



**A GUIDANCE NOTE ON THE  
TECHNICAL, MANAGEMENT AND MONITORING  
REQUIREMENTS**

**FOR**

**SPECIFIED PROCESS –  
TAR AND BITUMEN WORKS**

**(ASPHALT CONCRETE PLANTS)**

Environmental Protection Department

Environmental Compliance Division/  
Air Policy Division

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## 1. INTRODUCTION

1.1 This Note is one of a series issued by the Environmental Protection Department to guide the air pollution management of specified processes (SP), to which Part IV of the Air Pollution Control Ordinance (the Ordinance) applies, and the assessment of an application for SP licence. It covers operations for the manufacture of asphalt concrete under Tar and Bitumen Works, which are described as follows in Schedule 1 to the Ordinance -

“Tar and Bitumen Works” of the following kinds in which the installed capacity exceeds 250 kg per hour and in which -

- (a) gas tar or coal tar or bitumen is distilled or is heated in any manufacturing process; or
- (b) any product of the distillation of gas tar or coal tar or bitumen is distilled or heated in any process involving the evolution of any noxious or offensive gas; or
- (c) heated materials produced from gas tar or coal tar or bitumen are applied in coating or wrapping of iron or steel pipes or fittings.

1.2 Under section 12 of the Ordinance, the owner of any premises used for the conduct of an SP shall use the **best practicable means** (BPM) for preventing the emission of noxious or offensive emissions from their plants, preventing the discharge of such emissions into the atmosphere and rendering such emissions where discharged harmless and inoffensive. This Note sets out the minimum requirements for the provision and maintenance of the BPM for individual plant. However, an applicant for an SP licence should recognize that fulfilment of the requirements in this Note does not necessarily lead to the granting of the licence because the decision will take into account the circumstances of an individual application. In addition, the Authority may impose specific requirements in the licence, if granted, on top of the requirements set out in this Note. The terms and conditions in the SP licence should be the statutory requirements for the environmental management of an SP.

(Note: “best practicable means”, where used with respect to the emission from a premises of an air pollutant, has reference not only to the provision and the efficient maintenance of appliances adequate for preventing such emission, but also to the manner in which such appliances are used and to the proper supervision by the owner of the premises of any operation in which such an air pollutant is evolved.)

1.3 If an SP licence holder seeks to renew the licence of his existing SP that fails to meet the latest version of this Note at the time of the licence renewal application, he should provide full justifications for the failure and propose for the Authority’s consideration his plan to upgrade the emission control performance of his plant including the implementation timeframe.

## 2. EMISSION LIMITS

- 2.1 All emissions to air, other than steam or water vapour, shall be colourless, free from persistent mist or fume, and free from droplets.
- 2.2 Emissions from non-fugitive fixed emission points in the specified process and associated processes as covered by this Note shall not:
- (a) exceed the concentration limits set out in Annex I.
  - (b) appear to be as dark as or darker than Shade 1 on the Ringelmann Chart when compared in the appropriate manner with the Ringelmann Chart or an approved device.

### **3. FUEL AND MATERIAL RESTRICTION**

- 3.1 All fuels to be used shall comply with the Air Pollution Control (Fuel Restriction) Regulations in force.
- 3.2 Use of coal tar involving heating process in the manufacturing of asphalt concrete for road paving is not allowed.

### **4. CONTROL OF EMISSIONS**

#### **4.1 Design of chimney**

Chimney includes structures and openings of any kind from or through which air pollutants, generated from combustion, drying and/or other manufacturing process of the plant, may be emitted.

