastes such as non-recyclable hazardous & other wastes, segregated combustible fractions from MSW or Municipal Solid Wastes (MSW) based Refuse Derived Fuel (RDF), non-hazardous industrial wastes, plastics wastes, tyre wastes, non-usable bio-mass etc. as an alternative fuel and raw material (AFR) in cement kilns. Such utilization would help in recovering energy and material value present in them thereby reducing the consumption of primary fossil fuels and raw materials. Utilising these materials as AFRs will also reduce large quantity of GHG emissions of the country which is in line with our commitment made in the Paris agreement.

Many trial runs for co-processing of different kind of hazardous & other wastes in cement kiln have been conducted as per the technical support provided by CPCB since the year 2005. These wastes have been permitted by CPCB and

then authorized by SPCBs to implement regular co-processing in various cement kilns under Rule 11 of the Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008. CPCB has also published guidelines on co-processing of wastes in cement plants in the year 2010.

Subsequently, these rules have been superseded with re-notification vide GSR 395 (E) dated 04.04.2016 as the Hazardous and Other Wastes (Management and Trans-boundary Movement) Rules, 2016 (HOWM Rules 2016).

The Rule 9 of the HOWM Rules 2016 is reproduced below:

***“Utilisation of hazardous and other wastes.-****(1) The utilisation of hazardous and other wastes as a resource or after pre-processing either for co-processing or for any other use, including within the premises of the generator (if it is not part of process), shall be carried out only after obtaining authorization from the State Pollution Control Board in respect of waste on the basis of standard operating procedures or guidelines provided by the Central Pollution Control Board.*

*(2) Where standard operating procedures or guidelines are not available for specific utilisation, the approval has to be sought from Central Pollution Control Board which shall be granting approval on the basis of trial runs and thereafter, standard operating procedures or guidelines shall be prepared by Central Pollution Control Board:*

*Provided, if trial run has been conducted for particular waste with respect to particular utilization and compliance to the environmental standards has been demonstrated, authorization may be granted by the State Pollution Control Board with respect to the same waste and utilisation, without need of separate trial run by Central Pollution Control Board and such cases of successful trial run, Central Pollution Control Board shall intimate all the State Pollution Control Board regarding the same.*

*(3) No trial runs shall be required for co-processing of waste in cement plants for which guidelines by the Central Pollution Control Board are already available; however, the actual users shall ensure compliance to the standards notified under the Environment (Protection) Act, 1986 (29 of 1986), for cement plant with respect to co-processing of waste:*

*Provided that till the time the standards are notified, the procedure as applicable to other kind of utilisation of hazardous and other waste, as enumerated above shall be followed.”*

The above provisions have prompted CPCB to bring out these revised guidelines to facilitate SPCBs/PCCs to grant authorisation for utilization of different kinds of wastes, including Hazardous & other wastes, as AFRs through co-processing in cement kilns in an environmentally sound manner.

## **2.0 Benefits of Co-processing:**

Co-processing in cement kiln is considered as environmentally sustainable option for the management of different kinds of wastes including hazardous and other wastes. In co-processing, these wastes are not only destroyed at a higher temperature of up to 1450°C and long residence time during which its inorganic content gets fixed with the clinker and becomes part of cement apart from using the energy content of the wastes, thus no residues are left. While in case of incineration, the residual ash requires to be land filled as hazardous waste. Further the acidic gases, if any generated during co-processing gets neutralized in the large alkaline environment available within the kiln system. This phenomenon also reduces the non-renewable resources requirement such as coal and lime stone etc. Thus the utilization of wastes in cement kilns through co-processing provides a win-win option of waste disposal.

Co-processing of wastes in the cement plants would require a large scale management of Hazardous and other wastes. This would mean that a large quantum of waste will be received, stored, handled and pre-processed in the cement plants or TSDFs or stand-alone pre-processing facilities so as to make an homogenised mixture of wastes suitable for co-processing in the cement kilns. Further it may require installation of different systems for feeding such homogenised mixtures into cement kilns. Fig 1 given in Annexure 1 provides an overview of the pre-processing of the waste in a facility and co-processing in cement kiln.

Hence, there is a need to define appropriate methodology with which, necessary authorization can be granted by SPCBs to cement plants or pre-processing facilities apart from TSDFs for collection, transportation, receipt, storage, handling & pre-processing of wastes and also for co-processing operation in cement kilns.

### **3.0 Authorization for pre-processing and/or co-processing:**

As per HOWM Rules, 2016, utilisation of hazardous and other wastes for co-processing or for any other use shall be carried out only after obtaining authorization from the State Pollution Control Board in respect of waste on the basis of standard operating procedures or guidelines provided by the Central Pollution Control Board.

Further, no trial runs would be necessary for grant of authorisation for co-processing of wastes in cement kilns since Ministry of Environment, Forests and Climate Change has notified the Emission Standards for co-processing of wastes in cement kiln vide GSR No. 497 (E) dated 10.5.2016 under the Environment (Protection) Rules, 1986. Such co-processing shall be carried out as per the guidelines and SOPs outlined in this document

SPCBs may grant Authorisation to cement plants for co-processing of wastes listed in Schedule I, Schedule II and Schedule III of the Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016. Authorisation for co-processing of commonly recyclable hazardous wastes listed in Schedule-IV may be considered only if there are no recyclers for such wastes at reasonable distance as may be decided by SPCBs.

Further, SPCBs may also grant consent to the cement plants under Air (P&C) Act, 1981 for co-processing of any wastes not listed in HOWM Rules, 2016 like SCF, RDF, plastic & other packaging wastes, tyre chips, non-hazardous

industrial wastes, biomasses, agro-wastes (which are not suitable for use as cattle feed) and date expired or off-specification FMCG and food & kindred other products which are not-recyclable. While co-processing all such wastes including hazardous & other wastes, cements plants shall comply with the emission standards prescribed for co-processing of wastes notified by MoEF&CC vide GSR No. 497 (E) dated 10.05.2016.

Use of wastes for co-processing in cement kilns does not warrant the requirement of EC as per MoEF&CC Notification No. S.O.3518 (E) dated 23.11.2016

As per HOWM Rules, 2016, every person who is engaged in generation, collection, transportation, receipt, storage, and handling of hazardous and other wastes for pre-processing and /or co-processing shall obtain an authorization or its renewal by applying in Form 1 from the State Pollution Control Board / Pollution Control Committee.

Accordingly, cement plants may co-process the pre-processed hazardous wastes received from TSDFs or stand-alone pre-processing facilities or their captive pre-processing facilities only after obtaining such authorization.

Every TSDF or standalone pre-processing facility or cement plant who is engaged in pre-processing of wastes for co-processing shall have minimal requisite infrastructure facilities & operational controls as mentioned below;

S.No	Type of operations	Check-list
i.	Type of packaging	May use liners, Bags Small / Jumbo, Drums, Containers, Bulklers, Tankers, etc. suitable for handling of hazardous wastes as per CPCB guidelines
ii.	Reception	Weighing bridge
iii.	Waste characterisation / qualification	Laboratory
iv.	Storage	Shall install covered sheds with Impervious flooring. Waste shall be stored in storage tanks/Containers/bins. Bulky wastes may be handled on impervious lined flooring under shed.
v.	Equipment for Size reduction	Shredder, Grinder, mixers, Cutter, Hammer, Jaw Crusher, Chipper, Hydro-pulper machines, etc.
vi.	Feed material preparation equipment	Impregnation, Drying, Screening, Crushing, Palletisation, Granulation, Others
vii.	Moving machinery	Shall use machinery like trucks, Bob cat, Forklifts, loaders, dumpers, Arm handlers, Wheel loaders, Crawler loaders, Telescopic etc.
viii.	sorting equipment	Shall use equipment like Metal detectors, Electro-Magnetic separators, etc.
ix.	Screening material	Shall use equipment such as disc screen, Rotary screen, Trommel screen, Oscillating screens etc.
x.	Conveyers to transport the material from one to another place	Shall use belt conveyors, Inclined Belt conveyors, Cleated belt conveyors, chain conveyors, bucket conveyors, closed conveyors, pipe conveyors etc

