Environmental Guidelines for Concrete Batching Plants

Environmental Protection Agency - Maldives

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1. INTRODUCTION

This guideline prepared by the Environmental Protection Agency of Maldives is intended to help mitigate the adverse environmental impacts that may arise while operating ready mix concrete batching plants. Poorly controlled concrete batching plants may discharge highly alkaline wastewater, dust and excess noise, but plants operated in accordance with these guidelines should operate in harmony with the environment and neighboring communities. This guideline aims to minimize waste generation, water and auxiliary chemicals.

1.2 Objective

This guideline will assist the concrete batching plants to achieve the best practical environmental outcome. Thus, the guideline will provide:

- a statement on each element of the environment that may experience potential impacts due to the operations of concrete batching plants.
- Suggested measures to mitigate and avoid adverse environmental impacts on the environmental elements.

1.3 Scope

This guideline applies to all the concrete batching plants of the construction industry and will assist the concrete batching plants' managers and operators to:

- Identify potential environmental problems and use appropriate tools to monitor and solve these problems
- Maintain the air quality of surrounding area at a standard that has minimal health effects to human and other inhabitants of the area
- Understand their plant management's responsibilities

The guideline permits and encourages innovative, effective and improved solutions for the environmental management of concrete batching.

2. ENVIRONMENTAL CONSIDERATIONS

2.2 Site Considerations

Concrete batching plants must be located in an area where they will not pose a hazard to the environment or the amenity of the local community.

Highly alkaline wastewater, dust emissions and noise are the key potential impacts associated with concrete batching plants. These problems need to be considered when planning new operations and during upgrading stages.

- Plants should be located so that contaminated storm water (at heavy rainfall times) and process wastewater can be retained on-site. The land should not be flood prone (it should have a flood average recurrence interval less than 100 years). These measures will help to ensure that wastewater is not discharged to waterways.
- Dust problems can be minimized by siting the concrete batching plant out of prevailing high winds. The prevailing wind direction should be considered during the planning proposal, to ensure that bunkers and conveyors are sited in the leeward direction to minimize the effects of the wind. The provision of natural or artificial wind barriers – such as trees, fences and landforms – to help control the emission of dust from the plant should be considered during the planning process.
- To protect amenity, buffers should be provided between batching plants and sensitive land uses. Buffers are designed to minimize any potential impacts due to accidental or fugitive air emissions. They assume that good control practices will be followed and do not eliminate the need for effective point source emission control.
- A minimum buffer distance of 100 meters between batching plants and sensitive land uses shall be maintained. Sensitive land uses include residential areas and zones, hospitals, schools or other similar uses. Access and exit routes for heavy transport vehicles should be planned to minimize impacts on the environment and other local facilities.
- Thoughtful site selection and planning will mean fewer problems for future environmental management.

2.3 Water Quality

Potential pollutants in batching plant waste water include cement, sand, aggregates and petroleum products. These substances can adversely affect the environment by:

- increasing soil and water pH
- Increasing the turbidity of waterways (turbidity is a measure of the cloudiness of a suspension).

2.3.1 Wastewater management – principles

Using the waste minimization approach, the keys to avoiding adverse impacts on water quality are to minimize wastewater generation and to recycle the wastewater which is generated. These steps require that:

- The area of the site which generates contaminated storm water is minimized
- Separate dedicated drainage systems are provided for contaminated and clean storm water
- All contaminated storm water and process wastewater should be collected and recycled.

2.3.2 Wastewater generation

The main sources of wastewater at batching plants are:

- contaminated storm water runoff
- dust control sprinklers
- the agitator washout station
- the agitator charging station
- the slumping stations
- cleaning and washing.

- The site should be designed to minimize the areas which are contaminated with cement dust and thus have the potential to generate contaminated storm water runoff.
- Clean storm water runoffs should be separated from contaminated storm water, or it will add to the volume of wastewater needing management. Separate drains should be provided for clean storm water runoff.
- All contaminated storm water and processed wastewater should be collected and retained on site.
- All sources of wastewater should be paved and bunded. The specific areas that should be paved and bunded include:
  - the agitator washout area

- the truck washing area
- the concrete batching area
- any other area that may generate storm water contaminated with cement dust or residues.

2.3.3 Wastewater capture and reuse

If the batching plant is not roofed, contaminated storm water resulting from heavy rainfalls and should be captured and recycled along with the processed wastewater, by a system with the following specifications.

