GHANA STANDARDS AUTHORITY

GHANA STANDARD **GS 1236:2019**

ENVIRONMENT AND HEALTH PROTECTION – REQUIREMENTS FOR AMBIENT AIR QUALITY AND POINT SOURCE/STACK EMISSIONS

ICS 13.040.20;13.040.40 **Ref. No. GS 1236:2019**

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Foreword

The Ghana Standards Authority is the National Statutory Body responsible for the development and promulgation of Ghana Standards.

The Ghana Standards Authority is a member of the African Organization for Standardization (ARSO), the International Organization for Standardization (ISO) and an affiliate member of the International Electrotechnical Commission (IEC).

This Ghana Standard is on Environment and Health Protection – Requirements for Ambient Air Quality and Point Source/Stack Emissions. This Ghana standard specifies the requirements and methods of analysis for ambient air. It also specifies the requirements and test methods for point source or stack emissions based on the sources of energy.

The National Committee responsible for this standard (GS 1236:2019) is the Technical Committee on Environmental Quality Standards – Ambient Air Quality.

This is the first edition.

Users of this standard should note that the standard undergoes revision from time to time and any references to it statutorily imply its latest edition.

NATIONAL TECHNICAL COMMITTEE ON ENVIRONMENTAL QUALITY STANDARDS – AMBIENT AIR QUALITY

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GHANA STANDARD **GS 1236:2019**

Environment and Health Protection – Requirements for Ambient Air Quality and Point Source/Stack Emissions

0 Introduction

0.1 Ghana recognizes the need to reduce air pollution from stationary, aerial, mobile and non-point sources to levels which minimize harmful effects on public health, paying particular attention to sensitive populations such as the elderly, children and pregnant women, and the environment.

0.2 It is important to control emissions of pollutants at source and to identify and implement the most effective emission reduction measures at national, regional and local levels. Therefore, emissions of harmful air pollutants should be prevented, minimized or controlled through the implementation of relevant standards and guidelines.

0.3 Ghana stands to benefit by applying resource-efficient, less polluting and best available technologies and practices.

0.4 Clean air is essential to maintaining the delicate balance of life on this planet. Poor air quality is a result of a number of factors, including emissions from various sources, both natural and anthropogenic. Poor air quality occurs when pollutants reach concentrations which may endanger public health and/or the environment. Our everyday lifestyles, such as choices of transportation, open burning of waste, source of energy for industrial, domestic and commercial activities etc. can have significant impacts on air quality and public health.

0.5 This first Ghana Ambient Air Quality, Point Source or Stack Emission Standard is derived from data collected by the Ghana Environmental Protection Regulator and research institutions in Ghana.

0.6 Standards for cleanair are very important instruments for protecting environment and public health. The evidence that regulation of air-quality has the concomitant result of protecting public health is based on a broad range of interdisciplinary research findings. Diseases and disorders associated with exposure to air pollution tend to be widely distributed across populations.

0.7 Due to the potential adverse environmental and public health implications of air pollution, Ghana intends in the immediate to long term, to improve the air quality for the entire population.

1 Scope

1.1 This Ghana standard specifies the requirements and test methods for ambient air quality.

1.2 It also specifies the requirements and test methods for point source or stack emissions based on the sources of energy.

2 Normative References

The following standards contain provisions which through reference in this text, constitute provisions of this standard.

All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards.

2.1 AS 3580.4.1, Methods of sampling and analysis of ambient air – Determination of Sulphur Dioxide – Direct reading instrumental method

2.2 ASTM D3162-12, Standard test method for carbon monoxide in the atmosphere (continuous measurement by nondispersive infrared spectrometry)

2.3 ASTM D3266-91, Standard test method for automated separation and collection of particulate and acidic gaseous fluoride in the atmosphere (double paper tape sampler method)

2.4 ASTM D4096 – 17, Standard Test Method for Determination of Total Suspended Particulate Matter in the Atmosphere (High–Volume Sampler Method)

2.5 ASTM D4323 – 15, Standard test method for hydrogen sulphide in the atmosphere by rate of change of reflectance

2.6 ASTM D5466 – 15, Standard test method for determination of volatile organic compounds in the atmospheres (canister sampling methodology)

