SAE International™

SURFACE VEHICLE RECOMMENDED PRACTICE

SAE J1030

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Maximum Sound Level for Passenger Cars and Light Trucks

1. ***Scope—***This SAE Recommended Practice establishes the test procedures, environment, and instrumentation for determining the maximum exterior sound level of passenger cars, multipurpose vehicles, and light trucks having a gross vehicle mass (weight) rating of 4540 kg (10 000 lb) or less.

This document is intended for use when the maximum sound generating capability of any applicable vehicle is to be measured. The test procedure is characterized by having fixed terminal conditions (attainment of rated engine speed at a fixed end point on the test site) in contrast to the procedure of SAE J986 NOV81, Sound Level for Passenger Cars and Light Trucks, which has fixed initial conditions (specified initial vehicle speed at a fixed acceleration point on the test site). Full-throttle acceleration and closed-throttle deceleration of the vehicle are included in both procedures.

Sound levels determined in accordance with this document are essentially independent of transmission and final-drive ratios for a vehicle family having otherwise identical characteristics. Thus, this document is particularly applicable to development testing of vehicle families or to test development where vehicle performance differences are to be minimized.

2. ***References***

2.1 **Applicable Publications—**The following publications form a part of the specification to the extent specified herein. Unless otherwise indicated, the latest revision of SAE publications shall apply.

2.1.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

SAE J184 MAR85—Qualifying a Sound Date Acquisition System
SAE J986 NOV81—Sound Level for Passenger Cars and Light Trucks
SAE J1349 JUN85—Engine Power Test Code - Spark Ignition and Diesel

2.1.2 ANSI PUBLICATIONS—Available from ANSI, 25 West 43rd Street, New York, NY 10036-8002.

ANSI S1.4-1983—American National Standard Specification for Sound Level Meters

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3. Definitions

3.1 **Rated Engine Speed—**The engine speed at which the engine delivers rated net power output as defined in SAE J1349 JUN85, as determined by the manufacturer.

3.2 **Throttle Control—** The driver-operated pedal (or other control) which connects through some mechanism to the engine fuel metering device (carburetor, fuel injectors, fuel distributor, or equivalent device) and thereby controls the engine power output.

NOTE—For the purpose of this document, depression of the throttle control acts to increase engine speed and release of the throttle control acts to reduce engine speed.

4. Instrumentation

4.1 The instrumentation necessary to conduct this test shall meet the minimum performance requirements specified as follows.

4.2 The sound level meter shall meet the Type 1 or S1A requirements of the American National Standard Specification for Sound Level Meters, S1.4-1983.

4.2.1 As an alternative to making direct measurements using a sound level meter, a microphone or sound level meter may be used with a magnetic tape recorder and/or a graphic level recorder or other indicating instrument providing the system is in conformance with SAE J184 MAR85.

4.3 The sound level calibrator shall be accurate to ±0.5 dB.

4.4 The engine speed tachometer shall be accurate to ±2% of full scale, calibrated to read no less than actual speed over the upper third of the scale. The full scale of the instrument used for the measurement shall not be greater than 150% of rated engine speed. (See 8.4.)

4.5 The anemometer shall be accurate to ±10% at 19 km/h (12 mph) wind speed.

4.6 A microphone windscreen may be used, provided that it does not affect the microphone response more than ±1 dB for frequencies from 20 to 4000 Hz and ±1.5 dB for frequencies from 4000 to 10 000 Hz.

5. Test Site

5.1 The test site shall be a flat, open space free of large reflecting surfaces, such as parked vehicles, signboards, buildings, or hillsides, located within 30 m (100 ft) of the measurement area, which is defined by the microphone location, the entrance point, and the end point, as specified by 5.4 and 5.5 and as shown on Figure 1. (See 8.6.1.)

