



**ST. KITTS & NEVIS DRAFT NATIONAL STANDARD**

**Road Vehicles – Code of Practice for Inspection and Testing of  
Used Motor Vehicles for Roadworthiness**

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## Foreword

Following EAA's policy on trade liberalization, various types of products have been imported into the market. Among the products are used motor vehicles.

In order to restrict importation of substandard used motor vehicles, this EAA Standard has been formulated to prescribe the basic requirements for vehicle roadworthiness together with the inspection system procedures for its approval for road worthiness.

In preparation of this EAA Standard, assistance was drawn from the following:

- JAAI 16 – 303, Inspection standard for exported used cars published by Japan Auto Appraisal Institute (JAAI).
- SABS 047, The testing of motor vehicle for roadworthiness published by the South African Bureau of Standards.
- TZS68: 2012 Tanzania Standard for Road Vehicles – Code of practice for inspection and testing of used motor vehicles for roadworthiness
- Road Traffic Act No. 30 of 1973.
- Vehicle Inspectors Training Manual published by the Ministry of Works.

This second edition cancels and replaces the first edition (EAA 001:2003) which has been revised.

In reporting the results of a test made in accordance with this EAA Standard, if the final value observed or calculated is to be rounded off, it shall be done in accordance with TZS 4 (see clause 3).



## **1 Scope**

This Bahamas National Standard (BNS) specifies the safety related performance characteristics of used motor vehicles and their inspection and tests for road worthiness.

## **2 Definitions**

For the purpose of this Bahamas National Standard (BNS), the following definitions shall apply:

### **2.1**

#### **inspection**

Activities such as measuring, examining one or more characteristics of a product or service and comparing these with specified requirements to determine conformity.

### **2.2**

#### **specification**

Prescribed requirement with which the product or service must conform.

### **2.3**

#### **defect**

The non-fulfillment or intended usage and requirements.

### **2.4**

#### **non-conformity**

The non-fulfillment of specified requirement.

### **2.5**

#### **reliability**

The ability of an item to perform a required function under stated conditions or a stated period.

### **2.6**

#### **quality**

The totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs.

### **2.7**

#### **background radiation**

The ionizing radiation constantly present in a natural environment of the earth, which is emitted by natural and artificial sources.

### **3 References**

For the purpose of this standard, the following references shall apply:

- The Commonwealth of The Bahamas Road Traffic Act 220 and Regulations;
- TZS 4: 2009, Rounding off numerical values
- TZS 598: 2010, Automotive engineering – Bus body building-Code of practice
- TZS 240: 1984, Road vehicles – Positioning and routing of engine exhaust pipes – General requirement
- TZS 238:1984, Road vehicle – Laf spring- Specification
- TZS 557: 1995, Road Vehicles – Reflective rear marking plates for motor vehicles- Specification

### **4 Inspection for Performance Characteristics**

#### **4.1 Inspection of steering wheel alignment**

The alignment of the steered wheels shall be inspected with a side slip tester machine or any other suitable apparatus. The reading for skidding shall not exceed 5 mm inward or outward for 1 m of travel (see annex A). Wheel alignment shall also be inspected visually in accordance with the following:

- a) the camber shall not exceed the manufacturer's specified limits or
- b) in case of a semi-trailer, any axle shall not be out of square to longitudinal center - line of the vehicle by more than 10.0 mm/m of length of trailer and
- c) the front wheels (in the straight-ahead position) and rear wheels shall be in the same vertical plane. When relevant, sidecar wheel shall be parallel to or shall not have slight "toe-in" towards the front wheel (in the straight - ahead position).

#### **4.2 Inspection of braking force**

The braking force of a vehicle under inspection shall be measured with one inspector therein as an occupant with no passenger or luggage, according to the requirements specified in annex B and the results conform to 4.2.1 and 4.2.2

##### **4.2.1 Braking force of main brake system**

- a) The total braking force of the main braking system shall not be less than 50% of the axle weight of the vehicle, and the sum of braking forces on the rear wheels shall not be less than 50% of the axle weight of the subject axle when un laden.
- b) For the main braking system, the difference of braking forces applied to the right and left wheels shall be 8% or less of the axle weight of the subject axle when un laden.

#### **4.2.2 Braking force of parking brake system**

The total sum of the braking force of the parking brake system shall not be less than 20% of the weight of the vehicle as inspected.

#### **4.3 Level of noise produced by automobile**

**4.3.1** The measurement of the noise level of steady running noise shall not be more than 88 dB(A).

To allow for any lack of precision in the measuring equipment the highest sound level reading obtained shall be reduced by 1 dB (A).

