# Vehicle Standard (Australian Design Rule 28/01 — External Noise of Motor Vehicles) 2006

I, JAMES ERIC LLOYD, Minister for Local Government, Territories and Roads, determine this vehicle standard under subsection 7 (1) of the *Motor Vehicle Standards Act 1989*.

Dated Twenty First March 2006

[SIGNED]

JAMES ERIC LLOYD

Minister for Local Government, Territories and Roads

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## 0.1 NAME OF STANDARD

0.1.1 This Standard is the *Vehicle Standard (Australian Design Rule 28/01 – External Noise of Motor Vehicles) 2006.*

0.1.2 This Standard may also be cited as ADR 28/01.

## 0.2 COMMENCEMENT

0.2.1 This Standard commences on the day after it is registered.

## 0.3 REPEAL

0.3.1 This Standard repeals each vehicle standard with the name ADR 28/01, and each amendment of such a standard, that is:

(a) made under section 7 of the *Motor Vehicles Standard Act 1989*; and

(b) in force at the commencement of this Standard.

0.3.2 This Standard also repeals each instrument made under section 7 of the *Motor Vehicles Standard Act 1989* that creates or amends a vehicle standard with the name ADR 28/01, if there are no other vehicle standards created by that instrument that are still in force at the commencement of this Standard.

## 1 SCOPE

1.1 The function of this ADR is to define limits on external noise generated by motor vehicles in order to limit the contribution of motor traffic to community noise.

## 2 APPLICABILITY AND IMPLEMENTATION

2.1 ADR 28/01 applies to the design and construction of vehicles as set out in the following table.

| VEHICLE CATEGORY | VEHICLE CATEGORY CODE | MANUFACTURED ON OR AFTER |
|---|---|---|
| Motor Tricycle | LE | |
| | LEP | 1 July 1992 |
| | LEG | 1 July 1992 |
| Passenger Car | MA | 1 January 1992 |
| Forward-control Passenger Vehicle | MB | 1 January 1992 |
| Off-road Passenger Vehicle | MC | 1 January 1992 |
| Light Omnibus | MD | 1 July 1992 |
| Heavy Omnibus | ME | |
| up to 270 kW | ME1 | 1 July 1992 |
| over 270 kW | ME2 | 1 July 1993 |
| Light Goods Vehicle | NA | 1 January 1993 |
| Medium Goods Vehicle | NB | 1 July 1992 |
| Heavy Goods Vehicle | NC | |
| up to 270 kW | | |
| over 270 kW | NC1 | 1 July 1992 |
| | NC2 | 1 July 1993 |

2.2 Vehicles complying with ADR 83/00 *External Noise*, need not comply with this ADR.

## 28.1 DEFINITIONS

28.1.1 'Component' means one of the individual constituent parts whose assembly constitutes the 'Noise Reduction System'.

28.1.1.1 These 'Components' are, in particular, the exhaust manifold, the exhaust piping, the expansion chamber, the silencer proper. If the engine intake is equipped with an air filter and the filter's presence is essential to ensure observance of the prescribed sound level limits, the filter must be regarded as a 'Component' of the 'Noise Reduction System'.

28.1.2 'Diesel Engine' means an internal combustion engine which operates on the compression-ignition principle.

28.1.3 'Engine Speed at Maximum Power' ('ESMP') means the speed at which the engine develops maximum power (r/min).

28.1.4 'Net Engine Power' ('NEP') means the engine power expressed in kW (ECE) and measured:

28.1.4.1 for positive-ignition engines, by the method described in Annex 8 to UN ECE Regulation No 15 - "Emission of Gaseous Pollutants":

28.1.4.2 for 'Diesel Engines', by the method described in Annex 10 to UN ECE Regulation No. 24 - "Diesel Engine Pollutant Emissions",

28.1.5 'Noise Reduction System' means a complete set of 'Components' necessary for limiting the noise made by a motor vehicle and its exhaust.

28.1.6 'Off-road Use' means the type of use requiring a vehicle to have the special design features listed in the definition of 'Off-road Passenger Vehicle'.