S.No	Type of operations	Check-list
xi.	Feeding arrangements (applicable to cement plants alone)	Weigh feeders (Volumetric and Gravimetric feeding), Apron and Gottwald feeders etc. for liquid, solid and semi-solid waste feeding, including facilities for impregnation of wastes.
xii.	Safety equipment (applicable to cement plants alone)	Rotary Air Lock, Safety shut off gate, Double slide gates are utilized into the feeding mechanism to avoid any back fire due to any pressure build-up into the kiln.
xiii.	Fugitive Emission Control Systems	Fume extraction systems with vacuum ducts connected to Scrubbers / bag filters VOC emission control systems Biological treatment etc. ID fan and stack.
xiv.	Fire protection	Approved by fire safety auditor / fire department should be provided
xv.	Spillage/leachate collection / containment measures.	Shall install collection pits, impervious liners, segregation of storm water drainage systems
xvi.	Electrical fittings / Equipment	Systems shall be designed to handling flammable / explosive materials (If relevant)
xvii.	Odour control	The facility must have appropriate odor control facility to deal with the odor nuisance.
xviii.	Safety Equipment	There shall be provision of emergency showers and eye wash stations. Use of PPEs, ear-plug etc.
xix.	Facility has implemented a monitoring plan for checking the health of the operating personnel as per the statutory requirement	Medical surveillance of the operating personnel as per HOWM Rules 2016
xx.	Emergency Response Plan	Emergency Response Plan to deal with spills, fires and emergencies as per CPCB guidelines
xxi.	CEMS	Shall install CEMS for PM, NO <sub>x</sub> & SO <sub>2</sub> and connected to SPCB / CPCB for online data transmission (applicable to cement plants alone)

TSDFs, Stand alone Pre-processing Facilities & Cement plants shall undertake pre-processing of and co-processing of wastes as per the Standard Operating Procedures (SOPs) specified in these guidelines.

In case a TSDF/stand-alone pre-processing facility is located at a distance much closer to the generator of the hazardous waste as compared to location of cement plant, those generators may be authorised by SPCBs to send their waste to an authorised TSDFs/stand-alone pre-processing facility. This would minimize transportation of waste to long distances and the corresponding carbon foot-print. Decision on authorising waste generators for sending their wastes for pre-processing/co-processing to a cement plant/TSDF/standalone pre-processing facility shall be taken by concerned SPCBs on case to case basis considering the logistics of waste movement.

#### 4.0 Trial Runs

Trial runs for co-processing of hazardous wastes would not be necessary except for few specific wastes such as Persistent Organic Compounds (PoPs), PCBs, obsolete and date expired pesticides, Ozone Depleting Substances etc. listed for restrictions in international conventions, for which trial studies were not yet conducted. Kiln specific trial runs may be required for such wastes to study the destruction and removal efficiencies (as per the requirement of Stockholm convention) in the given kiln, compliance to emission standards, safe transport, storage and handling etc. prior to issuance of authorisation by SPCBs. In such cases, SPCBs may consult CPCB for conducting such kiln specific trial studies.

## **5.0 Standard Operating Procedures**

### **5.1 Handling of Hazardous & other wastes:**

The hazardous wastes need to be handled in an environmentally safe manner avoiding the possibilities of contaminating the environment and eliminate the chances of accidents leading to environmental damage. The requirements of handling, including labelling, packaging, transport and storage applicable to the hazardous & other wastes have been described in following sub-sections.

#### **5.1 Responsibilities of occupier for handling of hazardous & other wastes**

“Occupier” in relation to any factory or premises, means a person who has control over the affairs of the factory or the premises and includes in relation to any hazardous waste the person in possession of the hazardous waste.

The occupier shall take all adequate steps while handling hazardous wastes to:

- (a) Contain contaminants and prevent accidents and limit their consequences on human beings and the environment; and
- (b) Provide persons working on the site with the training, equipment and information necessary to ensure their safety.

#### **5.2 Packaging of Hazardous & other wastes:**

The containers utilized for storing and handling Hazardous and other wastes for the purpose of co-processing must be able to withstand normal handling and retain integrity for a minimum period of six months. In general, packaging of hazardous substances must meet the following requirements:

- (i) All packaging materials including containers shall be of such strength, construction and type as not to break open or become defective during transportation.
- (ii) All packaging materials including containers shall be so packed and sealed that spillages of hazardous wastes / substances are prevented during transportation due to jerks and vibrations caused by uneven road surface.
- (iii) Re-packing materials including that used for fastening must not be affected by the contents or form a dangerous combination with them.
- (iv) Packaging material should be such that there will be no significant chemical or galvanic action among any of the material in the package.

- (v) Bulk transportation of hazardous wastes in trucks without suitable packaging or containers shall not be allowed.
- (vi) The containers when used for packaging of the hazardous & other wastes shall meet the following requirements:

Container shall be of mild steel with suitable corrosion-resistant coating and roll-on roll-off cover, which may either be handled by articulated crane or by a hook lift system comfortably for a large variety of wastes. Other modes of packaging, like collection in 22-liter plastic or steel drums, PP and HDPE/LDPE containers, HDPE liner bags etc., also work for variety of waste. However, all such container should be amenable to mechanical handling.

- It should be leak proof.
- In general, the containers for liquid hazardous waste should be completely closed / sealed. There should be no gas generation due to any chemical reaction within the container, and thus should be devoid of air vents.
- Container should be covered with a solid lid or a canvas to avoid emissions of any sort including spillage, dust etc. and to minimize odour generation both at the point of loading as well as during transportation.
- Container used for transportation of waste should be able to withstand the shock loads due to vibration effect/undulations of pavements etc.
- Container should be easy to handle during transportation and emptying.
- As far as possible, manual handling of containers should be minimized. Appropriate material handling equipment is to be used to load, transport and unload the containers. Drums should not be rolled on or off vehicles. Preferably, equipment such as fork lift & pallets shall be used.
- Where a two-tier or three-tier storage is envisaged the frame should have adequate strength to hold the containers. Palletised drums may be stacked not more than 2 layers high in the transport vehicle.
- One-way containers (especially 16-liter drums) are also allowed. The multi-use container should be re-useable provided it should be cleaned and free from deterioration or defects.
- Loads are to be properly placed on vehicles. Hazardous & other waste containers are not to overhang, perch lean or be placed in other unstable base. Load should be secured with straps, clamps, braces or other measures to prevent movement and loss. Design of the container should be such that it can be safely accommodated on the transport vehicle.
- Non-compatible wastes shall not be collected in the same container. These wastes shall be segregated & packed separately. Non-compatible wastes shall not be transported together under any circumstance.

### **5.3 Labelling of Hazardous & other wastes**

There are two types of labelling requirements:

- (i) Labelling of individual transport containers (ranging from a pint-size to a tank); and
- (ii) Labelling of transport vehicles.

All hazardous & other waste containers must be clearly marked with the contents. The marking must be irremovable, waterproof and firmly attached. Previous content labels shall be obliterated when the contents are different. Proper marking of containers is essential.

Containers that contain hazardous waste shall be labelled with the words "HAZARDOUS WASTE" in Vernacular language, Hindi / English. The information on the label must include the code number of the waste, the waste type, the origin (name, address, telephone number of generator), hazardous property (e.g. flammable), and the symbol for the hazardous property (e.g. the red square with flame symbol).