**4.3.2** The muffler shall be free from corrosion, damage, and cracking, and shall function favorably to muffle sound.

**4.3.3** The noise level in the cabin should not be more than 70 dB(A).

#### **4.4 Exhaust gas from automobile**

The concentration of, or the level of contamination from exhaust gas shall be determined according to annex C and observe the following requirements:

##### **4.4.1 Automobiles using gasoline or liquefied petroleum gas as fuel**

The concentration of the exhaust gas from an automobile shall be measured when the engine is idling, and inserting the probe of a tester into the exhaust pipe to a depth of approximately 60 cm (If this is not feasible, measures to prevent the ingress of air from outside shall be taken before inserting the probe). The measurements shall not exceed the following reference values:

- a) concentration of carbon monoxide: 4.5% and
- b) concentration of hydrocarbon:

4 - cycle engine: 1,200 ppm

##### **4.4.2 Automobiles using light oil (diesel) as fuel**

The excessive black smoke or fumes emitted from the automobile shall not be allowed.

##### **4.4.3 Smoke and soot emission**

- a) The exhaust pipe shall be securely installed and be free from damage and excessive deformation.
- b) The catalytic muffler shall be securely installed and free from damage.
- c) The blow by gas reducing device shall be securely installed and free from damage.
- d) The emission control device for fuel evaporative gases shall be securely installed and free from damage.

**4.4.4** When the vehicle subjected to radiation dose test as described in annex F, the radiation dose rate shall not exceed 0.3 microsieverts/hour (0.3  $\mu$ Svlh).

## **4.5 Brightness of headlamps and orientation of main optical axis**

The brightness of headlamps and the orientation of their main optical axis shall be measured either manually or using suitable apparatus with the light receiving portion of a tester squarely opposed to the headlamp according to the distance and method of measurement. The manual measurements shall be done in accordance with test methods specified in annex D and shall agree with the following reference values:

### **4.5.1 Luminous intensity**

#### **a) Four-lamp type**

For the main headlamp for driving, the intensity shall be 12 000 cd or above and with a sub headlamp added, the intensity shall be 15 000 cd or above.

#### **b) Other types**

For the headlamps for driving, the intensity shall be 15 000 cd or above.

### **4.5.2 Orientation of main optical axis**

The main optical axis shall be properly oriented both in the horizontal and vertical directions.

### **4.5.3 Pre-set Lights & Oxidation**

Headlights should be visibly clear, free from defects, physical damage and oxidation in accordance of 4.5.1 and 4.5.2.

## **4.6 Horn**

With the engine of an automobile stopped, the loudness of its alarm unit (horn) shall meet the following requirements. Measurement shall be conducted in accordance with test method specified in annex E, a microphone set in a position 1.0 m above the ground and at 2.0 m from the front of the vehicle:

- a) reference value: within the range 90 dB (A) through 115 dB(A).
- b) the sound of an alarm buzzer shall be continuous and of constant volume.

## **4.7 Speedometer**

The speedometer shall be in good working order.

## **5 Inspection for the operational requirements**

### **5.1 Inspection for engine**

The engine shall be inspected visually while observing the following:

**5.1.1** The engine shall start with ease, and shall not produce excessive unusual noise or vibration during operation.

**5.1.2** No oil leakage or water leakage shall be observed from the main body of the engine.

**5.1.3** No cracking, damage, or deformation shall be observed in the oil sump, and there shall be no oil leaking from gaskets.

## **5.2 Exhaust pipe**

**5.2.1** No damage or cracking shall be permitted in the intake or exhaust manifold.

**5.2.2** No cracking or rubber flaking shall be observed in the exhaust pipe and support bracket.

**5.2.3** The muffler and the gaskets of the exhaust pipe shall be free from excessive odor, damage, exhaust leakage, noise and smoke.

## **5.3 Inspection of cooling system**

No coolant leakage shall be observed from the radiator or rubber hoses. Where an air-conditioning system is fitted, the refrigerant shall not be chlorofluorocarbons (CFCs).

## **5.4 Fuel system**

**5.4.1** The fuel system shall have no visible leakage.

**5.4.2** The fuel tank shall not be deformed and shall be firmly mounted.

## **5.5 Transmission system**

### **5.5.1 Clutch**

- a) There shall be no anomalies in the engagement system of the clutch (e.g. slip, incomplete disengagement, judder and unusual noise) and shall operate smoothly.
- b) No oil leakage shall be permitted in the clutch system.
- c) A clutch pedal shall be provided with a mechanism to prevent slipping
- d) For automatic transmission vehicles, the torque converter shall function properly.

### **5.5.2 Gearbox**

- a) The transmission shall be capable of being turned to each shift position with ease in the idling state, and there shall be no excessive play in the shift lever in any shift position.
- b) The gears or bearings in the transmission shall not produce unusual noise, and no oil leakage shall be permitted from oil seals.
- c) For an automatic transmission car, the indicator reading shall be matched with the actual shift position, and its engine shall not be capable of being started in any position other than the (P) position and neutral (N) position.

