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Measurement method of weighted sound insulation index of ship internal material

船舶内装材料计权隔声指数测量方法

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Note Note on the printed English title

The English title on the cover of the document is printed as Measure method of weighted sound insulation index of ship internal material. The first word has been set here as Measurement, which is what the Chinese title and the body of the document call for; nothing else in the title has been changed.

3 Terms and definitions

Four terms are defined. The average sound pressure level in a room (3.1) is the ratio of the space and time average of the squared sound pressure to the squared reference sound pressure; a note says that the space average covers the whole test room but excludes the region directly radiated by the source and the region close to the boundaries, for example the wall faces. The sound reduction index (3.2) is the ratio of the sound power incident on the test specimen to the sound power transmitted through it.

The apparent sound reduction index (3.3) is the ratio of the sound power incident on the partition specimen from the source room to the total sound power transmitted into the receiving room, which includes the power transmitted through the specimen and the power transmitted by other paths. The weighted sound reduction index (3.4) is the single number obtained by weighting a set of band sound reduction index data against a set of reference values.

4 Measuring equipment

4.1 The accuracy of the sound pressure level measuring equipment shall meet the class 1 or class 2 accuracy requirements of GB/T 3785.1-2023, and unless the source room and the receiving room both use microphones with the same frequency response in a diffuse field, the measuring equipment shall be corrected for the diffuse field.

4.2 Before use, the whole measuring system including the microphone shall be calibrated with a sound calibrator meeting the class 1 accuracy requirements of GB/T 15173-2010. 4.3 The one third octave band filters shall meet GB/T 3241. 4.4 The reverberation time measuring equipment shall meet ISO 354.

5 Test specimens

5.1.1 The size of the specimen is determined by the size of the test opening in the laboratory facility; for panels it is about 10 square metres and for deck structures between 10 and 20 square metres, the short side of a panel or deck structure being not less than 2.3 m. A note says that if the wavelength of the lowest free bending wave frequency is shorter than half the shortest side of the specimen the specimen can be smaller, but that the smaller the specimen the more sensitive the result is to the boundary fixing conditions and to local variations in the sound field.

5.1.2 The specimen shall be installed so as to reproduce the normal connection and sealing at the boundaries and at the nodes under real conditions. 5.1.3 Where the specimen is installed in an opening between the source room and the receiving room, the ratio of the niche depth on the source room side to that on the receiving room side should be 2 to 1, as shown in Figure 1; the legend of Figure 1 names those two depths, the specimen and the

wall in which it is mounted.

5.1.4 Where one face of the specimen absorbs markedly more than the other, the more absorbent face shall face the source room, and diffusers shall then be installed in the source room. 5.1.5 In a laboratory meeting GB/T 19889.1-2005, the sound power transmitted by paths other than the direct one shall be shown to be negligible against the power transmitted through the specimen; to verify this the maximum apparent sound reduction index of the laboratory installation shall be measured with a construction of very high sound insulation fitted in the test opening, following Annex A of GB/T 19889.1-2005.

5.2.1 The test method for doors, windows, glazing and similar components is the same as for panels and deck structures. 5.2.2 Where the specimen is smaller than the test opening, a special filler wall of sufficiently high sound insulation shall be built into the opening and the specimen placed in it, the sound power transmitted indirectly by the filler wall and the other parts being negligible against that transmitted through the specimen. 5.2.3 A specimen that has to open and close shall be installed so that it opens and closes freely as in use, and shall be opened and closed at least five times before the test. 5.2.4 Where a door is set into the test opening, its threshold shall be as close as possible to the laboratory floor. 5.2.5 For glazing, windows and doors the specimen area means the area of the opening in the filler wall in which the specimen is mounted.

5.2.6 For some glazing systems or components the sound insulation depends strongly on the temperature at which it is measured; for such specimens the temperature in the source room and the receiving room is recommended to be held at 20 °C +/-3 °C and the specimen is to be kept at that temperature for 24 h before the test, and it is better still to measure at the temperature for which the specimen was designed. A note adds that because the sound insulation of windows, doors and small external wall components depends on size, a component in a building whose size differs from that of the laboratory specimen will give a noticeably different sound reduction index; where the areas differ by a factor of about two the single number index generally differs by not more than 3 dB, and a larger real area generally gives a lower index, an accurate and reliable result being obtainable only by measuring a specimen of the same size.

5.2.7 Window sashes shall be installed as close as possible to the real application; when a window is fitted into the test opening the niche depths on the two sides should not be equal, unless the particular design of the window makes this impossible, the ratio being 2 to 1 as in Figure 1. The gap between the window and the test opening, about 10 mm to 13 mm at the window edge, shall be filled with a sound absorbing material such as mineral wool and sealed on both sides with an elastic sealant, or sealed as the window manufacturer's instructions require.

5.2.8 Glazing installed in the test opening shall also keep a niche depth ratio of 2 to 1 as in Figure 1, with a 10 mm gap left between the pane and the opening. The specimen shall be fixed with two wooden beads of 25 mm by 25 mm, with about 5 mm of sealing compound

between the glass and the beads, the beads overlapping the glass by 12 mm to 15 mm. A first note says that the sound insulation of the glass does not represent that of a window made from it, which is obtained by measuring the whole window; a second note says that mounting and sealing the glass in the test opening, although not the arrangement used in real work, is a practicable, quick and repeatable method.

6 Measurement conditions

6.1 The laboratory test facility shall meet GB/T 19889.1-2005. 6.2.1 The sound produced in the source room shall be steady and shall have a continuous spectrum over the frequency range considered; where a filter is used its bandwidth shall be at least one third octave. Where broadband noise is used its spectrum shall give a suitable signal to noise ratio in the receiving room at high frequencies as well, white noise being recommended. In every case the difference in sound pressure level between adjacent one third octave bands of the source room spectrum shall be not more than 6 dB.

6.2.2 The sound pressure level in the receiving room shall exceed the background noise by more than 15 dB in every band, and where that cannot be met the correction of 8.2 shall be applied; the correction for background noise is actually given in 8.5 of the document, and the cross reference is translated here as printed. 6.2.3 Where several loudspeakers in a source enclosure work at the same time they shall be driven in phase.

6.2.4 Where another method is used to give the loudspeakers the uniform non-directional radiation required by A.1.3, the following apply. Where several sources may be used at the same time, they shall be of the same type, driven at the same level and radiating uncorrelated signals; a continuously moving source may also be used; where a single source is used it shall have at least two positions. Those loudspeaker positions may be in the same room, or the source room and the receiving room may be interchanged and the measurement repeated in the opposite direction, in which case one or more source positions are used in each room; where one face of the specimen absorbs markedly more than the other, the measurement may be made in one direction only. The loudspeaker shall be placed where it gives as diffuse a sound field as possible and at some distance from the specimen, so that the direct sound is not prominent; the sound field in a room depends strongly on the type and position of the source, and the technical requirements for the loudspeaker and the measurement point positions shall meet Annex A, the use of a moving loudspeaker being described in A.2.5.

7 Measurement requirements

7.1.1 The average sound pressure level may be obtained with a single microphone used at different positions, with a fixed array of microphones, with a single microphone moved continuously, or with a rotating microphone. For all source positions the levels measured at the different points shall be averaged on an energy basis, as in 8.1.