

ENVIRONMENTAL GUIDELINES FOR PREVENTION AND CONTROL OF FUGITIVE EMISSIONS FROM CEMENT PLANTS

For achieving effective prevention and control of potential fugitive emission sources in cement manufacturing plants, specific requirements along with guidelines have been evolved. In order to establish proper management practices, requirements such as Operation and Maintenance aspects, trained manpower and documents & records to be maintained are also prescribed. In addition, general guidelines are also evolved for the sources otherwise not specified.

1.1 Requirements for Prevention and control of fugitive emission for various Potential Sources

For the purpose of effective prevention and control of fugitive emissions, the cement industry is required to implement the following for the sections mentioned:

1. Unloading Section (Limestone, Coal & other relevant material)

Sr. No.	Control Measures to be Provided	Guidelines
1.	Enclosure should be provided for all unloading operations, except wet materials like gypsum	The enclosures for the unloading sides could be flexible curtain type material covering up to height of dumpers discharge from the roof.
2.	Water shall be sprayed on the material prior and during unloading	A dust suppression system should be provided to spray water. The amount of water sprayed should preferably be optimized by employing proper design of spray system. Suitable systems may be adopted to reduce the problems like choking, jamming of the moving parts.

2. Material Handling Section (Including Transfer Points)

Sr. No.	Control Measures to be Provided	Guidelines
1.	All transfer point locations should be fully enclosed.	The enclosures from all sides with the provision for access doors, which shall be kept, closed during operation. Spillages should be periodically removed.
2.	Airborne dust at all transfer operations / points should be controlled either by spraying water or by extracting to bag filter.	Either water spray system should be provided for suppressing the air borne dust or dry extraction cum bag filter with adequate extraction volume.

3.	Belt conveyors should preferably be closed.	This will avoid wind blowing of fines.
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3. Coal Storage Section

Sr. No.	Control Measures to be Provided	Guidelines
1.	Coal yard / storage area should be clearly earmarked.	A board should be erected to display the area earmarked.
2.	The pathways in coal yard for vehicle movement should be paved.	Proper pathways with entry and exit point should be provided.
3.	Accumulated dust shall be removed / swept regularly and water the area after sweeping.	Any deposits of dust on the concrete roads should be cleaned regularly by sweeping machines.
4.	Coal other than coal stock pile should preferably be stored under covered shed.	Where ever blending activity is carried out by chaining in open ground, covered shed should be provided to reduce the fine coal dust getting airborne. The enclosure walls shall cover minimum three sides up to roof level.
5.	The coal stock pile should preferably be under covered shed for new plants.	The enclosure should be from three sides and roof so as to contain the airborne emissions.
6.	Instead of dust extraction cum bag filter system, If dust suppression measure is used, following additional control measures should be provided.	
a	Wetting before unloading.	Coal should be sufficiently moistened to suppress fines by spraying minimum quantity of water, if possible.
b	Spray water at crusher discharge and transfer points.	Water spray should also be applied at crusher discharge and transfer points.

4. Clinker Cooler Section

Sr. No.	Control Measures to be Provided	Guidelines
1.	Air borne fines extracted from clinker cooler shall be separated and sent to last possible destination directly, if possible.	The possibilities especially in new cement plant may be explored for the following: The unit may need to add on / install necessary provisions for separating fine particulates from the clinker cooler ESP collection. Fines separation may be achieved by passing collected dust through cyclone, the fines escaping cyclone to be separated, cyclone collection (coarse particles) could be

		recycled. The fines shall be recycled to the last possible destination (like clinker day silo) suitable or safely disposed.
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5. Clinker Stock Piles Section