### **5.5.3 Propeller shaft**

- a) No excessively loose fixing bolt or joint shall be present at the coupling portions in the propeller shaft.
- b) The propeller shaft shall not produce run-out or excessive vibration during driving.

#### **5.5.4 Final drive system**

The final drive system shall be free from excessive backlash, unusual noise, and oil leakage.

#### **5.5.5 Axle housing**

No cracking, damage, deformation or oil leakage shall be permitted in the axle housing.

### **5.6 Suspension system**

**5.6.1** No cracking damage, setting, or misalignment shall be permitted in the spring and the clip band. Center bolt or U-bolt shall not be damaged, missing, or loose.

#### **5.6.2 Miscellaneous**

- a) No excessive play, oil leakage, or gas leakage shall be present at the mounting portions of the shock absorber.
- b) The torque rod, radius rod, and their brackets shall be free from deformation and damage such as cracking and mounting portions and coupling portions shall not be loose or damaged.
- c) No damaged or loosely mounted upper or lower arm shall be permitted, and the knuckle arm and support arm shall be free from cracking, damage, and bends.
- d) The bellows and piping of an air suspension system shall be free from damage, and no air leakage shall be permitted from air piping.

## **6 Inspection of axles, wheels, and tyres**

### **6.1 Axles**

**6.1.1** The axle shall be free from cracking and damage, and the drive shaft shall be free from looseness and backlash.

**6.1.2** No nuts or bolts shall be loose or missing in a wheel

**6.1.3** The wheel disks, rims, and side rings shall be free from cracking and damage due to excessive corrosion or deformation, and the disks shall be free from excessive run-out.

**6.1.4** Wheel bearings shall be free from excessive backlash, and the drag from the brakes and the preload on bearings shall be correct.

### **6.2 Steering system**

#### **6.2.1 Steering wheel**

- a) The steering wheel shall be capable of being easily and reliably operated by a driver sitting in the regular position, and the steering wheel shall be mounted without backlash, easy to operate and provided with proper play.
- b) There shall be no backlash in the direction of the axis of the steering shaft.
- c) The effort required to manipulate the steering wheel shall not be excessively different between the clockwise direction and the counterclockwise direction.

### **6.2.2 Steering gear box**

- a) The gearbox shall be mounted without looseness and be free from oil leakage.
- b) The sector shaft shall be free from backlash.

### **6.2.3 Steering linkage**

- a) The steering linkage shall be free from deformation and damage such as cracking.
- b) No loosely mounted parts, excessive backlash, or defective split pins shall be present in any part of the rod arms.
- c) There shall be no risk of the wheels coming into contact with the frame, fender, brake hose or any other part during steering.

### **6.2.4 Power steering/Hydraulic Steering**

The power steering/hydraulic system shall be free from oil leakage and looseness in its body or connecting portions and shall operate and function properly.

## **6.3 Brake system**

### **6.3.1 Brake pedal**

- a) The height, play, and full depression of the brake pedal shall be correct, and the clearance between it and the floorboard shall not be less than 25% of the overall stroke of the pedal. (For an air brake, the play of its pedal shall not exceed 20 mm).
- b) The brake pedal shall be free from backlash in the axial direction, and shall not produce any unusual noise when depressed.
- c) The brake pedal shall be provided with a mechanism to prevent slipping or a rubber pad.
- d) The brake system shall be free from oil leakage and the ingress of air.

### **6.3.2 Parking brake**

- a) The parking brake shall be completely engaged when the brake lever is fully activated.
- b) The pulling margin of the brake lever shall not be more than 70% of its overall stroke.
- c) The ratchet shall not be worn or damaged.

### **6.3.3 Brake rods and cables**

Any visual damage shall not be allowed.

### **6.3.4 Brake hose and piping**

- a) No damaged or loosely installed brake hoses or pipes shall be permitted and there shall be no oil leakage or air leakage from piping or joints.
- b) There shall be no risk of a hose or pipe being brought into contact with any other part and no hose or pipe shall show signs of having been in contact with any other part.

### **6.3.5 Master cylinder and wheel cylinder**

The master cylinder and wheel cylinder shall function properly and shall be free from oil leakage, and no bend or damage shall be present in the push rod.

### **6.3.6 Backing plate**

The backing plate shall be free from deformation and distortion and shall not be cracked especially in proximity to anchor pin installation areas.

### **6.3.7 Air brake**

The hoses and pipes, release valve, and brake chamber shall be free from damage and air leakage. The brake chamber and rod shall be free from deformation, and no split pins shall be missing.

