

Book  
**9**



Technical Guidance  
Document Series  
Number:  
DOE-APCS-9



R  
628.5  
MAL

**TECHNICAL  
GUIDANCE ON**

# **BEST PRACTICAL MEANS FOR THE CONCRETE BATCHING INDUSTRY IN MALAYSIA**

Malaysia  
First Edition:  
July 2009

**FOR THE USE OF  
THE INDUSTRIES AND  
CONSULTANTS**

CONTROL NUMBER	0000023491
ACCESSION NUMBER	27935 / HQ
DATE	28/10/09

R 628.5 MAL



27935

Technical guidance on best practical means for the concrete batching industry in Malaysia / Department of Environment.

**TECHNICAL GUIDANCE ON  
BEST PRACTICAL MEANS FOR THE CONCRETE BATCHING INDUSTRY IN MALAYSIA**

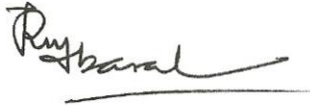
**TABLE OF CONTENTS**

<b>Items</b>	<b>Title</b>	<b>Page</b>
FORWARD		2
PREAMBLE		3
1.0	Introduction	4
2.0	Establishment of CBP	5
3.0	Pollution Control Considerations	6
3.1	Air quality	6
3.2	Water quality	7
3.3	Control of road and yard dust	7
3.4	Solid wastes management	8
3.5	Environmental audits	8
4.0	Specific Requirements	8
4.1	Siting	8
4.2	Stock piling, material handling and storage	9
4.3	Washwater collection and recycling system	10
4.4	On-site washout	11
4.5	Cement storage and handling	11
4.6	Hopper mixer and weigh batcher	12
4.7	Conveyors	13
4.8	Mixer	13
4.9	Transport	14
4.10	Wastes management	14
4.11	Spill Control	15
4.12	Monitoring requirement and auditing	15
4.13	Education	16
ACKNOWLEDGEMENT		17

## FORWARD

Improvement in environmental management in concrete batching industry is undoubtedly a present day necessity. Concrete batching plants (CBPs) have been known to cause various environmental impacts including visual pollution, dust emission, noise and effluent discharge. In order to bring about a harmonious existence with their neighbors, CBPs must adopt a paradigm shift, hence implement the whole range of pollution mitigation measures which are already standard features in CBPs in developed countries.

This Guidance Document compiles a whole range of mitigation measures which can be applied by CBP operators to change the image of the industry into a more environment friendly industry, hence be in consonance with sustainable development principles and at the same time complies with the regulatory requirements of the Department of Environment.



(DATO' HAJAH ROSNANI IBARAHIM)

Director General

Department of Environment, Malaysia

## BEST PRACTICAL MEANS FOR THE CONCRETE BATCHING INDUSTRY IN MALAYSIA

### Preamble

Concrete batching plant (**CBP**) is an important component in the supply chain of the construction industries, ensuring efficient, just-in-time delivery of specific quality concrete to construction sites. In the 90's, the industries mushroomed reaching its peak in 1997. There are many players in Malaysia and the severe competition has resulted in many operators improving their efficiency and yet, at the same times made some cut corners to maintain existence or maximize profit. Since distance of delivery is crucial in cost and quality control, industry tends to choose the nearest site available and many a times give little consideration to the amenities of local community and the status of the water bodies. All these have resulted in numerous environmental problems arising from dust, noise, waste spillage and river pollution.

