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ICS: 13.040.30

DRAFT TANZANIA STANDARD

Tolerance limits for noxious gases/fumes

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0 Foreword

Noxious smells/odors are sensed mainly from gases/fumes produced either from bacterial decomposition of organic matter, volatilization, chemical reactions or industrial processes. The general population however does not realize that odour/smell, which is mostly associated with noxious gases/fumes, is among the pollutants that could affect public health. Odours at low concentrations primarily produce psychological stress rather than harm to the human body. Offensive odors can cause poor appetite for food, lowered water consumption, impaired respiration, nausea and vomiting, and mental perturbation. In extreme cases, offensive odors can result in asphyxiation, deterioration of personal and community pride, interference with human relations, discourage capital investment, lower socio-economic status, and deter growth. This Tanzania Standard is developed partly due to the requirements of the Law (EMA, 2004) and partly because of the public outcry on noxious smells emanating from various locations including industries and households. Therefore, the limit values provided by this Tanzania Standard will provide the basis for authorities to assess and manage noxious smells.

In the preparation of this Tanzania Standard considerable assistance was derived from the following sources;

Threshold Limit Values & Biological Exposure Indices, copyright 2005 by the American Conference of Governmental Industrial Hygienists (ACGIH).
(http://www.mathesongas.com/pdfs/products/threshold-limit-values-(tlv).pdf), visited May 2010.

NIOSH Pocket Guide to Chemical Hazards, 2004 published by the National Institute for Occupational Safety and Health (NIOSH)
(http://www.mathesongas.com/pdfs/products/threshold-limit-values-(tlv).pdf), visited May 2010.

Occupational Health and Safety Regulation; Guidelines for workers compensation Act and OHS Regulations (http://www2.worksafebc.com/PDFs/regulation/exposure_limits.pdf), visited May 2010.

This assistance is gratefully acknowledged.

1 Scope

This Tanzania Standard sets tolerance limits for noxious gaseous and fumes emitted from industrial, commercial, municipal operations and informal sector activities. It also specifies methods for direct measurement of concentration of noxious gases and fumes from emitting source.

2 Normative references

For the purpose of this Tanzania Standard the following references shall apply:

TZS 837 (1):2011, *Air quality — Sampling and test methods (Part 1) — Guidelines for planning the sampling of atmosphere and location of monitoring stations*

TZS 837 (2): 2011, *Air quality — Sampling and testing methods (Part 2) — Sampling of gaseous pollutants*

3 Definition of terms and phrases

For the purpose of this Tanzania Standard, the following terms and phrases shall have the meanings respectively ascribed to them by this clause.

3.1 Asphyxia	is a condition of severely deficient supply of oxygen to the body that arises from being unable to breathe normally
3.2 Noxious	Injurious to physical or mental health
3.3 Odor/smell	The perception experienced when one or more chemical substances in the air come in contact with the various human sensory systems (odor is a human response)
3.4 Noxious smell	The emission of odors or smells injurious to persons or property.
3.5 Threshold limit value (TLV)	The amount of a gas exposure for an 8 hour day for 5 days a week without any harmful effects.
3.6 Ceiling limit (CL)	The amount of gas at no time a person can be exposed to.
3.7 Short term exposure limit (STEL)	The maximum concentration of a chemical to which persons may be exposed continuously for up to 15 minutes without danger to health or work efficiency and safety.
3.8 Time weighted average (TWA)	The average exposure to a contaminant or condition (such as noise) to which workers may be exposed without adverse effect over a period such as in an 8-hour day or 40-hour week.
3.9 Immediately dangerous to life or health(IDLH)	The maximum concentration of a gas, in case of Compressed Air Breathing Apparatus (CABA), failure, one could escape without any irreversible health effects.
3.10 Compressed air breathing apparatus (CABA),	Or simply Breathing Apparatus (BA) is a device worn by rescue workers, firefighters, and others to provide breathable air in an IDLH (Immediate Danger to Life and Health) Atmosphere.

4 Requirements

The noxious smell/noxious gases/fumes emissions from industrial processes/products, commercial units operations, urban centers and informal sector activities shall conform to the requirements given in Table 1.

Table 1 – Tolerance limits for noxious gases and fumes emitted from industrial, commercial municipal operations and informal sector activities.