The label must withstand the effects of rain and sun. Labelling of containers is important for tracking the wastes from the point of generation up to the final point of disposal. The following are the requirements for labelling:

- The label should contain the name and address of the occupier and facility where it is being sent for pre-processing or co-processing i.e. labelling of container shall be provided with a general label as per Form 8 of the HOWM Rules, 2016.
- Emergency contact phone numbers shall be prominently displayed viz; the phone number of concerned officer of the sender and receiver, Regional Officer of the SPCB / PCC, Fire Station, Police Station and other agencies concerned.

Explanation: As a general rule, the label has to state the origin/ generator of the waste. He / she and only he / she – is responsible and shall know, in case of any accident / spillage etc. what kind of wastes it is, what hazard may occur and which measures should be taken. The second in the line is the collector / transporter / disposer /co-processor / pre-processor, who has to know the risk and what to do to minimize risks and hazards.

#### **5.4 Collection and transportation of Hazardous & other wastes**

The transportation of the Hazardous wastes has to be undertaken by the transporter who is engaged by either authorised sender or receiver. The responsibility of safe transportation of hazardous & other waste to the site for pre-processing or co-processing shall rest with either waste generator or the occupier of the pre-processing / co-processing facility that engages the transporter for the waste transportation. The detailed guidelines for collection and transportation of hazardous and other wastes have been provided at **Annexure-2**.

#### **5.5 Storage of Hazardous & other wastes**

The storage period of hazardous and other wastes shall be in accordance with the Rule 8 of the Hazardous & Other wastes (Management and Transboundary Movement) Rules 2016. The minimal requisite facilities for storage of hazardous and other wastes are given at **Annexure-3**.

## 5.5 Waste reception

Waste Characterization plays an important part in any treatment process of the waste which may be required before pre-processing and ultimately co-processing into the cement kilns. Upon receipt of the waste, it shall be weighed and property logged. It shall then undergo a visual inspection to confirm the physical appearance. A representative sample of the waste shall be collected and send to the onsite laboratory for finger printing analysis. Finger print analysis is performed to confirm that a particular waste stream belongs to an offsite waste generation source or not, based on its characteristics. The results of the finger printing analysis should be compared with the results of earlier analysis. Upon confirmation, this shall then be sent for pre-processing or co-processing.

The operator of the pre-processing facility of the cement plant shall perform following finger print analysis for each of the consignment of waste received for pre-processing or co-processing from generation site;

- Moisture content,
- Ash content,
- Net Calorific Value (NCV),
- Chloride and Sulphur content.
- Chemical compatibility
- Any other specific parameter, which may be decided on merit of each case keeping the clinker production process in focus.
- In case of liquid samples, viscosity, pH, suspended particle content etc shall also be performed.
- Heavy metal analysis, Reactive Sulphide, Reactive Cyanide or Halide analysis should be performed if sample comes from a sector which is suspected to have these in the waste material.

The results of this finger print analysis confirm that the waste belongs to already tested and verified waste stream which is suitable for co-processing into the kiln and do not have any side effects on clinker and cement quality parameters.

As the main product of the kiln is clinker, there must not be any side effect on its quality while utilizing the waste streams as AFRs. For pre-qualification for co-processing or pre-processing, a representative sample should be collected from the waste generator's site and analysed in a laboratory for above said parameter which shall form basis for comparing the finger print analysis of the waste consignments.

Quality Control - The quality of the pre-processed wastes (AFRs) largely depends on the quality control process followed during the quality assessment stage. Starting from sampling like collection of a representative sample, its storage in suitable container, avoiding any adulteration during transportation to lab, sample preparation in lab, performing test as per BIS standards for different quality parameters and carefully observing, recording and comparing the results

for specific waste streams is the key to define and confirm its suitability for pre-processing / co-processing in to the cement kiln.

Samples of wastes received at the pre-processing facility or the cement plant for pre-qualification must be preserved for one year for traceability considerations.

Samples of waste collected from regular consignments for finger print analysis must be preserved for one month for traceability consideration.

Samples that are beyond times as mentioned above must be sent to the TSDF or standalone pre-processing facility or to the cement plant for ensuring its disposal through co-processing.

## **5.6 Acceptance process for Hazardous & other wastes**

Appropriate knowledge of the hazardous and other wastes is necessary to ensure that it will not adversely affect the process, safety or environment while handling it during pre-processing or co-processing. Hence, appropriate characterization of the waste for its acceptance and safe handling is an essential requirement.

Characterization of Hazardous and other waste for acceptance comprises two stages: pre-acceptance (or screening) and on-site acceptance. Pre-acceptance involves the provision of assessing the representative samples of the waste to allow operators to determine suitability of the infrastructure to handle the waste before receiving the same in the facility. The second stage concerns procedures when the waste arrives at the facility to confirm previously approved characteristics.

Failure to adequately screen waste samples prior to acceptance and a confirmation of its composition on arrival at the installation may lead to subsequent problems, inappropriate storage, mixing of incompatible substances, and accumulation of wastes could occur.

Hence, the pre-processing / co-processing facility must have appropriate laboratory facility for characterizing solid, liquid and sludge wastes with qualified analysts to ensure that proper waste acceptance process is practiced. This laboratory shall be equipped with facilities to test Moisture, Calorific value, Ash, Chlorine, Fluorine, Carbon, Hydrogen, Sulphur, Nitrogen, Phosphorous, alkali and heavy metals, flash point, mixing compatibility, reactive sulphide, reactive Cyanide or halides etc.

In case the waste received at cement plant or standalone pre-processing facility does not meet the required criteria, in such case, the receiver should make arrangement for transfer of such waste to TSDF for final disposal by adopting necessary manifest system.

## **6.0 Pre-processing of wastes for co-processing:**

Due to the heterogeneity of wastes, pre-processing is required to produce a relatively uniform waste stream for co-processing in cement kilns. This waste stream should comply with the technical and administrative requirements of cement manufacture and guarantee that emission standards and product quality are met. The proposal in this regard shall be submitted to SPCB by the cement plant or standalone pre-processing facility or TSDF. Waste mix having

uniform characteristics needs to be prepared from different waste streams for trouble free co-processing in a cement kiln.

The characteristics of the waste mix that need to be uniform pertain to particle size, chemical composition and heat content. For optimum operation, kilns require very uniform waste mix flows in terms of quality and quantity. Uniform quality of waste mix can be achieved by pre-processing different types of wastes by different physical processes in a pre-processing facility.

Pre-Processing is defined as pre-treatment of waste streams coming from different sectors and industries to make it suitable/homogenised for feeding into the kiln system to avoid process fluctuations. Pre-processing involves only physical transformations like size reduction (By Shredding and cutting), separation of foreign/undesirable materials (magnetic materials separation by Magnetic separator, use of metal detectors to remove metallic particles), impregnation (introducing and proper mixing of biomass/saw dust in semi solid streams to soak extra flowing liquids & maintaining good flow ability) and desired size selection (Size selection by screening operation, manual size selection by handpicking of large material size on very low speed Belt conveyors).

Pre-processing produces a homogenised Alternative Fuel mix from different incoming waste streams from various industrial sectors and reduces the possibilities of process fluctuations during Co-Processing the pre-processed fuels.

Various types of equipment are utilized during pre-processing operations like Shredder, Grinder, Cutter, Hammer, Jaw Crusher, Chipper and Hydro pulper machines for size reduction. Mixers for homogenizing the waste mix into large vessels/pits. Moving machinery like trucks, Bob cat, Forklifts, loaders, dumpers, Arm handlers, Wheel loaders, Crawler loaders, Telescopic handlers etc for material movement from one to another place and loading unloading of the material. Metal detectors, Electro-Magnetic separators, metal sorting equipments are utilized to remove small metallic traces which may be present into the incoming hazardous and other wastes from various sources. Different type of screens like Disc screen, Rotary screen, Trommel screen, Oscillating screens are used to separate the differently sized portions of the processed waste and choosing the right fraction for feeding into the system. Various types of Belt conveyors like flat belt conveyors, Inclined Belt conveyors, Cleated belt conveyors, chain conveyors, bucket conveyors, closed conveyors, pipe conveyors etc are utilised to transport the material from one to another place, usually pre-processed waste from the processing area to feeding area.