28.1.7 'Spark Ignition' means positive ignition.

## 28.2 SPECIFICATIONS

28.2.1 General specifications

28.2.1.1 The vehicle, its engine and its 'Noise Reduction System' shall be so designed, constructed and assembled as to enable the vehicle in normal use, despite the vibration to which it may be subjected, to comply with the provisions of this vehicle standard.

28.2.1.2 The 'Noise Reduction System' and its 'Components' shall be so designed, constructed and assembled as to resist the corrosive action to which the vehicle is exposed.

28.2.2 Specifications regarding sound levels

28.2.2.1 Methods of measurement.

28.2.2.1.1 The noise made by the vehicle shall be measured by the two methods described in the Annex for the vehicle in motion and for the vehicle when stationary.[1]

28.2.2.1.2 The values so obtained shall be entered in the test report for the vehicle.

28.2.2.2 Sound level limits.

28.2.2.2.1 The sound level measured by the two methods described in the Annex for vehicles in motion and for stationary vehicles shall not exceed (except as prescribed) the limits contained in Table 1.

## 28.3 ALTERNATIVE STANDARDS

28.3.1 For vehicles other than Goods Vehicles and Omnibuses the technical requirements of UN ECE Regulation 51/01 or 51/02 - "Vehicle Noise Emissions" (as harmonized with EEC Directives 84/424 or 92/97- "The Sound Level of Vehicles") shall be deemed to be equivalent to the technical requirements of this Vehicle standard provided that the noise level recorded during the test on the vehicle while stationary does not exceed the appropriate limit listed in Table 1.

28.3.2 For Goods Vehicles and Omnibuses the technical requirements of UN ECE Regulation 51/01 or 51/02 (as harmonized with EEC Directives 84/424 or 92/97) shall be deemed to be equivalent to the technical requirements of this Vehicle standard relating to tests on vehicles in motion. Additional evidence of compliance with the appropriate stationary test requirements of this Vehicle standard will be required.

[1] A test is made on a stationary vehicle in order to provide a reference value for administrations which use this method to check vehicles in use.

28.3.3 The test site requirements contained in ADR 28/00 clause 28.5 shall be deemed equivalent to clause 2.1 in Annex A of this Vehicle standard.