2.7 ASTM D6209 – 13, Standard test method for determination of gaseous and particulate polycyclic aromatic hydrocarbons in ambient air (collection on sorbent-backed filters with gas chromatographic/ mass spectrometric analysis)

2.8 ASTM D6602 -13(2018), Standard practice for sampling and testing of possible carbon black fugitive emissions or other environmental particulate, or both

2.9 ASTM D7773-12, Standard test method for determination of volatile inorganic acids (HCl, HBr and HNO_3) using filter sampling and suppressed ion chromatography

2.10 California EPA Method 425, Determination of total chromium and hexavalent chromium emissions from stationary sources

2.11 ISO 7996, Ambient air -- Determination of the mass concentration of nitrogen oxides -- Chemiluminescence method

2.12 ISO 9096, Stationary source emissions – Manual determination of mass concentration of particulate matter

2.13 ISO 9855, Ambient Air – Determination of the particulate lead content of aerosols collected on filters – Atomic absorption method

2.14 ISO 10849, Stationary source emissions -- Determination of the mass concentration of nitrogen oxides -- Performance characteristics of automated measuring systems

2.15 ISO 13964, Air Quality – Determination of ozone in ambient air – ultraviolet photometric method

2.16 ISO 15713, Stationary Source emissions – Sampling and determination of gaseous fluoride content

2.17 ISO 17733, Workplace air — Determination of mercury and inorganic mercury compounds — Method by cold-vapour atomic absorption spectrometry or atomic fluorescence spectrometry

2.18 ISO 21438-2, Workplace atmospheres -- Determination of inorganic acids by ion chromatography -- Part 2: Volatile acids, except hydrofluoric acid (hydrochloric acid, hydrobromic acid and nitric acid)

2.19 USEPA Method 10, Determination of carbon monoxide emissions from stationary sources (instrumental analyzer procedure)

2.20 USEPA Method 23, Determination of Polychlorinated dibenzo–p–Dioxins and Polychlorinated dibenzofurans from stationary sources

2.21 USEPA Method 29, Determination of metals emission from stationary sources

2.22 USEPA Method 0050, Isokinetic HCl/Cl_2

2.23 USEPA Method 0061, Determination of hexavalent chromium emissions from stationary sources

2.24 USEPA Method 426, Determination of Cyanide Emissions from Stationary Sources

3 Definitions

For the purpose of this Ghana standard, the following definitions apply:

3.1
regulator
statutory body responsible for air quality

3.2
air pollution
contamination of indoor or outdoor environment by any chemical, physical or biological agent that modifies the natural characteristics of the atmosphere

3.3
ambient air
refers to outdoor air in our surrounding environment

3.4
ambient air quality
the quality of outdoor air in our surrounding environment

3.5
atmospheric emission
any release emanating from a point, non-point or mobile source that changes the composition of the air

3.6
black carbon
is formed through the incomplete combustion of fossil fuels, biofuel and biomass, and is emitted as part of anthropogenic and naturally occurring soot. It consists of pure carbon in several linked forms

3.7
chimney
stack or final exit duct on a stationary system used for the dispersion of residual process gases and particulates

3.8
fenceline
key field locations, including along pipelines, at factory perimeters and even along rooflines

3.9
gaseous fuels
refers to any one of a number of fuels that under ordinary conditions are gases. Example liquified petroleum gas (LPG), biogas and natural gas

3.10
hood
any device that removes airborne grease, combustion products, fumes, smoke, heat, and steam from the air by evacuation of the air and filtration

3.11
incinerator
an enclosed device that burnswaste materials undercontrolledtemperature until the material is reduced to ash

3.12
liquid fuels
can be natural fuels (mainly used in engines, and in boilers and large and slow engines) and manufactured (or artificial) fuels (mainly alcohols, biofuels and products from the synthesis of hydrocarbons and coal)

3.13
mobile source
identifiable source(s) of air emissions which does not emanate from a fixed location

3.14
non-point source
a source of air emissions which cannot be identified as having emanated from a single identifiable source or fixed location, and includes open fires, industrialand agricultural activities

