

	SURFACE VEHICLE STANDARD		SAE J377		REV. DEC2007
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Vehicular Traffic Sound Signaling Devices (Horns)					

RATIONALE

This revision of this standard incorporates requirements for areas of the world where horns experience high or severe usage. The Combined Environment Test was also updated to more accurately reflect real world conditions.

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1. SCOPE—GENERAL

This SAE Standard establishes the minimum operational life, environmental requirements, and sound level output for electrically driven Vehicular Traffic Sound Signalling Devices (hereinafter referred to as Horns) on new automotive vehicles. Test equipment, environment, and procedures are specified.

1.1 Intended Usage and Life Expectation

The horns meeting this specification are intended to be used on automotive vehicles, in defined climatic conditions and environments.

Any device functioning as a horn, is intended to perform its function, to this specification for at least 10 years or 250 000 km (150 000 miles). Two levels of usage shall be defined: A – Normal Usage; and B – High Usage.

For the purposes of this specification, Normal Usage (A) life shall be interpreted as:

Nominal Duty—50 000 actuations

Chirp Duty—40 000 actuations

Long Duty—200 actuations

Continuous Duty—4.0 minutes (per section 8.14)

These duty cycles are defined in Appendix B (figure B1):

For purposes of this specification, High Usage (B) life shall be interpreted as Normal Usage (A) followed by an additional 450 000 Nominal Duty Actuations.

These duty definitions shall be modified for Combined Environment Testing as shown in the Combined Environment section.

2. REFERENCES

2.1 Applicable Publications

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue shall apply.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

SAE J184 Qualifying a Sound Data Acquisition System

SAE J575 Test Methods and Equipment for Lighting Devices and Components for Use on Vehicles Less than 2032 mm in Overall Width

2.1.2 AIAG Publication

Available from Automotive Industry Action Group, 26200 Lahser Road, Suite 200, Southfield, MI 48034-7100, Tel: 248-358-3570, www.aiag.org.

AIAG QS9000 Quality Systems

2.1.3 ANSI Publication

Available from ANSI, 25 West 43rd Street, New York, NY 10036-8002, Tel: 212-642-4900, www.ansi.org.

ANSI S1.4-1983 and S1.4A-1985 Specification for Sound Level Meters

2.1.4 ASTM Publication

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM B117-85 Testing for Salt Spray (Fog)

2.1.5 ECE Publication

Available from United Nations Economic Commission for Europe, Palais des Nations, CH-1211, Geneva 10, Switzerland, Tel: +41-0-22-917-12-34, www.unece.org.

ECE Regulation R28 Uniform Provisions Concerning the Approval of Audible Warning Devices and of Motor Vehicles with Regard to Their Audible Signals

2.1.6 EEC Publication

Available from European Economic Community Council, Information and Documentation Centre, BREY 5/150, B-1049 Brussels, Belgium, Fax: +32-2-296-99-30, <http://ec.europa.eu/enterprise/automotive/directives/vehicles/>

EEC Directive of 70/388/EEC, 27 July 1970, Relating to Audible Warning Devices for Motor Vehicles

2.1.7 IEC Publications

Available from International Electrotechnical Commission, 3, rue de Verambe, P.O. Box 131, 1211 Geneva 20, Switzerland, Tel: +41-22-919-02-11, www.iec.ch.

IEC Publication 60068-2-27 Basic Environmental Testing Procedures Part 2: Test Ea and Guidance: Shock

IEC Publication 529: 1989 Degrees of Protection Provided by Enclosures (IP Code)

IEC Publication 60068-2-64 Environmental Testing Part 2: Test Fh: Vibration, Broad-Band Random

IEC Publication 60651: 1979 Sound Level Meters

IEC Publication 60942: 1988 Sound Calibrators

2.1.8 ISO Publications

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

ISO 10844: 1994 Acoustics—Test surface for road vehicle noise measurements

ISO 12103-1 Road vehicles—Test dust for filter evaluation—Part 1: Arizona test dust

ISO 9001—Quality Systems

2.1.9 USCAR Publication

Available from USCAR, 1000 Town Center Drive, Suite 300, Southfield, MI 48075, Tel: 248-223-9000, www.uscar.org.

USCAR Connector Drawing 150-S-002-A01

2.1.10 US Government Documents

Available from the Superintendent of Documents, U.S. Government Printing Office, Mail Stop: SSOP, Washington, DC 20402-9320.