The pre-processing facility must have appropriate design to ensure that the waste homogenization operation is carried out in an environmentally sound manner and has equipment & facilities that are designed to handle the required hazardous wastes.

The pre-processing area must have impervious concrete floor and should be adequately covered to avoid exposure of rain to the material being stored and handled while pre-processing or co-processing.

Fume extraction systems with vacuum ducts and fume hoods should be installed at receiving pits/tanks, mixing units, blending units, shredders, transfer

points, dryers, impregnation units, granulators, pelletizes, crushers, grinders, blenders etc. where there is source of such emissions. Such fume extraction systems should be connected to scrubbers / bag filters / VOC emission control through carbon adsorption, thermal or biological treatment etc. depending on type of emissions. The cleaned gases should be vented through ID fan and stack.

A fire protection system of approved design should be in place in the storage and pre-processing area.

The storage, handling and pre-processing facility should have appropriate spillage / leachate collection and storage system with impervious liners to avoid contamination of the ground water and soil.

The storm water and spillage / leachate drainage systems should be so designed that there should be no contamination of the storm water with the spillage or leachate from the storage, handling and pre-processing area.

The electrical and instrumentation fitting should be conforming to the standards.

The facility must have appropriate odor control facility to deal with the odor nuisance.

Emergency showers and eye wash stations should be provided within the storage, handling and pre-processing work area for immediate emergency use following exposure to the wastes.

Abatement techniques should be in place for control of noise to required levels.

## **7.0 Co-processing of wastes in Cement kiln:**

Co-processing is defined as the use of waste as raw material, or as a source of energy, or both to replace natural mineral resources (material recycling) and fossil fuels such as coal, petroleum and gas (energy recovery) in industrial processes, mainly in energy intensive industries (EII) like cement production. In Co-processing, the combustible waste is utilized as fuel (Alternative Fuels) into the kiln system for maintaining the high temperature during clinker production. Some of the waste streams like biomass, small quantity waste streams, etc which have suitable quality parameters may be directly fed into the kiln system. However, majorly waste streams, especially when volumes are more, are fed after pre-processing which make it homogenized to reduce the process fluctuations.

Various equipments are utilized for feeding the pre-processed AFR into kiln system. Automated mechanical extraction machines such as walking Floor and various belt conveyors as mentioned above are utilized for transporting material from processing area to feeding point. Different kinds of volumetric and gravimetric dosing machinery are utilized for feeding the AFR material into the kiln in a controlled manner. Various safety equipments like Rotary Air Lock, Safety shut off valves & gates & Double slide gates are utilized into the feeding mechanism to avoid any back fire due to pressure build-up inside the kiln. Bag filters are utilised at transfer points to avoid any dust emission into the atmosphere in case of feeding fine AFRs.

For optimal performance (co-processing without additional emissions), waste materials (pre-processed or as received) should be fed to the cement kiln through appropriate feed points, in adequate proportions and with proper waste quality and emission monitoring systems.

Different feed points can be used to feed the waste materials into the cement kiln for co-processing. The most common ones are:

- Main burner at the rotary kiln outlet end
- Rotary kiln inlet end
- Pre-calciner
- Mid kiln (for long dry and wet kilns)

Appropriate feed points have to be selected according to the physical, chemical and toxicological characteristics of the waste materials. Wastes of high calorific value have to be always fed into the high temperature combustion zones of the kiln system. Wastes containing stable toxic components and also wastes containing more than 1.5% chlorine should be fed to the main burner to ensure complete combustion in the high temperature and long retention time.

Alternative raw materials containing constituents that can be volatilized at operating temperatures in the pre-heater system have to be fed into the high temperature zones of the kiln system.

Coal feeding circuit and raw material feeding circuits of the cement plant must not be utilised to feed any type of wastes for co-processing unless a trial is performed to demonstrate the suitability of the same and specific approval from the SPCB is obtained along with the authorisation. SPCBs may consult CPCB in specific cases in this regard.

Feeding of alternative raw materials containing volatile (organic and inorganic) components to the kiln via the normal raw meal supply should be avoided unless it has been demonstrated by trial runs in the kiln that there is no VOC emission from the stack. Such trial runs should be carried out with permission from SPCBs.

Destruction of waste materials that are covered under the Stockholm convention and Montreal Protocol such as PCBs, Expired or obsolete pesticides, Ozone Depleting Substances etc. must however be undertaken in a given kiln only after obtaining specific approval from SPCB and other concerned organisations. For this, SPCB in consultation with CPCB will provide steps to be followed including implementing a trial as per a defined protocol.

### **7.1 Suitability of Substances for co-processing:**

The decision on what type of substances can be used is based on the clinker production processes, the raw material and fuel compositions, the feeding points, the air pollution control devices and the given waste management problems. The Accept - Refuse Chart in **Annexure-4** could be used by plant operators to help them in considering, which type of substance is suitable for co processing.

As a basic rule, waste accepted for co-processing must be safe enough to handle in the given facility and shall contribute to recovery of material or energy value present in it or provide its safe disposal.

Sometimes, some waste streams are not suitable in large volumes but can be co-processed in small volumes with controlled feed rate into the system.

The wastes listed below are normally not recommended till otherwise proved / evidenced for and hence need not be considered for pre and co-processing.

- Biomedical waste
- Asbestos containing waste.
- Electronic scrap.
- Entire batteries.
- Explosives.
- Corrosives.
- Mineral acid wastes.
- Radioactive Wastes.
- Unsorted municipal garbage.

## **7.2 Operating Conditions:**

Cement plants shall ensure to prevent waste feed in following conditions;

- i. at start up, until the temperature of 850°C in calciner or 1100°C at kiln inlet as the case may be.
- ii. Whenever the temperature of 850°C or 1100°C as the case may be is not maintained.
- iii. Whenever emission monitoring show that any emission limits value is exceeded due to disturbances or failures of air pollution control devices.
- iv. In case of disturbed process condition in the kiln

The management of the pre and co-processing plant shall be in the hands of a skilled person, competent to manage the hazardous waste in an environmentally sound manner.

## **8.0 Emission standards:**

The cement kilns undertaking co-processing of the different wastes as above must comply with the following notified emission standards notified vide GSR 497 (E) dated 10.5.2016;

Draft Guidelines for Authorizing / implementing Pre-processing and Co-processing of Hazardous and Other Wastes in Cement Plants as per H&OW(M&TBM) Rules, 2016

