

SAE J1030 SEP85

**Maximum Sound
Level for Passenger
Cars and Light
Trucks**

SAE Recommended Practice
Revised September 1985

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Submitted for Recognition as
an American National Standard

RATIONALE:

Several minor technical, and extensive editorial, revisions were made to SAE J1030, originally approved in January 1977, to produce the present procedure. These revisions were made to clarify the present intent of the procedure, to codify current testing practices, and to bring the procedure into agreement with current SAE and ISO documents; they were prompted by the recent revision to the companion document, SAE J986 NOV81, Sound Level for Passenger Cars and Light Trucks.

The basic procedure is unchanged from the previous version. Several non-critical values were changed slightly to improve the metrication of the present document. Other revisions are detailed as follows:

- Para. 1.2.1: This definition of rated engine speed, which was previously contained in a footnote, has been expanded to include reference to SAE J1349 DEC80, Engine Power Test Code - Spark Ignition and Diesel.
- Para. 1.2.2: This definition of throttle control is added, to clarify the intent of the procedure and to make it generally applicable to light vehicles having gasoline engines (carbureted or fuel-injected), diesel engines, or even electric propulsion means.
- Para. 3.2: A requirement for the asphalt surface within the measurement area to be "non-porous" has been added. This term is felt to be more descriptive and correct than the term "sealed" coming into use in some U.S. documents. Addition of asphalt "driveway sealer" to a coarse- or open-graded asphalt may not in fact produce the non-sound-absorptive (or reactive) surface required for best measurement accuracy. Also, sand-aggregate asphalt surfaces meet the requirement without additional coatings which may compromise traction capabilities of the surface.
- Para. 4.1.5: A requirement has been added for stabilized vehicle operation for a minimum of 7.5 m prior to the acceleration point, to improve (or maintain) reproducibility of test results.
- Para. 4.3: This paragraph has been expanded to require power train and exhaust system, not just engine, operating temperatures to be normal during testing, to provide for better test repeatability. A note has been added to indicate practical implementation of the requirement.
- Para. 6.6.1: A recommendation for flatness of the measurement area has been added. Other test work and test experience have shown that sites meeting the flatness limits cited yield improved repeatability and reproducibility of test results.

REFERENCE SECTION:

American National Standard Specification for Sound Level Meters, S1.4-1983.
(Available from American National Standards Institute, 1430 Broadway, New York, NY 10018)

SAE J184a, Qualifying a Sound Data Acquisition System (June 1978)

SAE J986 NOV81, Sound Level for Passenger Cars and Light Trucks

SAE J1349 JUN83, Engine Power Test Code - Spark Ignition and Diesel

APPLICATION:

This SAE Recommended Practice establishes the test procedure, 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 Recommended Practice 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 Standard 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 Recommended Practice are essentially independent of transmission and final-drive ratios for a vehicle family having otherwise identical characteristics. Thus, this Recommended Practice is particularly applicable to development testing of vehicle families or to test development where vehicle performance differences are to be minimized.

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Ø MAXIMUM SOUND LEVEL FOR PASSENGER CARS AND LIGHT TRUCKS

1. INTRODUCTION:

- 1.1 Scope: This SAE Recommended Practice establishes the test procedure, 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 Recommended Practice 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 Standard 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 Recommended Practice are essentially independent of transmission and final-drive ratios for a vehicle family having otherwise identical characteristics. Thus, this Recommended Practice is particularly applicable to development testing of vehicle families or to test development where vehicle performance differences are to be minimized.

1.2 Definitions:

- 1.2.1 Rated Engine Speed: The engine speed at which the engine delivers rated net power output as defined in SAE Standard J1349 JUN83, Engine Power Test Code - Spark Ignition and Diesel, as determined by the manufacturer.

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- 1.2.2 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 Recommended Practice, depression of the throttle control acts to increase engine speed and release of the throttle control acts to reduce engine speed.

2. INSTRUMENTATION:

- 2.1 The instrumentation necessary to conduct this test shall meet the minimum performance requirements specified below.
- 2.2 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.
- 2.2.1 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 Recommended Practice J184a, Qualifying a Sound Data Acquisition System (June 1978).
- 2.3 The sound level calibrator shall be accurate to ± 0.5 dB.
- 2.4 The engine speed tachometer shall be accurate to $\pm 2\%$ 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 paragraph 6.4.)
- 2.5 The anemometer shall be accurate to $\pm 10\%$ at 19 km/h (12 mph) wind speed.
- 2.6 A microphone windscreen may be used, provided that it does not affect the microphone response more than ± 1 dB for frequencies from 20-4000 Hz and ± 1.5 dB for frequencies from 4000-10 000 Hz.