- 4.2 The design of chimney is to be determined by mathematical or physical dispersion modelling techniques acceptable to the Authority. The aims are to ensure:
- (a) the relevant Air Quality Objectives (AQOs) will not be threatened;
  - (b) the emission of non-AQO pollutants, in particular, heavy metals and carcinogenic organic compounds, will not cause any adverse effect to human health or environment;
  - (c) no undue constraint will be incurred to existing and future development or land use.
- 4.3 In any case, the design of chimney shall at least satisfy the following conditions:

#### **(a) Chimney height**

The final chimney height shall be agreed with the Authority but, as a general guideline, the chimney height in a flat terrain situation should as far as practicable be at least Building Height + 1.5 x Building Width or Building Height, whichever is the lesser. Suitable adjustment should be made to take

into account local meteorological data, local topography and background air pollutant concentrations. In any case, the chimney shall not be less than 3 metres plus the building height or 8 metres above ground level, whichever is the greater.

(b) Efflux velocity

The efflux velocity of gases from the main chimney (i.e., chimney for the kiln dryer), whenever practicable, should be at least 1.5 times of the wind speed at the chimney top. In any case, it shall not be less than 12 m/s at full load condition.

(c) Exit temperature

For combustion process, the flue gases exit temperature shall not be less than the acid dew point.

(d) Mode of discharge

Release to air from chimney shall be directed vertically upwards and not be restricted or deflected by the use of, for example, plates, caps or cowls.

Chimney flues and ductwork leading to the chimney shall, as far as practicable, be adequately insulated with materials not containing asbestos to minimize the cooling of waste gases and to prevent liquid condensation on internal surfaces.

In order to obtain maximum thermal buoyancy, hot emissions shall, as far as practicable, be discharged from the minimum number of chimneys, i.e., a multi-flue chimney design should be used.

4.4 Clean energy sources and fuels with proven benefits to air pollution reduction shall be used whenever possible in the relevant specified process and associated operations. The use of electricity or gaseous fuel for process heating or production of goods is always recommended.

## 5. FUGITIVE EMISSION CONTROL

### 5.1 Engineering Design / Technical Requirements

The Authority will prescribe the requirements in consideration of the circumstances of individual SP plant. As a general guideline, the loading, unloading, handling and storage of fuel, raw materials, products, wastes or by-products shall be carried out in a manner acceptable to the Authority so as to prevent the release of:

- (a) visible dust emissions; and/or
- (b) emissions of organic vapours; and/or
- (c) other noxious or offensive emissions.

### Fine Powder Materials

- 5.2 The loading, unloading, handling, transfer or storage of fine powder materials such as filler and/or other equally dusty materials shall be conducted in a totally enclosed system acceptable to the Authority. All dust-laden air or waste gas generated by the process shall be properly extracted and vented to fabric filtering system to meet the emission limit stipulated in Section 2 of this Note.
- 5.3 Fine powder materials such as filler and/or other equally dusty materials shall be stored in storage silos fitted with audible high level alarms to warn of over-filling. The high-level alarm indicators shall be interlocked with the material filling line such that in the event of the silos going to be overfilled, an audible alarm will operate, and after 1 minute or less the material filling line will be closed to avoid overfilling.
- 5.4 Vents of all silos shall be fitted with fabric filtering system to meet the emission limit stipulated in Section 2 of this Note.
- 5.5 Vents of filler weighing scale shall be fitted with fabric filtering system to meet the emission limit stipulated in Section 2 of this Note.
- 5.6 Seating of pressure relief valves of all silos shall be checked at least once a week during the process of filling dusty materials into the silos to ensure no dust-laden air leakage from the pressure relief valves.

### Cold feed side

- 5.7 Aggregates with a nominal size less than or equal to 5 mm shall be stored in totally enclosed structure such as storage bin and shall not be handled in open area. Where there is sufficient buffer area surrounding the plant, 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. If these aggregates are stored above the feeding hopper, they shall be enclosed at least on top and 3 sides and be wetted on the surface to prevent wind-whipping.
- 5.8 Aggregates with a nominal size greater than 5 mm should preferably be stored in totally enclosed structure. Aggregates stockpile that is above the feeding hopper shall be enclosed at least on top and 3 sides. If open stockpiling is used, the stockpiles shall be enclosed on 3 sides with the enclosure wall sufficiently higher than the top of the stockpile to prevent wind whipping.
- 5.9 Belt conveyors shall be enclosed on top and 2 sides and provided with a metal board at the bottom to eliminate any dust emission due to the wind-whipping effect. Other type of enclosure will also be accepted by the Authority if it can be demonstrated that the proposed enclosure can achieve the same performance.
- 5.10 Scrapers shall be provided at the turning points of all belt conveyors inside the chute of the transfer points to remove dust adhered to the belt surface.