US EPA-40-CFR Ch1, Part 205 Test Surface

US FMVSS 302 Flammability

2.2 Related Publications

The following publications are provided for information purposes only and are not a required part of this document.

2.2.1 SAE Publication

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

SAE 951361 Paper from the SAE Noise & Vibration Conference Report, P-291, Volume 2, SAE and ISO Noise Test Site Variability

2.2.2 ANSI Publication

Available from ANSI, 25 West 43rd Street, New York, NY 10036-8002, Tel: 212-642-4900, www.ansi.org.

ANSI S1.40-1984 Specification for Acoustical Calibrators

3. DEFINITIONS

For purposes of this specification the following terms will be used:

3.1 Sound Signaling Device

A device that makes an audible sound of sufficient amplitude to alert people in the vicinity of the vehicle. For purposes of this document, the more common term “horn” will be used.

3.2 Horn Subsystem

The Horn Subsystem will be considered to include the horn or horn assembly, the horn attachments, the driver-controlled actuation device (steering column horn pad), any control devices between the actuation device and the horn (e.g., relay), and the related portions of any other horn actuation interfaces (e.g., electronic modules, wiring).

This document addresses only the horn or horn assembly as defined as follows. Unless otherwise specified, or defined by context, the term horn shall always be construed in the broadest context to include all pieces of the deliverable part, including, but not limited, to multiple horns, bracket(s), jumper harness(es), and connector(s).

3.3 Horn

A device for making an audible tone for signaling persons in the vicinity of the vehicle, or annunciating the occurrence of some event on or in the vehicle. Where multiple horn units are supplied with a common bracket, the units will meet their requirements both individually and as a horn assembly. Excluded from this specification are sirens and other special signaling devices.

3.4 Disk Horn

A horn that produces the majority of its acoustical energy by use of a shaped metallic disc attached to the primary vibrating diaphragm.

3.5 Trumpet Horn

A horn that produces its acoustical energy by a diaphragm operating on an air column which is tuned to the diaphragm frequency. The air column (trumpet) is usually spiraled or otherwise bent to fit within the diameter of the basic horn.

3.6 Bracket

A connecting piece that interfaces between the audio-producing assembly (horn) and the vehicle mounting point. Due to acoustic and/or packaging reasons the bracket can consist of several parts or layers. The bracket is usually supplied as an integral part of the delivered horn, and may be an acoustic part of the horn system.

4. TEST ENVIRONMENT

4.1 On-Vehicle

4.1.1 Test Equipment Defaults

The following instrumentation defaults shall apply where applicable:

Sound Levels shall be measured with a meter or measurement system that meets the requirements of ANSI S1.4 or IEC 60651. The meter shall be set for the A weighting scale and the Fast response. If a system other than a single sound level meter is used the system performance should be verified following the recommendations of SAE J184.

A microphone wind screen, if used must not affect the microphone response more than ± 1 dB for frequencies from 20 to 4000 Hz, and ± 1.5 dB from 4000 to 10 000 Hz.

When using a system that includes a periodic monitoring of the A-weighted sound level, a reading should be made at a time interval not greater than 30 ms.

At the beginning and at the end of a complete measurement session, but not less than once per day, the entire measurement system shall be checked by means of a sound calibrator that fulfills the requirements for sound calibrators of at least precision Class 1 according to IEC 60942. Without any adjustment, the difference between the readings of two consecutive checks shall be less than or equal to 0.5 dB. If this value is exceeded the results of the measurements obtained after the previous satisfactory check shall be discarded.

Wind velocity shall be measured with an anemometer accurate to $\pm 10\%$ at 20 km/h (12 mph).

Measurement instruments, not otherwise specified, shall be accurate to one order of magnitude (1 decimal point) greater than the stated requirement.

Measurement instruments must be calibrated to a recognized standard as often as manufacturer recommends, but not less than once per year.

4.1.2 Test Environment Defaults

The test site shall be a smooth dry asphalt or concrete surface with an acoustic absorption of less than 0.10 in the frequency range from 400 to 1600 Hz. Surfaces that meet the requirements of ISO 10844 or the U.S. Federal EPA surface per 40 CFR Ch1 Part 205 will meet this requirement.