## Table 1 - Sound Level Limits dB(A)

| VEHICLE CATEGORY CODE | VEHICLE TYPE | VEHICLES IN MOTION | | STATIONARY VEHICLES | | | |
|---|---|---|---|---|---|---|---|
| | | | | Spark Ignition Engines Exhaust Outlet Height | | Diesel Engines Exhaust Outlet Height | |
| | | Direct injection Diesel Engines | Spark Ignition Engines and Indirect injection Diesel Engines | <1500 mm | ≥1500 mm | <1500 mm | ≥1500 mm |
| LE | Motor Tricycle | | | | | | |
| LEP | | 78 | 77 | 90 | 90 | 90 | 90 |
| LEG | | 79 | 78 | 89 | 85 | 99 | 95 |
| MA | Passenger Cars | 78 | 77 | 90 | 90 | 90 | 90 |
| MB | Forward Control Passenger Vehicles | | | | | | |
| | GVM < 2 tonne | 78 | 77 | 90 | 90 | 90 | 90 |
| | GVM ≥ 2 tonne | | | | | | |
| | On Road Use | 78 | 77 | 90 | 90 | 90 | 90 |
| | Off Road Use | | | | | | |
| | NEP < 150 kW | 79 | 78 | 90 | 90 | 90 | 90 |
| | NEP ≥ 150 kW | 80 | 79 | 90 | 90 | 90 | 90 |
| MC | Off Road Passenger Vehicles | | | | | | |
| | GVM < 2 tonne | 78 | 77 | 90 | 90 | 90 | 90 |
| | GVM ≥ 2tonne | | | | | | |
| | NEP < 150 kW | 79 | 78 | 90 | 90 | 90 | 90 |
| | NEP ≥ 150 kW | 80 | 79 | 90 | 90 | 90 | 90 |
| MD | Light Omnibuses | | | | | | |
| | GVM < 2 tonne | 79 | 78 | 89 | 85 | 99 | 95 |
| | GVM ≥ 2 tonne < 3.5 tonne | | | | | | |
| | On Road Use | 80 | 79 | 89 | 85 | 99 | 95 |
| | Off Road Use | | | | | | |
| | NEP < 150 kW | 81 | 80 | 89 | 85 | 99 | 95 |
| | NEP ≥ 150 kW | 82 | 81 | 89 | 85 | 99 | 95 |
| | GVM ≥ 3.5 tonne < 5 tonne | | | | | | |
| | On Road Use | | | | | | |
| | NEP < 150 kW | 80 | 80 | 95 | 91 | 101 | 97 |
| | NEP ≥ 150 kW | 83 | 83 | 95 | 91 | 101 | 97 |
| | Off Road Use | | | | | | |
| | NEP < 150 kW | 81 | 81 | 95 | 91 | 101 | 97 |
| | NEP ≥ 150 kW | 85 | 85 | 95 | 91 | 101 | 97 |
| ME | Heavy Omnibuses | | | | | | |
| | GVM ≥ 5 tonne < 12 tonne | | | | | | |
| | On Road Use | | | | | | |
| | NEP < 150 kW | 80 | 80 | 95 | 91 | 101 | 97 |
| | NEP ≥ 150 kW | 83 | 83 | 95 | 91 | 101 | 97 |
| | Off Road Use | | | | | | |
| | NEP < 150 kW | 81 | 81 | 95 | 91 | 101 | 97 |
| | NEP ≥ 150 kW | 85 | 85 | 95 | 91 | 101 | 97 |
| | GVM ≥ 12 tonne | | | | | | |
| | On Road Use | | | | | | |
| | NEP < 150 kW | 80 | 80 | 95 | 91 | 103 | 99 |
| | NEP ≥ 150krn < 270 kW | 83 | 83 | 95 | 91 | 103 | 99 |
| | NEP ≥ 270 kW | 86 | 86 | 95 | 91 | 103 | 99 |
| | Off Road Use | | | | | | |
| | NEP < 150 kW | 81 | 81 | 95 | 91 | 103 | 99 |
| | NEP ≥ 150 kW < 270 kW | 85 | 85 | 95 | 91 | 103 | 99 |
| | NEP ≥ 270 kW | 86 | 86 | 95 | 91 | 103 | 99 |
| NA | Light Goods Vehicles | | | | | | |
| | GVM < 2 tonne | 79 | 78 | 89 | 85 | 99 | 95 |
| | GVM ≥ 2 tonne ≤ 3.5 tonne | | | | | | |
| | On Road Use | 80 | 79 | 89 | 85 | 99 | 95 |
| | Off Road Use | | | | | | |
| | NEP < 150 kW | 81 | 80 | 89 | 85 | 99 | 95 |
| | NEP ≥ 150 kW | 82 | 81 | 89 | 85 | 99 | 95 |
| NB | Medium Goods Vehicles | | | | | | |
| | GVM >3.5 tonne ≤ 12 tonne | | | | | | |
| | On Road Use | | | | | | |
| | NEP <75 kW | 81 | 81 | 95 | 91 | 101 | 97 |
| | NEP ≥ 75 kW < 150 kW | 83 | 83 | 95 | 91 | 101 | 97 |
| | NEP ≥ 150 kW | 84 | 84 | 95 | 91 | 101 | 97 |
| | Off Road Use | | | | | | |
| | NEP < 75 kW | 82 | 82 | 95 | 91 | 101 | 97 |
| | NEP ≥ 75 kW < 150 kW | 84 | 84 | 95 | 91 | 101 | 97 |
| | NEP ≥ 150 kW | 86 | 86 | 95 | 91 | 101 | 97 |
| NC | Heavy Goods Vehicles | | | | | | |
| | GVM > 12 tonne | | | | | | |
| | On Road Use | | | | | | |
| | NEP < 75 kW | 81 | 81 | 95 | 91 | 103 | 99 |
| | NEP < 75 kW < 150 kW | 83 | 83 | 95 | 91 | 103 | 99 |
| | NEP ≥ 150 kW < 270 kW | 84 | 84 | 95 | 91 | 103 | 99 |
| | NEP ≥ 270 kW | 87 | 87 | 95 | 91 | 103 | 99 |
| | Off Road Use | | | | | | |
| | NEP < 75 kW | 82 | 82 | 95 | 91 | 103 | 99 |
| | NEP ≥ 75 kW < 150 kW | 84 | 84 | 95 | 91 | 103 | 99 |
| | NEP ≥ 150 kW < 270 kW | 86 | 86 | 95 | 91 | 103 | 99 |
| | NEP ≥ 270 kW | 87 | 87 | 95 | 91 | 103 | 99 |

