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EAST AFRICAN STANDARD

Code of practice — Measurement of noise emitted by motor vehicles

EAST AFRICAN COMMUNITY

Foreword

Development of the East African Standards has been necessitated by the need for harmonizing requirements governing quality of products and services in East Africa. It is envisaged that through harmonized standardization, trade barriers which are encountered when goods and services are exchanged within the Community will be removed.

In order to meet the above objectives, the EAC Partner States have enacted an East African Standardization, Quality Assurance, Metrology and Test Act, 2006 (EAC SQMT Act, 2006) to make provisions for ensuring standardization, quality assurance, metrology and testing of products produced or originating in a third country and traded in the Community in order to facilitate industrial development and trade as well as helping to protect the health and safety of society and the environment in the Community.

East African Standards are formulated in accordance with the procedures established by the East African Standards Committee. The East African Standards Committee is established under the provisions of Article 4 of the EAC SQMT Act, 2006. The Committee is composed of representatives of the National Standards Bodies in Partner States, together with the representatives from the private sectors and consumer organizations. Draft East African Standards are circulated to stakeholders through the National Standards Bodies in the Partner States. The comments received are discussed and incorporated before finalization of standards, in accordance with the procedures of the Community.

Article 15(1) of the EAC SQMT Act, 2006 provides that "Within six months of the declaration of an East African Standard, the Partner States shall adopt, without deviation from the approved text of the standard, the East African Standard as a national standard and withdraw any existing national standard with similar scope and purpose".

East African Standards are subject to review, to keep pace with technological advances. Users of the East African Standards are therefore expected to ensure that they always have the latest versions of the standards they are implementing.

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Code of practice — Measurement of noise emitted by motor vehicles

1 Scope

This code of practice covers recommendations for the measurement of the noise emitted by motor vehicles. No recommendations are made regarding sound level limits.

NOTE

- a) The titles of standards referred to by number in the code of practice are given in Clause 2.
- b) The noise limits recommended by the Economic Commission for Europe (United Nations) are given in Annex A.

2 Normative references

The following referenced documents are indispensable for the application of this East African Standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60179, *Precision sound level meters*

3 Definitions

For the purposes of this code the following definitions shall apply:

3.1

background noise

any noise at the test site (other than that emitted by the vehicle under test) that is recorded by the microphones at the time of testing

3.2

motor vehicle

any vehicle that is powered by a fuel or by electricity (either transferred to the vehicle by suitable means or from a source carried on the vehicle)

3.3

sound level (A) (dB(A))

reading in dB on a sound level meter complying with the requirements of IEC 60179, the 'A'-weighting network being used

4 Test method

4.1 Measurement equipment

4.1.1 Meter

A sound level meter that is

- a) as specified in IEC 60179;
- b) so designed that the microphone is at a distance of at least 0.3 m from the case of the instrument and can be positioned at least 1 m from the observer;
- c) such that, when interference by non-acoustic sources (e.g. magnetic fields, vibration) is minimized in accordance with the manufacturer's operating instructions, it does not affect the readings by more than 0.5 dB;

- d) such that it may be used in wind velocities up to 5 m/s without the reading being influenced by more than 0.5 dB.

(This may require the use of a windscreen, in which case its effects on the readings must be taken into account.)

4.1.2 Calibration source

An acoustic source designed for use with the particular sound level meter specified in 4.1.1 and having preferably a single frequency sound output, the amplitude of which at the temperature and barometric pressure at which the calibration check is performed is known to within 0.3 dB.

NOTE Automatic measuring equipment assemblies (such as individual outdoor microphone systems, level recorders) and calibration assemblies may be used provided that the characteristics of the assemblies comply with all the relevant requirements of IEC 60179.

4.2 Calibration

- a) Ensure that the sound level meter and the calibration source are so calibrated (by a laboratory having the necessary facilities) at intervals not exceeding one year that they comply with the requirements of 4.1.1 and 4.1.2.
- b) Using the calibration source (see 4.1.2), check the performance of the complete measuring equipment immediately before and after each series of sound measurements and discard the test results if the two checks do not coincide to within 1.0 dB.

