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# Sound Level for Passenger Cars and Light Trucks—SAE J986b

SAE Standard  
Last Revised November 1976

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**PREPRINT**

# SOUND LEVEL FOR PASSENGER CARS AND LIGHT TRUCKS—SAE J986b

SAE Standard

Report of Vehicle Noise Committee approved July 1967 and last revised by Vehicle Sound Level Committee November 1976. Rationale statement available.

**1. Scope**—This SAE Standard establishes the test procedure, environment, and instrumentation for determining the exterior sound level for  $\phi$  passenger cars, multipurpose vehicles, and light trucks having a gross vehicle weight rating (GVWR) of 4540 kg (10 000 lb) or less.

The test procedure of this Standard is characterized by having fixed initial conditions (specified initial vehicle speed and gear selection at a fixed acceleration point on the test site) in contrast to the procedure of SAE Recommended Practice J1030, Maximum Sound Level For Passenger Cars and Light Trucks, which has fixed terminal conditions (attainment of rated engine speed at a fixed end 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 Standard are dependent on the performance capability of the test vehicle, as influenced by power-to-weight ratio and overall power train gear ratio. Thus, this Standard is particularly applicable to emphasize sound emission of vehicles with large power-to-weight ratio or high overall gear ratio within the overall vehicle population.

**2. Instrumentation**—The following instrumentation shall be used:

**2.1** A sound level meter which meets the Type 1 or S1A requirements of the American National Standard Specification for Sound Level Meters, S1.4-1971.

**2.1.1** 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 meets the requirements of SAE Recommended Practice J184, Qualifying a Sound Data Acquisition System.

$\phi$  **2.2** A wind screen, which if used does not affect the microphone response more than  $\pm 1$  dB for frequencies from 20 to 4000 Hz and  $\pm 1.5$  dB for frequencies from 4000 to 10 000 Hz.

$\phi$  **2.3** A sound level calibrator accurate to  $\pm 0.5$  dB. (See Section 6.3.4.)

$\phi$  **2.4** An engine speed tachometer 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 used for the measurement shall not be greater than 150% of rated engine speed<sup>1</sup>. (See Section 6.4.)

$\phi$  **2.5** An anemometer accurate to  $\pm 10\%$  at 19 km/h (12 mph) wind speed.

## 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 defined by the microphone location, the acceleration point, and the end zone, as defined in Sections 3.4 and 3.5. (See Fig. 1.)

$\phi$  **3.2** The surface of the ground within the measurement area shall be dry concrete or asphalt, free from snow, soil, or other extraneous material.

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

**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.

**3.5** The following fixed points and zones shall be established on the center line of the vehicle path:

**3.5.1** The acceleration point, 7.5 m (25 ft) ahead of a perpendicular to the vehicle path through the microphone location;

**3.5.2** The end zone, starting at 7.5 m (25 ft) beyond and ending at 38 m (125 ft) beyond a perpendicular to the vehicle path through the microphone location.

$\phi$  **3.6** 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 zone shall be established laterally opposite, meeting the requirements of paragraphs 3.1, 3.2, and 3.4.

<sup>1</sup>Speed at which maximum net horsepower is rated, or maximum governed speed, as determined by the manufacturer.

## 4. Vehicle Operation

**4.1 Acceleration Test**—From a stabilized approach speed of 48 km/h (30 mph), wide-open throttle shall be established when the front of the vehicle reaches the acceleration point. The highest numerical ratio transmission gear shall be used such that the front of the vehicle will have reached or passed the entrance to the end zone when rated engine speed is attained. The throttle shall then be closed sufficiently to prevent further increase of engine speed, and the test continued until the front of the vehicle reaches the end of the end zone. Should rated engine speed not be attained in the end zone, the test is terminated when the front of the vehicle reaches the end of the end zone.

$\phi$  **4.1.1** Vehicles equipped with an automatic transmission shall be tested without an automatic or forced downshift to a higher numerical gear ratio when wide-open throttle is established. If necessary, the downshift mechanism shall be disconnected or otherwise disabled so that the test is conducted using the gear ratio determined in Section 4.1.

**4.2 Deceleration Test**—If it is anticipated or indicated by prior testing that the maximum sound level may be produced during vehicle deceleration, the following test shall be conducted:

**4.2.1** The measurement area shall be approached at constant rated engine speed in the same gear selected for the acceleration test. At the perpendicular to the vehicle path through the microphone location, the throttle shall be rapidly and fully closed, and the vehicle allowed to decelerate until the engine speed drops to one-half of rated engine speed or the front of the vehicle is beyond the end of the end zone.

**4.3** The engine temperature shall be within the normal operating range throughout each run. A one min stabilizing period with engine at idle and transmission in neutral is required prior to any preliminary or test run.

**4.4** Preliminary runs to familiarize the driver and to establish the engine operating conditions should be made before measurements begin.

## 5. Measurements

**5.1** The sound level meter shall be set for fast dynamic response and for the A-weighting network.

**5.2** 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.

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

**5.4** The sound level meter or indicating instrument shall be observed while the vehicle is proceeding according to paragraph 4.1 or 4.2. The applicable reading shall be the highest sound level observed during the run.