Sr. No.	Control Measures to be Provided	Guidelines
1.	In new cement plant, clinker should be stored preferably in silo.	Bag filter may be provided before venting out the gases.
2.	Clinker should be stored in closed enclosure covered from all sides and should have a venting arrangement along with a bag filter.	The enclosures should have a venting arrangement located at transfer point where clinker is dropped to the stockpile. The extraction / venting should be sufficient enough. Clinker stockpile access door should be covered by mechanical gate or by flexible rubber curtain. The access doors shall be kept closed at all possible times.
3.	The dust extracted and captured in bag filter should be avoided to feed back / recycled to the clinker stockpile, if possible.	Extracted dust should be captured in bag filter and the collected dust should be avoided to feed back to the clinker stockpile, if layout permits. It may be recycled at last possible destination i.e., cement mill section through suitable arrangement, if possible.
4.	Generally open storage of clinker should be avoided. Only in case of emergency clinker should be stored in open with following control measures.	
5.	Area for open storage of clinker should be clearly earmarked.	After earmarking the open storage area of clinker, a board should be erected to display the area earmarked.
6.	Provide cover on openly stored clinker.	During the period when the openly stored clinker is inactive, it should be covered fully by HDPE or tarpaulin type sheets to prevent wind blowing of fugitive dust.
7.	Provide windbreak walls or greenbelt on three sides of open stock piles	Install three sided enclosures, which extend to average height of the stockpile, where ever feasible.
8.	Provide partial enclosure for retrieving area.	Flexible type wind breaking enclosure should be provided covering the clinker retrieval area as wind barrier to prevent dust carry over by wind. The enclosure could be of lightweight material like moulded plastic material or similar, which could be dismantled / assembled and shifted from one place to other.
9.	The travel path of pay loaders should be paved and frequently	Travel areas path used by the front – end pay loader shall be paved with concrete. It should

	swept.	be regularly swept by high efficiency vacuum sweeper to minimize the material build – up.
10.	Provide loading of clinker by pay loaders into trucks / trailers be carried out in an enclosure vented to a bag filter.	The possibilities especially in new cement plant may be explored for the following: An enclosure fitted with bag filter could be located at the most central place adjacent to the clinker storage area. The pay loader moves to the fixed loading area from one end of the enclosure and the truck/trailer enters the enclosure from other end.

6. Storage of Limestone, Gypsum, Flyash and other additives:

Sr. No.	Control Measures to be Provided	Guidelines
1.	The storage should be done under covered shed.	The enclosure walls shall cover minimum two sides up to roof level.
2.	Dry fly ash shall be transported by closed tankers. In case of wet fly ash trucks may be used for transportation.	Flyash shall be pumped directly from the tankers to silos pneumatically in closed loop or mechanically such that fugitive emissions do not occur.
3.	Dry Fly ash shall be stored in silos only.	The silo vent be provided with a bag filter type system to vent out the air borne fines.
4.	Flyash in the dry form should be encouraged and in wet form should be discouraged. In case wet flyash is to be used, it may be stored in open temporarily for the purpose of drying with necessary wind break arrangement to avoid wind carryover of fly ash. The fly ash should be removed immediately after drying.	If possible, the dry flyash should be sent to closed silos. Otherwise, flyash should be transported through closed belt conveyors to avoid wind carryover of flyash.

7. Cement Packing Section:

Sr. No.	Control Measures to be Provided	Guidelines
1.	Provide dust extraction arrangement for packing machines.	The packing machines should be equipped with dust extraction arrangement such that the packing operation is performed under negative pressure. The dust may be captured in bag filters.
2.	Provide adequate ventilation	Adequate ventilation for the packing hall

	for the packing hall.	should be provided for venting out suspended particulate thereby ensuring dust free work environment.
3.	Spillage of cement on floor shall be minimized and cleared daily to prevent fugitive emissions.	The spilled cement from the packing machine should be collected properly and sent for recycling. The spilled cement on the shop floor should be swept by vacuum sweeping machines periodically. Proper engineering controls to prevent the fugitive emissions may include arrangements like providing guiding plate, scrapper brush for removing adhered dust on cement bag etc.
4.	Prevent emissions from the recycling screen by installing appropriate dust extraction system.	The vibratory screen provided for screening/recycling spilled cement should be provided with a dust extraction arrangement to prevent fugitive emission from that section.