### **6.3.8 Braking servo unit**

The servo unit shall function properly and there shall be no liquid or air leakage from the unit or pipe joints.

### **6.3.9 Rotors, brake pads and liners**

Rotors should be free from scaring and rust. The brake pads and liners thickness must meet manufactures specification which should not be less than 4mm.

## **6.4 Tyres**

The tyres shall be inspected visually in accordance to types and sizes while observing the following:

**6.4.1** The tread pattern shall not be excessively worn or damaged. The sidewall shall be free from cracking and damage and tread shall not show signs of slipping.

**6.4.2** Tyres shall be free from excessive wear, the minimum tread depth to be no less than 4mm.

**6.4.3** Tyres age of acceptance will be in accordance to manufactures recommendations for use.

**6.4.4** No Snow tyres shall be permitted.

## **6.5 Front windshield and all other window glass**

### **6.5.1 Front windshield**

The windshield shall be made of safety glass and shall be free from any flaws that may limit visibility.

### **6.5.2 Other window glass**

Other window glass shall not be broken, and the window glass shall be clear.



## **6.6 Lighting devices and reflectors**

### **6.6.1 Colour of lighting**

The light from headlamps shall be white and the colour of all headlamps shall be identical.

### **6.6.2 Brake lights**

The light from brake lamps shall be red, and the brake lamps shall be automatically turned on when the main brake system is activated.

### **6.6.3 Number plate lights**

The light from license plate lamps shall be white in colour and the license plate lamps shall be so structured that they are not interlocked with the headlamps or position lamps.

### **6.6.4 Parking lights**

The light from parking lamps shall be red in colour and the parking lamps shall be so structured that they are interlocked with the headlamps or auxiliary headlamps.

### **6.6.5 Reverse lights**

The light from back-up lamps shall be white in colour.

### **6.6.6 Indicating device**

Indicator light lamps shall be installed at the front and rear of an automobile, and shall be positioned bilaterally and symmetrically in pairs, respectively. The light from the indicator lamps shall be orange, and the lights shall flash 60 through 120 times per minute.

### **6.6.7 Indicator lights**

The light from position lamps shall be orange or light yellow and the colour of left and right position lamps shall be identical.

### **6.6.8 Reflectors**

Reflectors used shall be in accordance with requirements specified in The Bahamas.

### **6.6.9 Function and damage**

Lighting devices and reflectors shall function normally and shall be free from damage and/or dirt.

## **6.7 Devices for ensuring vision**

### **6.7.1 Wipers**

The windscreen shall be provided with wipers capable of cleaning the wind screen. The wipers shall function normally, and its blades shall be free from damage.

### **6.7.2 Rear view mirror**

- a) The rear-view mirror shall be firmly installed, and its surface shall be free from smudges, distortion and cracking.

- b) The rear-view mirror shall be so structured that its orientation can be easily adjusted and maintained.
- c) Requirements for rear-view mirror shall apply to other devices used to view the rear of vehicle such as cameras and other sensor devices.

## **6.8 Mileage meter and other instruments**

The mileage meter and other instruments such as water temperature indicator, fuel gauge, and tachometer, shall function properly and be free from damage.

## **6.9 Warning system**

### **6.9.1 Warning lights**

Warning lights shall provide warning on the state of oil pressure, charging, parking brake and opening of doors, and the warning lights shall function favorably and be free from damage.

### **6.9.2 Hazard warning flashing lights**

Hazard warning flashing lights shall be installed bilaterally and symmetrically and shall function properly. The hazard warning flashing lights shall be free from damage and shall be orange or light yellow.

## **6.10 Goods - carrying equipment**

Goods - carrying equipment shall be capable of carrying goods safely and reliably.

## **6.11 Frame and vehicle body**

### **6.11.1 Frame**

- a) The frame of an automobile shall be sufficiently rigid to withstand driving.
- b) The frame shall be free from cracking, damage or deformation.
- c) No loose rivets shall be permitted at the joints between a side member and a cross member and no cracking shall be observed in proximity to rivet holes.

### **6.11.2 Vehicle body**

- a) The vehicle body shall be reliably secured on the frame and shall not be loosened by vibration or impact.
- b) The contour and any other shape of the vehicle body shall not contain any sharp projections, protruded rotating parts or any other elements that may interfere with the safe traffic of other vehicles or pedestrians.
- c) Any damage including cracking, corrosion or distortion in structural areas, such as pillars, sills and the floorboard, which constitute the fundamentals of a vehicle body shall be remedied.