"S. No.	Industry	Parameter	Standards		
(1)	(2)	(3)	(4)		
"10A.	Cement Plant with co-processing of wastes	<b>A- Emission Standards</b>			
		Rotary Kiln – with co-processing of Wastes			
			<b>Date of Commissioning</b>	<b>Location</b>	<b>Concentration not to exceed, in mg/Nm<sup>3</sup></b>
			<b>(a)</b>	<b>(b)</b>	<b>(c)</b>
		Particulate Matter (PM) <sup>o</sup>	on or after the date of notification (25.8.2014)	anywhere in the country	30
			before the date of notification (25.8.2014)	critically polluted area or urban centres with population above 1.0 lakh or within its periphery of 5.0 kilometer radius	30
				other than critically polluted area or urban centres	30
		SO <sub>2</sub> <sup>+</sup>	irrespective of date of commissioning	anywhere in the country	100, 700 and 1000 when pyritic sulphur in the limestone is less than 0.25%, 0.25 to 0.5% and more than 0.5% respectively.
		NO <sub>x</sub> <sup>o</sup>	After the date of notification (25.8.2014)	anywhere in the country	(1) 600
			Before the date of notification (25.8.2014)	anywhere in the country	(2) 800 for rotary kiln with In Line Calciner (ILC) technology.
			(3) 1000 for rotary kiln using mixed stream of ILC, Separate Line Calciner (SLC) and suspension pre-heater technology or SLC technology alone or without calciner.		
		HCl	10 mg/Nm <sup>3</sup>		
		HF	1 mg/Nm <sup>3</sup>		
		TOC	10 mg/Nm <sup>3</sup> **		
		Hg and its compounds	0.05 mg/Nm <sup>3</sup>		
		Cd +Tl and their compounds	0.05 mg/Nm <sup>3</sup>		
		Sb+As+Pb+Co+Cr+Cu+Mn+Ni+V and their compounds	0.5 mg/Nm <sup>3</sup>		
		Dioxins and Furans	0.1 ngTEQ/ Nm <sup>3</sup>		

Continuous Emission Monitoring System (CEMS) should be installed & functioning for the parameters PM, SO<sub>2</sub> and NO<sub>x</sub> in the first phase and the data should be uplinked to CPCB and SPCB servers. Additional emission parameters for CEMS may be added in future as per the directions of CPCB or SPCBs from time to time.

Other parameters shall be monitored manually once in a year and data should be submitted to SPCBs/CPCB.

SPCB / PCC shall monitor the emission from the cement plant to verify the compliance of notified emission standards. In case, SPCB/PCC does not have the emission monitoring facilities, they can engage any EPA recognized / NABL accredited laboratory for the purpose.

## 9.0 Procedure for obtaining Authorisation

For co-processing of hazardous and other wastes, cement plants shall obtain Consent to Establish (CTE) and Consent to Operate (CTO) prior to obtaining authorisation under HOWM Rules, 2016.

The proposal for co-processing may include any kind of hazardous & other waste (as listed in the Schedules of HOWM rules, 2016) and non-hazardous wastes such as segregated combustible fractions from MSW, Refuse Derived Fuel (RDF) from MSW, Plastic wastes, Tyre chips, biomasses, food and other products, agro-wastes etc. with exceptions as described in section 7.1 of this guidelines.

The cement plants /standalone pre-processing facilities / TSDFs shall have valid authorisation for receiving, transporting, handling, storing, pre-processing or co-processing of hazardous and other wastes, for which they shall apply for authorisation as per Form 1 of HOWM Rules, 2016.

Application for authorisation shall provide details of the infrastructure available at their end to receive, characterize, transport, handle, store, pre-process and co-process wastes with minimum requisite facilities as specified in section 3.0 and 6.0 of these guidelines.

SPCB / PCC shall undertake physical inspection and verify the required equipment for pre-processing and co-processing of hazardous and other wastes. Format for verifying adequacy of the infrastructure for Pre-processing / Co-processing of waste materials is given below;

### Format for verifying adequacy of the infrastructure for Pre-processing / Co-processing of waste materials

S.No	Type of operations	Check-list
i	Nature of the waste materials applied for	a. Solid b. Liquid c. Sludge d. Gas e. Hazardous f. Non-Hazardous g. Flammable h. Toxic i. Corrosive j. Explosive
ii	Type of packaging	a. Liners b. Bags Small / Jumbo

S.No	Type of operations	Check-list
		c. Drums d. Containers e. Bulkers f. Tankers g. Other (pl specify)
iii	Type of material handled	a. Solids b. Liquids c. Sludges d. Gases e. Flammable f. Toxic g. Corrosive
iv	Reception	Weighing bridge
v	Type packaging	Loose Bags Drums Containers Bulkers Tankers
vi	Laboratory for Waste characterisation	a. Yes b. No
vii	Storage	Covered sheds Impervious flooring Storage tanks/Containers/bins
viii	Equipment for Size reduction	Shredder, Grinder, mixers, Cutter, Hammer, Jaw Crusher, Chipper, Hydro-pulper machines others (pl. specify)
ix	Feed material preparation equipment	Impregnation Drying,

S.No	Type of operations	Check-list
		Screening Crushing Palletisation Granulation Others
x	Moving machinery	like trucks, Bob cat, Forklifts, loaders, dumpers, Arm handlers, Wheel loaders, Crawler loaders, Telescopic
xi	sorting equipment	Metal detectors, Electro-Magnetic separators, etc.
xii	Screening material	Disc screen, Rotary screen, Trommel screen, Oscillating screens etc.
xiii	Conveyers to transport the material from one to another place	belt conveyors, Inclined Belt conveyors, Cleated belt conveyors, chain conveyors, bucket conveyors, closed conveyors, pipe conveyors etc
xiv	Feeding arrangements	Weigh feeders (Volumetric and Gravimetric feeding), Apron and Gottwald feeders etc. for liquid, solid and semi-solid waste feeding.  Facilities for impregnation of wastes.
xv	Safety equipment	Rotary Air Lock, Safety shut off gate, Double slide gates are utilized into the feeding mechanism to avoid any back fire due to any pressure build-up into the kiln.
xvi	Fugitive Emission Control Systems	Fume extraction systems with vacuum ducts  Scrubbers / bag filters /  VOC emission control systems  Biological treatment etc.  ID fan and stack.

S.No	Type of operations	Check-list
xvii	Fire protection  Approved design should be provided	Yes  No
xviii	Spillage/leachate collection / containment measures.  Collection pits, impervious liners, segregation of storm water drainage systems	Yes  No
xix	Electrical fittings / Equipment / Systems are designed to handle flammable / explosive materials (If relevant)	Yes  No
xx	Odour control  The facility must have appropriate odor control facility to deal with the odor nuisance.	Yes  No
xxi	Safety Equipment  Provision of emergency showers and eye wash stations,  PPEs, ear-plug etc.	Yes  No  Remarks:
xxii.	Facilities implemented at the location have been approved by the office of the Factory Inspector	Yes  No
xxiii.	Facility has implemented a monitoring plan for checking the health of the operating personnel as per the statutory requirement	Yes  No

S.No	Type of operations	Check-list
xxiv.	Facility has prepared an Emergency Response Plan	Yes No
xxv.	CEMS installed for PM, NOx& SO <sub>2</sub> and connected to SPCB / CPCB for online data transmission	a. Yes b. No

SPCBs shall attach the verified check-list to their inspection report. In case of refusal, SPCB shall communicate the reasons for the same.

SPCBs may also grant authorization for utilization of chemical gypsum, stabilized jarosite, other similar waste material having potential to be used as set retarder and other high volume low-effect wastes as specified under HOWM Rules, 2016 in cement mill, for which cement plant shall apply to SPCB in form 1. Cement plant shall provide details of the infrastructure available at their end to receive, characterize, transport, handle, store, pre-process and utilize wastes and illustrate their suitability to manage these wastes in an environmentally sound and safe manner with requisite facilities given in section 3.0 and 6.0 as applicable.