- 5.11 All conveyor transfer points shall be totally enclosed. Openings for the passages of conveyors shall be fitted with adequate flexible seals.
- 5.12 All materials returned from dust collection system shall be transferred in enclosed system and shall be stored inside bins or enclosures.

Hot feed side

- 5.13 The inlet and outlet of the rotary dryer shall be enclosed and ducted to a dust extraction and collection system such as a fabric filter. The particulate and gaseous concentration at the exhaust outlet of the dust collector shall not exceed the limiting values specified in Section 2 of this Note.
- 5.14 The bucket elevator shall be totally enclosed and the air be extracted and ducted to a dust collection system to meet the particulates limiting value specified in Section 2 of this Note.
- 5.15 All vibratory screens shall be totally enclosed and dust tight with close-fitted access inspection opening. Gaskets shall be installed to seal off any cracks and edges of any inspection openings.
- 5.16 Chutes for carrying hot material shall be rigid and preferably fitted with abrasion resistant plate inside. They shall be inspected daily for leakages.
- 5.17 All hot bins shall be totally enclosed and dust tight with close-fitted access inspection opening. Gaskets shall be installed to seal off any cracks and edges of any inspection openings. The air shall be extracted and ducted to a dust collection system to meet the particulates limiting value specified in Section 2 of this Note.
- 5.18 Appropriate control measures shall be adopted in order to meet the bitumen emission limit specified in Section 2 of this Note as well as the ambient particulates and odour standards stated in paragraph 7.

Load-out zone (for new applications on or after 1 January 2017)

- 5.19 Bitumen fumes from the loading out of hot asphalt concrete onto trucks shall be minimized by capturing and extracting the fumes to the aggregate dryer for combustion and subsequently discharging by way of bag filters whenever the aggregate dryer is in operation.

Material transportation and cleaning of leaving vehicles

- 5.20 All practicable measures shall be taken to prevent or minimize the dust emission caused by vehicle movement.
- 5.21 The loading, unloading, handling, transfer or storage of other raw materials which may generate airborne dust emissions such as crushed rocks, sands, stone aggregates, reject fines, shall be carried out in such a manner as to minimize dust emissions.

- 5.22 Roadways from the entrance of the premises to the product loading points and/or any other working areas where there are regular movements of vehicles shall be paved or hard surfaced.
- 5.23 Haul roads inside the premises shall be adequately wetted with water and/or chemical suppressants by water trucks or water sprayers.
- 5.24 Vehicle exhausts, wherever possible, shall be directed upward.
- 5.25 Transportation of finished products shall be carried out with closed tankers or trucks that are fully and tightly covered with tarpaulin sheet before leaving the premises.
- 5.26 For premises with exit leading to public areas directly, vehicle cleaning facilities shall be provided at the site exit and used to clean leaving vehicles as follows:
- (a) All vehicle cleaning activities shall be carried out within the site boundary and there shall be no splashing of visible muddy wash water to public area outside the site boundary at all times;
  - (b) Effective vehicle washing facilities including high pressure water spray nozzles shall be in place and operated to remove dust and muddy water on the vehicles body and wheels thoroughly before the vehicles are allowed to leave the site exit; and .
  - (c) There shall be no visible muddy water being tracked onto areas outside the premises by leaving vehicles.
- 5.27 For premises with exit inside other construction sites, cleaning facilities shall be provided and used to clean asphalt concrete trucks leaving the construction sites to the satisfaction of the Authority.

