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**GOVERNMENT NOTICE**

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**DEPARTMENT OF ENVIRONMENTAL AFFAIRS**

No. 924

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**NATIONAL ENVIRONMENTAL MANAGEMENT: WASTE ACT, 2008  
(ACT NO. 59 OF 2008)****NATIONAL STANDARDS FOR THE EXTRACTION, FLARING OR RECOVERY OF LANDFILL GAS**

I, Bomo Edith Edna Molewa, Minister of Water and Environmental Affairs, in terms of section 19(3)(a) of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008), hereby publish the national standards for the extraction, flaring or recovery of landfill gas in the Schedule for implementation.

**BOMO EDITH EDNA MOLEWA****MINISTER OF WATER AND ENVIRONMENTAL AFFAIRS**

**SCHEDULE**  
**NATIONAL STANDARDS FOR THE EXTRACTION, FLARING OR RECOVERY OF LANDFILL GAS**

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**ACRONYMS**

**CDM**- Clean Development Mechanism

**CH<sub>4</sub>**-Methane gas

**CO<sub>2</sub>**- Carbon dioxide

**CO**-Carbon Monoxide

**EA**- Environmental Agency

**EMP**-Environmental Management Plan

**ERP**-Emergency Response Procedure

**GHG**-Greenhouse gases

**HDPE**- High Density Polyethylene

**LFG**- Landfill Gas

**NO<sub>x</sub>**-Oxides of Nitrogen

**SABS**- South African Bureau of Standards

**SEMA**s- Specific Environmental Management Acts

**VOC**s- Volatile Organic Compounds

## 1. DEFINITIONS

In these Standards, any word or expression to which a meaning has been assigned in the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) shall have the meaning so assigned and, unless the context otherwise indicates.

**“Basic Assessment”** has the meaning assigned in the Environmental Impact Assessment Regulations;

**“Burner”** means a device inside the flaring unit to ignite or combust the gas;

**“Condensate”** means liquid that forms as gas cools down in a landfill gas collection system;

**“Extraction”** means the removal of gas from a landfill site by means of a network of pipes connected to a header and the gas sucking system;

**“Flame arrester”** means a crimped ribbon aluminum or stainless steel flame cell to protect against rapid burn backs in low-pressure situations to prevent flame fronts from propagating back through lines, destroying facilities, and causing injuries;

**“Flame detector”** means a device inside the flaring unit to minimise potential explosions especially on start ups and to check that ignition has been successful and combustion is indeed taking place;

**“Flare System”** means a system that safely disposes of waste gases through the use of combustion;

**“Flare Unit”** means a combustion device that uses a flame (in these standards an enclosed flame) to burn combustible gases in a landfill site;

**“Flaring”** means the burning of landfill gas in a flare;

**“Knockout Drum”** means a drum installed near the flare base, and serves to recover liquid hydrocarbons, prevent liquid slugs, and remove large liquid particles from the gas stream released from relief system;

**“Knock off points”** means specific sections in a LFG extraction system where condensate formed is allowed to settle and from which such condensate can be pumped out of the system;

**“Landfill Gas”** means a combination of gases that form as a result of the anaerobic decomposition of organic waste in a landfill site; and

**“Spark Ignition Engine”** means an internal combustion engine for electricity generation in a landfill site, in which an electrical discharge ignites the explosive mixture of fuel and air.

## **2. PURPOSE**

The standards aim at controlling the extraction, flaring or recovery of landfill gas at facilities as described in paragraph 4 of these Standards in order to prevent or minimize potential negative impacts on the bio-physical and socio-economic environments.

## **3. LEGISLATIVE FRAMEWORK**

The Bill of Rights contained in Chapter 2 of the Constitution of the Republic of South Africa, 1996 places an obligation on the State to (through reasonable legislative and other measures) give effect to the right to an environment that is not harmful to the health or well-being of its citizens, and to have the environment protected for the benefit of present and future generations. South African legislators responded to this provision of the Constitution by developing and promulgating the National Environmental Management Act, 1998 (Act No. 107 of 1998) which sets principles for environmental management in the country. The National Environmental Management Act, 1998 was followed by a number of SEMAs, including amongst others the National Environmental Management: Waste Act, 2008 (Act No.59 of 2008), which makes provisions for the development of standards set in this notice.

## **4. APPLICATION**

- (1) These standards apply to a landfill gas extraction, flaring or recovery facility initiated, constructed or upgraded after the coming into operation of the standards.
- (2) The standards are applicable throughout the Republic of South Africa.

