

Sound Measurement—Trenching Machines

1. **Scope**—This SAE Standard specifies procedures for measuring operator and exterior sound levels emitted by self-powered trenching machines regardless of engine size. This procedure does not cover operation of devices such as backup alarms, horns, or accessories such as paving breakers.

The sound levels obtained using this procedure are repeatable and representative of the higher range of sound levels generated by machines under actual field operating conditions, but do not necessarily represent the average sound level over a field use cycle. Measurement and calculation of the operator's sound exposure should follow SAE J1166.

2. **References**

2.1 **Applicable Publications**

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

SAE J184 AUG87—Qualifying a Sound Data Acquisition System

SAE J732 FEB80—Specification Definitions - Loaders

SAE J833 MAY89—USA Human Physical Dimensions

SAE J1166 MAY90—Sound Measurement - Earthmoving Machinery - Operator - Work Cycle

SAE J1349 JUN90—Engine Power Test Code - Spark Ignition and Diesel

SAE J1382 AUG85—Classification, Nomenclature and Specification Definitions for Trenching Machines

- 2.1.2 ANSI DOCUMENTS—Available from the American National Standards Institute, Inc., 11 West 42nd Street, New York, NY 10036-8002.

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

3. **Definitions**

- 3.1 **Trenching Machine**—An off-road machine used primarily to produce trench in a continuous operation by means of a digging chain, wheel, disk, plow blade, or other functionally similar device (see SAE J1382).

- 3.2 **Trench**—A narrow excavation. In general, the depth is greater than the width.

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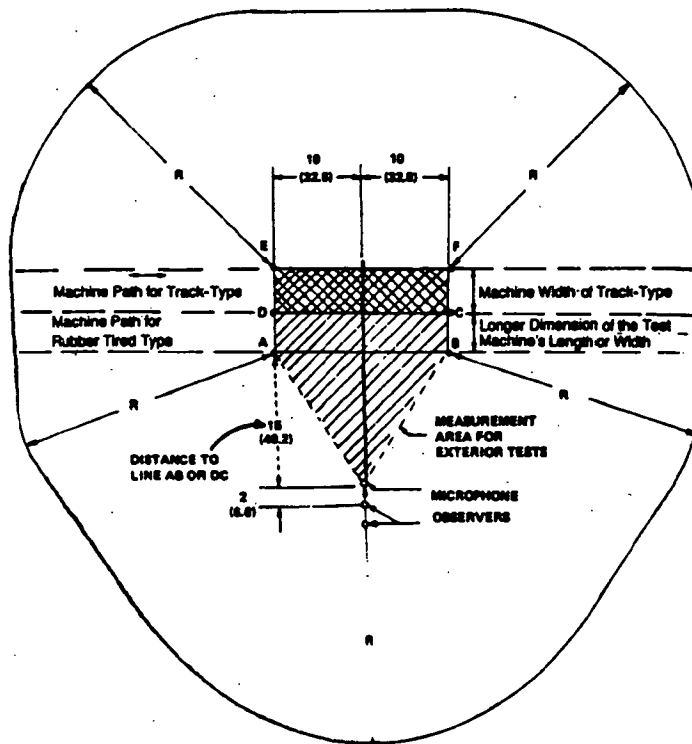
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4. *Instrumentation*

- 4.1 A sound level meter which meets the Type 1 requirements of the ANSI S1.4.
- 4.2 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 graphic level recorder or indicating instrument, providing the system meets the requirements of SAE J184 for the frequency range that is of primary concern. The deviations in the magnetic tape recorder frequency response from flat response, especially at lower frequencies, must not affect the overall reading by more than ± 0.5 dB(A).
- 4.3 An acoustical calibrator (accuracy within ± 0.5 dB). (see 6.2.4).
- 4.4 The use of a windscreen may be required under some test conditions (see 5.1.3), otherwise its use is optional, providing that it does not affect the A-weighted sound level of the source being measured by more than ± 0.5 dB(A), under zero wind speed conditions. (see 6.2.2).
- 4.5 An anemometer or other device for measurement of ambient wind speed and direction (accuracy within $\pm 10\%$ at the highest recommended wind speed). (see 6.2.2).
- 4.6 A power source speed indicator (accuracy within $\pm 2\%$ of the indicated reading).
- 4.7 A thermometer for measurement of ambient temperature (accuracy within ± 1 °C).
- 4.8 A barometer for measuring atmospheric pressure (accuracy within ± 1.1 kPa of the indicated reading).

5. *Procedure*

- 5.1 **Test Site**—The test area shall consist of a flat open space free of acoustically absorptive material, such as snow or tall grass, and any large reflecting surfaces, such as a signboard, building, or hillside, located within 30 m of either the microphone or the machine being measured for exterior measurements or within 15 m of the machine for operator station measurements. See Figure 1.
- 5.1.1 The minimum measurement area for operator station measurements (Figure 1), shall consist of the rectangle formed by points A, B, C, and D. In addition, exterior measurements require the triangle formed by the microphone location and points A and B. Both designated areas shall be smooth concrete or smooth and sealed asphalt or a similar hard and smooth surface. The rectangle formed by points C, D, E, and F is for moving tests on crawler machines and shall consist of hard-packed earth or gravel. The moisture content should be low enough to prevent the material from sticking to the tracks. The planes between the exterior microphone location and line AB and planes encompassed by points A, B, C, F, E, and D shall form a continuous, uniform plane. It should not have over $\pm 1\%$ grade in the direction of travel. If the minimum exterior measurement area is used, it will require reorientation of the machine for each major surface measuring during the stationary exterior tests, and the moving exterior tests will have to be run in two opposite directions. The other option is to enlarge the exterior measurement area and relocate the microphone with the machine in one position for stationary tests and for driving by in only one direction for moving tests.
- 5.1.2 Because bystanders may have an appreciable influence on the meter response when they are in the vicinity of the machine or microphone during exterior measurements, not more than one person, other than the observer reading the meter, shall be within 17 m of the trenching machine or within 2 m of the measuring microphone, and that person shall be directly behind the observer who is reading the meter, on a line through the microphone and the observer. (See Figure 1.) No person other than the operator shall be in the operator station area of the machine during operator station measurements.



NOTE: R=30 (98.4) RADIUS MINIMUM FOR EXTERIOR MEASUREMENTS
R=15 (49.2) RADIUS MINIMUM FOR OPERATOR STATION MEASUREMENTS
DIMENSIONS ARE IN M (FT)

FIGURE 1—TEST SITE CONFIGURATION

- 5.1.3 The ambient sound level due to sources other than the trenching machine being measured (including wind effects) shall be at least 10 dB(A) lower than the sound level of the machine being tested at that microphone location (see 5.6.3).
- 5.1.4 **STATIONARY TESTS**—The machine shall be located on the hard surface area formed by points A, B, C, and D in Figure 1.
- 5.1.5 **MOVING TESTS**
 - 5.1.5.1 For all rubber tired machines, the path of travel shall be across the area defined by points A, B, C, and D in the directions shown in Figure 1.
 - 5.1.5.2 For all track-type machines the path of travel shall be across the area defined by points C, D, E, and F in the directions shown in Figure 1.
- 5.2 The machine shall be at a stabilized operating temperature during the test and must be operated in a manner such that the break-in procedure specified by the manufacturer is not violated.