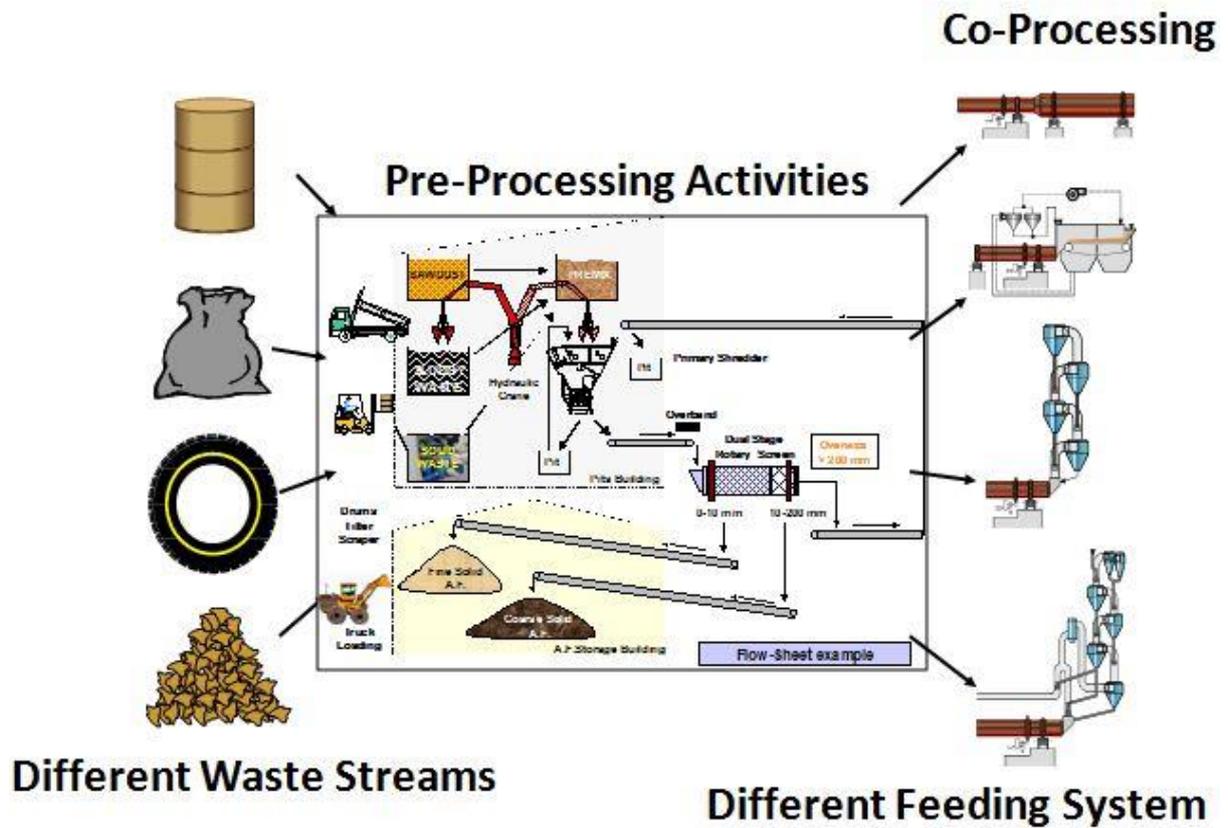
Waste generator shall also obtain authorisation for sending chemical gypsum, stabilized jarosite, and other high volume low-effect wastes as specified under HOWM Rules, 2016 for utilization in cement mill.

Before undertaking pre-processing or co-processing of a waste stream which were introduced for co-processing or pre-processing, the facility operator shall give intimation to SPCB / PCC as per the format given at Annexure - 5

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Annexure 1

Schematic Representation of Pre and Co-Processing in Cement Kiln



**Annexure-2**

**Collection & Transportation of Hazardous Wastes**

The occupier of the hazardous waste shall ensure that wastes are packaged in a manner suitable for safe handling, storage and transport as specified in section 5.2 of these guidelines. Labelling on packaging is readily visible and material used for packaging shall withstand physical conditions and climatic factors as specified in Section 5.3.

In case of transportation of hazardous and other waste, the responsibility of the safe transport shall be either of the sender or the receiver whosoever arranges the transport and has the necessary authorization for the transport from the concerned State Pollution Control Board. The authorization for the transport shall be obtained either by the sender or the receiver on whose behalf the transport is being arranged. This responsibility should be clearly indicated in the manifest. Thus the occupier involved in transportation of hazardous wastes for co-processing or pre-processing shall comply with the following requirements;

- (a) Ensure that information regarding characteristics of wastes particularly in terms of being corrosive, reactive, Ignitable or toxic is provided on the label.
- (b) The transport of hazardous waste containers shall be in accordance with the provisions of the Hazardous and other Wastes (Management and Transboundary Movement) Rules, 2016, (herein after referred as HW (M & TBM) Rules) and the rules made by the Central Government under the Motor Vehicle Act, 1988 and other guidelines issued from time to time.
- (c) Provide the relevant information in Form 9 to the transporter, regarding the hazardous nature of the waste and measures to be taken in case of an emergency and shall mark the hazardous wastes containers as per Form 8.
- (d) All hazardous waste containers shall be provided with a general label as given in Form 8 of the HW (M& TBM) Rules.
- (e) Intimate both the State Pollution Control Boards before handing over the waste to the transporter. In case of transportation of hazardous through a State other than the State of origin and destination, the sender shall give prior intimation to the concerned State Pollution Control Board of the States of transit before handing over the hazardous wastes to the transporter.
- (g) Manifest System shall be applicable for movement of wastes within the country only
- h) The sender of the waste shall prepare seven copies of the Manifest in Form 10 comprising of colour code indicated below and all seven copies shall be signed by the sender:

Copy number with colour code	Purpose
------------------------------	---------

Copy 1 (White)	To be forwarded by the sender to the State Pollution Control Board or Committee after signing all the seven copies.
Copy 2 (Yellow)	To be retained by the sender after taking signature on it form the transporter and the rest of the five copies to be carried by the transporter.
Copy 3 (Pink)	To be retained by the receiver (actual user or treatment storage and disposal facility operator) after receiving the waste and the remaining four copies are to be duly signed by the receiver.
Copy 4 (Orange)	To be handed over to the transporter by the receiver after accepting waste.
Copy 5 (Green)	To be sent by the receiver to the State Pollution Control board/Committee.
Copy 6 (Blue)	To be sent by the receiver to the sender.
Copy 7 (Grey)	To be sent by the receiver to the State Pollution Control Board of the sender in case the sender is in another State.

**Note:**

- i. *The sender shall forward copy 1 (white) to the State Pollution Control Board, and in case of hazardous waste is likely to be transported through any transit State, the sender shall intimate State Pollution Control Boards of the transit States about the movement of the waste.*
  - ii. *No transporter shall accept waste from the sender for transport unless it is accompanied by signed copies 3 to 7 of the manifest.*
  - iii. *The transporter shall submit copies 3 to 7 of the manifest duly signed with date to the receiver along with the waste consignment.*
  - iv. *The receiver after acceptance of the waste shall hand over copy 4 (orange) to the transporter and send copy 5 (green) to his State Pollution Control Board and send copy 6 (blue) to the sender and the copy 3 (pink) shall be retained by the receiver.*
  - v. *The copy 7 (grey) shall only be sent to the State Pollution Control Board of the sender, if the sender in another State.*
- i) The transporter engaged for transportation of hazardous wastes for co-processing meets the following requirements;
    - i) Vehicle used for transportation shall be in accordance with the provisions under the Motor Vehicle Act, 1988, and rules made thereunder.
    - ii) Transporter shall possess requisite copies of the certificate (valid authorization obtained from the concerned SPCB/PCC for transportation of waste by the waste generator and operator of a facility) for transportation of hazardous waste.

