

AUSTRALIAN DESIGN RULE 39 - MOTORCYCLE AND MOPED NOISE

39.1 DEFINITIONS

39.1.1 "Net Engine Power" (NEP) - means the maximum power output at the fly-wheel of an engine representing a standard version in all parts, including intake and exhaust system, the fan, water pump or cooling blower, as the case may be, fuel pump, injection pump and unloaded generator with standard carburettor adjustment and ignition or injection timing as the case may be, using a commercial fuel as prescribed for the vehicle, and at the coolant and lubricant temperatures occurring in normal operation.

The measured maximum power output shall be converted to standard conditions of barometric pressure and temperature (101.3 kPa, 20 degrees Celsius) according to the following formula:

$$NEP = \frac{101.3}{b} \times \sqrt{\frac{(273 + t)}{(273 + 20)}} \times (\text{Measured maximum power output})$$

where: b = the observed barometric pressure in the laboratory, in kiloPascals (kPa).

t = the temperature of the air at the engine air intake, in degrees Celsius.

39.1.2 "Vehicle" - means a vehicle to which this Design Rule applies, i.e. a motorcycle or moped (refer ADR Definitions for definitions of these 2 vehicles).

39.1.3 "Engine Speed at Maximum Power" - means the engine speed expressed in rpm at which Net Engine Power (refer Definitions Clause 39.1.1) is developed by an engine as determined by the manufacturer of the engine or of a vehicle incorporating this engine or an agent of either of them and published or made available to the public and, where that engine speed has been determined with the Net Engine Power of the engine being determined in different ways, means the greater or greatest of the engine speeds so determined and published or made available.

39.1.4 "Approved" - means approved by the AMVCB.

39.1.5 "AMVCB" - means the Australian Motor Vehicle Certification Board or a person to whom the Board has delegated by an instrument in writing, revocable at will, its powers and functions.

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39.2 REQUIREMENTS39.2.1 Drive-by Test Requirements

When any vehicle is operated in accordance with the requirements of Clause 39.4 the sound level at a point between 7.3 metres and 7.7 metres from the path of the centre line of the vehicle and 1.1 metres and 1.3 metres above ground level shall not exceed by more than one dB(A) the following limits:

Category of Vehicle	Maximum Sound Level in dB(A)
Motorcycles or Mopeds with engine capacity not exceeding 125 millilitres	81
Motorcycles with engine capacity exceeding 125 millilitres	84

39.2.2 Stationary Test Requirements

When measured by the method described in Clause 39.6, the A weighted value (refer Appendix 1) of the sound level of any noise emitted by a vehicle shall not exceed 94 dB(A).

39.2.3 Requirement for Manufacturers to Supply Information

With every motorcycle or moped the manufacturer shall provide the information specified in this sub-clause in the handbook of the motorcycle or moped, or otherwise:

- (i) the "Engine Speed at Maximum Power" (refer Definitions Clause 39.1.3); and
- (ii) the arithmetic average value of the sound level in dB(A) for the model, when measured in accordance with the procedures specified in Clause 39.6, Test Procedures for Stationary Test.

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39.3 SOUND LEVEL MEASURING INSTRUMENTS FOR DRIVE-BY TEST

39.3.1 Sound level measurements shall be carried out using a sound level meter designed to have:

- (a) a weighting network conforming to the curve given in:
 - (i) IEC Publication 179(1973) referred to below# and reproduced in Appendix 1; or
 - (ii) Australian Standard 1259, Part 2, referred to below#; and
- (b) response characteristics as specified in Clause 39.3.2 and Clause 39.3.3.

#Note: A sound level meter designed to meet the requirements of:

- (i) Publication 179(1973) 'Precision Sound Level Meters' of the International Electrotechnical Commission (IEC); or
- (ii) Australian Standard 1259, Part 2 - 'Sound Level Meters Type 2 - Precision'

will meet the requirements of Clause 39.3.

39.3.2 If a pulse of sinusoidal signal having a frequency of one kHz and a duration of 200 milliseconds is applied, the maximum reading shall be from 0 to 2 dB(A) less than the reading for a steady signal of the same frequency and amplitude.

39.3.3 If a sinusoidal signal, at any frequency between 100 Hz and 12.5 kHz is suddenly applied and thereafter held constant, the maximum reading shall exceed the final steady reading by 0.6 ± 0.5 dB(A).

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39.4 TEST PROCEDURES FOR DRIVE-BY TEST

39.4.1 Measurement shall be performed with the vehicle at the unladen mass plus rider and on a sealed surface consisting of concrete, bitumen or other approved material. The wind velocity shall be not greater than 15 km/h.