8. Silo Section :

Sr. No.	Control Measures to be Provided	Guidelines
1.	The silo vent be provided with a bag filter type system to vent out the air borne fines.	The bag filter should be operated and maintained properly, especially the cleaning of bags to avoid pressurization of silos thereby causing fugitive emissions from leakages etc.

9. Roads:

Sr. No.	Control Measures to be Provided	Guidelines
1.	All roads on which vehicle movement of raw materials or products take place should be paved.	The paved roads should be maintained as paved at all times and necessary repairs to be done immediately after damages to the road if any.
2.	Limit the speed of vehicles.	Limit the speed of vehicle to 10 Km/h for heavy vehicles with in the plant premises to prevent the road dust emissions.
3.	Employ preventive measures to minimize dust build up on roads.	Preventive measures include covering of trucks and paving of access areas to unpaved areas.
4.	Carry out regular sweeping of roads to minimize emissions.	Mitigative controls include vacuum sweeping, water flushing.

1.2 Requirement of Maintaining Documentation and Records:

The industry shall maintain records to document the specific dust control actions taken and maintain such records for a period of not less than two years and make such records available to the regulatory authorities upon request. In addition documents of technical specifications of the control system and O&M guidelines should also be maintained. (Refer Appendix A1 for details of documents and records to be maintained)

1.3 Requirement of trained Manpower:

- The industry shall employ or contract a “dust control officer” who shall be available on site during working hours and should have authority to expeditiously employ sufficient dust mitigation measures to ensure control of fugitive emissions especially in abnormal circumstances. *A suitably qualified person could be designated to operate as dust control officer. But, he should be provided necessary training and should be aware of operational, maintenance aspects. He should be responsible for proper control of fugitive emissions. Environmental Officer may act as a Dust Control Officer.*
- Regular training should be given to the personnel operating and maintaining fugitive emissions control systems on the operational and maintenance aspects and record keeping responsibility.

1.4 Operation and Maintenance Requirement for all Dust Extraction cum Bag filter Systems:

- A “U”-tube manometer (of minimum 400 mm length) shall be fixed at all bag filters. It shall be connected with inlet and outlet side of the bag filter through flexible rubber tubes. Coloured water should be filled to zero level mark for proper visibility of the pressure drop across bag filter.
- The minimum dust extraction volume should be based on the guidelines for ventilating various sources as per industrial ventilation hand book guidelines
- Un-interrupted supply of dry compressed air at desired pressure should be always ensured for pulsejet cleaning type bag filter.
- The flow rate and static pressure at the bag filter inlet should be monitored at least quarterly and recorded to ensure appropriate functioning of the bag filter installed.
- A sampling platform, portable and access ladder shall be provided at the final stack to carry out stack monitoring (in main stacks). Final emission should not exceed the prescribed standard.
- In systems where water is also spread, it should be ensured that water does not get carried over/sucked to the bag filter. The details such as bag house

specifications, layout drawing, operation and maintenance guidelines are to be maintained.

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1.5 Operation and maintenance Requirements for all Dust Suppression Systems:

- Basic details/specifications of the dust suppression systems installed at various locations should be maintained. The information should contain the quantity of water sprayed in LPH, number of nozzles, type of nozzles, desired water pressure, details of suppliers of spares, pipeline diagram, system layout etc.
- A fine mesh micro filter should be installed for filtering suspended solids from water prior to pumping to the nozzles to prevent choking of nozzles thereby ensuring proper sprays.
- A pressure gauge and water flow meter shall be installed at major source for on-line measurements and a record be maintained for quantity of water sprayed.