#### Control of emissions from bitumen heating and storage

- 5.28 The heating temperature of the particular bitumen type and grade shall not exceed the corresponding temperature limit of the same type listed in Appendix 1. Tamper-free high temperature cutoff device shall be provided to shut off the fuel supply or electricity in case the upper limit for bitumen temperature is reached.
- 5.29 Bitumen fumes control device meeting the concentration limit set out in Annex I shall be provided to control bitumen fumes from the vent of bitumen heating and storage tank. Exit of the bitumen fumes control device shall be provided at high level.
- 5.30 The air-to-fuel ratio shall be properly controlled to allow complete combustion of the fuel. Fuel burners, if any, shall be maintained properly and free from carbon deposits in the burner nozzles.

#### Liquid fuel

- 5.31 The receipt, handling and storage of liquid fuel shall be carried out so as to prevent the release of emissions of organic vapours and/or other noxious and offensive

emissions to the air.

### Housekeeping

- 5.32 A high standard of housekeeping shall be maintained. Waste material, spillage, deposits of materials on ground, support structures or roofs and scattered piles gathered beneath belt conveyors, inside and around enclosures shall be cleared promptly by a cleaning method acceptable to the Authority. Dumping of dusty materials in open area shall be prohibited.

## **6. OPERATION AND MAINTENANCE**

- 6.1 Requirements include not only the provision of the appliances but the proper operation and maintenance of equipment, its supervision when in use, and the training and supervision of properly qualified staff. Specified operation and maintenance requirements may be specified for individual equipment.
- 6.2 In particular, the dust extraction and collection system shall be routinely inspected and maintained in good condition at all times and shall be used whenever the concerned equipment or emission points are in use. The owner shall conduct inspection of the dust extraction and collection system at least once per month and record on the list of inspection items that are to be agreed with the Authority. The handling and storage of the dust collected by the dust collection system shall be carried out without fugitive particulate emissions.
- 6.3 Malfunctioning or breakdown of equipment leading to abnormal emissions shall be dealt with promptly. In any case, the duration of any abnormal emission due to equipment failure shall not be more than 5 minutes or an aggregate of 30 minutes in any calendar month. These incidents shall be reported to the Authority within 3 working days.

## **7. MONITORING REQUIREMENTS**

- 7.1 Parameters and sampling frequency will be determined by the Authority. In any case, the emissions of particulate matter and bitumen fumes from the main chimney (i.e. the chimney serving the kiln dryer) shall be tested at least annually. In addition, the following parameters should be monitored as specified below:

- (a) In-stack monitoring

Particulate matter (opacity) from the combustion process by an opacity meter installed at the main chimney.

- (b) Process Monitoring

Monthly total of raw material input, product output and material stock (by



manual recording), and other essential operating parameter(s) which may significantly affect the emission of air pollutants.

(c) Ambient Monitoring

At site boundary and/or any other locations acceptable to the Authority:	<ul style="list-style-type: none"> <li>(i) Respirable suspended particulates (at least one 24-hour sample per 6 calendar days)</li> <li>(ii) Odour patrols along or beyond the site boundary (odour patrols to be conducted by the plant environmental personnel, who shall be free from any respiratory diseases, to detect any odour on weekly basis, two times a day in a week, one in the morning and one in the afternoon, or at frequency to be determined by the Authority.)</li> <li>(iii) Bitumen fumes to be measured half-yearly based on methods of measuring health exposure levels to be agreed with the Authority</li> </ul>
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7.2 The following Boundary Ambient Standards set for triggering investigations by the licence holder

Respirable suspended particulates:	100µg/m <sup>3</sup> (24 hour average)
Odour :	Objectionable odour noticeable at the site boundary and/or outside the premises

Event and Action Plan

7.3 Should non-compliance with the boundary ambient standards be found, the licence holder shall take action according to the Event and Action Plan at Annex II.

## **8. COMMISSIONING**

- 8.1 Commissioning trials (to be witnessed by the Authority whenever appropriate) shall be conducted to demonstrate the performance and capability of the air pollution control measures and a report of commissioning trial shall be submitted to the Authority within 1 month after completion of the trial.

