



SURFACE VEHICLE RECOMMENDED PRACTICE

J331™

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Superseding J331 JAN2012

Sound Levels for Motorcycles

RATIONALE

SAE J331 has been reaffirmed to comply with the SAE Five-Year Review policy.

FOREWORD

This recommended practice establishes a method for measuring total motorcycle sound pressure levels under full throttle acceleration and closed throttle deceleration. Factors which contribute to total motorcycle sound include those from the exhaust, intake, mechanical components, tires/road interface and others. SAE J47 is recommended for measuring the maximum total motorcycle sound pressure level under wide open throttle acceleration and closed throttle deceleration. SAE J47 is intended to capture the maximum total sound pressure of a motorcycle but is not intended to reflect real in use operating conditions. SAE J331 is intended to capture the sound pressure emitted during a typical in-use acceleration or deceleration of a motorcycle. Two other standards address measurement of exhaust sound pressure levels of stationary motorcycles; SAE J1287 is recommended for off-highway motorcycles, and SAE J2825 is recommended for on-highway motorcycles.

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https://www.sae.org/standards/content/J331_202007

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

SAE J47 Maximum Sound Level Potential for Motorcycles

SAE J184 Qualifying a Sound Data Acquisition System

SAE J213 Motorcycle Classifications

SAE J1349 Engine Power Test Code - Spark Ignition and Compression Ignition – As Installed Net Power Rating

2.1.2 ANSI Publication

Available from American National Standards Institute, 25 West 43rd Street, New York, NY 10036-8002, Tel: 212-642-4900, www.ansi.org.

ANSI S1.4-1983 Specification for Sound Level Meters

3. DEFINITIONS

3.1 MANUAL TRANSMISSION

A transmission having multiple discrete gear ratios which are individually selectable by the vehicle operator.

3.2 AUTOMATIC TRANSMISSION

A transmission which does not have multiple discrete gear ratios individually selectable by the vehicle operator.

3.3 RATED ENGINE SPEED

The engine speed in revolutions per minute at which the engine delivers its maximum net brake power as defined in SAE J1349 as determined by the manufacturer.

3.4 LONGITUDINAL PLANE OF SYMMETRY

As defined in SAE J213.

4. INSTRUMENTATION

4.1 The following instrumentation shall be used where applicable:

- 4.1.1 A sound level meter which meets the Type 1 or Type S1A requirements of ANSI S1.4-1983. As an alternative to making direct measurements using a sound level meter, a microphone or sound level meter may be used with recorder or other indicating instrument, provided that the system meets the requirements of SAE J184.
- 4.1.2 A sound level calibrator with an accuracy of ± 0.5 dB conforming to IEC942 (1988) Class 1 and/or ANSI S1.40-1984 (see 9.6.4).
- 4.1.3 An engine speed tachometer, or other means of determining engine speed, with a steady-state accuracy of $\pm 3\%$ at 60% and 100% of rated engine speed.
- 4.1.4 A speedometer with steady-state accuracy of $\pm 3\%$ at a vehicle speed of 50 km/h (31 mph).
- 4.1.5 An anemometer with steady-state accuracy of $\pm 10\%$ at a wind speed of 5.5 m/s (12 mph).
- 4.1.6 An acceptable windscreen may be used with the microphone. To be acceptable, the screen shall not affect the microphone response more than ± 1 dB for frequencies of 63 to 4000 Hz and ± 1.5 dB for frequencies of 4000 to 10000 Hz, taking into account the orientation of the microphone.

5. TEST SITE

5.1 The test site (Figure 1) shall be a flat open space accommodating a straight vehicle path and the following points:

On the vehicle path—

- a. The microphone target point
- b. Acceleration point - a point 7.5 m (25 ft) prior to the microphone target point
- c. End point - a point 30 m (100) beyond the microphone target point
- d. A point 15 m (50 ft) prior to the microphone target point
- e. A point 15 m (50 ft) beyond the microphone target point

Off the vehicle path—

- f. Microphone point - a point 15 m (50 ft) from the vehicle path on the perpendicular line which passes through the microphone target point
- g. Measurement area

