NOTICE 946 OF 2012

DEPARTMENT OF ENVIRONMENTAL AFFAIRS

NATIONAL ENVIRONMENTAL MANAGEMENT ACT: AIR QUALITY ACT, 2004 (ACT NO. 39 OF 2004)

DRAFT DECLARATION OF SMALL BOILERS AS CONTROLLED EMITTERS

I, Bomo Edith Edna Molewa, Minister of Water and Environmental Affairs, hereby give notice of my intention to declare small boilers as controlled emitters under section 57(1)(a) and section 23 of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004), set out in the Schedule hereto.

Members of the public are invited to submit to the Minister, within 30 (thirty) days after the publication of the notice in the *Gazette*, written representations or objections to the following addresses:

By post to: The Director-General: Department of Environmental Affairs
Attention: Mr O Matshediso
Private Bag X 477
Pretoria
0001

By hand at: 2nd Floor (Reception), Fedsure Forum Building, 315 Pretorius Street, Pretoria

By email: OMatshediso@environment.gov.za, or by fax to: 086 546 5786

Any inquiries in connection with the notice can be directed to Dr T Mdluli at 012 310 3436 or Mr O Matshediso at 012 310 3102

Comments received after the closing date may not be considered.

BOMO EDITH EDNA MOLEWA
MINISTER OF WATER AND ENVIRONMENTAL AFFAIRS

SCHEDULE

Part 1: Definitions

1. Definitions

In this Notice a word or expression to which a meaning has been assigned in the Act has that meaning and, unless the context otherwise indicates-

'act' means the National Environmental Management: Air Quality Act 2004 (Act No.39 of 2004).

'authorized person' means any person authorized by municipal council to implement this Notice.

'biomass' means non-fossilized and biodegradable organic material originating from plants, animals and micro-organisms excluding-(a) sewage; and (b) treated or coated wood waste which may contain halogenated organic compounds or heavy metals.

'black smoke' should be interpreted / understood to refer to smoke as dark or darker than Shade 4 of the Ringelmann chart, which refers to an equivalent of 80% black (refer Schedule B).

'boiler' means a combustion appliance designed to heat water.

'dark smoke' should be interpreted / understood to refer to smoke as dark or darker than Shade 2 of the Ringelmann chart, which refers to an equivalent of 40% black (refer Schedule B).

'existing small boiler' shall mean any small boiler that was manufactured before the date on which this Notice takes effect.

'new small boiler' shall mean any small boiler manufactured after the date on which this Notice takes effect.

'operator' means a person who owns, manages, or controls a small boiler.

'small boiler' means any boiler with a design capacity equal to 10MW but less than 50MW net heat input, capable of burning biomass, solid, liquid and/or gaseous fuels or a combination thereof, with:

$NHI = M_f \times NCV / (3.6 \times 10^6)$

Where,
- NHI refers to the Net Heat Input expressed in MW;
- M_f refers to the Mass flow rate of the fuel expressed in kg/hour;
- NCV refers to the Net Calorific Value of the fuel expressed in kJ/kg;

With:

NCV = GCV - 2442 x (H_2O in fuel + 9 x H_2 in fuel)
Where, GCV refers to the Gross Calorific Value expressed in kJ/kg (Air dried basis for solid fuels);
H_2O in fuel refers to the Total moisture in the fuel, expressed as a Mass fraction (As fired condition);
H_2 in fuel refers to the Total hydrogen in the fuel including hydrocarbons, expressed as a Mass fraction (Obtained from the ultimate analysis of the fuel);

'soot blowing' refers to a method of cleaning deposited carbon from the internal surfaces of a boiler, which usually includes the use of a jet of air or steam onto heat exchange surfaces to clean deposits. Soot blowing is conducted on a regular schedule during each day.

Part 2: General

2. Application

This Notice shall apply to any small boiler under normal operating conditions subject to the provisions for start-up, soot-blowing and incidences of abnormal conditions.

3. Permitted black and dark smoke emissions and associated timeframes:

(1)During small boiler start-up, black smoke shall be limited to a period of twenty (20) minutes.