$\phi$  **5.5** 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 case 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 average of the two highest readings which are within 2 dB of each other. The sound level reported shall be that of the side of the vehicle having the highest sound level.

## 6. General Comments

**6.1** Technically competent personnel should select equipment, and tests should be conducted only by qualified persons familiar with the current techniques of sound measurement.

**6.2** While making sound level measurements, not more than one person other than the observer reading the meter shall be within 15 m (50 ft) of the vehicle or microphone, and that person shall be directly behind the observer reading the meter, on a line through the microphone and the observer.

**6.3** Proper use of all test instrumentation is essential to obtain valid measurements. Operating manuals or other literature furnished by the instrument manufacturer should be referred to for both recommended operation of the instrument and precautions to be observed. Specific items to be considered are:

**6.3.1** The type of microphone, its directional response characteristics, and its orientation relative to the ground plane and the sound source;

**6.3.2** The effects of ambient weather conditions on the performance of all instruments (for example, temperature, humidity, and barometric pressure);

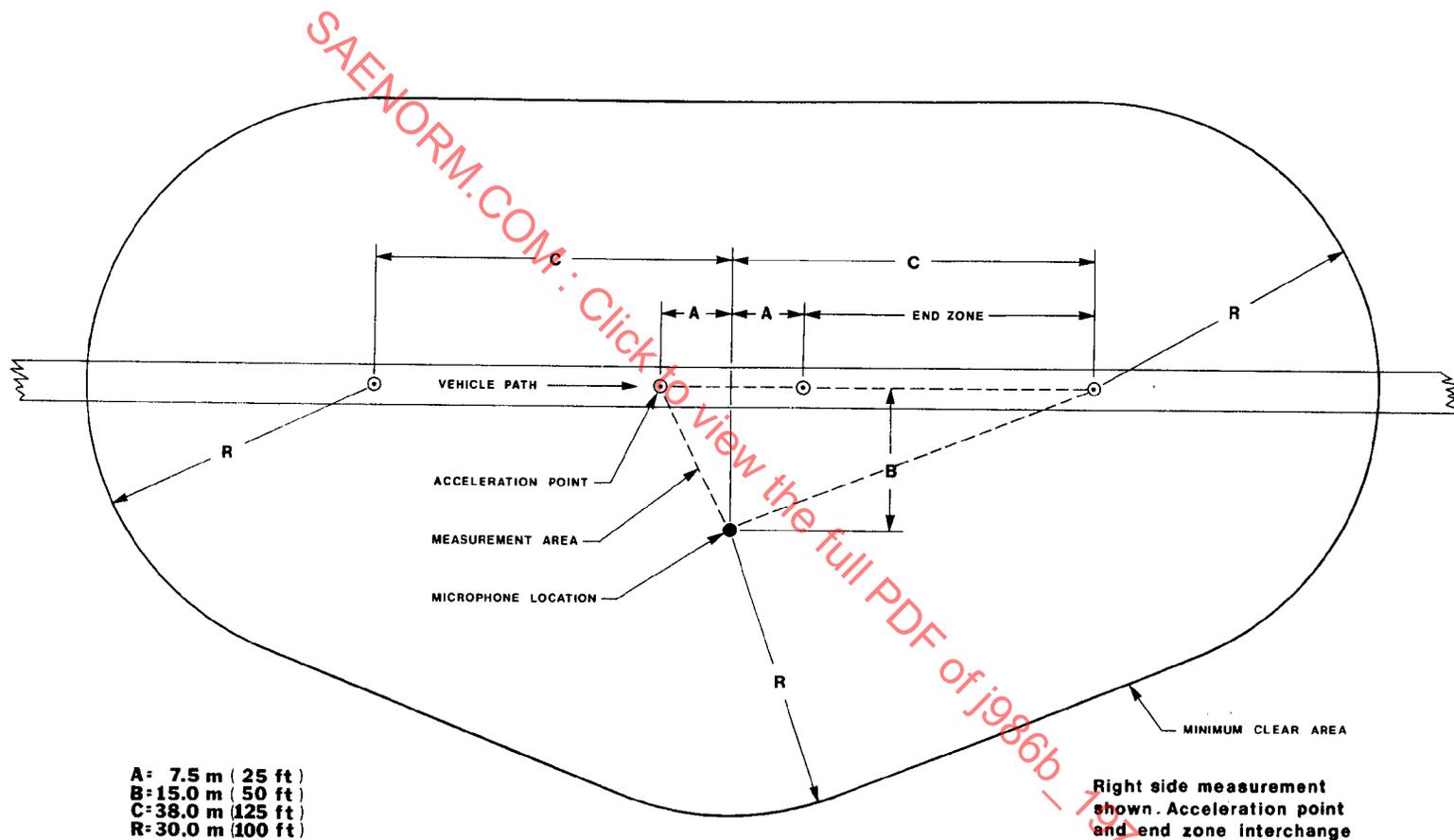


FIG. 1 – MINIMUM TEST SITE

Right side measurement shown. Acceleration point and end zone interchange for left side measurement.