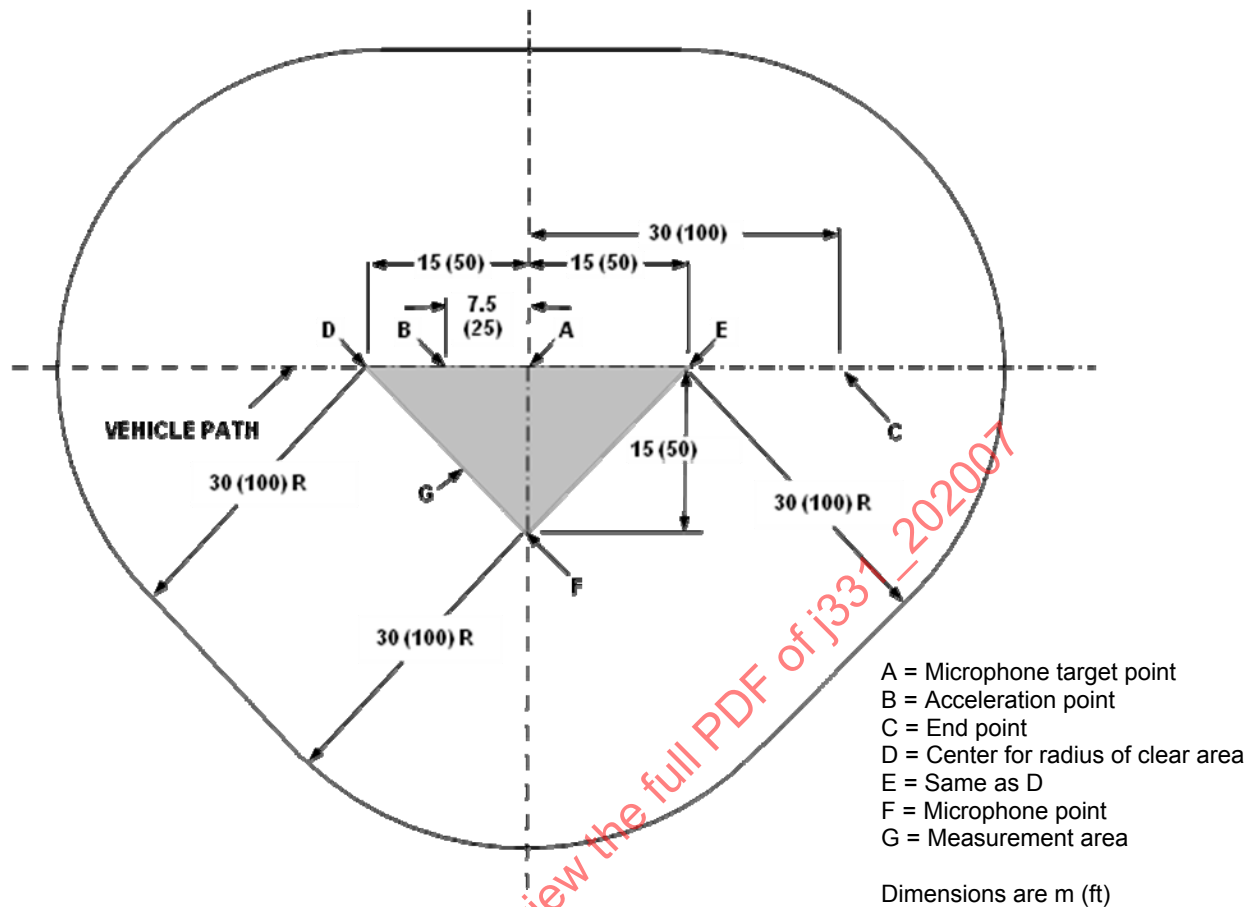


FIGURE 1 - TEST SITE

- 5.2 The measurement area (G) within the test site shall be a triangular area defined by the microphone point (F) and the points D and E. The surface of the ground within the measurement area shall be Portland cement or bituminous asphalt concrete, dry and free from snow, soil, or other extraneous material.
- 5.3 The test site shall be free of large sound reflecting surfaces (other than the ground) such as parked vehicles, signboards, buildings, or hillsides, located within 30 m (100ft) of the measurement area.
- 5.4 The vehicle path shall be on relatively smooth Portland cement or bituminous asphalt concrete, dry and free of extraneous material such as gravel, snow, or ice and of sufficient length for acceleration, deceleration, and stopping of the vehicle (see 7.1.4).
- 5.5 The microphone of the sound level measurement system shall be located above the microphone point. The microphone shall be positioned $1.2 \text{ m} \pm 0.02 \text{ m}$ ($4 \text{ ft} \pm \frac{3}{4} \text{ in}$) above the ground plane. The microphone's reference axis shall be perpendicular to the vehicle path. (Also see 9.6 and 9.6.1.)
- 5.6 The test site layout in Figure 1, for purposes of clarity, illustrates an approach from left to right. Sound level measurements are to be made on both sides of the vehicle; therefore, it will be necessary to establish either a sound microphone location on the opposite side of the vehicle path with a corresponding clear area, or to use approaches from both directions with corresponding acceleration points and end points.

6. TEST MASS

- 6.1 At the start of the test series, the vehicle shall be filled with fuel to not less than 75% capacity and other fluids to a nominal, full capacity.
- 6.2 The combined mass of the test rider and test equipment used on the vehicle shall be not more than 90 kg (198.5 lb) or less than 75 kg (165.4 lb).