(2)During soot blowing of a small boiler and abnormal conditions, dark smoke shall be limited to the following periods:

Number of small boilers per shared stack	**Permitted emissions of dark smoke in any period of 8 hours**	
	Abnormal conditions	**Soot blowing**
One (1)	10 minutes	14 minutes
Two (2)	18 minutes	25 minutes
Three (3)	24 minutes	34 minutes
Four or more (4 +)	29 minutes	41 minutes

4. Implementation

The emission standards contained in this Notice shall be implemented by the municipalities.

5. Compliance time frames

(1) New small boiler must comply with the new small boilers emission standards as contained in Part 3 on the date of publication of this Notice.

(2) Existing small boiler must comply with emission standards for existing small boilers as contained in Part 3 within 5 years of the date of publication of this Notice

6. Reporting requirements

(1) The operator of a small boiler must:—

(a) Submit at least one (1) emissions report per annum to the relevant authorized person per the format specified in Schedule C ;

(b) Submit the first emissions report to the relevant authorized person within 12 months from the date on which this Notice takes effect;

(c) Provide any additional emission reports and/or other necessary information as requested by an authorized person, for the implementation of this Notice;

(d) Record all measurement results and keep a copy of this record for at least five (5) years after obtaining the results;

(e) Produce the record of the measurement results for inspection if requested to do so by an authorized person.

(2) For reporting requirements, emissions shall be measured by stack emission measurement and may be supplemented by means of either of the following methods:

(a) Mass balance;

(b) Engineering calculations;

7. Emission measurement:

(1) The concentration or mass of pollutant for which emissions standards have been set in this Notice shall be reported as the average of at least three (3) measurements; measured over a minimum sample period of 60 minutes to obtain a representative sample.

(2) The manner in which measurements shall be carried out must be in accordance with the standard sampling and analysis methods listed in Schedule A of the Notice.

(3) Methods other than those contained in Schedule A may be used with the written consent of the National Air Quality Officer. In seeking the written consent referred, an applicant must provide the National Air Quality Officer with any information that supports the equivalence of the method other than those referred.

Part 3: Emission Standards

8. Emission Limits

All small boilers affected by this Notice must comply with the emission limits and requirements as scheduled in the tables below:-

(a) **Solid fuel-fired small boilers**

Description	Small boilers fueled with solid fuels.		
Application	All small boilers fueled with hydrocarbon based solid fuel, excluding biomass.		
Substance or mixture of substances		**Small Boiler status**	**Limit value (dry mg/ Nm^3 at 273K; 101.3kPa and 6% O_2)**
Common name	**Chemical symbol**		
Particulate matter	PM	New	120
		Existing	250
Sulphur dioxide	SO_2	New	2800
		Existing	2800

(b) Liquid fuel-fired small boilers

Description	Small boilers fueled with liquid fuels.		
Application	All liquid fuel-fired small boilers		
Substance or mixture of substances		**Small Boiler status**	**Limit value (dry mg/ Nm^3 at 273K; 101.3kPa and 3% O_2)**
Common name	**Chemical symbol**		
Particulate matter	PM	New	100
		Existing	150
Sulphur dioxide	SO_2	New	500
		Existing	3500

(c) Gaseous fuel-fired small boilers (using natural gas and liquefied petroleum gas)

Description	Small boilers fueled with gaseous fuels.		
Application	All small boilers fueled with low particulate matter content gaseous fuels.		
Substance or mixture of substances		**Small Boiler status**	**Limit value (dry mg/ Nm^3 at 273K; 101.3kPa and 3% O_2)**
Common name	**Chemical symbol**		
Particulate matter	PM	New	10
		Existing	20
Sulphur dioxide	SO_2	New	35
		Existing	100

(d) Gaseous fuel-fired small boilers (using process gas)

Description	Small boilers fueled with gaseous fuels.		
Application	All small boilers fueled with gaseous fuels generated by industrial processes.		
Substance or mixture of substances		**Small Boiler status**	**Limit value (dry mg/ Nm^3 at 273K; 101.3kPa and 3% O_2)**
Common name	**Chemical symbol**		
Particulate matter	PM	New	90
		Existing	130
Sulphur dioxide	SO_2	New	1000
		Existing	3500