- iii) Transporter should have valid "Pollution under Control Certificate" (PUCC) during the transportation of hazardous waste and shall be properly displayed.
- iv) Vehicle shall be painted preferably in blue colour with white strip of 15 to 30 cm width running centrally all over the body. This is to facilitate easy identification.
- v) Vehicle should be fitted with mechanical handling equipment as may be required for safe handling and transportation of the wastes.
- vi) The words "HAZARDOUS WASTE" shall be displayed on all sides of the vehicle in Vernacular Language, Hindi and English.
- vii) Name of the facility operator or the transporter, as the case may be, shall be displayed.
- viii) Emergency phone numbers and TREM Card in Form 9 of HW (M& TM) Rules,2016.
- ix) Vehicle shall be fitted with roll-on /roll-off covers if the individual containers do not possess the same.
- x) Carrying of passengers is strictly prohibited and those associated with the waste haulers shall be permitted only in the cabin.
- xi) Transporter shall carry documents of manifest for the wastes during transportation as required under Rule 19 of the HW (M & TBM) Rules.
- xii) The trucks shall be dedicated for transportation of hazardous wastes and they shall not be used for any other purpose.
- xiii) Each vehicle shall carry first-aid kit, spill control equipment and fire extinguisher.
- xiv) Hazardous Waste transport vehicle shall run only at a speed specified under Motor Vehicle Act in order to avoid any eventuality during the transportation of hazardous waste.
- xv) Educational qualification for the driver shall be minimum of 10<sup>th</sup> pass (SSC). The driver of the transport vehicle shall have valid driving license of heavy vehicles from the State Road Transport Authority and shall have experience in transporting the chemicals.
- xvi) Driver (s) shall be properly trained for handling the emergency situations and safety aspects involved in the transportation of hazardous wastes. He should aware of procedures outlined in Emergency Response Plan and trained on emergency spill control procedures.
- xvii) The design of the trucks shall be such that there is no spillage during transportation.

### **Responsibilities of the hazardous waste Transporter**

The sender or receiver whoever is involved in transportation of hazardous wastes shall be responsible for:

- i) Obtaining requisite authorization from SPCB/PCC for transport of hazardous waste (in addition to any other permission that may be required under the Motor Vehicle (Amendment) Act of 1981).
- ii) The transport vehicles shall be designed suitably to handle and transport the hazardous wastes of various characteristics.
- iii) The transporting should follow all the Rules pertaining to transportation of hazardous waste as stipulated under HW (M& TM) Rules,2016.
- iv) Transporting the wastes in closed container at all time.
- v) Delivering the wastes at designated points only.
- vi) Informing SPCB/PCC in Form 11 of the HW (M & TBM) Rules, or local authority, occupier / operator of a facility, and others concerned immediately in case of spillage, leakage or other accidents during transportation.
- vii) The transporter shall train the driver with regard to the emergency response measures to be taken during the transportation of waste.
- viii) Cleaning of vehicles shall be carried out at designated places as authorized by SPCB/PCC.
- ix) Clean-up in case of contamination - Liable for taking up immediate emergency response measures in the event of spillage, improper disposal, fire or mishandling of hazardous waste. The main objective of the emergency response measures is to secure immediate human & environmental safety and contain/control further spillage or release of hazardous waste or release of fumes/gases. Each occupier, transporter, operator or cement plant responsible for transportation of hazardous waste shall develop Emergency Response Plan (ERP) as stipulated in "Guidelines on Implementing Liabilities for Environmental Damages due to Handling & Disposal of Hazardous Waste and Penalty" published by CPCB.

**Draft letter of Intimation**

The draft letter of intimation to SPCBs in case of sending wastes for co-processing from one State to another State is give below;

Date : \_\_ \_\_ 201\_\_

To,

State Pollution Control Board / Pollution Control Committee  
(Belonging to State in which waste generator is located)

\_\_\_\_\_  
\_\_\_\_\_

Subject : Letter of intimation for sending our wastes for co-processing located in another state.

This is to inform you that we have finalized arrangement with \_\_\_\_\_ (Name of the cement plant) to send our following hazardous & other wastes to them for undertaking co-processing. This cement plant is located in the State of \_\_\_\_\_.

1. \_\_\_\_\_ HW Category no. \_\_\_\_\_.
2. \_\_\_\_\_ HW Category no. \_\_\_\_\_.
3. \_\_\_\_\_ HW Category no. \_\_\_\_\_.

The route of the vehicle transporting these wastes will be passing through following states.

- 1.
- 2.
- 3.

We agree to maintain appropriate date wise & waste wise records of transport and receipt of the same at the receiving cement plant for your kind review as per the need.

Further, as mandated by the rules, we agree to file returns to you towards the co-processing of all the Hazardous Wastes carried out in our facility on an yearly basis.

Yours faithfully,

(Authorised Signatory)

Copy to SPCB / PCC (Receiving state)  
Copy to SPCB / PCC (in between states)

\*\*\*\*

### Annexure - 3

#### Storage And Handling Requirements For Hazardous And Other Wastes

The minimum requirements for ensuring safe storage of hazardous and other wastes at TSDFs / Cement Plants / Standalone Pre-processing facilities shall be as below.

##### Storage Sheds

- i. Flammable, ignitable, reactive and non-compatible wastes should be stored separately and never should be stored in the same storage shed.
- ii. Storage area may consist of different sheds for storing different kinds of hazardous wastes and these sheds should be provided with suitable openings.
- iii. Adequate storage capacity (i.e. 25% of the annual capacity of the hazardous waste utilization as a supplementary resource or for energy recovery, or after processing) should be provided in the premises.
- iv. Storage area should be designed to withstand the load of material stocked and any damage from the material spillage.
- v. Storage area should be provided with the flameproof electrical fittings and it should be strictly adhered to.
- vi. Automatic smoke, heat detection system should be provided in the sheds. Adequate fire fighting systems should be provided for the storage area, along with the areas in the facility.
- vii. There should be at least 15 m distance between the storage sheds.
- viii. Loading and unloading of wastes in storage sheds should only be done under the supervision of the well trained and experienced staff.
- ix. Fire break of at least 04 meter between two blocks of stacked drums should be provided in the storage shed. One block of drum should not exceed 300 MT of waste.
- x. Minimum of 1 meter clear space should be left between two adjacent rows of pallets in pair for inspection.
- xi. The storage and handling should have at least two routes to escape in the event of any fire in the area.
- xii. Doors and approaches of the storage area should be of suitable sizes for entry of fork lift and fire fighting equipment;
- xiii. The exhaust of the vehicles used for the purpose of handling, lifting and transportation within the facility such as forklifts or trucks should be fitted with the approved type of spark arrester.
- xiv. In order to have appropriate measures to prevent percolation of spills, leaks etc. to the soil and ground water, the storage area should be

provided with concrete floor or steel sheet depending on the characteristics of waste handled and the floor must be structurally sound and chemically compatible with wastes.

- xv. Measures should be taken to prevent entry of runoff into the storage area. The Storage area shall be designed in such a way that the floor level is at least 150 mm above the maximum flood level.
- xvi. The storage area floor should be provided with secondary containment such as proper slopes as well as collection pit so as to collect wash water and the leakages/spills etc.
- xvii. All the storage yards should be provided with proper peripheral drainage system connected with the sump so as to collect any accidental spills in roads or within the storage yards as well as accidental flow due to fire fighting.

### **Storage in Drums / Containers**

- i. The container shall be made or lined with the suitable material, which will not react with, or in other words compatible with the hazardous wastes proposed to be stored.
- ii. The stacking of drums in the storage area should be restricted to three meters high on pallets (wooden frames). Necessary precautionary measures should be taken so as to avoid stack collapse. However, for waste having flash point less than 65.5°C, the drums should not be stacked more than one height.
- iii. Stacking of drums may be done on specially rakes designed for holding pallets up to three rows, with height not exceeding 4.5 meters.
- iv. No drums should be opened in the storage sheds for sampling etc. and such activity should be done in designated places outside the storage areas;
- v. Drums containing wastes stored in the storage area should be labeled properly indicating mainly type, quantity, characteristics, source and date of storing etc.