3.15
oxides of nitrogen (NO_x)
nitric oxide and nitrogen dioxide

3.16
$PM_{2.5}$
particulate matter with aerodynamic diameter of less than 2.5 micrometre

3.17
PM_{10}
particulate matter with aerodynamic diameter of less than 10 micrometre

3.18
point source
a single identifiable source and fixed location of air emission and includes stacks, chimneys, hoods among others

3.19
stack
a shaft for ventilation or passage of smoke

3.20
solid fuels
refers to various types of materials that are used as fuel in the solid state

3.21
total suspended particulate matter
an airborne particulate matter representing a complex mixture of organic and inorganic substances, covering a wide range of diameters, from <0.1 µm and up to some 100 µm.

3.22
undertaking
any enterprise, activity, scheme of development, construction, project, structure, building, work, investment, plan, programme and any modification, extension, abandonment, demolition, rehabilitation or decommissioning of such undertaking, the implementation of which may have a significant impact

4 Requirements

4.1 Requirements for point source/stack emissions

The maximum limits for the corresponding pollutant based on source of fuel/type of energy used as given in column 2 of Table 1. The point source/stack emissions are measured in accordance with the relevant test methods specified in column 3 of Table 1

Table 1: Requirements for point source/stack emission

#	POLLUTANTS	MAXIMUM LIMITS	TEST METHOD
1.	**Solid fuels**		
a.	Sulphur Dioxide (mg/Nm^3)*	200	USEPA Method 6C
b.	Oxides of Nitrogen (mg/Nm^3)	200	ISO 10849
c.	Particulate Matter (mg/m^3)	50.00	ISO 9096
2.	**Liquid fuels**		
a.	Sulphur Dioxide (mg/Nm^3)	500	USEPA Method 6C
b.	Oxides of Nitrogen (mg/Nm^3)	400	ISO 10849
c.	Particulate Matter (mg/m^3)	50.00	ISO 9096
3.	**Gaseous fuels**		
a.	Sulphur Dioxide (mg/Nm^3)	100	USEPA Method 6C
b.	Oxides of Nitrogen (mg/Nm^3)	320	ISO 10849
c.	Particulate Matter (mg/m^3)	20.00	ISO 9096
4.	**Electrical energy**		
a.	Sulphur Dioxide (mg/Nm^3)	200	USEPA Method 6C
b.	Oxides of Nitrogen (mg/Nm^3)	200	ISO 10849
c.	Particulate Matter (mg/m^3)	50.00	ISO 9096
5.	**Incinerators**		
a.	Sulphur Dioxide (mg/Nm^3)	200	USEPA Method 6C
b.	Oxides of Nitrogen (mg/Nm^3)	400	ISO 10849
c.	Particulate Matter (mg/m^3)	70.00	ISO 9096
6.	**Other parameters (that may apply)**		
a.	Carbon Monoxide (mg/Nm^3)	100	USEPA Method 10
b.	Hydrochloric Acid (HCl) (mg/Nm^3)	60.00	USEPA Method 0050
c.	Hydrogen Fluoride (mg/Nm^3)	4.00	ISO 15713
d.	Mercury and mercury compounds (mg/Nm^3)	0.03	USEPA Method 29
e.	Particulate Lead (mg/m^3) (expressed as lead)	0.50	USEPA Method 29
	Note:1) Electrical Energy usage include induction/electric arc furnaces, dryers, oven, kilns, Alumina & iron smelting among others. 2)* N represents Normal atmosphere and pressure		

4.2 Requirements for Ambient Air quality

For requirements for ambient concentrations of air pollutants see Table 2.