## **5. REQUIREMENTS DURING PREPARATION OR PLANNING PHASE**

- (1) A landfill site, where a LFG project is to be constructed, must as part of the project planning and preparation, undertake the following:
  - (a) identify and list all environmental aspects or hazards of the proposed project and associated potential negative impacts or risks on the bio-logical and socio-economic environments;
  - (b) evaluate the level of significance of such impacts or risks;
  - (c) develop an EMP specifying actions or measures, timeframes and responsibilities for mitigating potential negative impacts or risks on bio-physical and socio-economic environments during the construction, operation and decommissioning phases of the project. The EMP must be implemented throughout the project phases and must as a minimum, address all the requirements stipulated in these standards; and

- (d) conduct studies or develop models to determine the depth of the landfill site and the landfill lining system prior to the digging of wells.

## 6. REQUIREMENTS DURING CONSTRUCTION PHASE

### (1) LFG Extraction System

- (a) Vertical wells must be drilled in such a way that no damage will be caused to the underlying landfill lining system.
- (b) The wells and associated vertical piping must be designed in a manner that will discourage excessive sucking in of leachate and dirty material into the system, which in turn may cause system clogging.
- (c) The wells and the piping system must be sealed in a manner that will prevent or minimise unnatural migration of the gas through the wells and the pipes.
- (d) All landfill gas transmission pipe work that operates under pressure should be pressure-tested to demonstrate its integrity.
- (e) Gas pipelines must be laid in a way that will encourage easy draining of condensate from one pipe to the other until condensate settles at the condensate collection points.
- (f) Where natural stones or crush aggregates are used in the construction of gas extraction wells, these must have a low calcareous content to reduce fugitive emissions from exhaust pipes.
- (g) Condensate knockoff points must be installed at lower level points of the gas collection system.
- (h) Condensate must be handled in a manner that does not pose a threat to the environment and in a way that landfill stability and or gas extraction is not compromised.

### (2) LFG Flaring System

- (a) The type of the flare required for a particular site must be determined based on a site specific survey or modeling of the key elements of the landfill gas in question. In order to minimise potential adverse impacts on the bio-physical and socio-economic environments, all the requirements in this section on the design of the flare unit, must be complied with.
- (b) To prevent unauthorised entry and potential tampering with the system, the flaring plant or unit must be fenced off and warning signage erected with only operational staff allowed to enter the premises unaccompanied.

- (c) Any other person, including visitors and temporary contractors working on the site must on entry to the facility be accompanied by operational staff.
- (d) An emergency diesel generator must be installed to provide alternative power source for the unit in case unexpected electricity power disruptions take place.
- (e) The flare unit must be enclosed and be wind and/or tamper proof to minimise the generation of back fires, noise emission, light pollution and to provide high combustion temperatures and specific residence periods to destroy unwanted constituents. The unit must be equipped with gas analyzer to monitor the composition and amount of gas extracted from the wells and that is coming into the flare unit.
- (f) To be able to destroy unwanted gas impurities and to minimise emissions to the atmosphere, the flaring unit must be designed and operated in accordance with the manufacture's specifications with regard to the level of gas combustion temperatures, destruction efficiencies and retention time in the burner.
- (g) The flare unit must be designed with the following features:
  - i. a flame arrester in the landfill gas feed line to prevent flash-back of the flame down the pipe;
  - ii. a burner designed in such a way that it maintains turbulent mixing of air and fuel and that the velocity of the gas is high enough to reduce the risk of flash-back of the flame down the feed pipe without blowing off the flame;
  - iii. a flame detector to minimise potential explosions especially on start ups and to check that ignition has been successful and combustion is indeed taking place;
  - iv. a method of controlling the flow rate of landfill gas to the burner and the supply of combustion air;
  - v. a method of cleaning/conditioning the gas before the flare to remove moisture and possibly impurities, such as airborne debris, from the landfill gas;
  - vi. A condensate knock-out drums to collect condensate as well as a pumping system to divert condensate to the condensate treatment or collection system.
- (h) On delivery to the site, the unit must be issued with a manufactures' certification, which confirms that the unit is indeed able to meet the above specifications.

## (3) LFG to Energy System

- (a) The electricity generating plant must be fenced off with only operational staff allowed to enter the premises unaccompanied in order to prevent unauthorised entry and potential tampering with the system.
- (b) Any other person, including visitors and temporary contractors working on the site must on entry to the facility be accompanied by operational staff.
- (c) Where spark ignition engine or generators are used, these must be enclosed in units or containers acoustically designed for noise reduction. Alternatively, these engines or generators should be placed in sound proofed housing facilities.
- (d) The gas combustion and power generating systems must be designed with the following features in place:
  - i. A generator or generators with exhausts or stacks fitted with silencers to minimise noise emission. These stacks must be designed to point at an upward direction in order to encourage easy dispersion of emissions from the generator;
  - ii. A chamber capable of combusting the gas at temperatures high enough to effectively destroy potential pollutants;
  - iii. A leachate or condensate collection and pumping system;
  - iv. A gas filtration or treatment system to remove impurities.
- (e) Install lightning conductors to prevent or minimize potential damage of the facility by lightning.

