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**Laboratory measurement of
airborne sound insulation of
small building elements**

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Foreword

This translation has been made based on the original Japanese Industrial Standard established by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee.

This Standard has been made based on **ISO 140-10:1991** *Acoustics—Measurement of sound insulation in buildings and of building elements—Part 10 : Laboratory measurement of airborne sound insulation of small building elements* for the purposes of making it easier to compare this Standard with International Standard; to prepare Japanese Industrial Standard conforming with International Standard; and to propose a draft of an International Standard which is based on Japanese Industrial Standard.

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In the event of any doubts arising as to the contents,
the original JIS is to be the final authority.

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Laboratory measurement of airborne sound insulation of small building elements

Introduction This Japanese Industrial Standard has been prepared based on the first edition of **ISO 140-10** *Acoustics—Measurement of sound insulation in buildings and of building elements—Part 10 : Laboratory measurement of airborne sound insulation of small building elements* published in 1991.

The portions given sidelines are the matters in which the contents of the original International Standard have been modified. A list of modifications with the explanations is given in Annex 4 (informative).

1 Scope This Standard specifies the laboratory measurement method of airborne sound insulation of small building elements under diffuse field conditions. The measurement results obtained with this Standard will be used for development of small building elements with appropriate acoustical properties, estimation of such elements according to their sound insulation properties and estimation of their influence on the sound insulation of partition constructions in buildings.

This Standard shall apply to small building elements with an area of not more than 1 m² excluding windows and doors. The small building elements covered by this Standard are those mounted on the partition between two adjoining rooms or outside walls and measured as the independent performance without performance change due to the mutual interference even when several small building elements are mounted on the wall with a definite interval which is clearly specified.

Element examples covered in this Standard are as follows.

Transfer air devices

Airing panels (ventilators)

Outdoor air intakes

Electrical raceways (cable ducts)

Transmit sealing systems

In the case where the insulation of the system which is made of several units and therefore its insulation may change according to the combination of units, the performance estimation of each unit by the method specified in this Standard is not necessarily appropriate.

NOTE : The International Standard corresponding to this Standard is as follows.

In addition, the symbols which denote the degree of correspondence in the contents between **JIS** and the relevant International Standard are IDT (identical), MOD (modified) and NEQ (not equivalent) according to **ISO/IEC Guide 21**.

ISO 140-10 : 1991 *Acoustics—Measurement of sound insulation in buildings and of building elements—Part 10 : Laboratory measurement of airborne sound insulation of small building elements* (MOD)

2 Normative reference The following standard contains provisions which, through reference in this text, constitute provisions of this Standard. The most recent edition of the standard (including amendments) indicated below shall be applied.

JIS A 1416 *Acoustics—Method for laboratory measurement of airborne sound insulation of building elements*

NOTE : **ISO 140-1**:1997 *Acoustics—Measurement of sound insulation in buildings and of building elements—Part 1: Requirements for laboratory test facilities with suppressed flanking transmission* and **ISO 140-3**:1995 *Acoustics—Measurement of sound insulation in buildings and of building elements—Part 3: Laboratory measurements of airborne sound insulation of building elements* are equivalent to the said standard.

3 Terms and definitions For the purposes of this Standard, the following definition shall apply.

3.1 element-normalized sound pressure level difference $D_{n,e}$ the value obtained by adding the value 10 times the common logarithm of the ratio of the reference area to the equivalent absorption area in receiving room to the average sound pressure level difference being measured in sound source room and receiving room respectively

It is calculated by the following equation and is expressed with the unit in decibels (dB).

$$D_{n,e} = L_1 - L_2 + 10 \log_{10}(A_0/A) \dots\dots\dots (1)$$

where, L_1 : average sound pressure level in sound source room (dB)

L_2 : average sound pressure level in receiving room (dB)

A_0 : reference area ($A_0 = 10 \text{ m}^2$) ⁽¹⁾

A : equivalent absorption area in receiving room (m^2)

Note ⁽¹⁾ In Japan, 1 m^2 has been usually used as the reference area of the test object for the sound transmission area to express the apparent sound reduction index, however, $A_0 = 10 \text{ m}^2$ is adopted based on the original International Standard.

Refer to Annex 1 when using 1 m^2 as the reference area for measurement and expression.

Information : Calculation of the integrated sound reduction index of the overall wall surface when the small building elements (element-normalized sound pressure level difference) are mounted on the outside wall surface or partition of the building (sound transmission loss) is given in Annex 2.