Table 2 – Ambient air pollutants -Maximum limits

#	Substance	Maximum Limits	Averaging Time	Test Method
1	Sulphur Dioxide (SO_2), µg/m^3	520 50	1 hour 24 hours	AS 3580.4.1
2	Nitrogen Oxides (measured as NO_2), µg/m^3	250 150	1 hour 24 hours	ISO 7996
3	Total Suspended Particulate matter, µg/m^3	150 80	24 hours 1 year	ASTM D4096 - 17
4	PM_{10} , µg/m^3	70 70	24 hours 1 year	ASTM D4096 - 17
5	$PM_{2.5,}$ µg/m^3	35	24 hours	ASTM D4096 - 17
6	Black Carbon, µg/m^3	25	24 hours	ASTM D6602 -13
7	Benzene, µg/m^3	5	1 year	ASTM D5466 – 15
8	Lead, µg/m^3	0.5 1	1 year 24 hours	ISO 9855

Table 3 – Fenceline Air Pollutants – Maximum limits

#	Substance	Maximum Limits	Averaging Time	Test Method
1	Carbon Monoxide, mg/m^3	100 60 30 10	15 minutes 30 minutes 1 hour 8 hours	ASTM D3162-12
2	Hydrogen Sulphide, µg/m^3	150	24 hours	ASTM D4323 - 15
3	Hydrogen Cyanide, µg/m^3	220	24 hours	USEPA Method 426
4	Hydrogen Chloride, µg/m^3	20	24 hours	ASTM D7773-12 / ISO 21438-2
5	Cadmium, ng/m^3	3	1 year	ISO 9855
6	Sulphur Dioxide (SO_2), µg/m^3	150	24 hours	AS 3580.4.1
7	Nitrogen Oxides (measured as NO_2), µg/m^3	150	24 hours	ISO 7996
8	Total Suspended Particulate, µg/m^3	150 100	24 hours 1 year	ASTM D4096 - 17
9	$PM_{10,}$ µg/m^3	70 70	24 hours 1 year	ASTM D4096 - 17
10	$PM_{2.5}$, µg/m^3	35	24 hours	ASTM D4096 - 17

Cont.Table 3 – Fenceline Air Pollutants – Maximum limits

#	Substance	Maximum Limits	Averaging Time	Test Method
11	Black Carbon, µg/m^3	25	24 hours	ASTM D6602 -13
12	Benzene, µg/m^3	5	1 year	ASTM D5466 - 15
13	Lead, µg/m^3	1 0.5	24 hours 1 year	ISO 9855
14	Mercury (and its derivatives compounds), ng/m^3 µg/m^3	 15 1	 24 hours 1 year	ISO 17733
15	Cadmium, ng/m^3	5	1 year	ISO 9855
16	Manganese, µg/m^3	1	24 hours	ISO 9855
17	Toluene, mg/m^3	8	24 hours	ASTM D5466 – 15
18	Arsenic, ng/m^3	15	24 hours	USEPA Method 29
19	Fluoride, µg/m^3	10	24 hours	ASTM D3266-91
20	Ozone, µg/m^3	120	8 hours	ISO 13964
21	Nickel, ng/m^3	20	1 year	USEPA Method 29
22	PAH, ng/m^3	1	1 hour	ASTM D6209 - 13
23	Xylene, µg/m^3	700	1 year	
24	Dichloromethane (Methylene chloride), mg/m^3	3	24hours	OSHA Method No 80
25	Trichloroethane, mg/m^3	0.7	24hours	OSHA Method No 14
26	Dioxins/Furans, pg TEQ/m^3	0.1 0.6	24 hours 1 year	USEPA 23
27	Total PCB, pg TEQ/m^3	0.6 0.035	24 hours 1 year	GC-MS

5. Testing

5.1 Equipment used for measurement of all pollutants shall be approved by the regulator.

5.2 The testing laboratories shall use the test methods prescribed in this Ghana Standard or any equivalent International Standard test methods or other standard measuring instruments as shall be approved by the regulator for air quality monitoring.

5.3 Measuring instruments shall for the purpose of this standard include any approved device to indicate or record air pollution or give warning of excessive air pollution.

6 Monitoring

6.1 Measurements of air quality (ambient and point source) shall take place at any facility as determined by the regulator.

6.2 An Owner or Operator of any premises shall provide the regulator or any other officer duly authorized by the regulator every reasonable assistance or facility available at the premises that the officer may require for the purpose of taking an action required to be undertaken under this standard in respect of the premises.

6.3 Measurement of fenceline air quality and point source/stack air emission shall be carried out by the undertakings and records kept. The records shall be open for inspection by the officers of the regulator as and when required.