## (4) General Construction Requirements

- (a) Construction within the site must be carried out under the supervision of a registered professional engineer appointed by the site owner and according to the approved engineering site plans.
- (b) The construction site must be defined, warning signage erected and limited to authorized persons only. All activities must be confined to the construction site.
- (c) Fugitive emissions of dust during the construction site from the movement of motor vehicles must be minimised by road wetting and speed limits.



- (d) Onsite fueling and servicing of construction equipment and motor vehicles must only occur in a designated area.
- (e) A motor vehicle requiring maintenance must be removed from site and repaired at a service workshop or garage.
- (f) During the digging of vertical gas collection wells and horizontal trenches, dug up waste material must be put back into the landfill as soon as practically possible.

## 7. REQUIREMENTS DURING OPERATIONAL PHASE

### (1) LFG Extraction and Flaring Systems

- (a) A scheduled maintenance plan must be prepared and the efficiency of the flaring system as well as details of the volume and types of gases that are flared must be maintained in accordance with the manufacturer's specifications and in a manner that prevents or minimises the generation of environmental pollution.
- (b) During the shutting down of the flaring system for scheduled maintenance, LFG must be sealed off and only allowed to escape the system through the natural migration process.
- (c) The emergency generator required in terms of paragraph 6(2) of these standards must be maintained according to the manufacturer's specifications.
- (d) The area where the generator will be stored or located must be made of impermeable surfaces and must be bunded, with capability to hold up to 110% of the engine oil, and fuel in case of accidental spillages or leaks.
- (e) The generator must be operated in a manner that prevents or minimises environmental pollution.
- (f) Any liquid or solid waste generated during the maintenance of the emergency generator and during the maintenance of the flaring unit must be handled in a manner that does not cause pollution to the environment.
- (g) Smoking or fire making must not be allowed in and near the vicinity of the LFG extraction and flaring system and the signs indicating such must be erected on entrance to the facility.
- (h) Bins or receptacles for the storage of waste must be made available at all times and placed at a designated area.

- (i) The contents of the bins or receptacles must be removed from the site on a regular basis for disposal at a licensed disposal facility.
- (j) Leachate or condensate extracted from the flaring system must be handled in a manner that does not pose a threat to the environment and in such a way that the landfill stability and gas extraction is not compromised.
- (k) Washing of machinery or equipment, motor vehicles, materials, clothes or bathing is prohibited unless it is done in a designated area that has suitable impervious flooring designed for this purpose.
- (l) Bunded areas must be regularly inspected to ensure no leakages, overflows or spillages occur.
- (m) Any spillages must be cleaned-up immediately.
- (n) Contaminated soil must be removed and disposed at licensed landfill sites.

(2) LFG to Energy Plant

- (a) The LFG must be flared off during scheduled maintenance, emergency shutdowns or process upsets of the engines.
- (b) The LFG must be sealed off completely and only allowed to escape the system through the natural migration process when engines and flaring system are shut down for any reasons.
- (c) Any liquid and solid waste (including used oil, cooling system liquids, air and oil filters and any other waste emanating from the engines during maintenance) must be handled and stored in a manner that does not cause pollution to the environment prior to them being reused, recycled or disposed.
- (d) The engine performance must be measured and monitored throughout the duration of the project in order to ensure adherence to the manufacture efficiency specifications.
- (e) The gas extracted from the landfill must be used to run the electricity generating engine or engines.
- (f) All engine exhausts must be fitted with silencers to minimize noise emissions.

## 8. TRAINING AND CAPACITY BUILDING

- (1) All personnel on site, including visitors, temporary and permanent contractors as well as full time employees must undergo a safety; health and environmental induction which must as a minimum capacitate them to be able to identify, prevent, minimize or manage actions or behaviours that are likely to cause adverse impacts on the environment as a result of construction, operation and decommissioning of a LFG project.

- (2) Only suitably qualified and trained personnel must maintain and service (in accordance with the manufacture's specifications) the flaring unit, the energy generating engines and associated infrastructure as well as the emergency generator.

## 9. MANAGEMENT OF EMERGENCY SITUATIONS

Emergency incidents must be managed and reported in accordance with section 30 of the National Environmental Management Act, 1998 (Act No. 107 of 1998).