## ANNEX A – METHODS AND INSTRUMENTS FOR MEASURING THE NOISE MADE BY MOTOR VEHICLES

### 1. Measuring Instruments

1.1 A sound level meter of high precision complying at least with the specifications of Publication No 651 (1979) - "Precision sound level meters" of the International Electrotechnical Commission (IEC), or Type 1 of Australian Standard 1259-1982 - "Sound Level Meters", concerning the characteristics of sound level meters, shall be used. Measurement shall be carried out with a weighting network and a time constant conforming to "curve A" and the "fast response" respectively.

1.2 The sound level meter shall be calibrated against a standard noise source immediately before and after each series of test runs. If the meter reading obtained from either of these calibrations deviates by more than 1dB(A) from the corresponding reading taken at the time of the last free-field calibration the test shall be considered invalid. The actual deviation shall be recorded.

1.3 The rotational speed of the engine shall be measured by an independent tachometer whose accuracy is within 3 per cent of the actual speed of rotation.

### 2. Procedure for Vehicles in Motion

(Refer to diagram - Section 4)

2.1 Site for tests on vehicles in motion.

2.1.1 The measurements shall be made at an open site where the ambient and wind noise levels are at least 10 dB(A) below the noise level being measured. The site may take the form of an open space of 25 m radius having a central part of at least 10 m radius, practically level, consisting of concrete, asphalt or similar material and not covered with powdery snow, tall grass, loose soil, ashes or the like. During the test no one shall be in the measurement area except the observer and the driver. Their presence must have no influence on the meter reading.

2.1.2 The surface of the test track used to measure the noise of vehicles in motion shall be such as not to cause excessive tyre noise.

2.1.3 Measurements shall not be made under adverse weather conditions. Any sound peak which appears to be unrelated to the characteristics of the general sound level of the vehicle shall be ignored in taking the readings. If a wind guard is used, its influence on the sensitivity and the directional characteristics of the microphone shall be taken into account.

2.2 Vehicle condition.

2.2.1 Measurements shall be made on unladen vehicles and, except in the case of non-separable vehicles, without trailer or *'Semi-trailer'*.

2.2.2 The tyres of the vehicle shall be of the correct size and shall be inflated to the correct pressure(s) (etc.) for the vehicle in its unladen condition.

2.2.3 Before the measurements are begun, the engine shall be brought to its normal operating conditions as regards: temperatures, tuning, fuel, sparking plugs, carburettor(s), etc. as appropriate.

2.2.4 If the vehicle is fitted with more than two-wheel drive, it shall be tested in the drive which is intended for normal road use.

2.2.5 If the vehicle is equipped with devices which are not necessary for its propulsion, but which are used whilst the vehicle is in normal service on the road, those devices shall be in operation in accordance with the specifications of the *'Manufacturer'*.

2.3 Measurement of noise of vehicles in motion.

2.3.1 General conditions of test.

2.3.1.1 At least two measurements shall be made on each side of the vehicle.

Preliminary measurements may be made for adjustment purposes, but shall be disregarded.