- The system's storage capacity must be sufficient to store the runoff from the bunded areas generated by 50 mm of rain in 24hrs.
  - Water captured by the bunds should be diverted to a collection pit and then pumped to a storage tank for recycling.
  - An outlet (overflow drain) in the bund, one meter upstream of the collection pit, should divert excess rainwater from the bunded area when the pit fills due to heavy rain (more than 50 mm of rain in 24 hours).
  - Collection pits should contain a sloping sludge interceptor, to separate water and sediments. The sloping surface enables easy removal of sludge and sediments.
  - Wastewater should be pumped from the collection pit to a recycling tank. The pit should have a primary pump triggered by a float switch and a backup pump which automatically activates if the primary fails.
  - Collection pits should be provided with two visual alarms. The first should activate when the primary pump fails. The second should activate when water reaches the high-level mark in the pit. Both alarms should activate warning devices on the operator's console.
- Wastewater stored in the recycling tank needs to be reused at the earliest possible opportunity. This will restore the system's storage capacity, ready to deal with wastewater generated by the next rainfall.
- If the water level exceeds the capacity of the recycling tank, the wastewater must be taken to a waste treatment facility licensed by EPA for this type of waste.
- As the wastewater system captures and recycles process water, wastewater must not be discharged from concrete batching plants in dry weather.
- Runoff after heavy rainfall (more than 50 mm of rain in 24 hours) contains very small quantities of wastes and is unlikely to pose a significant threat to the environment

- However, during the dry season, the pH of wet weather discharges must be monitored and maintained in the range 6.0 to 9.0 and suspended solids must be less than 50 milligrams per liter.
- Whenever wet weather discharges occur, they should be monitored for pH and suspended solids, and records retained. If unacceptable levels are found:
  - an investigation should be carried out to determine the causes
  - remedial actions should be identified and implemented.
- Equipment and training should be provided; so that staff can carry out pH testing and take suspended solids samples for laboratory analysis (turbidity monitoring may also be used to provide an immediate indicator of discharge quality).

2.4 Air quality

Fine dust particles resulting from cement, sand and aggregates can enter neighboring premises and adversely affect amenity. Dust must be controlled through good design and management techniques, so there are no significant emissions from the plant. The provision of natural or artificial wind barriers such as trees, fences and high raised walls could be used to control the emission of dust from the plant The following controls are requirements that need to be followed to mitigate impacts on the environment.

2.4.1 Ground pavement

- The entire plant compound traversed by vehicles – including driveways leading into and out of the plant – should be paved with a hard, impervious material.
- Unsealed surfaces should be protected with barriers to exclude vehicles.
- The pavement should be kept clean and dust-free. Spills and leaks must be contained and cleaned up immediately, before dust is generated.

2.4.2 Sand and aggregate stockpiles

- It is a must that dust controlling measures should be taken during the delivery of sand and aggregates. This may be done by using covered trucks or other appropriate methods.
- Sand and aggregates should be stored in a hopper or bunker which shields the materials from winds. The bunker should enclose the stockpile on three sides. The walls should extend one meter (1m) above the height of the maximum quantity of raw material kept on site, and one meters (1m) between the stockpile and walls of bunker.

- In-ground storage bunkers minimize dust emissions from stock piles. Where these are filled by drive-over deliveries, the bunker should be shielded on two sides by shrouds or walls that are at least 0.5metres high and extend the entire length of the bunker.

2.4.3 Overhead bins

- Overhead storage bins should be totally enclosed. The swivel chute area and transfer point from the conveyor should also be enclosed.
- Rubber curtain seals may be needed to protect the opening of the overhead bin from winds.

2.4.4 Conveyor belts and raw material transfer

- If conveyor belts are used transfer raw materials and if exposed to the wind, the conveyor belts should be effectively enclosed, to ensure dust is not blown off the conveyor during transit
- Conveyor transfer points and hopper discharge areas should be fully enclosed. Double rubber curtain seals are recommended for transfer point outlets to prevent dust from raw materials escaping into the atmosphere.
- Conveyor belts should be fitted with belt cleaners on the return side of the belt. It is important that any raw material collected by the belt cleaners is contained, so that dust is not discharged.

2.4.5 Aggregate weighing bins

- Weigh hoppers at front end loader plants should be roofed and have weigh hoppers shrouded on three sides, to protect the contents from the wind.

2.4.6 Cement transfer, storage and delivery

- Store cement in sealed, dust-tight storage silos. All hatches, inspection points and ductwork should be dust-tight.
- Cement should be delivered in sealed vehicles equipped for pneumatic transfer from the vehicle to the cement storage silo.
- Any cement spills should be cleaned up as soon as they are detected.