(e) **Solid biomass fuel-fired small boilers**

Description	Small boilers fueled with solid biomass fuels		
Application	All small boilers fueled with biomass fuels		
Substance or mixture of substances		**Small Boiler status**	**Limit value (dry mg/ Nm^3 at 273K; 101.3kPa and 6% O_2)**
Common name	**Chemical symbol**		
Particulate matter	PM	New	120
		Existing	250
Sulphur dioxide	SO_2	New	1000
		Existing	1000

(f) **Co-generation**

Where a small boiler is fired simultaneously with two or more fuels, the following steps and formulas must be used to calculate the emission standards that will apply when the small boiler is being fired this way:

(i) The emission standard (as dry mg/Nm^3) of each pollutant for the different fuels used, must be referenced to a common oxygen reference concentration of 3%;

(ii) The Emission Standard for each substance is then calculated by means of the following formula:

$$CES = \frac{\text{Sum of } (NHI_{fuel\ i} \times ES_{fuel\ i}) \text{ for all fuels fired simultaneously}}{\text{Total NHI from all fuels fired simultaneously}}$$

Whereby:

CES is the Calculated Emission Standard for specific substance (pollutant), expressed as dry mg/Nm^3 at 3% O_2 reference concentration

$ES_{fuel\ i}$ is the Emission Standard of specific substance (pollutant) emitted from fuel, "fuel i", expressed as dry mg/Nm^3 at 3% O_2 reference concentration

NHI refers to Net Heat Input as referred under Part 1: Definitions

$NHI_{fuel\ i}$ is the Net Heat Input of fuel, "fuel i", expressed in MW

ANNEXURE A: EMISSION MEASUREMENT METHODS AND ANALYSIS

The following referenced documents are indispensable for the application of the Notice. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies. Information on currently valid national and international standards can be obtained from Standards South Africa.

(1) ISO Standards

(a) ISO 7934:1989 Stationary source emissions – Determination of the mass concentration of sulphur dioxide - Hydrogen peroxide/barium perchlorate/Thorin method.

(b) ISO 7934:1989/Amd 1:1998

(c) ISO 7935: Stationary source emissions – Determination of the mass concentration of sulphur dioxide – Performance characteristics of automated measuring method.

(d) ISO 9096: Stationary source emissions – Manual Determination of mass concentration of particulate matter.

(e) ISO 10155: Stationary source emissions – Automated monitoring of mass concentrations of particles – Performance characteristics, test methods and specifications

(f) ISO 10396: Stationary source emissions – Sampling for the automated determination of gas emissions concentrations for permanently-installed monitoring systems

(g) ISO 10780: Stationary source emissions – Measurement of velocity volume flow rate of gas steams in ducts.

(h) ISO 11632: Stationary source emissions – Determination of mass concentration of sulphur dioxide – Iron chromatography method.

(i) ISO 12141: Stationary source emissions – Determination of mass concentration of particulate matter (dust) at low concentrations- Manual gravimetric method.

(j) ISO 14164: Stationary source emissions – Determination of the volume flow-rate of gas streams in ducts - Automated method.

(2) EPA methods

(a) Method 1 – Traverse Points

(b) Method 1A – Small Ducts

(c) Method 2 – Velocity - S-type Pitot

(d) Method 2A – Volume Meters

(e) Method 2B – Exhaust Volume Flow Rate

(f) Method 2C – Standard Pitot

(g) Method 2D – Rate Meters

(h) Method 2F – Flow Rate Measurement with 3-D Probe

(i) Method 2G – Flow Rate Measurement with 2-D Probe

(j) Method 2H – Flow Rate Measurement with Velocity Decay Near Stack Walls

(k) Memo – New Test Procedures of Stack Gas Flow Rate in Place of Method 2

(l) Method 3 – Molecular Weight

(m) Method 3A – CO_2, O_2 by instrumental methods

(n) Method 3B – CO_2, O_2 by Orsat apparatus

(o) Method 3C – CO_2, CH_4, N_2, O_2 by determined by thermal conductivity

(p) Method 4 – Moisture Content

(q) Method 5 – Particulate Matter (PM)

(r) Method 5D – PM Baghouses (Particulate Matter)

(s) Method 5I – Determination of Low Level Particulate Matter Emissions

(t) Method 6 – Sulphur Dioxide (SO_2)