4 Measurement equipment Measurement equipment shall be in accordance with clause 4 of **JIS A 1416**.

5 Test equipment

5.1 Test room The test room to be used shall be in accordance with Type I test room (reverberation room) specified in **5.1A** or Type II test room specified in **5.1B** of **JIS A 1416**.

5.2 Partitions As the partition on which the test object is mounted is much smaller than the test opening, it is necessary that the partition shall have sufficiently high sound insulation. The transmitted sound composition through this partition and any other indirect path shall satisfy either of the following conditions:

a) it is negligible compared with the sound transmitted through the test object.

or, if this condition cannot be filled,

b) the measured values shall be corrected in consideration of the influence of flanking transmission.

The flanking transmission shall be determined by the measurement of the apparent sound reduction index of the partition wall inserted in the test opening. This measurement is carried out before making the opening for the test object mounting or with plates having a high sound insulation on both sides of the opening. This sound insulation including flanking transmission shall be calculated by equation (1) as with element-normalized sound pressure level difference $D_{n,e}$ and denoted by $D_{n,e,F}$.

If the measured value of the element-normalized sound pressure level difference for the test object is less than " $D_{n,e,F} - 10$ dB", the influence of flanking transmission is negligible. If the measured value is larger than or equal to " $D_{n,e,F} - 10$ dB", it shall be corrected using by the method shown in Annex A.

NOTE : The difficulties of measurement can be avoided by increasing the number of test objects mounted in the partition unless there is sufficient difference between the flanking transmission and transmission via the test object (see **6.3.3**).

6 Installation of test object

6.1 General As the sound insulation of small building elements depends on their dimensions, the actual dimensions shall be measured for each test object precisely.

6.2 Mounting of test object Ensure that the test object shall be mounted in a manner representative of field practice with a careful simulation of normal connections and sealing conditions at the perimeter and at joints within the unit.

If the test object is openable, mount it so that it can be opened and closed in normal manner. Open and close it at least ten times immediately before testing.

In order to adjust the thickness of the partition on which the test object is mounted to the thickness of the actual wall thickness, increase or decrease the thickness of the partition around the test object. The method shall be in accordance with Annex B.

6.3 Mounting position of test object

6.3.1 Mounting position The measurement result may differ appreciably between that obtained when the test object is mounted near one or more reflective planes (wall, floor and ceiling of the test room other than the partition on which the test object is mounted) and that obtained when mounted away from those. Therefore, the test object shall be mounted on the partition in positions representative of normal usage. The measurement for the test object whose mounting position cannot be determined shall be carried out near edge positions at least in both test rooms.

For transfer air devices and electrical raceways which are normally mounted near the reflective plane other than the mounting wall, the specific mounting methods are stated in 6.4 and 6.5. For other types of elements shall be in accordance with 6.3.1.1 to 6.3.1.3.

6.3.1.1 Elements mounted away from the reflective plane other than partition Normally, elements mounted away from an adjoining wall, floor or ceiling shall be mounted in such a manner that no part thereof is within 1 m at right angles to the mounting surface. In the case where several elements are tested simultaneously, the interval between each element shall be not less than 0.85 m.

6.3.1.2 Elements mounted near an edge position Normally, elements mounted near adjoining wall, floor or ceiling and away from a corner shall be mounted not less than 1 m (0.85 m if several elements are tested simultaneously) away from the nearest plane other than the plane having the edge. Unless otherwise specified by the manufacturer, locate the end of the element 0.1 m from the edge of the wall.

6.3.1.3 Elements mounted near a corner position Normally, elements mounted on a partition near a corner shall be mounted at the distance from a corner recommended by the manufacturer.

In the case for the reflective plane not having the edge or corner condition near the test opening of the test room, it is necessary to simulate such mounting conditions by attaching the reflective panels at right angles to the partition as shown in Annex C. In this case, the reflective panel shall be attached in both sound source room and receiving room under the same condition.

6.3.2 Number of mounting positions As the building elements are small and with the influence of the spatial variations of the sound fields, the performance result may differ appreciably according to the mounting positions. For this reason, the number of mounting positions of the partition should be three. These positions shall be as follows.

- a) In accordance with 6.3.1.
- b) Locate not less than 1.2 m from each other.

NOTES 1 A position dependency also exists for apparently equivalent corners which makes it necessary to use more than one corner to achieve an acceptable precision.