39.4.2 The engine shall be tuned to the vehicle manufacturer's specifications and brought to normal operating temperature.

39.4.3 The vehicle shall approach the test area at a steady speed and cross a line (depicted as line AA' in Appendix 2) under the following conditions:

39.4.3.1 Vehicle with no gear box

The vehicle speed shall be within a tolerance of + 5 km/h and - one km/h of 50 km/h or the speed which corresponds to 75 percent of the engine speed at which the engine develops its Net Engine Power (refer Definitions Clause 39.1.1) or to 75 percent of the maximum engine speed permitted by the engine governor, whichever of the 3 options is the lowest.

39.4.3.2 Vehicle with manually-operated gear box

If the vehicle is fitted with a 2 speed, 3 speed, or 4 speed gear box, the second gear shall be used. If the vehicle has more than 4 speeds, the third gear shall be used. If, by following the above procedure, the engine speed developed during the test run exceeds the manufacturer's recommended maximum, the first higher gear which ensures that this maximum is no longer exceeded may be used. Auxiliary step-up ratios ('overdrive') shall not be engaged. If the vehicle is fitted with a final drive of more than one gear ratio, the ratio selected shall be that allowing the highest vehicle speed.

The vehicle approach speed shall be within a tolerance of + 5 km/h and - one km/h of 50 km/h or the speed which corresponds to 75 percent of the engine speed at which the engine develops its Net Engine Power (refer Definitions Clause 39.1.1) or to 75 percent of the maximum engine speed permitted by the engine governor, whichever of the 3 options is the lowest.

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39.4.3.3 Vehicle with an automatic gear box

Where several forward drive selector positions are available, the position selected shall be that which results in the highest mean acceleration of the vehicle during the full throttle section of the test except that in the case of a vehicle with more than 2 selector positions any selector position which restricts operation to the lowest gear ratio shall not be used and any device which would automatically select the lowest ratio may be disconnected. The vehicle approach speed shall be within a tolerance of + 5 km/h and - one km/h of 50 km/h or 75 percent of the maximum speed of the vehicle whichever is the lower.

39.4.4 When the foremost portion of the vehicle reaches the line depicted as line AA' in Appendix 2, the throttle shall be fully opened.

39.4.5 When the rearmost portion of the vehicle reaches the line depicted as line BB' in Appendix 2, the throttle shall be fully closed.

39.4.6 The test shall be considered ended when the rearmost portion of the vehicle reaches the line depicted as line BB' in Appendix 2.

39.4.7 At least 2 measurements shall be made on each side of the vehicle.

39.5 INTERPRETATION OF RESULT OF DRIVE-BY TEST

39.5.1 A set of 2 measurements shall be considered valid if the difference between the 2 consecutive measurements on the same side of the vehicle is not more than 2 dB(A).

39.5.2 The drive-by sound level of the vehicle shall be the highest measurement of a set of measurements which shall include at least 2 consecutive measurements on each side of the vehicle except that if the set includes not more than one measurement which exceeds by more than one dB(A) the maximum sound level specified for the vehicle in Clause 39.2.1 then the set may be replaced by a second series of measurements including at least 2 consecutive measurements on each side of the vehicle.

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39.6 TEST PROCEDURES FOR STATIONARY TEST39.6.1 Site Requirements

39.6.1.1 The test site shall be in the open air and the ground within the test site shall be substantially level and covered with concrete, bitumen or other approved material providing acoustic reflection. The test site shall consist of the area bounded by a rectangle traced on the ground and having sides at least 3.0 metres from the outline of the vehicle under test. Only the vehicle under test, the rider of the vehicle and any instruments or other objects necessary for the performance of the test shall be permitted to be within the test site or within 3.0 metres of the microphone, and there shall not be any person other than the rider of the vehicle within one metre of any microphone in use, whilst testing is in progress except that one other person may be present within the test site provided that other person is standing on the opposite side of the longitudinal centreline of the vehicle to the microphone and is not standing to the rear of the position normally occupied by the rider of the vehicle.

39.6.2 Environmental Conditions

39.6.2.1 Sound level measurements shall be made only when the sound level due to the vehicle under test, when operated in accordance with this Design Rule, exceeds that received at the microphone due to all other sources by more than 10 dB(A). In order to determine whether this criterion has been satisfied, it shall be sufficient to ensure that the sound level immediately before and after the vehicle is tested, when the vehicle engine is not running is at least 10 dB(A) below the sound level recorded when the vehicle is under test.