Concrete batching plant is not a prescribed industry under the Environmental Quality Act (EQA) 1974, the establishment of a CBP does not go through a thorough examination like the others e.g. cement manufacturing plant. Some operators have taken advantage of this and many plants have been set up without meeting the basic environmental protection requirements. Under the Environmental Quality Act (EQA), the creation of new air emission and effluent discharge points do indeed require prior approval, but not all operators take the trouble to apply. Some large local authorities with adequate resources also require prior siting approval for such plants. Generally a number of operators are content to wait out for compliant-induced investigation and enforcement by the authorities. As evidenced in history there would always be a small group in a particular industry behaving this way. At the other end of the scale, there are also others who strive to be responsible corporate citizens and to always improve their operation using the ISO certification as a benchmark. These Best Practicable Means (BPM) notes are prepared to assist them moving towards this goal. On consultation, DOE is supportive of this effort and has indicated its willingness to facilitate acceptance and provide further guidance, if necessary, once the industry accepts this approach.

## 1.0 INTRODUCTION

- 1.1 These notes are prepared to guide the establishment and operation of concrete batching plant in Malaysia, bearing in mind the local conditions, the limitations and the needs to protect diminishing surface waters. Best Practical Means (BPM) is the approach adopted. These notes outline the general requirements for meeting the best practicable means for Concrete Batching Plant (CBP). It is desirable that these be further adapted to the status of each plant, wherever necessary, taking into consideration the location, the prevailing conditions at its vicinity, the receiving water body, available opportunities for waste reduction/ management, plant size and its remaining economic life. It should be noted that in granting an emission and discharge approvals under the Environmental Quality Act, DOE may also consider other relevant aspects and may impose more stringent and/or additional control requirements. The Director General on the other hand is also bound by laws to take into consideration the age, size of plant and the commensurate cost of compliance. As per all BPM practices, the basis for deviations is not arbitrary but depends much on engineering consideration.
- 1.2 Some of the siting criteria and pollution prevention opportunities presented may not be practical or viable for all concrete batch plants. Plant owners and operators are encouraged to evaluate waste reduction opportunities based upon the individual operation characteristics of their facilities. The same waste reduction idea that works for one plant may not necessarily work for all.
- 1.3 Additional opportunities may exist beyond those identified in these guidelines. Owners and operators would be in the best position and expertise to identify those opportunities applicable to their operation. Consultation with the authorities is desirable during the drawing up of the adapted individual plan as well as in the finalization of the individual compliance plan for the specific plant. DOE especially has a good track record of being open-minded and any suggestion or rationale backed up with experience or sound engineering principle and balanced economics has always received support.
- 1.4 **CBPs**, as defined for these notes include plants and fixtures that store, measure and transfer concrete constituents: sand, stones, and other aggregates, cement, ad-mixtures, additives etc. into trucks for transport to a job site; it also includes plants that use a central mix-drum to manufacture concrete on-site for transfer to transport trucks, and plants that pre-cast products on-site. It also includes the storage, blending, premixing of improvers, chemicals, fuels, lubricants and all supporting and maintenance activities needed for the transportation and handling of the products.

- 1.5 These notes aim primarily to promote wise location of plant, and through diligent pollution control effort and appropriate waste management practices to contribute towards environment protection and improve relation with the community in proximity. CBP facilities may typically consist of silos containing lime, cement; fines, sand and gravel material; storage areas; mixing equipment; above ground storage tanks containing concrete additives and water; and designated areas for sand and gravel truck unloading, concrete truck loading, and concrete truck washout. The emission of particulate matter and waste water runoff are primary pollutants of concern. Route for trucking, waste water management, proper utilization and / or disposal of washout solid and unused concrete present great challenge in early planning and subsequent implementation.
- 1.6 Point source emissions are a result of the transfer of material to silos. Fugitive sources include the transfer of sand and aggregate, truck loading, mixer loading, vehicle traffic and wind erosion from sand and aggregate storage piles. Adequate provision of control equipment, regular maintenance and close monitoring coupled with intelligent use of equipment, materials, and waste products from plant facilities will reduce the discharge of potential pollutants to the storm drain system or watercourses, reduce air emissions, and mitigate noise impacts.
- 1.7 It must be emphasized that environmental performance improvement includes not only proper siting and the provision of the appliances, but also the proper operation and maintenance of equipment, its supervision and close monitoring, and the training of staff and supervision by of qualified personnel. Close rapport with the local community, local authorities and the DOE is essential to tackle and resolve sudden plant upset. It is legally required that malfunctioning and breakdown of the process or pollution control equipment should be reported to DOE in the first instance.