## **6.12 Vehicle dimensions**

### **6.12.1 Overall length**

- a) A bus - train shall not exceed 20 m.
- b) A single vehicle, excluding a semi-trailer, including any drawbar or coupling, shall not exceed 12.5 m.
- c) A trailer with one axle or axle unit (other than a semi-trailer), the GVM of which does not exceed 12,000 kg, shall not exceed 8 m, excluding the length of the drawbar or coupling.
- d) An articulated motor vehicle or other combination of motor vehicles consisting of drawing vehicle and a semi-trailer, including any draw bar or coupling, shall not exceed 17 m.
- e) A distance between the drawing vehicle and the trailer, shall not exceed 1.8 m, including any drawbar or coupling.
- f) A trailer with one axle or axle unit (other than a semi-trailer) the GVM of which exceeds 12,000 kg, shall not exceed 11.3 m, excluding the length of the drawbar or coupling.
- g) A trailer not referred to in (c), (e) and (f) above (other than a semi-trailer), the GVM of which exceeds 12,000 kg, shall not exceed 12.5 m excluding the length of any drawbar or coupling.
- h) Any other combination of vehicles including any drawbar or coupling shall not exceed 22 m.

### **6.12.2 Overall width, and height**

The requirements in accordance with requirements of The Bahamas' Road Traffic Act 220.

### **6.12.3 Overall overhang**

- a) Front overhang

Measure the distance between the front axle and the front of the bumper and observe the following:

- i) semi - trailer shall not exceed 1.8 m or
- ii) any vehicle (other than a semi-trailer or trailer with one axle unit) shall not:
  - exceed 60% of wheel base or
  - exceed 6.2 m less half of the wheel base, in the case of vehicle in which the front surface of the backrest of the driver's seat and seat level is within 1.7 m of the front end of the vehicle, when such seat, if adjustable, is in the rear most position or
  - exceed 5.8 m less half the wheel base, in the case of any other vehicle.

- b) Rear overhang

The distance between the centre of the rear axle and the rear most part of the rear bumper shall be measured, and the observation of the following shall be made:

- i) any trailer with one axle or one axle unit other than a semi-trailer or

- ii) any trailer other than a semi-trailer, with two axles where the distance between the center - lines of the axles is less than 1.2 m shall not exceed 50% of the length of the body of the trailer or
- iii) any other vehicle shall not exceed 50% of the wheel base.

### **6.13 Coupling device**

**6.13.1** The coupling device shall be rigid and so structured that it will provide secure coupling. The coupling device shall not be disconnected due to vibration or impact during driving and shall sufficiently withstand driving.

**6.13.2** The coupler of the coupling device shall be installed without looseness, and shall function favorably. The pitching shaft, rolling shaft, and bearings shall be free from wear and damage.

**6.13.3** The kingpin of the coupling device for trailers, shall be installed without looseness.

**6.13.4** The pintle hook and lunette eye installed on trucks, etc., shall be reliably operable and free from damage.

### **6.14 Seating arrangement**

For public service vehicles, the seating arrangement shall conform to the requirements specified in The Bahamas.

### **6.15 Vehicle appearance**

**6.15.1** Any serious damage to an outer panel shall be remedied.

**6.15.2** Window glass elevating devices shall be functional.

**6.15.3** Any other damage that may interfere with the safe driving of the vehicle shall not be permitted.

## **7 Criteria for conformity**

Unless otherwise stated, the following information shall be made available:

**7.1** Certificate of roadworthiness attesting conformity to the requirements according to clauses 4, 5 and 6 above.

**7.2** Certificate of appraisal showing model, year of manufacture, engine capacity and mileage.

## **8. Marking**

**8.1** All vehicles shall be inspected for conformity as stated in Clause 7 and the marking shall be made only after a vehicle has undergone inspection and has been found to have no severe defects.

**8.2** Marking of the vehicle shall include the following: chassis number, engine number, type of vehicle, vehicle make, colour (body), year of manufacturing and vehicle registration number.

Marking shall not be tempered or concealed by any means, such as painting, welding or any kind of deformation process.

**8.3** If some particulars or vehicle configurations are changed, the owner shall report same to the vehicle registration authority.

**8.4** All vehicles shall have stickers issued by the registration authority indicating the vehicle particulars and placed at location as required by registration authority.

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**Annex A**  
**(normative)**  
**Wheel alignment testing**

**A.1 Purpose**

This annex sets out the assessment of the wheel slip sideways, to be measured while the vehicle is travelling. The unit of scale employed on measuring the slip is generally m/km which is the amount of the wheel slip perpendicular to the direction of travel as the vehicle makes a straight drive for 1 km.

**A.2 Apparatus**

The tester may be either mechanical or electrical depending on the method by which the amount of movement of the board is detected and transmitted to the indicator. The length of the running board is available in either 500 mm, 800 mm, or 1000 mm.