2.3.1.2 The microphone shall be situated 1.2 m $\pm$ 0.1 m above the test site surface at a

distance of 7.5 m $\pm$ 0.2 m from the path of the vehicle's centreline, measured along the perpendicular ($P_{P'}$) to that line.

2.3.1.3 Two lines, AA' and BB', parallel to line $P_{P'}$ and situated respectively 10m

forward and 10m rearward of that line shall be marked out on the test site surface. The vehicle shall approach line AA' at a steady speed as specified below. When the front of the vehicle reaches the line AA', the throttle shall be fully opened as rapidly as practicable and held in the fully-opened position until the rear of the vehicle crosses line BB', the throttle shall then be closed again as rapidly as possible.

2.3.1.4 In the case of articulated vehicles consisting of two non-separable units regarded

as a single vehicle, the semi-trailer shall be disregarded in determining when line BB' is crossed.

2.3.1.5 The maximum sound level recorded during this procedure shall constitute the

result of the measurement.

2.3.2 Method of conducting the test.

2.3.2.1 Symbols used.

The letter symbols used in this paragraph have the following meanings:

S *'ESMP,'*

NA uniform engine rotational speed at the approach of line AA',

$V_A$ uniform vehicle speed at the approach of line AA'.

2.3.2.2 Vehicle with no gearbox.

For vehicles with no gearbox or with no transmission controls, the uniform speed at the approach of line AA' will be such that either:

$N_A$ = ¾ S and $V_A \leq$ 50 km/h,

or

$V_A$ = 50 km/h

and within the specified range of +5, -1 km/h of that speed for each test.

2.3.2.3 Vehicle with a manually-operated gearbox.

2.3.2.3.1 Approach speed.

The vehicle will approach the line AA' with uniform speed such that either :

$N_A$ = 3/4 S and $V_A \leq$ 50 km/h,

or

$V_A$ = 50 km/h.

and within the specified range of +5, -1 km/h of that speed for each test.

2.3.2.3.2 Choice of gear ratio.

2.3.2.3.2.1 Vehicles of categories MA and NA fitted with a gearbox having four or less forward gears shall be tested in second gear.

Vehicles of categories MA and NA fitted with a gearbox having more than four forward gears shall be tested successively in second and third gear. The average value of the sound levels recorded for these two conditions shall be reported. However vehicles of category MA having more than four forward gears and equipped with an engine having *'NEP'* ≥ 140 kW(ECE) and a permissible maximum power to maximum mass ratio ≥ 75 kW(ECE) per tonne shall be tested only in third gear, provided that the speed at which the rear of the vehicle passes line BB' in third gear is greater than 61 km/h.

Vehicles of categories other than MA and NA whose number of forward gears is X (including those obtained by way of an auxiliary transmission or a multi-gear axle) will be tested successively with the gear selection equal to or higher than X/2. The condition giving the highest noise level shall be reported.

2.3.2.3.2.3.1 If the ratio X/2 is not an integer, the next higher gear shall be selected.

2.3.2.4 Vehicles with automatic transmission.

2.3.2.4.1 Vehicles without a manual selector.

2.3.2.4.1.1 Approach speed.

The vehicle shall approach the line AA' at various uniform speeds of 30, 40 and 50 km/h (or at 3/4 of the maximum on-road speed if this value is lower). The condition giving the highest noise level shall be reported and within the specified range of +5, -1 km/h of that speed for each test.

2.3.2.4.2 Vehicles equipped with a manual selector.

2.3.2.4.2.1 Approach speed.

The vehicle shall approach the line $A_{A'}$ at a steady speed corresponding to either:

$N_A$ = ¾ S and $V_A \leq$50 km/h,

or

$V_A$ = 50 km/h and NA < ¾ S

and within the specified range of +5, -1 km/h of that speed for each test.