## 2.0 ESTABLISHMENT OF CBP

### Location and Siting of Plant

- 2.1 The plant should be located away from residential and sensitive areas to avoid residual pollutants from affecting them. In general it should be sited such that impacts on the environment or the amenities of the local community from noise, odor or polluting emissions are minimized if not totally avoided. The DOE Zoning Guidelines for Industries should be observed. Site-specific circumstances (e.g. local topography, state-of-the-art technology) may indicate a reason for amending the recommended separation distance. Even so, proximity to

sensitive areas such as hospitals, clinics, old folks home, schools, childcare centers should be given particular attention and avoided. Where the site establishes its own power generator, extra care relating to noise disturbance must be taken into account. If the plant could be located in industrial areas, the minimum distance of 100 meters should be observed in case of proximity to food and beverages preparation, precision equipment maintenance, spray painting works etc where dust may ruin the quality of their products. Access roads to the plant should be carefully planned to preserve serenity to the community and safety to other road users, especially pedestrians and small vehicles; the load carrying capacity of the chosen roads must be taken into consideration, CBP operators must be aware that road damage complaints by local community have been attributed to them.

- 2.2 While all efforts must be initiated to maximize the recovery and reuse all wastewaters from the operation, receiving water bodies are still needed for the residual waters discharged. Therefore, in the location of the plant, the importance of finding a suitable recipient body for the necessarily discharged water cannot be over-emphasized. While advantage can be taken on the non-toxic nature of the discharge and, if any, the present multi-usage and prevalent stage of the urban drainage; still, the high alkaline nature of the discharge, the diluting capacity and the beneficial use of the receiving watercourses must be borne in mind. Where there is downstream drinking or manufacturing intakes or aquaculture activities, the location should be avoided. In case of absolute needs then detailed assessment must be carried out, taking into consideration downstream distances and flow volume. The DOE has provided guidelines in the classification of rivers and their beneficial usage, these should serve as guidance.

### 3.0 POLLUTION CONTROL CONSIDERATIONS

#### 3.1 Air quality

Cement, sand and aggregates at a batching plant can produce dust. Fine dust particles entering neighboring premises can adversely affect amenity value. The best way to avoid offsite problems is to prevent the release of the dust through good design and management techniques. The provision of natural or artificial wind barriers such as trees, fences and landforms may help control the emission of dust from the plant. Dust prevention equipment such as water sprays, enclosures, hoods, curtains, shrouds, movable and telescoping chutes, fabric filters, should be installed to points of emission. Experience has shown that manual or automatic water spraying system at all unloading areas, stock piles and material discharge points is effective in minimizing airborne dust. Most crucial of all is the insistence by

management on regular and systematic maintenance by site personnel. Mechanisms on regular internal and external audit should be put in place to monitor actual practices. In the Malaysian situation, holding of dialog to obtain community feedback helps to maintain good community relationship and early warning on plant inadequacy.

### 3.2 Water quality

Stormwater and process waste waters should be channeled into different drainages. Aside from avoiding increase in waste water quantity and inducing further problems in treatment management, dilutions also prohibited by laws. Process wastewater collected from the entire site should be diverted to a **settling pond**, or series of ponds, such that the water can be reused in the concrete batching process. In general a high standard of yard and equipment maintenance will considerably reduce the potential for discharge of sediment to the wastewater collection and recycling system. The installation of **sediment traps** within the boundaries of the site will further assist. Regular inspection and maintenance of the sediment traps is necessary to avoid discharges of contaminated water from the site. It is noted that site personnel tends to concentrate on meeting production quota and neglect this part of maintenance. More education and incentives scheme are recommended.