(u) Method 6A – SO_2, CO_2

(v) Method 6B – SO_2, CO_2 - Long Term Integrated

(w) Method 6C – SO_2 - Instrumental

(x) Method 6C – Figures SO_2

(y) Method 8 – Sulfuric Acid Mist

(z) Method 9 – Visual Opacity

(aa) Method 17 – In-Stack Particulate (PM)

(bb) Method 19 – SO_2 Removal & PM, SO_2, NO_X Rates from Electric Utility Steam Generators

(cc) Method 22 – Fugitive Opacity

(dd) Method 28A – Air to Fuel Ratio, Burn Rate - Wood-fired Appliances

(ee) Methods 203A, B, and C – Opacity Determination for Time-Averaged Regulations

(3) British standards

(a) BS 3405:1983 Method for measurement of particulate emission including grit and dust (simplified method).

(b) BS EN 14181:2004 Stationary source emissions. Quality assurance of automated measuring systems.

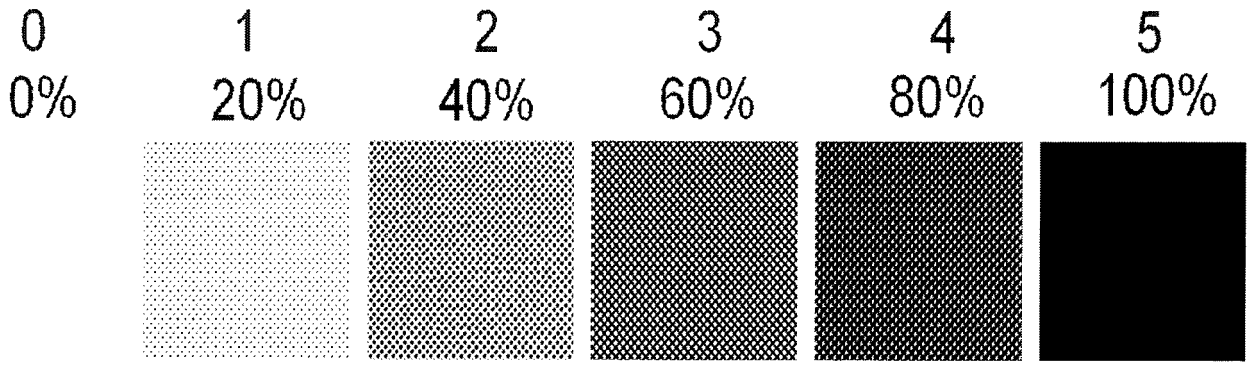
(c) BS EN 15259: Air quality. Measurement of stationary source emissions. Measurement strategy, measurement planning, reporting and design of measurement sites.

(d) BS EN 15267-1: Air quality. Certification of automated measuring systems. General principles.

(e) BS EN 15267-2: Air quality. Certification of automated measuring systems. Initial assessment of the AMS manufacturer's quality management system and post certification surveillance for the manufacturing process.

(f) BS EN 15267-3: Air quality. Certification of automated measuring systems. Performance criteria and test procedures for automated measuring systems for monitoring emissions from stationary sources.

ANNEXURE B: RINGELMANN SMOKE CHART



ANNEXURE C: TEMPLATE FOR REPORTING EMISSIONS

Emission Measurements Report for Small Boiler

Name of Enterprise:_____

Declaration of accuracy of information provided:

I, _____, declare that the information provided in this report is in all respect factually true and correct.

Signed at_____ on this_____day of _____

_____

SIGNATURE

_____

CAPACITY OF SIGNATORY

1. Enterprise Details

Enterprise Name	
Trading as	
Postal Address	
Telephone Number (General):	
Fax Number (General)	
Industry Type ?Nature of Trade	
Land Use Zoning as per Town Planning Scheme	
Land Use Rights if outside Town Planning Scheme	

2. Contact details

Responsible Person Name	
Telephone Number	
Cell Phone Number	
Fax Number	
E-mail address	

3. **Serial number, product name and model of the small boiler**

Serial Number	Product Name	Product Model	Rated Thermal Input (MW)

4. **Energy used**

Energy source	Sulphur content of fuel (%) (if applicable)	Ash content of fuel (%) (if applicable)	Design consumption rate (volume)	Actual consumption rate (volume)	Units (quantity /period)

