The Engineering Society For Advancing Mobility Land Sea Air and Space®
INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

SURFACE VEHICLE STANDARD

SAE J366

REAF. APR2001

Issued 1969-07
Reaffirmed 2001-04

Supersedes J366 FEB87

Submitted for recognition as an American National Standard

Exterior Sound Level for Heavy Trucks and Buses

***Foreword*—**This Document has not changed other than to put it into the new SAE Technical Standards Board Format. Scope is Section 1, References are Section 2. All other section numbers have changed accordingly.

***1. Scope*—**This SAE Standard establishes the test procedure, environment, and instrumentation for determining the maximum exterior sound level for highway motor trucks, truck tractors, and buses. The test results obtained by this test procedure give an objective measure of the maximum noise level emitted by vehicles under a prescribed condition. A subjective rating of the annoyance caused by vehicles in use may not be directly related to this type of noise level measurement.

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

SAE J184 MAR85—Qualifying a Sound Data Acquisition System

2.1.2 ANSI PUBLICATION—Available from ANSI, 11 West 42nd Street, New York, NY 10036-8002.

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

***3. Instrumentation*—**The following instrumentation shall be used, where applicable, for the measurement required:

3.1 A sound level meter which meets the Type 1 or S1A requirements of American National Standard, Specification for Sound Level Meters, S1.4-1983.

3.1.1 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 indicating instrument, providing the system meets the requirements of SAE J184 MAR85, Qualifying a Sound Data Acquisition System.

3.2 A sound level calibrator accurate within ±0.5 dB. (See 6.2.3.)

3.3 An engine-speed tachometer accurate within ±2% of full scale.

3.4 An anemometer having an accuracy of ±10% at 19 km/h (12 mile/h) wind speed.

3.5 A windscreen, which if used 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.

4. Test Site

4.1 A suitable test site shall consist of a level open space free of large reflecting surfaces such as parked vehicles, signboards, buildings, or hillsides, located within 30 m (100 ft) of either the vehicle path or the microphone. See Figure 1.

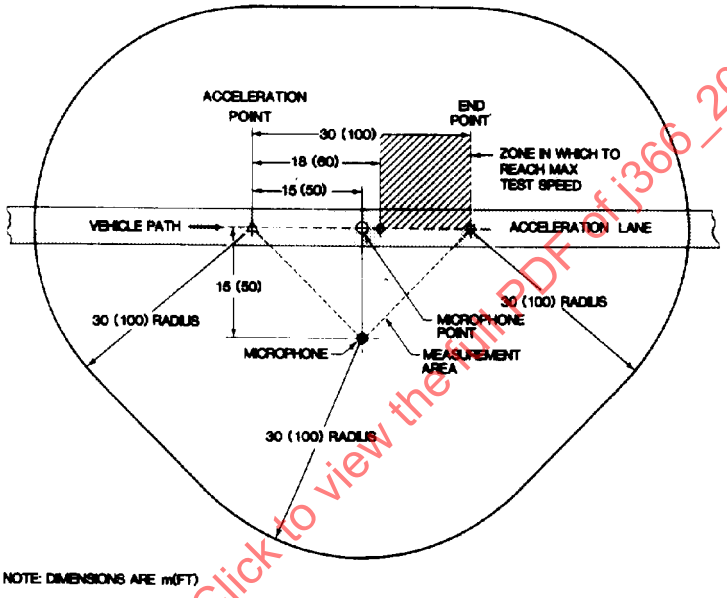

FIGURE 1—MINIMUM UNIDIRECTIONAL TEST SITE (SEE 4.1)

4.2 The microphone shall be located 15.2 m ± 0.1 m (50 ft ± 4 in) from the centerline of the vehicle travel and 1.2 m ± 0.1 m (4 ft ± 4 in) above the ground plane. The microphone point is defined as the point of intersection of the vehicle path and the normal to the vehicle path drawn from the microphone.

The microphone shall be oriented with respect to the source so that the sound strikes the diaphram at an angle at which the microphone was designed to have the flattest frequency response over the frequency range 100 Hz to 10 kHz.

4.3 An acceleration point shall be established on the vehicle path 15.2 m (50 ft) before the microphone point.

4.4 An end point shall be established on the vehicle path 30.4 m (100 ft) from the acceleration point and 15.2 m (50 ft) from the microphone point.

4.5 The end zone is the last 12.2 m (40 ft) of vehicle path prior to the end point.

4.6 The measurement area shall be the triangular area formed by the acceleration point, the end point, and the microphone location.

4.7 The reference point on the vehicle, to indicate when the vehicle is at any of the points on the vehicle path, shall be the front of the vehicle, except as follows:

4.7.1 If the horizontal distance from the front of the vehicle to the exhaust outlet is more than 5080 mm (200 in), tests shall be run using both the front and rear of the vehicle as reference points.