1.6 SPM Concentration Standard for Assessing Effectiveness of Control Measures Adopted:

- The effectiveness of prevention cum control measures provided for controlling fugitive emissions from any source shall be said to be satisfactory, provided the SPM concentration, measured at 10 metre distance (from the enclosure wall housing the emission source or from the edge of the stockpiles/pavement area) in downwind direction shall not exceed 2000 microgram per cubic metre and 5000 microgram per cubic metre for coal yard /coal stock pile and rest other area respectively. These standards are for one year period and will be reviewed after one year. In cases where SPM concentrations exceed the prescribed limit, necessary corrective measures in terms of improving the controls shall be taken and action taken records of improvements carried out be maintained.
- The measurement shall be carried out by High Volume / Respirable type samplers as per standard method prescribed by CPCB/BIS, covering at least 4 hours duration (240 minutes) during normal working hours with normal production rate of the operation / source being monitored on quarterly basis.

1.7 General Guidelines (For areas not otherwise specified):

Apart from the specific guidelines provided above for some specific sections/areas, for all other fugitive dust emitting areas, following general guidelines would apply.

- The industry should prevent fugitive emission from all active operation and storage piles, such that the emissions are not visible in the atmosphere beyond the boundary line of the emission source.
- The Industry shall conduct active operations by utilizing the applicable best available control measures to minimize the fugitive dust emission from each fugitive dust source type within active operation.
- Except for Gypsum and Clinker, all storage piles should be kept in moist condition by spraying water at regular intervals for controlling fugitive emission, wherever possible
- The operation of the pay loaders shall be slow down whenever the average wind speed is high exceeding 50 km/h, which may cause fugitive emission.
- All storage silos shall be vented to bag filters, which should have proper bag cleaning arrangement so as to avoid choking of filter bags, thereby to avoid pressurization of silos.
- Regular inspection at a pre-determined frequency be carried out of all fugitive dust control system and records be maintained of such inspection and corrective action taken if any.

A 1: List of Documents & records to be maintained for fugitive dust control

Title of Record to be maintained	Frequency of Recording	Information to be recorded
Documents:		
List of Fugitive Emission Management Systems (FEMS) installed	To be up-dated once in a year	Location of FEMS, marked on process flow diagram, Identity Number, Type of FEMS, Year of installation, Operating Status
Technical Specifications of FEMS installed		
Specification of Dust suppression system	As and when installed/modified	Locations of controlling emissions, Identity Number, Supplier Name, Date of Commissioning, Pump HP, flow rate in LPM, Pressure in kg/cm ² , Nozzles type, numbers, LPM, O&M instruction from supplier.
Specification of Dust Extraction cum APCD	As and when installed/modified	Location of system installed, Identity Number, Name of system supplier, date of commissioning, flow rate in m ³ /hr, Time, flow m ³ /hr, static pressure mmWc, velocity m/sec, Current Drawn by ID fan motor, operation & maintenance instruction from supplier.
Capacities of Closed Storages	Annually	For coal, limestone, clinker, gypsum, cement, additives, flyash, Dimensions, bulk density, Tons
Capacities of Open Storages	Annually	For coal, limestone, clinker, gypsum, additives, flyash, Dimensions, bulk density, Tons
Records		
Replacement of Damaged filter bags	As and when replaced	Number of Bags replaced, Date, Bag filter Identification number
Measurement of flow rate static pressure at bag filter inlet	Once a month	Bag filter Number, Date of monitoring, Time, flow m ³ /hr, static pressure mmWc, velocity m/sec, Current Drawn by ID fan motor Name of the person
Stack Monitoring of bag filters stack, where ever monitoring is feasible	Quarterly	Bag filter Number, Date of monitoring, Time, Measured Data in m ³ /hr and mmWc, Dust concentration in mg/Nm ³

Operational Details of Dust Suppression System	Once in a month	Quantity of material handled, Quantity of water sprayed, number of operational nozzles, water pressure at filter inlet and outlet, details of damaged nozzles and replacements,
Road Sweeping record	Daily	Road location swept, date, running hours of sweeping machines
Quantity of coal in open storage, if any	Quarterly	Inventory of Existing storage, add on, retrieved on quarterly basis, Date
Quantity of clinker in open storage, if any	Quarterly	Inventory of Existing storage, add on, retrieved on quarterly basis, Date
Corrective actions taken for improving controls	As and when	Details of modifications carried out, level of reduction in SPM achieved