### **Measures for Spillage/leakage control**

- i. The storage areas should be inspected daily for detecting any signs of leaks or deterioration if any. Leaking or deteriorated containers should be removed and ensured that such contents are transferred to a sound container.
- ii. In case of spills / leaks/dry adsorbents/cotton should be used for cleaning instead of water.
- iii. Proper slope with collection pits be provided in the storage area so as to collect the spills/leakages.

- iv. Storage areas should be provided with adequate number of spill kits at suitable locations. The spill kits should be provided with compatible sorbent material in adequate quantity.

#### **Record Keeping and Maintenance:**

Proper records with regard to the industry –wise type of waste received, characteristics as well as the location of the wastes that have been stored in the facility need to be maintained.

#### **Miscellaneous**

- i) Smoking shall be prohibited in and around the storage areas;
- ii) Good house-keeping need to be maintained around the storage areas.
- iii) Signboards showing precautionary measures to be taken, in case of normal and emergency situations should be displayed at appropriate locations.
- iv) To the extent possible, manual operations with in storage area are to be avoided. In case of manual operation, proper precautions need to be taken, particularly during loading / unloading of liquid hazardous waste in drums.
- v) A system for inspection of storage area to check the conditions of the containers, spillages, leakages etc. should be established and proper records should be maintained.
- vi) The wastes containing volatile solvents or other low vapor pressure chemicals should be adequately protected from direct exposure to sunlight and adequate ventilation should be provided.
- vii) Tanks for storage of liquids waste should be properly dyked and should be provided with adequate transfer systems.
- viii) Storage sites should have adequate & prompt emergency response equipment systems for the hazardous waste stored on-site. This should include fire fighting arrangement based on the risk assessment, spill management, evacuation and first aid.
- ix) Immediately on receipt of the hazardous waste, it should be analyzed and depending upon its characteristics its storage should be finalized.
- x) Only persons authorized to enter and trained in hazardous waste handling procedures should have access to the storage site.
- xi) Mock drill for onsite emergency should be conducted regularly and records maintained.

### **Storage Time**

Normal storage of incinerable hazardous wastes at TSDFs / Cement Plants / Standalone Pre-processing facilities should be restricted to maximum of 3 months. However State Pollution Control Board/Pollution Control Committee may extend the period upto 6 months in accordance with the Hazardous and other wastes (M & TM) Rules, 2016.

### **Hazard Analysis and Safety Audit:**

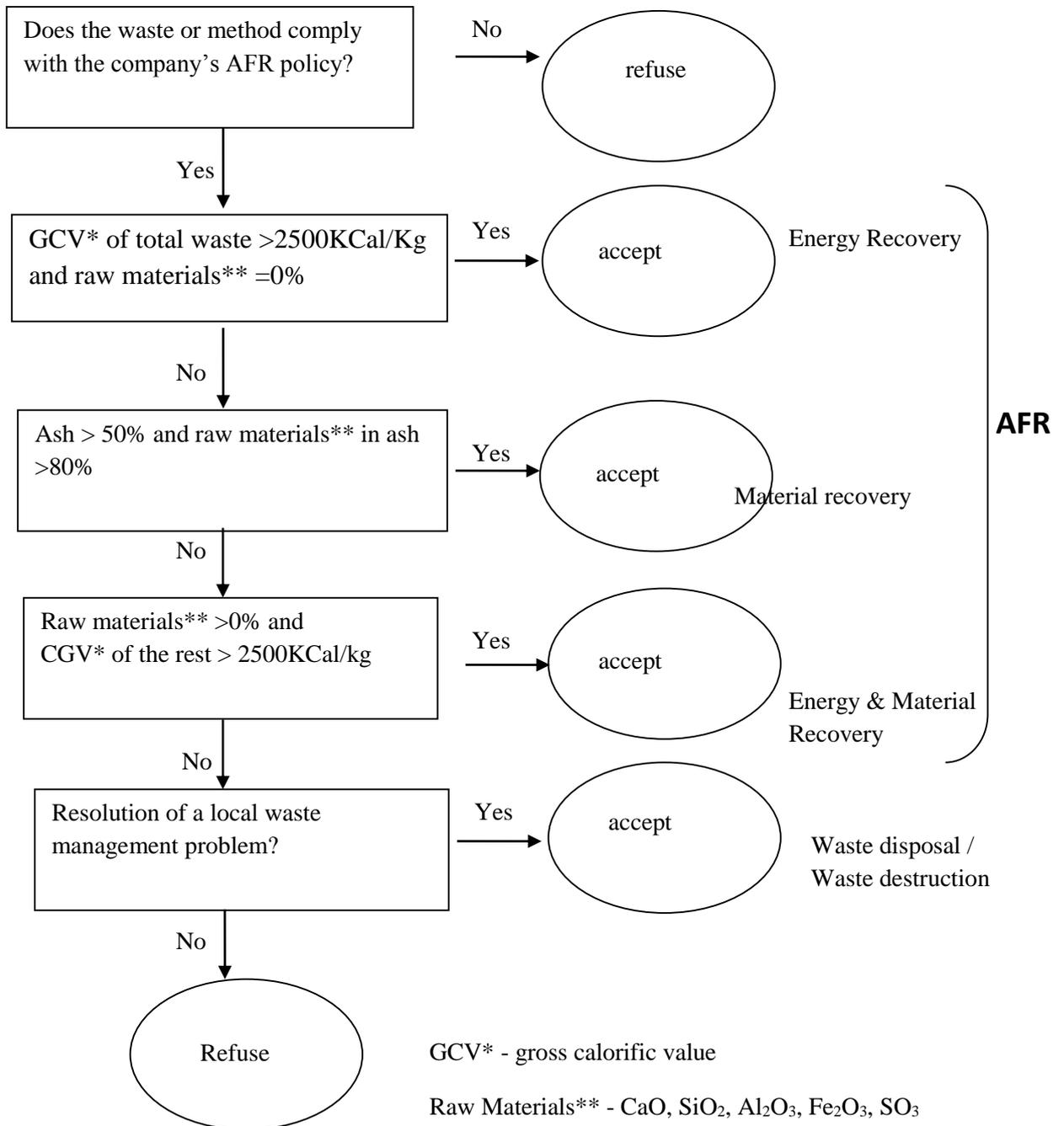
For every pre-processing and co-processing facility, a preliminary hazard analysis should be conducted. Safety Audit internally by the Operator every year & externally once in two years by a reputed expert agency should be carried out and same should be submitted to the SPCB/PCC. The code of practice and reporting shall comply to IS 14489.

Such conditions should be stipulated by SPCBs while granting authorization under the HW (M & TBM) Rules to the operators / pre-processing / co-processing facility.

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**Annexure -4**

**Acceptance / Refuse chart**



**Annexure-5**

**DRAFT OF THE 'LETTER OF INTIMATION' TO SPCBs FOR UNDERTAKING CO-PROCESSING / PRE-PROCESSING OF WASTES**

**(to be applied when new wastes are introduced for co-processing, which were not mentioned in while seeking authorization)**

Date : \_\_ \_\_ 20\_\_

To,

State Pollution Control Board / Pollution Control Committee

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Subject : Letter of intimation for undertaking pre-processing / co-processing of \_\_\_\_\_ from \_\_\_\_\_ in our pre-processing / co-processing facility

This is to inform you that we have finalized arrangement with \_\_\_\_\_ (Name of the industry / municipality / pre-processing agency) to undertake pre-processing / co-processing of following hazardous / non-hazardous waste being generated by them for pre-processing / co-processing in our facility.

- 1.
- 2.
- 3.
- 4.

We agree to maintain appropriate date wise & waste wise records of receipt, pre-processing, co-processing and stock of these wastes and agree to submit the same for scrutiny on demand.

Further, as mandated by the rules, we agree to file returns to you towards the co-processing of all the Hazardous Wastes carried out in our facility on an yearly basis.

Yours faithfully,

(Authorised Signatory)