4.3 Test site

4.3.1 The test site should be such that hemispherical divergence of sound propagation exists (to within ± 1 dB).

NOTE

- a) A suitable test site for the purpose of the measurements would consist of a level open space, of radius about 50 m, that has a centrally-positioned circle of radius 25 m and a vehicle path both having asphalt surfaces of texture such that excessive tyre noise is prevented.
- b) Departure from ideal conditions would be caused mainly by sound absorption by the ground surface and sound reflections from objects such as buildings and trees. It is, therefore, important that
 - 1) the ground surface within the measurement area be kept free from long grass, loose soil, and ash;
 - 2) an open space, of radius 50 m, around the microphones be maintained free from any large reflecting objects such as buildings, fences, rocks and bridges;
 - 3) no obstructions such as road kerbs and other similar vertical surfaces are present within a 25 m radius from the centre of the test site;
 - 4) acoustical focussing effects between parallel walls are avoided.
- c) The adequacy of the test site may be checked by the following procedure:

Set up a small broad-band sound source that radiates sound omni-directionally at the centre of the test site. Measure the level of the sound produced by the source at each microphone position (see 4.3.2), and at each position halfway between the sound source and a microphone position. The sound levels measured at the positions halfway between the microphone positions and the sound source should be 6 ± 1 dB higher than the sound levels at the relevant microphone positions. If this condition is not satisfied, the test site is not suitable for the tests.

4.3.2 Lay out a substantially level test area as in Figure 1. The reference line CC passes through the centre of the test site at a distance from each measuring position (M_1 and M_2) of 7.5 ± 0.2 m. Locate the microphone(s) 1.2 ± 0.1 m above ground level. Mark two lines AA and BE perpendicular to the reference line CC and each at a distance of 10 ± 0.3 m from the centre of the test site.

4.3.3 Ensure that the level of the background noise during the measurements is at least 10 dB(A) below that produced by the vehicle.

NOTE

- a) Persons (other than the observer(s)) should be kept at least 15 m away from the microphone points and, during a test, no person or other obstruction should under any circumstances be between a microphone and the vehicle when at any position in its path.
- b) Repeated checks of the level of background noise should be made during the test to ensure that no change has occurred; variations in wind noise, in particular, are of frequent occurrence in some localities.
- c) If a windscreen is required to shield the sound level meter from wind noise (see 4.1.1(d)), its effects on the readings must be taken into account.

4.4 Vehicle conditions

4.4.1 General

Ensure that

- a) the vehicle is unladen;
- b) no auxiliary equipment on the vehicle (e.g. a compressor or a concrete mixer) is operating;

NOTE If it is desired that the noise level of the vehicle be determined while auxiliary equipment is operating, the test should be repeated with such equipment in operation.

- c) the engine has reached its normal operating temperature.

4.4.2 Drive ratio and road speed

4.4.2.1 Vehicle with manually operated gearbox

In the case of a vehicle with a manually operated gearbox, determine the drive ratio and the approach speed to be used in the driving procedure (see 4.5) as follows:

- a)
 - i) If the vehicle is fitted with a two-speed, three-speed, or four-speed gearbox, engage the second gear;
 - ii) If the vehicle is fitted with a gearbox with more than four gears, engage the third gear;
 - iii) if the vehicle has a double gear ratio (transfer gearbox or two-speed rear axle assembly), engage the gear allowing the highest vehicle speed.
- b) Select a road speed corresponding to the lowest of the following three speeds:
 - i) An engine rotational speed equal to three-quarters of the engine rotational speed at which the engine develops its maximum power;
 - ii) an engine rotational speed equal to three-quarters of the maximum rotational speed permitted by the governor (if applicable);
 - iii) 50 km/h.

4.4.2.2 Vehicle with a fixed drive ratio

In the case of a vehicle with a fixed drive ratio, select the approach speed corresponding to the lowest of the three speeds given in 4.4.2.1(b).

4.4.2.3 Vehicle with automatic transmission

In the case of a vehicle with automatic transmission, use the lowest of the following approach speeds:

- a) Three-quarters of the maximum speed of the vehicle;
- b) 50 km/h.

Where there is a choice, the "NORMAL" selector for town driving should be used.

4.4.2.4 Agricultural tractors

In the case of an agricultural tractor, select as the drive ratio and the approach speed for the test (see 4.5), the drive ratio normally used for operation on open roads and three-quarters of the maximum speed in that drive ratio.

4.5 Driving procedure

At the speed and, when relevant, in the drive ratio determined in accordance with 4.4.2 drive the vehicle towards the test area (Figure 1) in a direction such that the vehicle will travel as closely as possible along the line CC. When the front of the vehicle reaches the line AA, bring the accelerator to its maximum position as rapidly as possible, maintain it in this position until the rear of the vehicle has passed the line BB, and then bring the accelerator to its minimum position as rapidly as possible. Note the entry and exit road-speeds to an accuracy of $\pm 3\%$ for each run of the vehicle.