6.4 The regulator shall determine:

a. the number of sampling locations;

b. the sampling duration;

c. frequency of monitoring air quality at any undertaking; and

d. frequency of submission of air quality monitoring report.

6.5 Every undertaking with a point source shall have an opening approved by the regulator on each stack, chimney, hood etc. for the measurement of air emissions.

6.6 The regulator shall establish a network of air quality monitoring stations in Ghana to monitor the trends in ambient air quality for policy formulation.

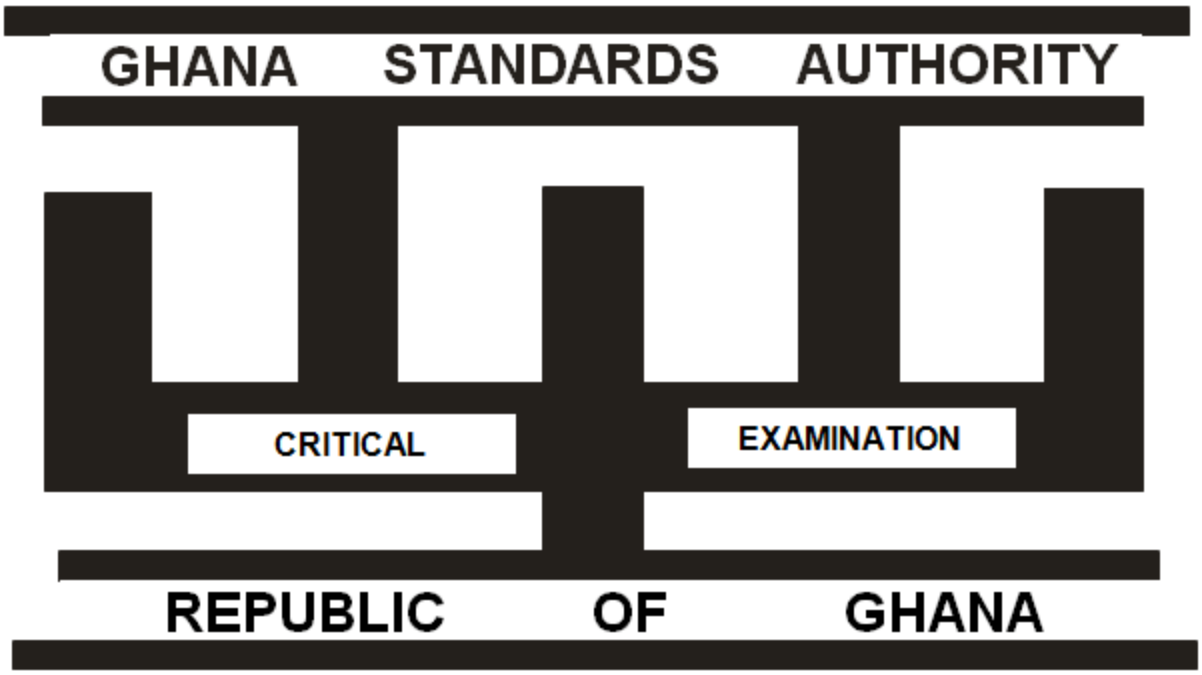
7 Compliance

An undertaking shall be deemed to have complied with the requirements of this standard if after measurement and monitoring, the results show that emission does not exceed limits presented in tables as prescribed under clause 4.

Annex A
(Informative)

Meaning of units used under clause 4

$\mu g/m^3$	microgram per cubic metre
mg/m^3	milligram per cubic metre
ng/m^3	nanogram per cubic metre
mg/Nm^3	milligram per normal cubic metre
$pgTEQ/m^3$	Picogram toxic equivalents per cubic metre
TEQ	Toxic equivalents
N	normal conditions (standard atmosphere = 101.325kPa)



LICENCE NO.

STANDARD NO.

Figure 2 – An illustration of the Layout of Information for Company Licence Number and the Standard Number on the Ghana Standards Certification Mark

THE GHANA STANDARDS CERTIFICATION MARK

For further information on the Ghana Standards Certification Mark Scheme, please contact:

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