### 3.3 Control of road and yard dust

The most effective means of reducing dust emissions at batch plants is to hard surface roadways and any other areas where there is a regular movement of vehicles. Access and exit routes for heavy transport vehicles should be planned to minimize noise and dust impacts on the environment and the amenity of the locality. Where it is not practicable to hard-surface a site (e.g. at a short-term location), there are a number of alternatives to suppress dust emissions from unsealed yards and roadways, including armoring (a thin layer of high quality pavement material is placed on the pavement surface), chemical suppressant products regular light watering. Dust emissions due to vehicles can be minimized by reducing travel distances within the site by appropriate site layout and design, the use of wheel and truck washing facilities at site exits, and the introduction of vehicle speed limits. All **CBP** sites should demonstrate good maintenance practices, including regular sweeping to remove dust build-up.

### 3.4 Solid wastes management

The main solid waste generated by batching plants is waste concrete brought back to site by mix trucks. Waste minimization is the preferred approach to dealing with this problem. It is expected that before the initiation of supply to a job site, negotiation has been conducted to have the possibility of utilizing waste concrete at the construction site; where possible waste concrete should be used for construction purposes at the batching plant (e.g. bunker blocks or paving unsealed areas). Alternatively, waste concrete can be directed to a suitable washout pit where it becomes gravel, sand and sludge, which can subsequently be collected and reused.

### 3.5 Environmental audits

Environmental audits by internal and external auditors should be conducted regularly to ensure that the plant is operating in accordance with its environmental objectives and within legislative requirements. Implementing environmental conformance procedures and training staff to recognize and minimize environmental hazards is also a good way of achieving high standards of environmental compliance through continuous improvement. There may be benefits in providing integrated quality, safety and environmental management systems for the site, operation of the plant, and delivery process. To reverse the general apathy of staff towards maintenance tasks (as compared to production) and to improve attitude and diligence, it could be made known to the staff that the environmental audit results on their plant would form part of their annual performance assessment.

## 4.0 SPECIFIC REQUIREMENTS

### 4.1 Siting

- 4.1.1 All new plants are to observe siting guidelines: they should be located at least 300 meters from residential areas, bearing in mind prevalent wind direction.
- 4.1.2 Proximity to sensitive areas such as hospitals, clinics, old folks home, schools, childcare centers should be avoided.
- 4.1.3 In industrial areas, plant should be at least 100 meters from food and beverages manufactures, spray paint shops, precision equipment maintenance facilities and the like where dust could seriously affect them.

- 4.1.4 The selected drainage, watercourses or water bodies meant to receive plant discharge shall not have downstream beneficial usage. Any deviation has to be justified and minimum impact demonstrated.
- 4.1.5 In addition to the buffer distance of plant site, the selected site itself shall be demonstrated to have sufficient buffer within the plant itself to accommodate the material stock piles, batching silos, waste storage/reuse areas, trucking, washout bays, settling ponds, sediment traps and all other necessary supporting equipment siting.
- 4.1.6 All work areas on site including roads, areas between stockpiles and conveyor hoppers shall be sealed and hard surfaced for the intended purpose and load carrying capacity, such that they can be repeatedly swept, maintained intact, and cleaned as necessary to control dust emissions. Truck loading areas, aggregate piles, truck washing stations, drum and chute wash-out areas, and chemical staging areas are to be bermed to ensure controlled flow of stormwater, washwater and slurry

## **4.2 Stock piling, material handling and storage**

- 4.2.1 It is generally more preferred to store all materials capable of becoming source of airborne dust emission in totally enclosed structure, this is especially desirable if there is insufficient buffer zone provided by the site.
- 4.2.2 Aggregates of size 5 millimeters or less should be stored in totally enclosed structure such as storage bin and should not be handled in open area.
- 4.2.3 Where there is sufficient buffer area surrounding the CBP, ground stockpiling may be used. The stockpile shall be enclosed at least on top and 3 sides and with flexible curtain to cover the entrance side.
- 4.2.3 The stockpiles shall be equipped with automatic or manual water spray to keep the materials sufficiently moist to prevent dust release.
- 4.2.4 The opening between the storage bin and weighing scale of the materials shall be fully enclosed
- 4.2.5 Fuel, lubricant and chemical additive storage areas must be sealed with an impervious material and bonded to 110% capacity to contain spills and leaks.