However, if during the test, in the case of vehicles having more than two separate gears, there is a down-shift to first gear, this down-shift may be avoided at the *'Manufacturer's'* choice either by:

increasing the speed of the vehicle $V_A$ to a maximum of 60km/h,

or

maintaining the speed $V_A$ at 50 km/h, with the fuel supply to the engine limited to 95 per cent of the supply necessary for full load.[2]

2.3.2.4.2.2 Position of the manual selector

The test shall be conducted with the selector in the position recommended by the *'Manufacturer'* for normal driving.

2.3.2.4.2.3 Auxiliary gears.

If the vehicle is fitted with an auxiliary manual transmission or multi-gear axle, the position used for normal urban driving shall be used. In all cases, the special selector positions for slow movement, parking, or braking shall be excluded.

2.4 Interpretation of results for vehicles in motion.

2.4.1 The measurements of the noise emitted by the vehicle in motion shall be considered valid if the difference between the two consecutive measurements on the same side of a vehicle is not more than 2 dB(A).

2.4.2 To allow for lack of precision in the measuring instrument the figures read from it during measurement shall be reduced by 1 dB(A).

2.4.3 The figure reported shall be that corresponding to the highest sound level. Should that figure exceed by more than 1dB(A) the maximum sound level authorised for the category of vehicle tested a second series of two measurements shall be made. Three out of the four results so obtained must fall within the prescribed limits.

## 3. Procedure for Stationary Vehicles

(Refer to diagram - Section 4)

3.1 Requirements for tests on stationary vehicles.

3.1.1 Tests on stationary vehicles (exhaust noise tests) should ideally be carried out consecutively with the tests on the same vehicle in motion.

3.1.2 The measurements shall be made at an open site where the ambient and wind noise levels are at least 10 dB(A) below the noise level being measured. The site may take the form of an open space where a rectangle with sides no closer than 3 m from the extremities of the vehicle can be described. The test site surface should be practically level, consisting of concrete, asphalt or similar material and not covered with powdery snow, tall grass, loose soil, ashes or the like.

3.1.3 Measurements shall not be made under adverse weather conditions. Any sound peak which appears to be unrelated to the characteristics of the general sound level of the vehicle shall be ignored in taking the readings. If a wind guard is used, its influence on the sensitivity and the directional characteristics of the microphone shall be taken into account.

3.1.4 Whilst testing is in progress no person other than any occupants of the vehicle shall be within 1 m of the microphone in use. No person or object other than the person conducting

[2] This condition shall be considered satisfied in the case of a positive-ignition engine when the angle of opening of the throttle is 90 per cent and in the case of a *'Diesel Engine'* when the movement of the feed rack of the injection pump is limited to 90 per cent of its stroke.

the test and an observer or the objects necessary for the performance of the test shall be within 3m of the microphone in use.

3.1.5 Before the measurements are begun, the engine shall be brought to its normal operating conditions as regards: temperatures, tuning, fuel, sparking plugs, carburettor(s), etc. as appropriate.

3.1.6 The use of special acoustic shielding may be permitted in unusual cases. Refer to paragraph

3.2 Microphone position.

3.2.1 The microphone shall be directed towards the orifice of the exhaust outlet and shall be supported by a tripod or similar device not providing excessive acoustic reflection.

3.2.2 The nominal axis of maximum sensitivity of the microphone shall be substantially parallel to the test site surface.

3.2.3 The height of the microphone above the test site surface shall be equal to that of the orifice of the exhaust outlet $\pm$ 25 mm but shall not be less than 200 mm above the test site surface.

3.2.4 The distance of the microphone from the orifice of the exhaust outlet shall be:

3.2.4.1 in the case of a *'Goods Vehicle'* or *'Omnibus'* 1050 mm $\pm$ 50 mm,

3.2.4.2 in the case of any other vehicle 525 mm $\pm$25 mm.

3.2.5 For vehicles fitted with one exhaust outlet which is at a height above the test site surface of less than 1500 mm, the nominal axis of maximum sensitivity of the microphone shall make an angle of 45 degrees $\pm$ 10 degrees with the principal direction of the gas flow from the exhaust outlet.

3.2.5.1 In selecting this microphone position the microphone shall be placed so that the greatest possible distance is achieved between it and the vehicle.

