



SURFACE VEHICLE RECOMMENDED PRACTICE

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Exterior Sound Level Measurement Procedure for Recreational Motorboats

RATIONALE

Minor revisions are needed to harmonize with ISO 14509-1. See 5.2.3, 5.2.4, and 5.3.6.

1. SCOPE

This SAE Recommended Practice establishes the procedure for measuring the maximum exterior sound level of recreational motorboats while being operated under a variety of operating conditions. It is intended as a guide toward standard practice and is subject to change to keep pace with experience and technical advances.

2. REFERENCES

2.1 Applicable Documents

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

2.1.1 IEC Publications

Available from IEC Central Office, 3, rue de Varembe, P.O. Box 131, CH-1211 Geneva 20, Switzerland, Tel: +41 22 919 02 11, www.iec.ch.

IEC 60942 Specifications for Sound Level Calibrators

IEC 61672-1 Specifications

2.1.2 ISO Publications

Copies of these documents are available online at <https://webstore.ansi.org/>.

ISO 8665 Small craft - Marine propulsion reciprocating internal combustion engines - Power measurements and declarations

ISO 8666 Small craft - Principal data

ISO 14509-1 Small craft - Airborne sound emitted by powered recreational craft - Part 1: Pass-by measurement procedures

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2.1.3 National Marine Manufacturers Association Publications

Available from NMMA Engineering Standards Department, 10 S. LaSalle Street, Suite 3500, Chicago, IL 60603, Tel: 312-946-6213, www.nmma.org.

DOC0722010 Powerboat Sound Level Engineering Report - October 16, 1987

2.2 Related Publications

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

2.2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

SAE J1970 Shoreline Sound Level Measurement Procedure for Recreational Motorboats

SAE J2005 Stationary Sound Level Measurement Procedure for Recreational Motorboats

2.2.2 ANSI Accredited Publications

Copies of these documents are available online at <https://webstore.ansi.org/>.

ANSI S1.1 Acoustical Terminology

ANSI S1.13 Measurement of Sound Pressure Levels in Air

2.2.3 ISO Publications

Copies of these documents are available online at <https://webstore.ansi.org/>.

3. DEFINITIONS

3.1 TYPE TESTING

Type testing is performed to prove that the operational sound level of a boat, or an outboard motor when used with a standard boat or a stern drive featuring an integral exhaust system, complies with sound specifications or prescribed limits.

3.1.1 Standard Boat Specifications for Outboard Motor Type Tests

Any series production boat with a V-hull shape meeting the dimensional and weight characteristics given in Table 1 may be used as a standard boat.

Table 1 - Standard boat specifications

Declared Propeller Shaft Power (according to ISO 8665) of the Outboard Motor Under Test Kilowatts	Length of Hull (according to ISO 8666)		Mass without Engine	
	Meters	Feet	Kilograms	Pounds
$P < 6$	3.8	12.5	135	297
$6 \leq P < 25$	4.2	13.8	220	484
$25 \leq P < 55$	4.7	15.4	400	880
$55 \leq P < 115$	5.5	18.0	800	1760
$115 \leq P < 150$	6.2	20.3	1100	2420
$P \geq 150$	7.5	24.6	1650	3630

A variation of $\pm 20\%$ is allowed in the dimensional characteristics and a variation of $\pm 25\%$ is allowed in the weight of the craft. In addition, the craft shall have no covers over the outboard motor or unusual extensions behind the transom that could affect the sound level.

Outboard motors shall be installed on the boat per the manufacturers' instructions. Additional damping or absorbing materials are not permitted.

3.1.2 Standard Boat Specifications for Stern Drives with Integral Exhaust Type Tests

Any series production boat with a V-hull shape meeting the dimensional and weight characteristics given in Table 2 may be used as a standard boat.

Table 2 - Standard boat specifications for spark ignition engines

Declared Propeller Shaft Power (according to ISO 8665) of the Stern Drive with Integral Exhaust System Kilowatts	Length of Hull (according to ISO 8666)		Mass with Engine	
	Meters	Feet	Kilograms	Pounds
$P < 78$	5.0	16.4	700	1540
$78 \leq P < 115$	5.8	19.0	1600	3520
$115 \leq P < 159$	7.0	23.0	1900	4180
$159 \leq P < 226$	7.7	25.3	2200	4840
$P \geq 226$	8.7	28.5	2600	5720

A variation of $\pm 20\%$ is allowed in the dimensional characteristics and a variation of $\pm 25\%$ is allowed in the weight of the craft. Stern drives with integral exhaust shall be installed in the boat per the manufacturers' instructions. In addition, the engine cover shall not have non-series absorbing or damping materials, and the boat shall not be fitted with unusual extensions or materials on or behind the transom that could affect the sound level.

3.2 MONITORING TEST

Monitoring tests are performed to determine if the operational sound level of a recreational motorboat complies with regulated sound level limits. Monitoring tests are used primarily in those jurisdictions where there are no sound level certification requirements prior to the sale of boats to the general public. Monitoring tests are also performed to ensure that a boat/motor/exhaust system has not been modified subsequent to prior testing.

3.3 MAXIMUM AS-WEIGHTED SOUND PRESSURE LEVEL FOR RECREATIONAL MOTORBOATS

L_{pasmax} is the maximum sound pressure level (SPL) of a passing recreational motorboat under specified operating conditions measured with "A" frequency weighting and with "S" slow time weighting according to IEC 61672-1.

4. INSTRUMENTATION

The following instrumentation shall be used for the measurement required.

- 4.1 For type testing, a sound level meter that meets IEC 61672-1 Type 1 specification for sound level meters.
- 4.2 For monitoring tests, a sound level meter that meets IEC 61672-1 Type 1 or Type 2 specifications for sound level meters.
- 4.3 A microphone windscreen that does not affect the overall reading by more than ± 0.5 dB(A).
- 4.4 A sound level calibrator that meets IEC 60942 specification for sound level calibrators.
- 4.5 A wind speed anemometer.
- 4.6 An engine speed tachometer.
- 4.7 A calibrated speedometer or radar gun.
- 4.8 A range finder.

5. TYPE TESTING PROCEDURE

5.1 Measurement Site

A suitable site is the shore of a body of water or a dock projecting out from the shore into the body of water. If the measurement is made from a dock, the dock shall be of open construction so that it presents a minimum of reflecting surfaces. The area around the microphone and boat being measured shall be free of large obstructions or reflective surfaces, such as buildings, high embankments, sea walls, hills, large piers, or breakwaters, etc., for a minimum distance of 30 m (100 feet). Three markers (buoys or posts) shall be placed in line, 50 m (165 feet) apart, to mark the course the boat is to follow while being tested. The site should be set up similar to that shown in Figure 1.

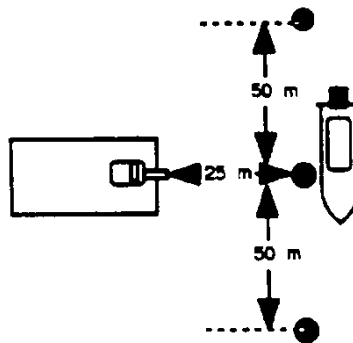


Figure 1 - Type test measurement site diagram

5.2 Boat Operation

- 5.2.1 The boat shall be operated with an equivalent two-person load ($150 \text{ kg} \pm 40 \text{ kg}$), except for boats intended for single person operation (PWC included).
- 5.2.2 The propeller/impeller shall be selected such that at level trim the full throttle engine speed falls within $\pm 4\%$ of the midpoint of the full throttle specified engine speed as recommended by the manufacturer.