- 4.2.6 The loading, unloading, handling, transfer or storage of other raw materials which may generate airborne dust emissions such as crushed rock, sand, stone aggregate, shall be adequately wetted prior to and during the loading, unloading and handling operations.
- 4.2.7 Water spraying system at unloading areas, stock piles or material discharge points, whether manual or automatic, shall be closely monitored to ensure adequate but no overspray lest they become wastewater generation points.
- 4.3 Washwater collection and recycling system**
- 4.3.1 Stormwater from site collected through its own drainage system may be directly discharged.
- 4.3.2 Contaminated stormwater and process wastewater should be captured and recycled. **Settling ponds and sediment traps** should be provided for contaminated water from:
- agitator washout
  - truck washing
  - yard washdown
  - contaminated stormwater
  - concrete batching area
  - slump stand
  - any other wastewater from operation.
- 4.3.2 Every endeavor should be made to recycle and / or reuse the waters (*wastewater, wash water and stormwater*), (*range of pH 6-9, and 50-200 parts-per-million total suspended solids (TSS) is ideal for re-use in batching, washing and rinsing*) It is noted that the practices are accepted and encouraged by current construction material standards and concrete quality codes.
- 4.3.3 Where wastewater have to be released into any water body, it shall conform to the discharge standards specified in the Environmental Quality (Sewage and Industrial Effluents) Regulations.
- 4.3.4 If testing laboratory is not readily accessible, simple test kits should be made available to enable quick on-site monitoring of the water qualities, eg. pH meter, litmus paper kit, etc.

#### 4.4 On-site washout

- 4.4.1 Specific areas should be designated on site for the washing. The washout area is to be located at least 50 feet from storm drains, open ditches, or water bodies.
- 4.4.2 Together with the collection pit, the area shall be enclosed and adequately bermed to prevent any runoff. Once concrete wastes are washed into the designated area and allowed to harden, the concrete should be broken up, removed, reused and / or disposed of on a regular basis.
- 4.4.3 The washout area and the collection pit shall be of sufficient size for the washing and collection and other maneuvers of the water and solids washout.
- 4.4.4 Washout of concrete trucks should be performed in designated areas only.
- 4.4.5 Only concrete from mixer truck chutes should be washed into concrete wash out.
- 4.4.6 Concrete agitator bowls and chutes must not be washed out to the stormwater system or roadways.
- 4.4.7 Concrete washout from concrete pumper bins can be washed into concrete pumper trucks and discharged into designated washout area or properly disposed of offsite.
- 4.4.8 Sweepings from exposed aggregate, concrete and street are not to be allowed into or storm drains. They are to be returned to aggregate base stockpile or dispose in the trash.

#### 4.5 Cement storage and handling

- 4.5.1 Cement shall be delivered and downloaded in delivery trucks equipped with dust emission prevention devices.
- 4.5.2 Cement storage silos shall be equipped with venting dust control device, overfill audible and visual alarms linked to automatic delivery shut-down.
- 4.5.3 Each cement storage silo shall be equipped with fabric filter complete with fabric cleaning device.

- 4.5.4 All emissions shall not exceed DOE standards and shall not be visible at all times.
- 4.5.5 Adequate access to the filters should be provided to allow for regular inspection and maintenance.
- 4.5.6 In cases where it is not necessary to achieve dispersion of the residual pollutants, the final particulate arrestment plant discharge point may be located at low level to minimize the effect on the local community in case of abnormal emissions, as well as to facilitate maintenance and inspection.