The location of the microphone within the test site shall also meet the following:

- a. Free of reflecting surfaces within 30.5 m,
- b. No one except microphone operator in test field,
- c. Wind velocity less than 20 km/h (12 mph).

Microphone shall be swept in a vertical path from a height of 0.5 m to 1.5 m to use the maximum sound pressure level occurring in that path.

Microphone shall be located at a distance of 7 m in front of, and on the longitudinal centerline of the vehicle.

Ambient sound level, including wind effects, coming from sources other than the vehicle being measured, shall be at least 10 dB(A) lower than the level of the horn(s) being tested. When engine noise makes the 10 dB differential impossible, the test may be run and the measurement may be corrected according to the principles for combining decibel signal levels; provided the result is identified as having been corrected, the correction method is identified, and the observed data is provided.

Ambient temperature shall be between 13 °C and 30 °C. If the temperature is outside this range the test may be conducted if agreed to by all parties.

Measurements shall be made with the vehicle stationary and the engine running at idle. The engine shall have been running for 30 min prior to the test with no headlamp or other heavy electrical loads activated. For reference purposes the battery voltage shall be recorded before and after the test and shall be in the range of the vehicle manufacturer's specification.

NOTE: The requirement to test with engine running differs from the engine off requirement of ECE R28. Under this requirement, all horns are tested at the vehicle level with the horn powered as it would be on the road, regardless of whether it is DC, AC, or air powered. It provides a more accurate representation of how the horn will sound in actual usage, and makes the measurement independent of the nominal vehicle system voltage.

Duration of the horn activation shall not exceed 5 s, with not less than 20 s between activations.

The vehicle operator should be seated in/on the vehicle in normal operating position for a stationary vehicle. Enclosed vehicles should have the windows closed during the test.

4.2 Component Level

4.2.1 Test Equipment Defaults

The following instrumentation defaults shall apply where applicable:

Sound Levels shall be measured with a meter or measurement system that meets the requirements of IEC 60651. The meter shall be set for the A weighting scale and the Fast response.

Measurement instruments, not otherwise specified, shall be accurate to one order of magnitude (1 decimal point) greater than the stated requirement.

Measurement instruments must be calibrated to a recognized standard as often as manufacturer recommendations but not less than once per year.

The power supply shall be capable of supplying a continuous output current of at least 200% of the nominal current for the quantity of units being tested simultaneously. Output regulation shall not allow voltage to deviate more than 1.0 V from zero to maximum load (including surges) and shall recover 63% of its maximum excursion within 5.0 ms. Ripple shall not exceed 100 mV peak-to-peak.

4.2.2 Test Environment Defaults

Unless otherwise specified all tests shall be run at 13.0 V DC $\pm$ 0.3 V DC.

Source Resistance including all wiring to a "device under test" shall be not more than 0.1 Ohm. For single terminal, case grounded horns, the case ground path resistance must be included.

For horns that have been designed to operate on a different voltage or with a different circuit resistance, the voltage and resistance specified by the vehicle manufacturer shall be used.

Voltage measurements shall be made at, or within 80 mm, of the horn harness connector terminals.

Ambient temperature shall be between 13 °C and 30 °C.

Airflow up to 10 m/s is permitted.

Production wiring and connections shall be used. Terminals shall be changed periodically to assure terminal wear does not affect test results.

The horn shall be mounted with its production bracket to a sturdy base of mass at least 30 times the mass of the horn assembly. Mounting hardware and torque shall be consistent with the horn manufacturer's recommendations.

In the case of multiple horns mounted to a single bracket, each horn should be tested on its intended bracket with the other horn, but with only one horn connected. If necessary, individual horns may be rotated on the bracket such that their speaking axes are pointing toward the measurement microphone, as long as such rotation does not adversely influence their operation.

Alternatively a horn may be tested with the horn mounted on a standardized bracket defined by the horn manufacturer. Horns intended to be mounted to a bracket integral to the vehicle, shall be tested with the horn mounted on a standardized bracket defined by the horn manufacturer.

Sound Pressure Level measurements shall be conducted in a "Sound Attenuation Chamber" that is substantially anechoic in the frequency range of 20 to 2000 Hz. The materials and dimensions of the chamber shall be such that the sound pressure level will decrease 6 dB(A) at each doubling distance between the horn and the microphone, or which has been calibrated to simulate a free field environment.