S/N	Chemical name	Formula	Molecular weight (MW) g/mol	Threshold limit value (TLV) ppm	Short term exposure limit (STEL) ppm	Ceiling limit (CL) ppm	Immediately dangerous to life or health (IDLH) ppm
ii	**Inorganic compounds**						
	Ammonia	NH_3	17	25	35	50	300
	Arsine	AsH_3	78	0.05	0.05	0.2	3
	Boron tribromide	BBr_3	250.5	1	-	1	50
	Boron trichloride	BCl_3	117.2	3	-	3	25
	Boron trifluoride	BF_3	67.8	1	1	1	25
	Bromine	Br_2	159.8	0.1	0.2	0.3	3
	Carbon dioxide	CO_2	44	5 000	30 000	30 000	40 000
	Carbon monoxide	CO	28	25	200	200	1 200
	Chlorine	Cl_2	71	0.5	1	0.5	10
	Halothane	$C_2HBrClF_3$	197.4	50	2	60	-
	Hydrogen chloride	HCl	36.5	-	2	2	50
	Hydrogen cyanide	HCN	27	-	4.7	4.7	50
	Hydrogen Sulphide	H_2S	34	10	15	15	100

	Nitrogen dioxide	NO_2	46	3	5	5	20
	Nitrogen oxide	NO	30	25	-	-	100
	Phosphine	PH_3	34	0.3	1	1	50
	Selenium hexafluoride	SeF_6	193	0.05	-	-	2
	Stibine	H_3Sb	124.8	0.1	-	-	-
	Sulfur pentafluoride	S_2F_{10}	254.1	-	0.01	0.01	-
ii	**Organic compounds**						
	1,3-Butadiene	C_4H_6	54.1	2	5	5	2000

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	Acetone	$(CH_3)_2CO$	58.1				
	Benzene	C_6H_6	78.1	0.5	2.5	2.5	500
	Butane	C_4H_{10}	58.1	600	750	-	-
	Chloroform	CHCl3	119.4				
	Dimethyl disulphide	$(CH_3)_2S_2$	94	0.5	-	-	-
	Dimethyl sulphide	$(CH_3)_2S$	62	10	-	-	-
	Ethyl Benzene	$C_6H_5CH_2C_3$	106.2				
	Ethylene oxide	C_2H_4O	44.1				
	Formaldehyde	HCHO	30	0.3	0.3	0.3	20
	Methane	CH_4	16	1000	-	-	-
	Methanol	CH_3OH	32	200	250	-	6000
	Methyl mercaptan	CH_3SH	48	0.5	-	0.5	150
	Sulphur dioxide	SO_2	64	2	5	10	100
	Toluene	C6H5CH3	92.1				
	Xylene	C(6)H(4)(CH(3))(2)	106				

- No data

5 Sampling

Sampling shall be done as prescribed in TZS 837 Part 1 and 2.

Annex A

(informative)

Expected sources of noxious gases

Sources	Possible noxious gases
Leather industry	Toluene, benzene, ammonia, methane, carbon monoxide, hydrogen sulfide
Tobacco industry	Butane
Sewage treatment plant	Methane, carbon dioxide
Pulp and paper industry	Chlorine, carbon monoxide
Textile dye industry	Ammonia, Hydrogen sulfide, chlorine
Hospitals	Formaldehyde, Ethylene oxides
Paint or Ink manufacturing industries	Chromium, VOC_S, Chloroform, ethyl benzene
Disposal sites (eg landfill)	Hydrogen sulfide, carbon monoxide, ammonia
Iron and Steel Industry	Carbon monoxide, ammonia, Sulphur dioxide
Laboratories (eg. Chemical labs, material testing labs)	According to the nature of activities of that lab
Processing Industries	Acetylene, carbon dioxide, nitrogen,
Petrochemical Industries	Ethylene, toluene, vinyl chloride, benzene

Annex B

(Informative)

Guideline on conversion factors

a) ppm to mg/m^3 - air

The conversion between ppm and mg/m^3 is dependent on both the molecular weight of the substance and the temperature at which the conversion is made. The assumption is that the pollutant behaves as an ideal gas and as such, 1 mole of the substance occupies 22.4 L at standard temperature (273 K) and pressure (101.3 kPa). This is consistent with normalised concentrations, and it is therefore not normally necessary to take account of the temperature or pressure difference in the conversion. However, when converting ppm to mg/m^3 at actual discharge conditions, it is important to take account of the necessary factors.

To convert from ppm to mg/m^3, the following formula should be used:

$$mg/m^3 = ppm \times (MW/22.4) \times (273/T) \times (P/101.3)$$

where
MW is the molecular weight of the substance (in grams)
T is the temperature at which the conversion is to be made (degrees Kelvin) *P* is the pressure at which the conversion is to be made (kPa)

b) mg/m^3 to ppm- air

To convert from mg/m^3 to ppm, the following formulae should be used:

$$ppm = mg/m^3 \times (22.4/MW) \times (T/273) \times (101.3/P)$$