4.7.2 If the engine is located rearward of the center of the chassis, the rear of the vehicle shall be used as the reference point.

4.8 During measurement, the surface of the ground within the measurement area shall be free from snow, long grass, loose soil, ashes, and other porous sound-absorbing materials.

4.9 Because bystanders have an appreciable influence on meter response when they are in the vicinity of the vehicle or microphone, not more than one person, other than the observer reading the meter, shall be within 15 m (50 ft) of the vehicle path or instrument, and that person shall be directly behind the observer reading the meter, on a line through the microphone and observer.

4.10 The ambient sound level (including wind effects) coming from sources other than the vehicle being measured shall be at least 10 dB lower than the level of the tested vehicle.

4.11 The vehicle path and measurement area shall be relatively smooth, dry concrete or sealed asphalt, free of extraneous material such as gravel.

5. Procedure

5.1 **Vehicle Operation—**Full throttle acceleration and closed throttle deceleration tests are to be used. A beginning engine speed and proper gear ratio must be determined for use during measurements.

5.2 **Maximum Test Speed—**The term maximum test speed as used in this document is defined as: For ungoverned engines, this is the rated engine speed as specified by the engine manufacturer. For governed engines, the maximum engine speed attained during the test, when wide open throttle is maintained past the end point.

5.2.1 Select the highest rear axle and/or transmission gear ("highest gear" is used in the usual sense; it is synonymous to the lowest numerical ratio) and an initial vehicle speed such that a wide-open throttle the vehicle will accelerate from the acceleration point:

a. Starting at no more than two thirds (67%) of maximum rated engine speed.
b. Reaching maximum test speed within the end zone.
c. Without exceeding 55 km/h (35 mile/h) before reaching the end point.

5.2.1.1 Should maximum test speed be attained before reaching the end zone, decrease the approach rpm in 100 rpm increments until maximum test speed is attained within the end zone.

5.2.1.2 Should maximum test speed not be attained until beyond the end zone, select the next lower gear until maximum test speed is attained within the end zone.

5.2.1.3 Should the lowest gear still result in reaching maximum test speed beyond the permissible end zone, increase the approach rpm in 100 rpm increments until the maximum test speed is reached within the end zone.

5.2.2 For the acceleration test, approach the acceleration point using the engine speed and gear ratio selected in 5.2.1 and at the acceleration point rapidly establish wide-open throttle. The vehicle reference shall be as indicated in 4.7. Acceleration shall continue until maximum test speed is reached.

5.2.3 Wheel slip which affects maximum sound level must be avoided.

5.2.4 For the deceleration test, approach the microphone point at maximum test speed in the gear selected for the acceleration test. At the microphone point, close the throttle and allow the vehicle to decelerate to one-half of maximum test speed. The vehicle reference shall be as indicated in 4.7. If the vehicle is equipped with an exhaust brake, this deceleration test is to be repeated with the brake full on immediately following closing of the throttle.

5.3 Measurements

5.3.1 The meter shall be set for fast response and the A-weighting network.

5.3.2 The meter shall be observed during the period while the vehicle is accelerating or decelerating. The applicable reading shall be the highest sound level obtained for the run. The observer is cautioned to rerun the test if unrelated peaks should occur due to extraneous ambient noises. Readings shall be taken on both sides of the vehicle.

5.3.3 The sound level for each side of the vehicle shall be the average of the two highest readings which are within 2 dB of each other. Report the sound level for the side of the vehicle with the highest average.

6. ***General Comments*****—**Measurements shall be made only when wind speed is below 19 km/h (12 mile/h).

6.1 It is strongly recommended that technically trained personnel select the equipment and that tests are conducted only by qualified personnel trained in the current techniques of sound measurement.

6.2 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:

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

6.2.2 Proper signal levels, terminating impedances, and cable lengths on multi-instrument measurement systems.

6.2.3 Proper acoustical calibration procedure, to include the influence of extension cables, etc.

6.3 Field calibration shall be made immediately before and after each test sequence. Internal calibration means is acceptable for field use, provided that external calibration (i.e., sound level calibrator) is accomplished immediately before or after field use.

6.4 The engine coolant shall be brought to within the manufacturer's recommended operating temperature range prior to and during testing.

6.5 A 2 dB variation in sound level may typically occur due to variations in test site, temperature gradient, test equipment, and inherent differences in nominally identical vehicles.

6.6 The sound level of a diesel engine may be dependent on the fuel's cetane level. A diesel fuel with a cetane number between 42–50 is recommended. For gasoline-fueled engines, a fuel grade consistent with the engine manufacturer's recommendation should be used.

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