3. TEST SITE:

- 3.1 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 paragraphs 3.4 and 3.5 and as shown on Fig. 1. (See paragraph 6.6.1.)
- 3.2 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.
- 3.3 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.

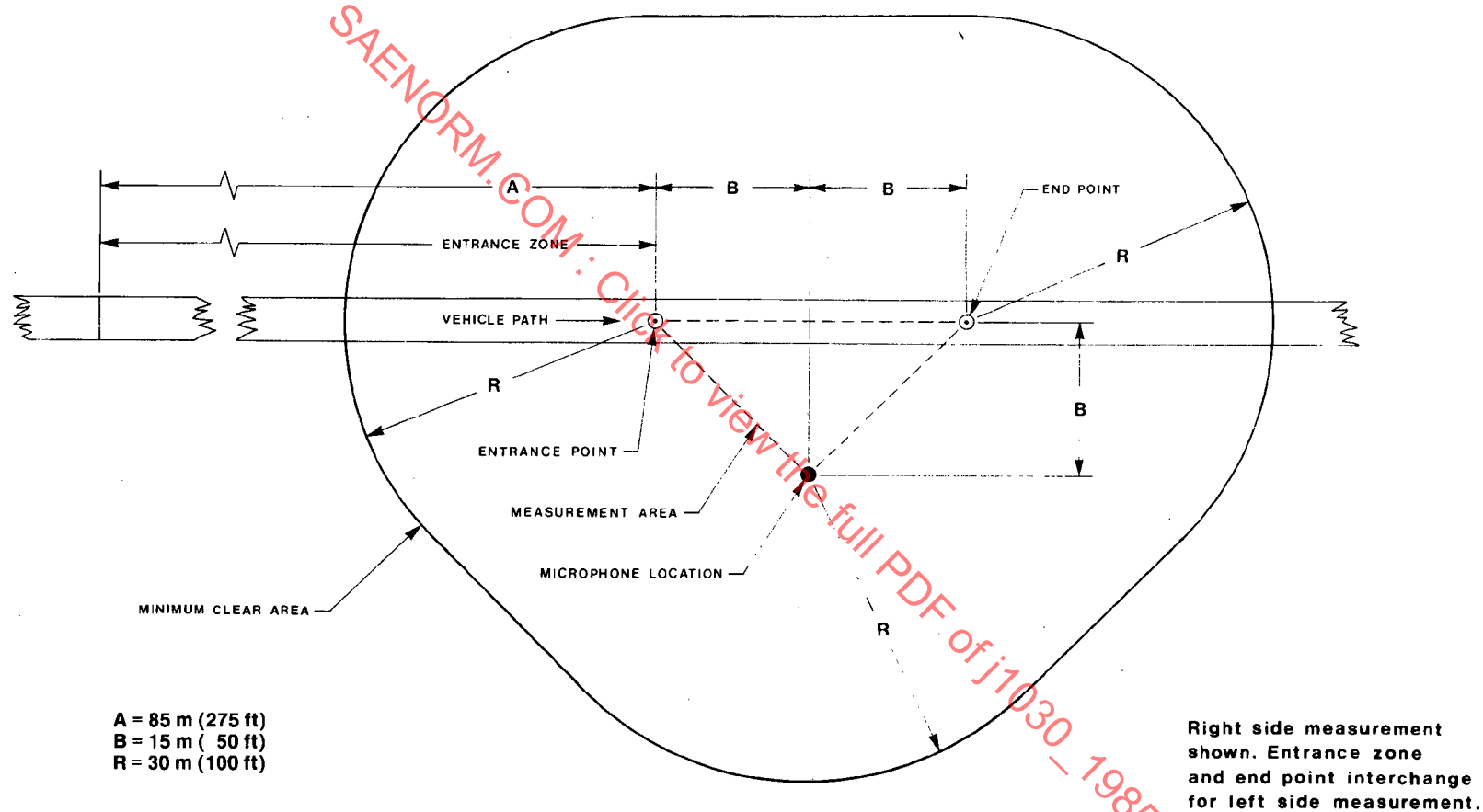


FIG. 1 - MINIMUM TEST SITE

- 3.4 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.
- 3.5 The following fixed points and zones shall be established on the vehicle path:
- 3.5.1 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;
- 3.5.2 The entrance point, 15 m (50 ft) ahead of the perpendicular to the vehicle path through the microphone location; and,
- 3.5.3 The end point, 15 m (50 ft) beyond the perpendicular to the vehicle path through the microphone location.
- 3.6 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 paragraph 4.2.
- 3.7 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 paragraphs 3.1, 3.2, and 3.4.

4. VEHICLE OPERATION:

- 4.1 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.
- 4.1.1 The transmission gear used shall be that with the largest numerical overall ratio which meets the requirements of paragraph 4.1.2.
- 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.
- 4.1.2 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.