**A.3 Procedure**

Before performing the test, make sure that there is no dirt on the board and that the boards and the indicator are functioning properly. Then let the vehicle run straight parallel to the center-line of the tester at 4 km/h and read the maximum amount of slip indicated on the scale, before the front wheels completely pass the boards: Make necessary adjustments to the vehicle wheel alignment if the reading is 5 mm or more or even when less than 5 mm or if the figure is different from the value designated from the given vehicle.

## **Annex B**

### **(normative)**

### **Brake testing**

#### **B.1 Purpose**

This annex sets out the assessment of the braking capacity of the vehicle. The widely used testers are roller driven. The rollers rotate with the wheels placed on top of them. The rollers are motor driven supplied in a set of two, one for each wheel. When brakes are applied, a rotation resistance is applied to the roller that creates torque in the direction opposite to the roller rotation.

#### **B.2 Apparatus**

There are various types of testing equipment such as the roller gearbox driven type and roller driven worn shaft type.

#### **B.3 Procedures**

Turn on the motor and let the rollers run idle to check that they are smoothly rotating. Make sure the needle indicator is adjusted to zero.

Turn off the motor and move the vehicle to place its wheels on top of and perpendicular to the rollers. Make sure that each of the wheels to be measured are firmly supported by two rollers.

Turn on the motor and let the rollers rotate. Before applying the brakes, check the reading on the indicator and make sure there is no drag of brakes. Then slowly step on the brake pedal. Gradually press down the pedal. The wheels will be eventually locked and the reading on the indicator will become constant.

Read the value indicated immediately prior to the locking of the wheels. This value is usually the maximum braking force.

Measure the braking force of both front and rear wheels.

**Annex C**  
**(normative)**  
**Exhaust emissions testing**

**C.1 Purpose**

The test is done to measure the volumetric concentrations of CO and HC emissions at idling and not at slightly higher speed and load.

**C.2 Apparatus**

The apparatus used should be an independent exhaust-gas analyzer unit or part of engine analyzer.

**C.3 Procedures**

Procedures for calibrating and using exhaust gas analyzers vary with the make and model of testers so emphasis shall be put on careful reading of the instructions for the analyzer.

Make necessary connections (electrical supply etc.), turn on the analyzer, warm the equipment and calibrate the HC and CO meters for zero reading.

Check the system to be sure it is leak free.

To measure the amount of CO, run the engine at fast idle (say 1 500 to 2 000rpm for about 30s), then run the engine at its specified idle speed and read CO on the CO metre.

To measure the HC, run the engine at fast idle (1 500 – 2 000rpm for about 30s), then run the engine at its specified idle speed, then read HC on the HC metre.

For diesel engine, vehicle measurement is done under no load and quickly accelerated and the percentage of smoke is read from the smoke metre or inspection done visually.



## **Annex D**

### **(normative)**

### **Head light testing**

#### **D.1 Purpose**

This annex sets out test for determining the luminosity and direction of irradiation (am) of the headlamp manually. The luminosity is expressed in candela (cd) and the direction of irradiation is generally indicated by the amount (in cm or mm) which the main optical axis oscillates at a 10 m distance in the front or as specified by the vehicle manufacturer as to agreed standards.

#### **D.2 Apparatus**

There are various types of testers according to the methodology and specifications of measurements. The types of headlight testers are classified into types: screen type, projecting type, and automatic tester (i.e. automatic optic axis tracking testing) type.

#### **D.3 Procedure**

The arrangement shall be done as shown in figure D.1. The results shown in figures D.2 and D.3, together with the following general guidelines on handling a headlight tester shall also be observed:

- a) air pressure of all the tyres is of standard/specified value;
- b) there is no inclination of vehicle body due to damaged springs;
- c) the tester and the vehicle are precisely facing each other;
- d) the testing floor is flat;
- e) the distance between the tester and the vehicle headlamp is accurate;
- f) the engine is running, and its battery is being charged while testing;
- g) the vehicle should be un-laden with one driver on board.

**NOTE - Luminosity refers to the brightness of light source and is expressed in candelas (cd) whereas illumination refers to the brightness of the irradiated surface and is expressed in lux (lx).**