39.6.2.2 Sound level measurements shall not be made if a sound level meter that is equipped with a device to indicate when the designed power handling capabilities of the sound level meter are being exceeded is used and the device is indicating that they are being exceeded.

39.6.2.3 If a sound level meter is being used that is not equipped with a device which indicates when the power handling capabilities of the sound level meter are being exceeded and if the sound level meter being used is unduly susceptible to the influence of wind, sound level measurements shall not be made in the presence of excessive wind gusts.

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- 39.6.2.4 Sound level measurements shall not be made when rain, hail, sleet or snow is falling upon the wind shield fitted to the microphone, or when snow is on the ground.
- 39.6.2.5 Sound level measurements shall not be made if any environmental operating limits set by the manufacturer of the sound level meter being used are exceeded.
- 39.6.3 Instruments
- 39.6.3.1 Sound level meter equipment shall be used capable of complying with the requirements for level of accuracy of either:
- Publication 179(1973) 'Precision Sound Level Meters' of the International Electrotechnical Commission (IEC); or
- Australian Standard 1259, Part 2 - 'Sound Level Meters Type 2 - Precision',
- and which incorporates the A-weighting network (refer Appendix 1) which shall cause the sound level meter to have the appropriate frequency response as specified in either of the above standards.
- 39.6.3.2 Other equipment used shall not degrade the specified performance of the sound level meter equipment.
- 39.6.3.3 The sound level meter dynamic characteristic used shall be "Fast".
- 39.6.3.4 The sound level meter shall be calibrated at regular intervals in accordance with the manufacturer's recommendation in a laboratory equipped for the purpose. Immediately before and after each series of measurements on a vehicle, the accuracy of the sound level meter shall be checked by performing a field calibration using a suitable reference sound source and the sound level meter shall be adjusted as necessary. If, when checked immediately following a series of measurements, the sound level meter registers a level differing by more than one dB(A) from that observed following any necessary adjustment prior to that series of measurements, then that series of measurements shall be disregarded.
- 39.6.3.5 A tachometer shall be used which is accurate to within + 3 percent.
- 39.6.4 Position of Microphone
- 39.6.4.1 The microphone shall be mounted on a tripod or similar device not providing excessive acoustic reflection and the height of the microphone above the ground shall be equal to that of the geometric centre of the orifice of the exhaust outlet ± 25 mm, but not less than 200 mm.

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The microphone shall be directed towards the orifice of the exhaust outlet and located at a distance of 525 mm + 25 mm from the geometric centre of the orifice of the exhaust outlet.

The nominal axis of maximum sensitivity of the microphone, as indicated by the manufacturer of the microphone, shall be parallel to the ground and shall make an angle of 45 degrees + 10 degrees with the vertical plane which contains the principal direction of the gas flow from the exhaust outlet.

When it can be determined, the vertical plane shall be that containing the longitudinal axis of the final 50 mm of the exhaust outlet of the vehicle.

39.6.4.2 In selecting the nominal 45 degrees angle to the vertical plane described in Clause 39.6.4.1, the microphone shall be placed so that it is on the same side of the longitudinal centreline of the vehicle as the exhaust outlet and where this does not result in a unique choice of the nominal 45 degrees angle, the microphone shall be located in the position which is furthest from the front of the vehicle.

39.6.4.3 In the case of a vehicle with 2 or more exhaust outlets on the same side of the longitudinal centreline of the vehicle and separated by less than 500 mm, only one microphone position shall be established on that side and that shall be selected as described in Clauses 39.6.4.1 and 39.6.4.2 with respect to the exhaust outlet which is higher or highest above the ground of the test site.

Where such an outlet does not exist, the microphone shall be positioned as described in Clauses 39.6.4.1 and 39.6.4.2 with respect to the exhaust outlet which results in the microphone being at the greatest distance from the vehicle.

Where 2 or more exhaust outlets on the same side of the longitudinal centreline of the vehicle are separated by a distance greater than 500 mm, microphone positions shall be established for each exhaust outlet in accordance with Clauses 39.6.4.1 and 39.6.4.2.

39.6.4.4 In the case of a vehicle provided with one or more than one exhaust outlet on each side of the longitudinal centreline of the vehicle, microphone positions shall be established on each side of the longitudinal centreline of the vehicle as described in Clauses 39.6.4.1, 39.6.4.2 and 39.6.4.3.