3.2.6 For vehicles fitted with one exhaust outlet which is at a height above the test site surface of at least 1500 mm, the nominal axis of maximum sensitivity of the microphone shall make an angle of 90 degrees $\pm$ 10 degrees with the longitudinal centreline of the vehicle.

3.2.6.1 In selecting this microphone position the microphone shall be placed so that the greatest possible distance is achieved between it and the vehicle.

3.2.7 For vehicles fitted with two or more exhaust outlets spaced less than 500 mm apart and connected to a single silencer only one microphone position shall be used. That position shall be selected in accordance with the procedure described in the preceding paragraphs in respect of an exhaust outlet which results in the microphone being at the greatest possible distance from the vehicle.

3.2.8 For vehicles fitted with two or more exhaust outlets connected to separate silencers or spaced more than 500 mm apart, each exhaust outlet shall be treated separately as if it was the only one.

3.2.9 Notwithstanding anything to the contrary in the preceding paragraphs if the microphone positioning procedures result in no suitable position due to an obstruction being part of the vehicle or in an obstruction being directly between the microphone and the exhaust outlet, the requirements of paragraphs 3.2.2 and 3.2.3 may be varied.

3.3 Vehicle operation and noise measurement.

3.3.1 The vehicle shall be stationary with the transmission in neutral or, in the case of a vehicle with automatic transmission, with the gear selector in the "park" position if such a position is provided.

3.3.2 In the case of Goods Vehicles and Omnibuses powered by a *'Diesel Engine'* the engine shall be operated in accordance with the following procedure.

3.3.2.1 With the engine at idling speed the accelerator pedal of the vehicle shall be depressed as rapidly as possible and kept fully depressed until the speed of the engine is substantially stable at maximum (or governed) speed. The accelerator pedal shall then be permitted to return to its original position as rapidly as possible and left in that position until the engine has returned to idling speed.

3.3.2.2 A single noise level measurement shall be made for each microphone position in use by noting the maximum noise level indicated during this procedure.

3.3.3 In the case of all other vehicles the engine shall be operated in accordance with the following procedure.

3.3.3.1 The engine shall be brought to 3/4 *'ESMP'* and stabilised at that speed.

3.3.3.2 A single noise level measurement shall then be made.

3.3.4 The specified procedure shall be repeated until four consecutive readings having a range less than or equal to 1dB(A) are obtained for each microphone position used.

3.4 Interpretation of results for stationary vehicles.

3.4.1 Where one microphone position is used the noise level of the vehicle shall be the arithmetic mean of the four readings specified in paragraph 3.3.4.

3.4.2 When the sound level of the vehicle has been calculated, non-integer results shall be rounded down to the nearest whole decibel.

3.4.3 Where more than one microphone position is used the noise level at each microphone position shall be determined as if it was the only one. The noise level of the vehicle shall be the higher or highest noise level so calculated.

3.4.4 If the microphone position is less than 1m from the engine compartment of the vehicle the calculated noise level shall be reduced by 2dB(A) unless the provisions of paragraph 3.4.5 have been invoked.

3.4.5 Where the mechanical noise of the vehicle (for example engine or transmission noise) can be shown to increase the measured noise level by 2dB(A) or more, special acoustic

shielding may be fitted to mask this source so that the test is carried out on the exhaust noise alone.