**NOTE :** *This provision does apply to emission from generator where the exhaust gas must be adequately dispersed.*

- 4.5.7 A performance monitoring log-book should be maintained on daily basis to record the following:
- the pressure drop across the fabric filter
  - the visual conditions of exhaust from all emission points
  - incidents of filter media failure/replacement
  - all activities related to the control of dust, noise and effluent discharge

The log book shall be signed by the site operator and counter signed by the supervisor and shall be available for inspection by the auditors as well as the officers of DOE.

#### **4.6 Hopper mixer and weigh batcher**

- 4.6.1 Weigh bins and hoppers should be enclosed on three sides and roofed where a front-end loader is used. The roof should extend 2 meters in front of the bin.
- 4.6.2 All material mixing operations must be carried out within an effective enclosure.
- 4.6.3 Mixer loading points should be roofed and enclosed on either two (drive-through) or three sides.
- 4.6.4 Material elevators and transfer chutes used shall be fully enclosed.
- 4.6.5 The opening between the weighing scale and storage bin of the materials shall be fully enclosed.

- 4.6.6 All dust-laden air or waste gas generated should be properly extracted and vented to fabric filtering system to meet the emission limits.
- 4.6.7 Seating of pressure relief valves of all silos shall be checked, and the valves resealed if necessary, before each delivery.

#### **4.7 Conveyors**

- 4.7.1 All conveyors should be fully enclosed where possible. The minimum standard is enclosure on top and 2 sides with a metal board at the bottom.
- 4.7.2 All free falling transfer points from conveyors to stockpiles shall be equipped with chute(s).
- 4.7.3 All conveyor passage opening shall be equipped with flexible seals.
- 4.7.4 Belt cleaning scrappers shall be installed at all conveyor turning points.
- 4.7.5 Use of suppression agents and water spray are permitted if dust extraction means cannot be effected. Care however must be exercised to avoid over-spray resulting in increase wastewater flow.

#### **4.8 Mixer**

- 4.8.1 Materials are to premixed in a totally enclosed concrete mixer before loading the materials into the concrete truck.
- 4.8.2 Water sprays and a robust curtain / shroud of suitable design, or an effective air extraction and filtration system, should be installed to suppress dust generated during mixing as well as mixer truck loading.
- 4.8.3 If truck mix-batching or other types of batching method are used, effective dust control measures shall be adopted. The dust control measures must have been demonstrated that they are effective in collection and venting to dust arrestment plant of all dust-laden air generated.

## 4.9 Transport

- 4.9.1 Transport routes out and into the plant site should not pass through highly build up areas. Operators shall submit plans showing steps taken to effect this.
- 4.9.2 All CBP are to avail equipment necessary to pre-clean all concrete trucks and other vehicles after loading (preferably dry cleaning methods) and before exit from the property.
- 4.9.3 Before the exit, a properly designed and adequately sized wheel-wash facility is to be provided in addition to the pre-cleaning specified above.
- 4.9.4 The wheel wash site to be located in an area that provides a sufficient track-out distance before exit from the property.
- 4.9.5 Off-property track-out is to be minimized by providing paved roadway immediately after the wheel wash within property boundaries.
- 4.9.6 A wash attendant is to be stationed at the wheel wash facility to ensure adequate cleaning and effective control of water; failing which motion sensor is to be installed to provide water only on-demand and the driver must be clearly instructed to carry out inspection to ensure adequate cleaning before exit from CBP site.