5. **Point source parameters**

Unique stack ID	Point source name	Height of release above ground	Height above nearby building [m]	Diameter at stack tip / vent exit [m]	Actual gas exit temperature	Actual gas volumetric flow	Actual gas exit velocity [m/s]

6. Point source emissions

Unique stack ID	Pollutant name	Average annual release rate			Emission hours [e.g. 07H00 – 17H00]	Type of emission [continuous/ intermittent]

7. Signature

_____ _____

Signature of the Operator **Date of Application**

ANNEXURE D: EXAMPLES ON CALCULATING NET HEAT INPUT AND ON CO-GENERATION

Example: Simultaneous combustion of Solid Biomass Fuel and Gaseous Fuel (low dust content gaseous fuel) for an Existing Small Boiler:

The first step is to calculate the NHI from each fuel based on individual firing rates (*refer Part 1: Definitions*), for the purpose of this example, it is assumed that both fuels each contribute with a NHI value of 5 MW:

Solid Biomass Fuel: NHI_{fuel1} = 5 MW

Gaseous Fuel (Low dust content): NHI_{fuel2} = 5 MW

The second step is to calculate the emission standard (ES) of each substance (pollutant) against the 3% O_2 reference concentration for the CES (refer "CESref" as subscript below) as referred above. Particulate Matter (PM) will be used for this example:

Fuel 1: The ES for PM for the solid biomass fuel: is 250 mg /Nm^3 dry at 6% O_2

$$ES_{PM\ for\ fuel1\ at\ 3\%O2} = ES_{PM\ for\ biomass\ fuel} \times (20.95 - \%O_{2\_CESref}) / (20.95 - \%O_{2\_biomass\ fuel})$$
$$= 250 \times (20.95 - 3) / (20.95 - 6)$$
$$= 300\ mg/Nm^3\ dry\ at\ 3\%\ O_2$$

Fuel 2: The ES for PM for the gaseous fuel: is 20 mg /Nm^3 dry at 3% O_2

$$ES_{PM\ for\ fuel2\ at\ 3\%O2} = ES_{PM\ for\ gaseous\ fuel} \times (20.95 - \%O_{2\_CESref}) / (20.95 - \%O_{2\_gaseousfuel})$$
$$= 20 \times (20.95 - 3) / (20.95 - 3)$$
$$= 20\ mg/Nm^3\ dry\ at\ 3\%\ O_2$$

The third step is to apply the equation provided under 8(f) above:

For PM the calculated emission standard (CES) for the simultaneous combustion of the two fuels is:

$$CES_{PM} = \frac{(NHI_{fuel1} \times ES_{PM\ for\ fuel1\ at\ 3\%O2}) + (NHI_{fuel2} \times ES_{PM\ for\ fuel2\ at\ 3\%O2})}{(NHI_{fuel1} + NHI_{fuel2})}$$
$$= ((5 \times 300) + (5 \times 20)) / (5 + 5)$$
$$= 1600 / 10$$
$$= 160$$

The calculated emission standard for PM for the simultaneous combustion of the two fuels used in this example is therefore calculated to be:

CES_{PM} = 160 mg /Nm^3 dry at 3% O_2

Example 1: Solid Fuel - Coal

Fuel consumption	=	2 000 kg/h
GCV	=	27 575 kJ/kg
Moisture in fuel	=	5 (m/m)% or 0.05 mass fraction
Hydrogen in fuel	=	4 (m/m)% or 0.04 mass fraction
NCV	=	27 575 - 2 442 x (0.05 + 9 x 0.04) = 26 573 kJ/kg
NHI	=	2 000 x 26 573 / (3.6 x10^6) = 14.76 MW

Example 2: Liquid Fuel - HFO

Fuel consumption	=	1 000 kg/h
GCV	=	43 400 kJ/kg
Moisture in fuel	=	0.4 (m/m) % or 0.004 mass fraction
Hydrogen in fuel	=	10.9 (m/m) % or 0.109 mass fraction
NCV	=	43 400 - 2 442 x (0.004 + 9 x 0.109) = 40 994 kJ/kg
NHI	=	1 000 x 40 994 / (3.6 x10^6) = 11.39 MW