**Figure D.1 Manual headlight aiming screen**

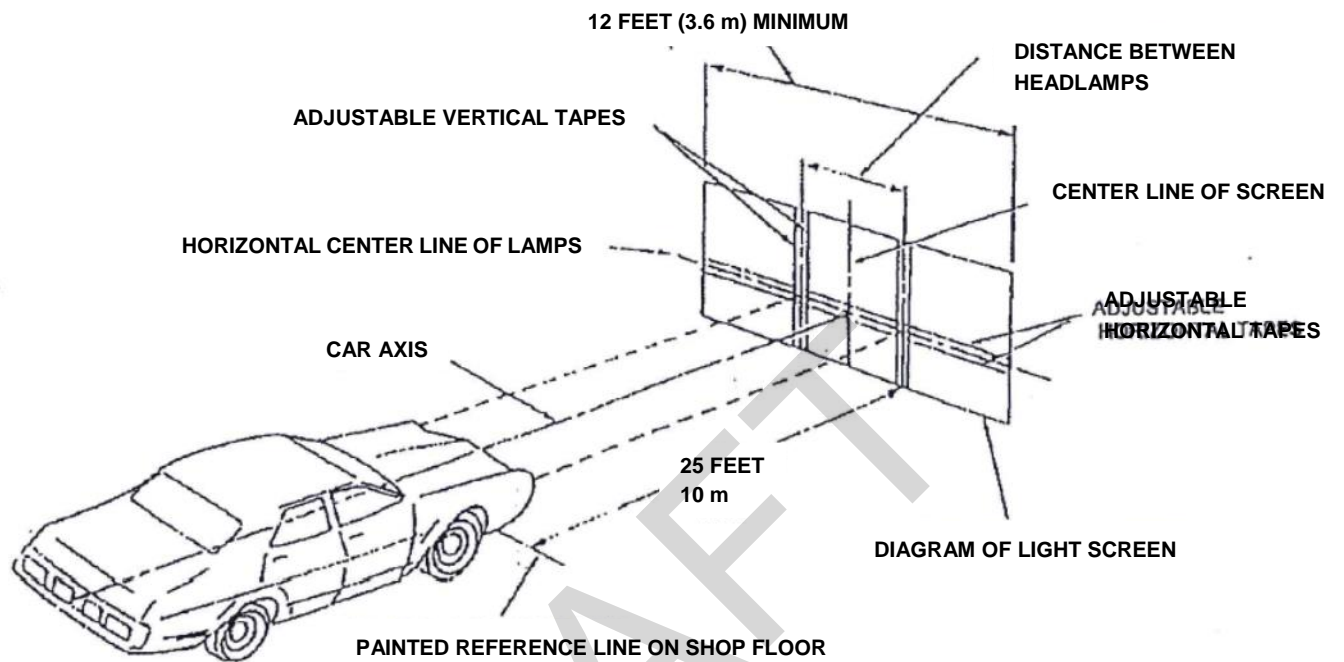


Figure D.2 Irradiating range of headlights

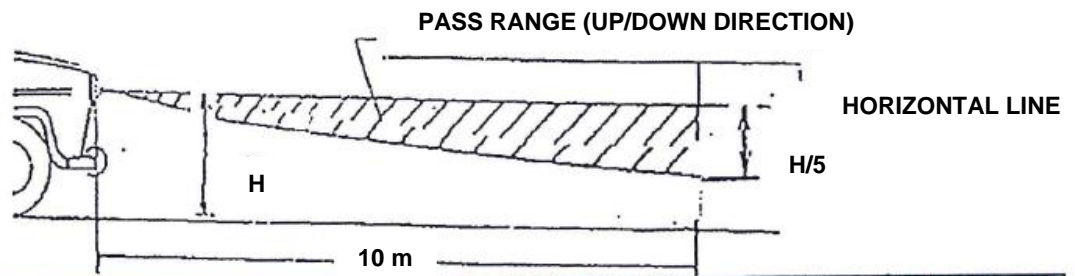
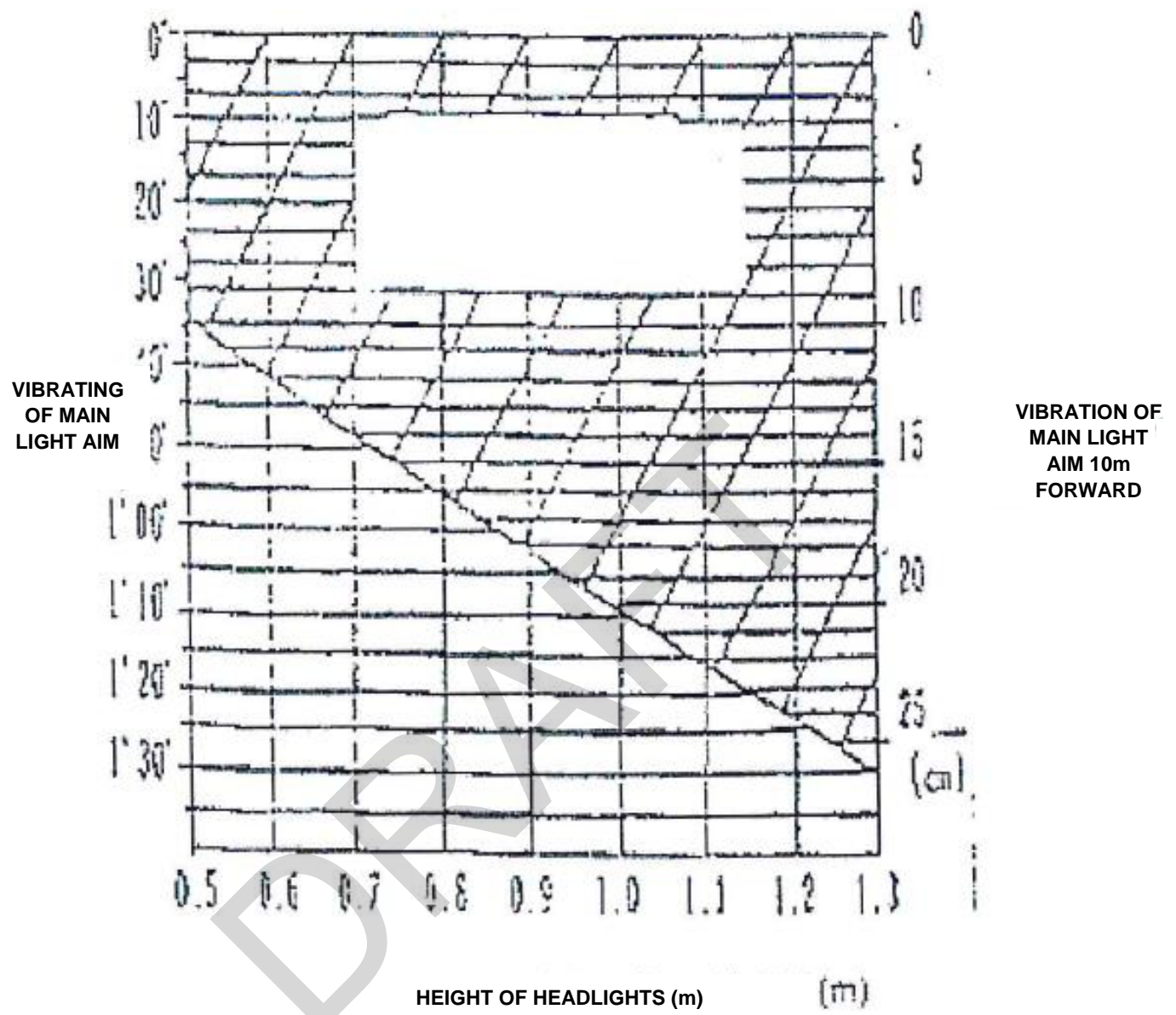