## 4.10 Wastes management

- 4.10.1 Before supply to a new project begins, CBP owner /operator should initiate discussion with project owner, local authorities and community to explore possibilities of utilizing remnant or recycled construction materials recovered from wastes from the operations of the CBP, e.g. road base, parking lots, as fill material, gravel road stabilizer, walkway, tracks or landfill cover etc. The plant itself should also consider using these as bunker blocks, in paving unsealed areas, fill around buildings, parking lot and driveway aggregate etcetera.
- 4.10.2 Waste concrete should be collected in a suitable washout pit and the gravel, sand and sludge be subsequently collected and reused aggregates reclaimed from settling ponds and traps shall be utilized for input back into batching. Effort with cement supplier shall be demonstrated to utilize any filter cakes produced.

4.10.3 Efforts shall be demonstrated to reduce quantity generated from left over mix truck concrete. Wherever appropriate, delayed-set admixtures is to used to keep the leftover in liquid form and to be subsequently added to the next batch of mix.

4.10.4 Any raw material spill should be removed promptly by dry sweeping. Water should not be used in the process of cleaning up spills except where the area drains to a wastewater collection point where washing down would be preferable to generating dust by sweeping.

#### 4.11 Spill control

4.11.1 Areas where spills of oils and chemicals may occur should be equipped with easily accessible spill control kits to assist in prompt and effective spill control.

4.11.2 Staff should be familiar with spill response and notification procedures. Drills and exercise shall be conducted to identify communication and operation weakness.

#### 4.12 Monitoring requirement and auditing

##### 4.12.1 Ambient monitoring

- Frequency, duration and site of monitoring to be discussed and agreed to with the DOE, taking into consideration such factors as plant location, control equipment installed, history and nature of complaints.
- Any approved / accredited laboratory can be engaged for the monitoring work. In-house lab could also be used provided the personnel and equipment have received appropriate accreditation.

##### 4.12.2 Environmental auditing

- Operator is encouraged to establish EHS unit which would serve as internal auditors and be responsible to the CEO. If this is not feasible then such service can be sourced from external resources.

- Regular auditing on the plant environmental performance should be carried out at least on quarterly basis; proper records should be kept both for reporting and for staff incentives scheme.
- An external auditor is desirable to provide unbiased assessment and expert advice to the operator. At the minimum, external audit should be carried out annually and more often in case of violations.

#### 4.13 Education

4.13.1 **CBP operators** should provide training to educate employees, subcontractors, and suppliers on the concrete waste management techniques, so as to:

- recognize and minimize environmental hazards;
- handle/transfer raw materials (sand, sand, aggregate, cement, water) in a manner to reduce particulate emissions and wastewater runoff;
- clean equipment/vehicle in a manner to reduce airborne particles / wastewater runoff;
- clean vehicles before transporting materials off-site;
- use dry clean-up whenever possible;
- dispose of / recycle leftover cement properly.

Advantage should be taken of the training facilities provided and courses offered by the Environment Institute of Malaysia (**EiMAS**) of DOE.

4.13.2 Outline and explain what pollution prevention and waste minimization are and encourage input in identifying site pollution prevention activities

4.13.3 Provide incentives or awards for those who practice proper or new pollution prevention techniques

4.13.4 Hold regular employee meetings training sessions to discuss changes or on-going equipment practices and procedures

---

## ACKNOWLEDGEMENT

The Department of Environment is especially grateful to Ir. Tan Meng Leng, former Director General of the Department of Environment, Malaysia for authoring this Guidance Document.

**NOTES**

BEST PRACTICAL MEANS FOR THE CONCRETE BATCHING INDUSTRY IN MALAYSIA

---

**NOTES**

**NOTES**

BEST PRACTICAL MEANS FOR THE CONCRETE BATCHING INDUSTRY IN MALAYSIA



Department of Environment  
Ministry of Natural Resources & Environment  
Level 1-4, Podium Block 2 & 3, Lot 4G3, Presint 4  
Federal Government Administrative Centre  
62574 Putrajaya, Malaysia  
Tel: 603-8871 2000 Fax: 603-8888 9987  
Website: [www.doe.gov.my](http://www.doe.gov.my)

ISBN 978-983-3895-12-0