If necessary, the vehicle/rider shall be laden with additional mass to compensate for any difference between the actual driver/equipment mass and the required 75 kg (165.4 lb) minimum.

7. PROCEDURE

- 7.1 The following test shall be performed with sufficient runs (see 8.4) to establish maximum sound levels under acceleration:
 - 7.1.1 Vehicles with manual transmissions shall proceed along the vehicle path in second gear at a constant approach speed which shall correspond to an engine speed of 60% of rated engine speed or a speed of 50 km/h (31 mph) whichever is slower. When the front of the vehicle reaches the acceleration point, the throttle shall be rapidly and fully opened to accelerate the motorcycle along the vehicle path until the front of the vehicle reaches the end point, or until rated engine speed is reached, at which time the throttle shall be rapidly and fully closed.
 - 7.1.2 Vehicles with automatic transmissions shall use a standing start procedure. The front of the vehicle shall be at the acceleration point and with the transmission in the lowest selectable range, the throttle shall be rapidly and fully opened to accelerate the motorcycle along the vehicle path, until the front of the vehicle reaches the end point, or until rated engine speed is reached, at which time the throttle shall be rapidly and fully closed.
 - 7.1.2.1 Some motorcycles with automatic transmissions may have the ability to select gears manually on an individual basis for specific operating conditions. If such motorcycles function in normal in use conditions with an automatic transmission which passes automatically and sequentially from one gear to the next, such motorcycles shall be allowed to conduct this procedure in accordance with point 7.1.2
 - 7.1.3 The maximum engine speed attained during each run shall be recorded.
 - 7.1.4 Wheel slip or front wheel lifting which affects the maximum sound level shall be avoided.
- 7.2 Unless it is apparent that maximum noise occurs during acceleration, the following test shall be performed with sufficient runs to establish maximum sound levels under deceleration:
 - 7.2.1 For the test under deceleration, the vehicle shall approach the end point from the reverse direction in the gear used and at the average maximum engine speed attained in the test under acceleration. When the front of the vehicle reaches the end point, the throttle shall be rapidly and fully closed and the vehicle allowed to decelerate along the vehicle path until one half of rated engine speed or the point 15 m (50 ft) past the microphone target point is reached, whichever comes later.
- 7.3 Before measurements begin, sufficient preliminary runs shall be made to familiarize the rider with the vehicle and to allow the engine to reach normal operating temperature. The engine temperature shall be within the normal operating range prior to each run.
- 7.4 The longitudinal plane of symmetry of the test vehicle shall remain on the vehicle path for all test runs.

8. MEASUREMENTS

- 8.1 The sound level meter shall be set for fast response and for the A-weighting network.
- 8.2 The ambient sound level (including wind effects) at the test site, due to sources other than the vehicle being measured, shall be at least 10 dB lower than the peak sound level produced by the vehicle under test.
- 8.3 Measurements shall be made only when the wind speed is below 5.5 m/s (12 mph).
- 8.4 The following measurements shall be made for both the acceleration and, if conducted, deceleration test modes:
 - 8.4.1 Measurements shall be taken for both sides of the vehicle.
 - 8.4.2 The meter shall be observed during each test as the vehicle is accelerating and decelerating. The highest sound level observed for each side during each test run shall be recorded.
 - 8.4.3 Sufficient test runs shall be made until at least four recorded measurements for each test mode and each side of the vehicle are within a 2 dB range. The sound level for that side and test mode shall be the arithmetic average for the first four measurements within a 2 dB range.
- 8.5 The sound level reported for the vehicle shall be the sound level of the side and test mode with the highest average sound level.

9. GENERAL COMMENTS

- 9.1 Technically competent personnel should select the equipment, and the test should be conducted only by trained and experienced persons familiar with the current techniques of sound measurement.
- 9.2 While making sound level measurements, not more than one person other than the rider and the observer reading the meter shall be within 15 m (50 ft) of the vehicle or microphone. The additional person shall be directly behind the meter observer on a line through the microphone and the observer.
- 9.3 The test rider should be fully conversant with and qualified to ride the machine under test, and be familiar with the test procedure.
- 9.4 It should be noted that error in the engine speed indicator as well as error due to operator response time may result in sound level measurement error.
- 9.5 Tachometers having steady-state accuracy within 3% of actual engine speed at 60% and 100% of the rated engine speed are commercially available and are included on some motorcycles as original equipment. This class of tachometers is regarded as being sufficiently accurate for general sound level measurements. In circumstances where very accurate sound level measurements are necessary, accurate engine speed determination is essential, and consideration must be given to the accuracy and response time of the engine speed measurement system. Special care must be taken not to exceed rated engine speed. Exact engine speed measurement must be based on the time interval for not less than one complete engine cycle; for example, two crankshaft revolutions for a four-stroke engine.