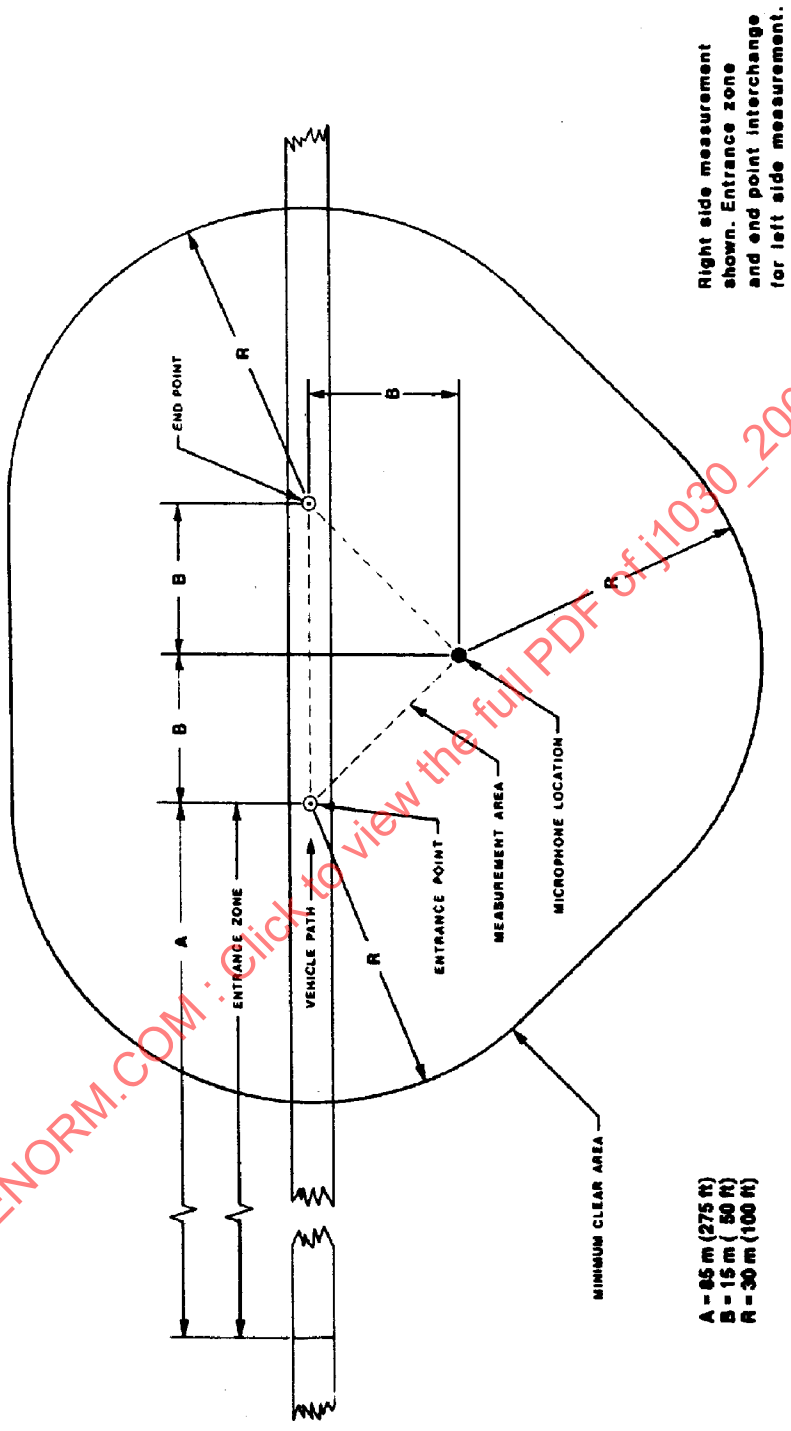

FIGURE 1—MINIMUM TEST SET

5.2 The surface of the ground within the measurement area shall be concrete or non-porous asphalt, dry, and free of snow, soil, or other extraneous material.

5.3 The test site shall include a vehicle path of relatively smooth concrete or asphalt, dry, and free of extraneous materials such as gravel and of sufficient length for acceleration, deceleration, and stopping of the vehicle.

5.4 The microphone shall be located 15 m (50 ft) from the center line of the vehicle path and 1.2 m (4 ft) above the ground plane. The reference axis of the microphone shall lie in the vertical plane containing the perpendicular to the vehicle path through the microphone location.

5.5 The following fixed points and zones shall be established on the vehicle path:

5.5.1 The entrance zone, beginning 100 m (325 ft) and ending 15 m (50 ft) ahead of the perpendicular to the vehicle path through the microphone location;

5.5.2 The entrance point, 15 m (50 ft) ahead of the perpendicular to the vehicle path through the microphone location; and,

5.5.3 The end point, 15 m (50 ft) beyond the perpendicular to the vehicle path through the microphone location.

5.6 An acceleration point for each vehicle shall be determined and marked along the vehicle path to indicate the point at which vehicle acceleration shall commence during the test. The point is selected to meet the requirements of 6.2.

5.7 If it is desired to measure the sound level for both sides of the vehicle during each run, another microphone location, measurement area, and clear area shall be established laterally opposite, meeting the requirements of 5.1, 5.2, and 5.4.