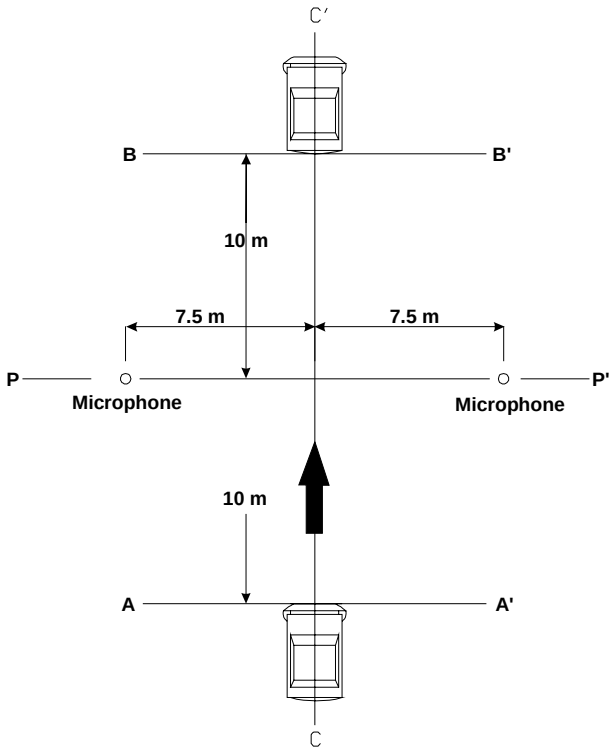
3.4.5.1 Such shielding shall not interfere with the normal acoustic properties of the '*Noise Reduction System*'.

3.4.5.2 Where such shielding is used both noise levels (with and without the shielding) shall be reported. The noise level with the shielding in place shall be used to assess the vehicle's compliance.

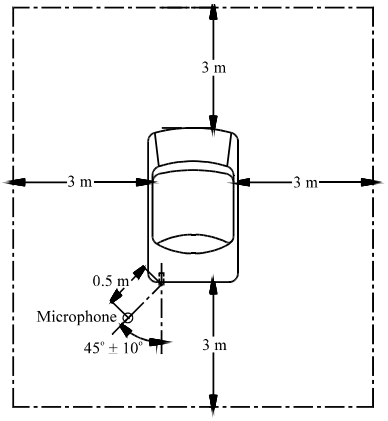
3.4.5.3 Where such shielding is used the provisions of paragraph 3.4.4 shall not apply.

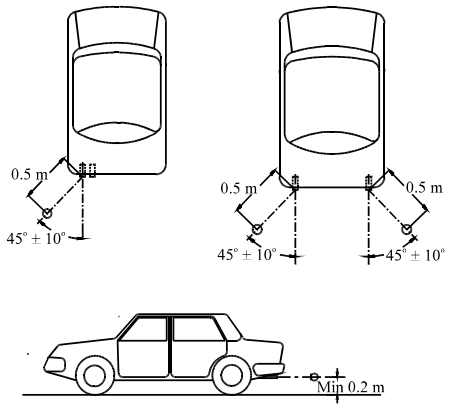
## 4. TEST SITE LAYOUT AND TYPICAL MICROPHONE LOCATIONS

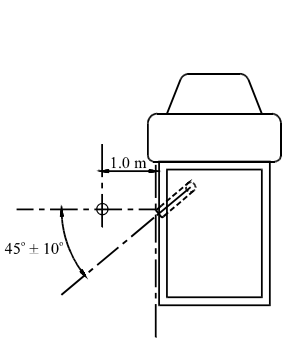
4.1 Vehicle in motion



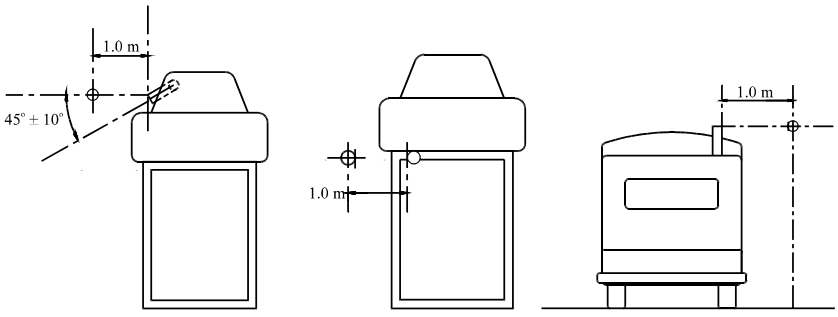

4.2 Stationary Vehicles




Exhaust outlet height less than 1500 mm




Exhaust outlet height at least 1500 mm