NOTE Trailers which cannot be detached, including the trailer portion of articulated vehicles, should be ignored when determining the moment of crossing the line BB.

4.6 Measuring procedure

4.6.1 Orient the sound level meter and the microphone with reference to the centre of the test site and to the observer in accordance with the operating instructions of the manufacturer.

4.6.2 Set the sound level meter to "A"-weighting network and "fast response". Record the highest reading shown on the meter for each run of the vehicle, including the noise registered during deceleration.

Ignore any readings that show undue high peaks of noise which are obviously out of character with the noise measured.

4.6.3 Make at least two measurements at each of the measuring positions M_1 and M_2 , i.e. at least two runs from the same direction.

Compare the readings taken on the same side of the vehicle for two consecutive measurements. If two consecutive readings for the same side of the vehicle do not coincide to within 2 dB it is an indication that the driving procedure is not consistent, and more measurements should be taken until two such readings do coincide to within 2 dB.

4.7 Interpretation of results

Calculate the arithmetic average of two consecutive readings for each side of the vehicle.

Take the higher value of the average readings as the highest level of the sound emitted by the vehicle, and compare it for compliance with the appropriate limit for the relevant type of vehicle.

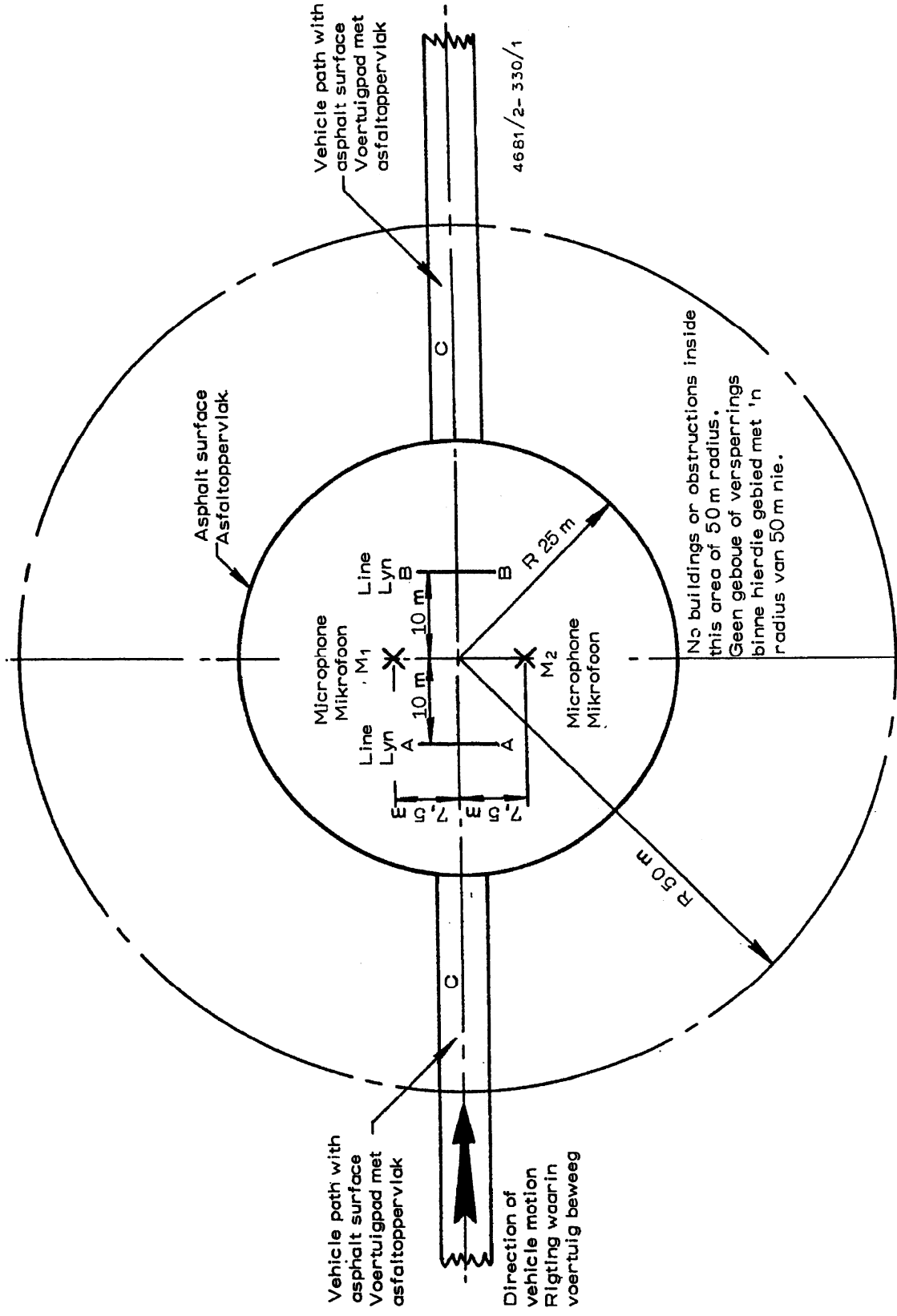


Figure 1 — Test Site for Vehicle Noise Measurement

5 Records

The testing authority should keep a full record of every vehicle tested. The record should include the following information:

- a) The name and address of the person or organization applying for the test;
 - b) the vehicle type, (the classification being preferably in accordance with that given in Annex A);
 - c) the trade name or trade mark of the vehicle;
 - d) the model designation including the designation of the engine of the vehicle;
 - e) the serial numbers of the vehicle and the engine;
 - f) the type of power source (internal combustion and whether petrol-, diesel-, or gas-fueled; electrical or steam);
 - g) if internal combustion, whether two-stroke or four-stroke;
 - h) if internal combustion, whether rotary, piston, or turbine;
 - i) if applicable, the cylinder displacement;
 - j) the maximum power in kW of the engine (stating the test procedure) and the engine rotational speed at which this power is developed;
 - k) the governor limiting speed, if applicable;
 - l) the number of drive ratios;
 - m) the drive ratio used during the test;
 - n) engine rotational speed/road speed relationship in the drive ratio used for the test;