6. Vehicle Operation

6.1 Acceleration Test—The intent of the acceleration test is to operate the vehicle through the upper third of the engine speed range at full power while passing through the entrance zone and the measurement area. To accomplish this, a transmission gear and a point at which full-throttle acceleration is initiated shall be selected prior to test runs.

6.1.1 The transmission gear used shall be that with the largest numerical overall ratio which meets the requirements of 6.1.2.

Vehicles equipped with an automatic transmission shall be tested without an automatic or forced downshift to a higher numerical gear ratio when full-throttle control depression is established. If necessary, the downshift mechanism shall be disconnected, limited, or otherwise altered to accomplish this.

6.1.2 The location of the acceleration point will vary depending on the performance capability of the test vehicle. This acceleration point shall be located so that rated engine speed is attained at the end point. The acceleration point shall be within the entrance zone and the vehicle shall not exceed 90 km/h (55 mph) at the end point.

The acceleration point may be established as follows: The vehicle shall approach the end point in the direction opposite to the direction in which the actual test run will be made at a stabilized engine speed equal to two-thirds of rated engine speed. When the front of the vehicle is at the end point, the throttle control shall be fully depressed as rapidly as possible and the vehicle allowed to accelerate until rated engine speed is attained. The point at which rated engine speed is attained is the acceleration point, provided that it falls within the entrance zone and the vehicle speed does not exceed 90 km/h (55 mph).

6.1.3 If the vehicle reaches rated engine speed in less than 30 m (100 ft), the acceleration point shall be determined using the next numerically smaller gear ratio and that gear shall be used for test runs.

6.1.4 If the vehicle requires more than 115 m (375 ft) to attain rated engine speed or exceeds 90 km/h (55 mph) at rated engine speed, and a larger numerical gear ratio does not satisfy the requirements of 6.1.2, then the following sequence shall be followed in order until the required conditions are met: (1) select a larger numerical gear ratio and reduce the approach engine speed so that the acceleration point will fall within the entrance zone (however, at the approach point, the speed shall not be less than one-fourth of rated engine speed); or (2) select a larger numerical gear ratio, relocate the entrance point 25 m (80 ft) from the end point, and redetermine the acceleration point so that it will fall within the modified entrance zone.

6.1.5 The vehicle shall maintain a constant speed for a minimum of 7.5 m (25 ft) prior to the acceleration point, at the speed and in the gear determined previously. When the front of the vehicle reaches the acceleration point, the throttle control shall be fully depressed as rapidly as possible and vehicle acceleration continued until rated engine speed is attained, at which time the throttle control shall be released.

6.2 Deceleration Test—The deceleration test shall also be conducted unless prior testing has established that the maximum sound level is produced in the acceleration test mode.

6.2.1 For this test, the vehicle shall approach the measurement area at constant rated engine speed in the same gear used for the acceleration test. At the perpendicular to the vehicle path through the microphone location, the throttle control shall be completely released as rapidly as possible and the vehicle allowed to decelerate until the engine speed drops to one-half of rated engine speed or the front of the vehicle reaches the end point. It is recommended that the approach speed be held constant for a distance of at least 7.5 m (25 ft) prior to reaching the perpendicular to the vehicle path through the microphone location.

6.3 The power train and exhaust system temperature shall be within the normal operating range throughout each test run. A 1 min stabilizing period with engine at idle and transmission in neutral is required prior to each test run.

NOTE—Usually, a vehicle brought to normal engine coolant temperature through moderate driving operations is adequately conditioned for testing.

6.4 Preliminary runs to familiarize the driver and to establish the vehicle operating conditions should be made before sound level measurements are made.

7. Measurements

7.1 The sound level meter shall be set for the fast exponential time-averaging characteristic and for the A-weighting network.

7.2 The ambient sound level at the test site due to sources other than the vehicle being measured, including wind effects, shall be at least 10 dB lower than the sound level produced by the vehicle under test.

7.3 Measurements shall be made only when the wind speed is below 19 km/h (12 mph).

7.4 The sound level meter or indicating instrument shall be observed while the vehicle is proceeding according to 6.1.5 or 6.2.1. The applicable reading shall be the highest sound level observed during the run.

7.5 Four measurements shall be made for each side of the vehicle unless it has been established from prior testing that one side has the highest sound level, in which instance only the side having the highest sound level need be measured. All values shall be recorded. The sound level for either side of the vehicle shall be the arithmetic average of the two highest readings which are within 2 dB of each other.