## ANNEX I CONCENTRATION LIMITS FOR EMISSIONS FROM TAR AND BITUMEN WORKS

- I.1 With respect to non-fugitive fixed emission points, air pollutant emissions from each emission point of the subject specified process and associated processes shall comply with the concentration limits specified below:

Air Pollutant	Concentration Limit
Bitumen fumes	5 mg/m <sup>3</sup>
Particulates	Arrestment equipment of filler silos: 10 mg/m <sup>3</sup> (design standard) [a]  Other arrestment equipment: 50mg/ m <sup>3</sup>

Note: [a] For the emission points of existing premises with a designed concentration limit of 50 mg/m<sup>3</sup>, the licence holder shall, upon licence renewal, submit an improvement plan to meet the limit of 10mg/m<sup>3</sup> (design standard). The limit of 10 mg/ m<sup>3</sup> should be met by January 2018 for all plants.

- I.2 For combustion gases, the concentration limits are expressed at dry, 0°C temperature, 101.325 kPa pressure and 3% oxygen content conditions.
- I.3 For non-combustion gases, the concentration limits are expressed at 0°C temperature, 101.325 kPa pressure and without correction for water vapour or oxygen content. The introduction of dilution air to achieve the emission limits is not permitted.

## ANNEX II EVENT AND ACTION PLAN

### Event and Action Plan

Parameter: Respirable Suspended Particulates (24 hour average)

Monitoring frequency: at least one 24-hour sample per 6 calendar days

Action level: 100 µg/m<sup>3</sup>

Plant Environmental Personnel	Licensee
<ol style="list-style-type: none"> <li>1. Identify the source, investigate the causes and propose remedial measures. (<i>Exceedance of action level may be caused by malfunction of sampler and its operation, high level of background concentration, failure of air pollution control equipment, mishandling of materials, etc.</i>)</li> <li>2. Discuss with the operator for remedial actions required.</li> <li>3. Carry out corrective actions.</li> <li>4. Check the effectiveness of actions.</li> <li>5. Repeat measurement and increase monitoring frequency if necessary.</li> </ol>	<ol style="list-style-type: none"> <li>1. Notify the Authority for events with concentration equal or above 100 µg/m<sup>3</sup>.</li> <li>2. Rectify any unacceptable practice by Licensee.</li> <li>3. Amend working methods if appropriate.</li> <li>4. Report details of the findings (together with the daily inspection records in the past six days before the event) to the Authority.</li> </ol>

Parameter: Objectionable Odour

Monitoring frequency and detecting method: to be agreed with the Authority

Action level: Objectionable odour noticeable at the site boundary and/or outside the premises

Plant Environmental Personnel	Licensee
<ol style="list-style-type: none"> <li>1. Identify the source, investigate the causes and propose remedial measures. (<i>A boundary check should be made at least two times per day/shift by the plant environmental personnel and operator when the plant is in operation. The time, location and result of these checks, along with weather conditions such as indicative wind direction and strength, should be recorded to help identify the source.</i>)</li> <li>2. Discuss with the operator for remedial actions required.</li> <li>3. Carry out corrective actions.</li> <li>4. Check the effectiveness of actions.</li> <li>5. Repeat odour patrols and increase patrol frequency if necessary.</li> </ol>	<ol style="list-style-type: none"> <li>1. Notify the Authority for events with emissions detected with objectionable odour.</li> <li>2. Rectify any unacceptable practice by Licensee.</li> <li>3. Amend working methods if appropriate.</li> <li>4. Report details of the findings to the Authority.</li> </ol>

**Appendix 1    MAXIMUM HEATING TEMPERATURE OF COMMON GRADES OF BITUMEN**

Grade	Maximum Temperature (°C)
<u>Penetration grades</u> 60/70	163
<u>Polymer Modified Grade</u> PG76	180

Note:    Maximum heating temperature of other grades of bitumen shall be agreed with the Authority