 - o) the road speed and the engine rotational speed at the commencement and at the end of the acceleration run for each run;
 - p) a brief description of the silencing system, both for exhaust and intake of the engine;
- NOTE The above descriptions should also clearly state how the silencing system(s) may be readily identified.
- q) the individual sound levels measured;
 - r) the date of the test;
 - s) the name of the person performing the test;
 - t) the name of the testing authority.

Annex A

Recommended noise limits

When limits are set for noise from motor vehicles, it is suggested that the current limits recommended by the Economic Commission for Europe of the United Nations be considered for adoption.

For guidance, the ECE limits recommended on 26 March 1974 are given in Table B.1. These noise level limits, or any other lower noise level limits that may be recommended at any future date, should not be incorporated into any legislation without prior consultation with the motor industry, in order to determine the required lead times for the introduction of such limits.

Table B.1 — Maximum sound levels for motor vehicles

Type of vehicle	Maximum noise level dB(A)*
A. Two-wheeled motor vehicles	
a) With a two-stroke engine of cylinder capacity: over 50 cm ³ but not exceeding 125 cm ³ over 125 cm ³	82 84
b) with a four-stroke engine of cylinder capacity: over 50 cm ³ but not exceeding 125 cm ³ over 125 cm ³ but not exceeding 500 cm ³ over 500 cm ³	82 84 86
B. Three-wheeled motor vehicles	
With a cylinder capacity exceeding 50 cm ³	85
C. Motor vehicles with four or more wheels	
a) Vehicles used for the carriage of passengers and containing not more than 9 seats (including the driver's seat)	82
b) Vehicles used for the carriage of passengers and containing more than 9 seats (including the driver's seat) and having a permitted mass not exceeding 3500 kg	84
c) Vehicles used for the carriage of goods and having a permitted mass not exceeding 3 500 kg	84
d) Vehicles used for the carriage of passengers and containing more than 9 seats (including the driver's seat) and having a permitted mass exceeding 3500 kg	89
e) Vehicles used for the carriage of goods and having a permitted mass exceeding 3500 kg	89
f) Vehicles used for the carriage of passengers and containing more than 9 seats (including the driver's seat) and having an engine rated at 150 kW or more	91
g) Vehicles used for the carriage of goods and having an engine rated at 150 kW or more and a permitted mass exceeding 12000 kg	91

* To allow for lack of precision in the measuring equipment, reduce each actual reading by 1 dB(A).

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