## 10. MONITORING AND REPORTING REQUIREMENTS

- (1) For the purpose of compliance monitoring, all facilities that fall within the scope as described in section 4 of these standards must prior to commencement with the construction of the landfill gas, flaring or recovery facility inform the Department for a once off registration of the facility in the Departmental database.
- (2) The registration application referred to in section 10(1) must as a minimum include the following:
  - (a) the owner of the facility;
  - (b) the area where the facility is situated;
  - (c) the location of the facility in terms of the name of the local municipality, erf number and geographical coordinates;
  - (d) the size of the facility;
  - (e) the proximity of the facility to the nearest residential area; and
  - (f) the land use/zoning.
- (3) The relevant authority must be given access to audit or site inspection at any time and at such frequency as they may decide or to have the site audited or inspected at any time and at such frequency as they may decide.
- (4) During such audits or site inspections, the site must make any records or documentation available to the inspection team as may be required.
- (5) Gas extraction must be monitored for the duration of the project lifetime and this should include a gas well monitoring programme to monitor potential deterioration in gas well performance.
- (6) Air quality monitoring should be conducted throughout the landfill gas flaring period at the perimeter of the site as a safety precaution.

- (7) Records of all hazardous waste removed from the site must be recorded and kept on file for future reference and these must be submitted to the relevant authority on request.
- (8) The environmental performance of the LFG extraction, flaring or recovery project should be reported and discussed in the landfill site steering committee meetings.
- (9) An annual environmental performance audit must be conducted at the site by a suitably qualified person and the results of the audit kept on record and handed over to the relevant authority upon request.
- (10) The annual environmental performance audit should include the following:
  - (a) Confirmation of compliance of the facility to these standards;
  - (b) Confirmation of compliance with any specific requirements issued by the relevant authority (local, provincial or national sphere of government);
  - (c) Reporting on any environmental incidences that occurred and detail of the manner the incidences were handled;
  - (d) Confirmation of compliance with the environmental management plan of the project;
  - (e) Confirmation of compliance with the air quality plan of the project;
  - (f) Confirmation of the inclusion of the project in the agenda for the landfill site steering committee.

## 11. GENERAL REQUIREMENTS

- (1) Compliance with these standards does not exempt the facility from complying with the requirements stipulated in other sector legislation.
- (2) These requirements are binding to the contractors and sub-contractors working on site and should be included in tender documentation for the construction contract.
- (3) Gaseous emissions from the flaring and electricity generation process must comply with the requirements of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004).
- (4) The requirements set in these standards including any other requirements by the relevant authority must be complied with in full.
- (5) A safety data sheet for each of the chemical products purchased from a manufacturer or vendor must be obtained, kept on site, maintained and updated regularly.

- (6) A hard copy of the safety data sheet must be kept in an easily accessible location to employees.
- (7) Waste stored temporarily, must be kept on bins or receptacles which are labeled or colour coded.
- (8) Waste bins should be placed on an impermeable surface to avoid soil, groundwater and surface water contamination.
- (9) Burning of waste is not allowed on the site.
- (10) The project owner is responsible to ensure that noise levels do not exceed the applicable noise standards in the relevant municipality or province.

## 12. REQUIREMENTS DURING DECOMMISSIONING PHASE

- (1) A rehabilitation plan for the site, including the indication of possible future use must be developed and kept on file at the facility.
- (2) The type of rehabilitation adopted would be dependent on the planned future use of the facility. The following requirements however apply where the future use is no longer the LFG project:
  - (a) When the amount of gas in the landfill site is no longer able to generate electricity, the gas engines or generators and all associated infrastructure must be removed from the site;
  - (b) The gas engines or generators and associated infrastructure may be reused in other landfill gas to energy projects elsewhere or recycled as scrap material;
  - (c) When no more gas is extractable from the landfill site to justify the need for the flaring operation, the flaring system and associated infrastructure must be removed;
  - (d) The flaring system and associated infrastructure may be reused in other LFG projects elsewhere or recycled as scrap material;
  - (e) When no more flaring is taking place, all valves (including inlet valves to the flaring system, valves at the monitoring points at the manifolds) must be shut off in order to prevent the remaining minor gas from escaping the landfill site unnaturally. The pipes buried inside the landfill may however be left buried provided that no subsequent gas generated in the landfill will migrate through them;
  - (f) All containers that were used to store waste or raw materials must be removed from the site for reuse, recycle or disposal at a licensed disposal facility;

- (g) The owner of the facility at any given point in time, including the subsequent owner of the facility will remain responsible for any adverse impacts on the environment, even after operations have ceased;
- (h) All remaining construction infrastructure, building rubble and waste are to be removed from the site;
- (i) Use of topsoil for rehabilitation, that contains the seeds of alien vegetation, will not be permitted unless a program to germinate indigenous seed and eradicate alien seedlings is implemented;
- (j) A grass mix should be selected for rehabilitation of disturbed open areas.

### 13. TRANSITIONAL ARRANGEMENTS

A person who lawfully conducted the activity of extracting, flaring or recovering of landfill gas prior to and on the date of coming into effect of these standards may continue with the activity for the duration as stipulated in the approval, authorisation or licence and after the expiry of the approval, authorisation or licence must comply with these standards.

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