- The delivery pipes should be clearly labelled with the silo identification and material stored inside the silo.
- The silo delivery pipe should be kept locked at all times except when a delivery is in progress.
- The infill pipe should be fitted with a fail-safe valve, which is ‘tight shut-off’, made of wear resistant materials, able to withstand high velocity product delivery. The valve should be located less than one meter (1m) above the fill point.

2.4.7 Silo dust control

- Silos should be equipped with high level sensors to prevent overfilling

- Cement dust emissions from the silo during filling operations must be minimized. The minimum acceptable performance should be obtained using an acceptable dust control technology.

2.4.8 Cement weigh hoppers

- Totally enclose the cement weigh hopper, to ensure that dust cannot escape to the atmosphere.
- The weigh hopper should be fitted to a dust control device, of similar design and specification to the dust control device must be installed to the silo.

2.4.9 Agitator loading bay

- There must be no significant emission of dust particles from the load point.
- Ensure the loading bay is roofed and enclosed on at least two sides.
- Ensure that there is no leakage or spillage of cement during either the filling or dispensing of cement from the silo.
- Any cement product that escapes during the filling process must be cleaned up immediately

2.4.10 Inspection program

An inspection of all dust control components should be performed routinely at least once a week.

2.5 Noise Emissions

Noise is a form of pollution and a potential source of conflict between the operators of a concrete batching plant and the local community. Noise emitted from a concrete batching plant must be managed as carefully as other discharges from the site. Noise emissions from batching plants must not exceed the following tabulated noise levels.

2.5.1 Measures to mitigate noise

Measures to be taken for noise abatement:

- Locating noisy equipment away from potential sources of conflict
- locating noisy equipment behind sound barriers or sound absorbers – for example, gravel stock piles or constructed barriers
- using self-cleaning weigh hoppers enclosing compressors and pumps
- fitting silencing devices to all pressure operated equipment
- lining hoppers with a sound absorbing material such as rubber
- sealing road sand plant site with concrete or bitumen
- positioning access and exit points away from noise sensitive areas

- fitting efficient muffling devices to all engines using visual alarms in preference to audible alarms
- using a personal paging service instead of hooters to gain attention of staff
- relocating engines to face away from residences weighing fine aggregates before coarse aggregates
- ensuring that maintenance is conducted in enclosed sheds, away from sources of conflict
- ensuring an adequate buffer is kept between the plant and neighbors
- erecting screens and barriers to reduce noise transmission
- storing aggregates below ground level where possible
- Operation times to be limited to between 7.00am and 6.00pm. If extend the noise level must be maintained at 35-40dB (for an 8hr period) within the buffer zone and should be followed by an interval of 2hrs.
- Special permit must be taken for extended operations.

2.6 Solid wastes

- The main solid waste generated by batching plants is waste concrete. Waste minimization is the preferred approach to dealing with this problem. Orders for concrete batch productions should be taken precisely to minimize the excess concrete manufacturing.
- If waste concrete cannot be reused for construction purposes at the batching plant all the waste concrete should be directed to a fully enclosed pit where it can be dried and disposed according to Waste management regulation 2013/R-58.
- Concrete agitator mixers and chutes must not be rinsed out to the storm water system or roadways.
- All concrete should be accounted for, to ensure proper disposal of the waste product.
- Aluminum cans, glass bottles, paper, other office waste and packaging materials such as plastic and cardboard should be disposed according to EPA's waste management regulation 2013/R-58 If possible, it is advised that these materials be recycled as minimization of waste and recycling are of best practice.
- Preference should be given to waste avoidance or reduction, ahead of recycling and reuse.
- Treatment and the least preferred alternative of waste disposal should only be considered if these actions are not possible.
- Waste minimization includes good housekeeping practices and staff attitudes, as well as technical factors. Actions as simple as reducing the volume of water used during washouts may significantly

reduce waste generation. The potential impact of such straightforward measures should not be underestimated.

- Some of the smaller incremental improvements are easy to gain, but difficult to maintain. Teamwork and commitment from production staff, supported by strong management and effective management systems, should enable sustainable and continuous performance.
- Another essential part of waste minimization is understanding what wastes are being produced and the processes which generate them. As well as establishing a baseline against which improvements can be assessed, this data will allow waste reduction options to be evaluated.
- Waste generated by the batch plant can be kept outside the boundary of the plant, only to be transported to the waste management facility. If waste is left unattended for more than 2hrs the operator will be liable and will be penalized under Waste Management Regulation 2013/R-58.