The Engineering Society For Advancing Mobility Land Sea Air and Space®
INTERNATIONAL
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SURFACE VEHICLE RECOMMENDED PRACTICE

Submitted for recognition as an American National Standard

SAE J34

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Superseding J34 APR77

(R) EXTERIOR SOUND LEVEL MEASUREMENT PROCEDURE FOR PLEASURE MOTORBOATS

1. ***Scope***—This SAE Recommended Practice establishes the procedure for measuring the maximum exterior sound level of pleasure motorboats while being operated under wide open throttle 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.

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

ANSI S1.4-1983—Type 1 Specification for Sound Level Meters

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

ANSI S1.1-1960(1976)—Acoustical Terminology

ANSI S1.13-1971(R1986)—Methods for the Measurement of Sound Pressure Levels

ANSI S1.4A-1985—Specifications for Sound Level Meters

3. ***Instrumentation***—The following instrumentation shall be used for the measurement required.

3.1 A sound level meter which meets ANSI Standard S1.4-1983 Type 1 Specification for Sound Level Meters.

3.2 A microphone windscreen that does not affect the overall reading by more than ±0.5 dB(A).

3.3 A sound level calibrator. (See 5.3.)

3.4 A wind speed anemometer.

3.5 An engine speed tachometer.

4. ***Procedure***

4.1 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

ft). Three markers (buoys or posts) shall be placed in line, 50 m (165 ft) 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.

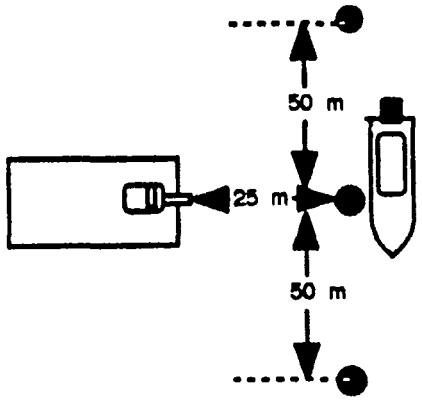

FIGURE 1—MEASUREMENT SITE DIAGRAM

4.2 Boat Operation

4.2.1 The boat shall pass all three markers within a distance of 3 m (10 ft) maximum on a straight course at full throttle with the engine operating at the midpoint of the manufacturer's recommended full throttle rpm range.

4.2.2 The engine speed tolerance shall be ±100 rpm if this falls within the recommended full throttle speed range. If a single top speed rpm is recommended, the tolerance shall be +0, -100 rpm.

4.2.3 For boats with motors or drive systems which are equipped with adjustable trim, the trim angle shall be adjusted so that the propeller thrust is parallel to the plane of the hull.

4.2.4 Boats which are sold with the power units installed (e.g., inboards and stern drives) shall be tested in this combination. Outboard motorboats shall be tested with a motor or motors for which the boat is rated.

4.3 Measurements

4.3.1 The microphone shall be placed 25 m (82.5 ft) from the line determined by the three markers, normal to the line and opposite the center marker. It shall be positioned 1.2 to 1.5 m (4 to 5 ft) above the water, and no less than 0.6 m (2 ft) above the surface of the shore, dock, or platform. If on a dock or platform the microphone shall be placed near or beyond the end of the dock or platform.

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

4.3.3 The observer reading the meter shall not be closer than arm's length from the microphone. Only one other person may be within 15 m (50 ft) of the microphone and that person shall be directly behind the observer reading the meter.

4.3.4 The meter shall be observed during the entire pass-by with the boat passing within 0.5 to 1 m (~1 to 3 ft) on the far side of all three markers. The applicable reading shall be the highest sound level measured during the pass-by provided that the background sound level is at least 10 dB lower than the boat being measured. A measurement shall be invalid if changes in the background sound level affect the applicable reading. Background sound level includes wind effects, noise from boats other than the one being measured, wave action, boat wakes, and other extraneous noises. Peak readings due to hull slaps which create intermittent sound levels shall be disregarded.

4.3.5 Measurements shall be made only when the wind speed is below 19 km/h (13 mph).

4.3.6 The observer shall record the applicable reading and the background sound levels taken immediately before and immediately after the applicable reading.

4.3.7 At least two measurements shall be made for each side of the boat. The sound level for each side of the boat shall be the average of the first two readings for each side which are within 1 dB of each other. The sound level reported shall be that of the louder side of the boat.