Figure D.3 Upper and lower limits to mounting position of headlight



## **Annex E**

### **(normative)**

### **Sound level testing**

#### **E.1 Purpose**

This annex sets out assessment of the levels of noises produced by the vehicle and the sound of its horn. The gauge simulates human auditory perception. The audit level is indicated in dB (A) units.

Also sound can be expressed in many physical quantities other than dB (A) such as in Pascal (Pa) unit of pressure, sound power (watts), intensity (sound/surface) in watts/meter<sup>2</sup> or particle speed (m/s).

NOTE-

Sound level dB<sub>a</sub>  $20 \times \log P/P_0$ ,

**where**

**P<sub>0</sub> is the lowest audible sound of 20 MPa.**

$2 \text{ Pa}_a = 1 \text{ N/m}^2$

$1 \text{ atm}_a = 10^5 \text{ Pa}$

#### **E.2 Apparatus**

Apparatus uses microphone that converts sound captioned in electrical current and its level is indicated on the indicator in dB(A).

#### **E.3 Procedures**

Calibrate the indicator before use. Follow specific instructions as to the gauge settings and measurements taking. Note the specific settings for measuring of exhaust noises and sound level of the horn, careful noting placement of a gauge to avoid interference of background noises and reflected sounds. Adjust for such noises where such noises cannot be avoided.

## **Annex F**

### **(normative)**

#### **Radiation measurement test**

##### **F.1 Purpose**

The aim of the test is to measure radiation dose on the surface, interior and on the tyres of motor vehicles when the vehicle is stationary.

##### **F.2 Apparatus**

The apparatus or equipment to be used for the measurement should be handheld radiation alert detector such as Geiger Muller (GM) tube, Scintillator counter, Ionization chamber, Semi-conductor survey meter etc. calibrated to an accuracy of  $\pm 10\%$  of the measure ranging from  $0.1\mu\text{Sv/h}$  and stop watch.

##### **F.3 Procedures**

**F.3.1** The equipment for measuring the dose rate should be placed as close as possible to the surface of the measuring point, though it shall not be in contact with the surface.

**F.3.2** The measurement should take place in such a manner that the time of measurement is enough for the equipment to stabilize to indicate the dose rate and that both the maximum and minimum value for the respective point are recoded.

To fully calculate and understand the amount of dose radiation at the given point, measure five to ten times and take an average.

**End of document**

DRAFT