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39.6.5 Engine Operation

- 39.6.5.1 The vehicle shall be stationary with the transmission in 'Neutral'. In the case of vehicles equipped with an automatic transmission, the gear selector shall be in the 'Park' or 'Neutral' position if such a position is provided.
- 39.6.5.2 The vehicle shall be situated in such a manner that the requirements described in Clause 39.6.1 are satisfied. The vehicle shall be held in a substantially vertical position.
- 39.6.5.3 The engine speed shall be controlled whilst the vehicle is under test.
- 39.6.5.4 At normal operating temperature the vehicle's engine shall be brought to half of the "Engine Speed at Maximum Power" (refer Definitions Clause 39.1.3) \pm 3 percent, as determined from the tachometer, and stabilised within those limits for a sufficiently long period to allow a sound level measurement to be made.

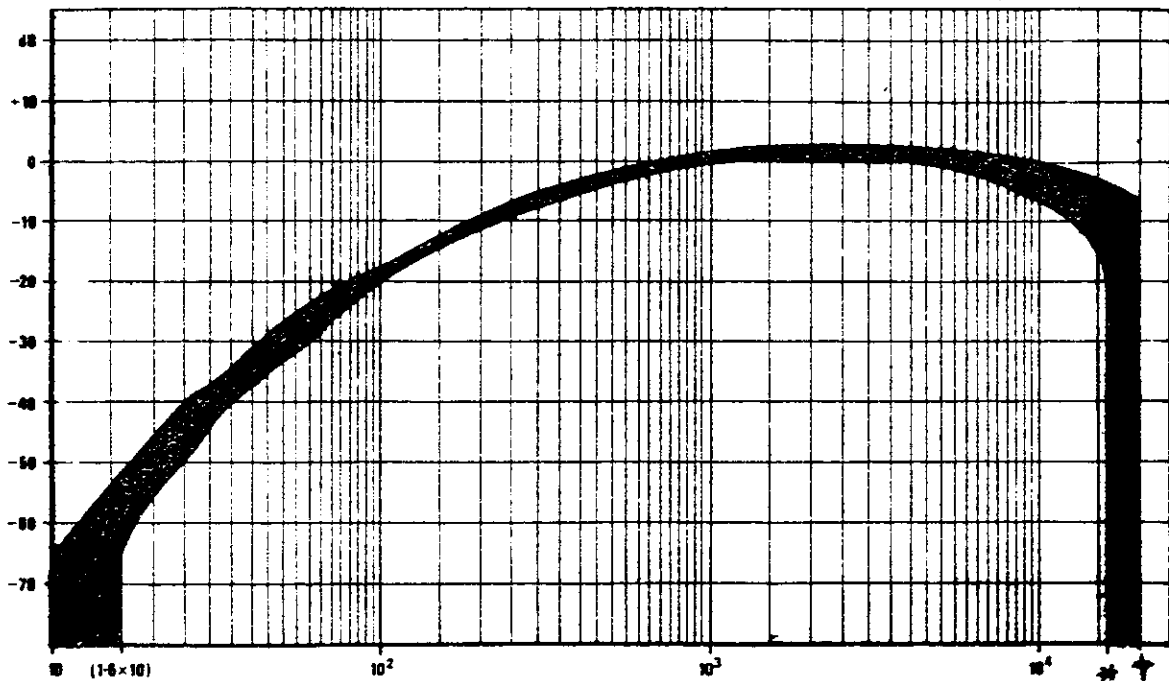
39.7 INTERPRETATION OF RESULT OF STATIONARY TEST

- 39.7.1 A series of sound level measurements shall be made by repeating the procedure described in Clause 39.6.5.4 until 4 consecutive measurements are obtained for each microphone position used that have a range of less than or equal to one dB(A).
- 39.7.2 Where one microphone position is used, the arithmetic mean of these 4 measurements shall be the reported sound level of the vehicle.
- 39.7.3 In the case of a vehicle having multiple exhaust outlets requiring more than one microphone position, the sound level at each microphone position shall be determined in accordance with Clauses 39.7.1 and 39.7.2, and the reported sound level of the vehicle shall be the higher or highest sound level so determined.

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Appendix 1"A - WEIGHTING" CURVE

(as taken from Publication 179(1973) of the International
Electrotechnical Commission (refer Clause 39.3))



Frequency in Hertz (c/s)

Notes:

- * This point is 1.6×10^4 Hertz
- † This point is 2.0×10^4 Hertz

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Appendix 2

DIMENSIONS RELEVANT TO DRIVE-BY TEST
(refer Clause 39.4)