5. General Requirements

5.1 The measurements shall be conducted only by persons qualified by training to perform these measurements.

5.2 Proper use of all test instrumentation is essential to obtain valid measurements. Operating manuals or other literature furnished by the instrument manufacturer should be consulted for both recommended operation of the instrument and precautions to be observed.

5.3 Proper acoustical calibration shall comprise the complete measurement system including extension cables, etc. Field calibration shall be performed immediately before and after each test sequence.

5.4 The use of the word "shall" in the procedure is to be understood to be mandatory. The use of the word "should" is to be understood as advisory. The use of the word "may" is to be understood as permissive.

6. Notes

6.1 **Marginal Indicia**—The (R) is for the convenience of the user in locating areas where technical revisions have been made to the previous issue of the report. If the symbol is next to the report title, it indicates a complete revision of the report.

PREPARED BY THE SAE MARINE SOUND LEVEL SUBCOMMITTEE OF THE MARINE TECHNICAL COMMITTEE AND THE SPECIALIZED VEHICLE AND EQUIPMENT DIVISION SOUND LEVEL COMMITTEE

APPENDIX A

The intent of this procedure is to provide manufacturers of marine equipment with a standardized set of conditions and method of measurement of the maximum sound level of boats and motors. When performing this procedure, the boat is typically operated at maximum speed at the measurement distance from the shoreline, requiring skilled operators and a quiet, safe location which is devoid of other boat traffic during testing. Background information is included in the Rationale Statement.

Rationale—J34 was due for 5-year review. It has been changed to correspond with the SAE Electronic Capture Guidelines.

SAE J34, the Exterior Sound Level Measurement Procedure for Pleasure Motorboats, was originally developed in the early 1970s for use by marine engineers to evaluate the effect of engine and boat design on overall sound level. The intent of SAE J34 was to provide manufacturers of marine equipment with a standard method of measuring the maximum sound level of pleasure motorboats. By virtue of the short measurement distance, originally 50 ft, the procedure provided a high resolution of contributors to the overall sound level, making it a valuable tool for marine engineers.

During the mid-1970s the rise in popularity of pleasure motorboating resulted in an increase in the number of complaints about boat noise. Since SAE J34 was the only boat noise measurement standard, several states in the United States adopted noise legislation based on a pass-by test which made reference to SAE J34. Simultaneously, international interest in boat noise measurement and enforcement, along with a desire for metric measurement conversion in the U.S., brought about the request to revise SAE J34 to a standard metric measurement distance. Consequently, SAE J34a was developed around a new distance of 25 m from microphone to the measured course to accommodate international standards.

Sound level measurements obtained with this procedure are not, however, indicative of typical operational sound levels because of the full-throttle requirement at relatively close distance. Pleasure motorboats are typically operated at considerably greater distances between the boat and the observer, resulting in significantly lower measured sound levels. Also, according to extensive boating industry studies, 94% of the time the average pleasure motorboat is operated at less than 90% of rated speed.[1] Consequently, observed sound levels during normal boat operation are typically less than half as loud [>10 dB(A) quieter] as compared to SAE J34 measured levels.

This latest version of SAE J34 contains a revision to the measurement site requirements which improves the accuracy and repeatability of sound level measurements. The original version specified three buoys spaced at 15 m (50 ft) intervals. This leads to inaccuracies in certain instances where the sound level peaks when the boat is well beyond the middle of the course. The new version specifies 50 m (165 ft) spacing between markers, essentially lengthening the course to insure that the sound level has peaked while the boat is within the confines of the course.

During testing it was noted that different boats and varying water conditions produced inordinate changes in the measured pass-by sound level. Further testing revealed that exhaust noise was the primary factor in measured level variations, and it was determined that this could be controlled by specifying a "level" trim position. Paragraph 4.2.3 has been added to minimize this variation.

Although SAE J34 continues to be an excellent method of measuring maximum motorboat noise output, it is not a suitable procedure for boat noise law enforcement. Users of the SAE J34 procedure are cautioned to perform these measurements only in remote locations where no other boats are in operation, and to utilize only skilled boat drivers during the performance of these tests.

Relationship of SAE Standard to ISO Standard—Not applicable.

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

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[1] ICOMIA 36-88