# Updated field sound insulation testing Standards

*By Steve Cawser*

The Standards used for the measurement within building acoustics are currently undergoing a revision. Over the last two years, some important revisions to the Standards that cover the field measurement of sound insulation have been published with the new BS EN ISO 16283 *Field measurement of sound insulation in buildings and of building elements*. This article covers some of the changes that are included within these Standards and the potential considerations for consultants who carry out these measurements.

February 2014 saw the publication of BS EN ISO 16283-1:2014, which supersedes ISO 140-4:1998 and covers the procedures for the field measurement of airborne sound insulation. December 2015 saw the publication of BS EN 16283-2:2015, which supersedes ISO 140-7:1998 and covers the procedures for the field measurements of impact sound insulation.

The primary purpose of these revisions is to cover procedures for when the sound field within the room does not approximate a diffuse field, and includes procedures for when operators are using a hand held sound level meter. The previous Standards only permitted fixed or mechanically swept microphones. Many of the changes are common to both Standards since the same sound level measurement procedures are used in both Standards.

The requirements for instrumentation have been updated from the ISO 140 requirements for sound level meters conforming to IEC 60651 to the current sound level meter Standard of IEC 61672. This means that anyone using a meter which does not conform to IEC 61672 will have to invest in new instrumentation; however, 61672 has been around for so long now that it is doubtful whether anyone carrying out this kind of testing is still using a meter that does not conform. The new Standard gives tighter requirements on the allowable level of field calibration drift. If the calibration level changes by more than 0.5 dB, then the measurements are required to be discarded, although it is likely that many consultants will already follow a similar procedure.

One change that potentially affects many consultants comes with a change to the requirements for the type of loudspeaker used for the sound source. The previous requirements of ISO 140-4 were not well defined and gave recommendations for using a dodecahedron style loudspeaker, but only went as far as stating that the loudspeaker used should be producing a diffuse field in the source room. The way this is achieved in the source room was left to the discretion of the operator. The new 16283-1 specifically requires a uniform and omni-directional source loudspeaker. The new Standard keeps the qualification method for measuring the source directivity from ISO 140-4, but includes a new requirement to have this directivity checked every two years. The new Standard recommends the use of a polyhedral type loudspeaker and specifically mentions the use of dodecahedrons and hemi-dodecahedrons as the most suitable for achieving the directivity requirements.

This is likely to be a change for many consultants who use different types of loudspeakers as the sound source, some of which will not be suitable for use with the new Standard. From experience, many consultants prefer the use of powered PA type loudspeakers due to them being much easier to handle when on site. This type of loudspeaker is unlikely to meet the requirements of the new Standard and will require testing to demonstrate its compliance. There is also now the requirement for periodic testing of the loudspeakers used in the testing, which potentially gives an increased burden on calibration requirements.

The new Standard has relaxed the requirements slightly for sound levels in the source room. The previous ISO 140-4 required there to be no more than 6 dB difference between adjacent one-third octave bands. This has now been slightly relaxed to 8 dB and recommends the use of a graphic equaliser where the 8 dB cannot be achieved by moving the source loudspeaker position.

One change that will assist many with on-site testing is the inclusion of using held-held microphone positions rather than purely fixed microphone positions. The new Standard includes different manual scanning paths along with diagrams to assist in visualising the requirements. This could assist many consultants by speeding up time it takes to carry out the testing on site.

The new Standard includes a beneficial change to the method of averaging the measured data. There has always been some conjecture about the exact requirements of ISO 140-4 on this subject. Approved Document E of the Building Regulations gives its own specific method to make this element of the calculation clear. The new ISO 16283-1 gives specific methods for carrying out this averaging depending on whether fixed or moving microphones have been used for the survey.

Another addition that many consultants should be aware of and give some thought to is the issue of uncertainty. This is a relatively new topic to many acousticians and is becoming a topic which we all should understand in more depth. The requirements for handling uncertainty within the new ISO 16283 series are referenced to BS EN ISO 12999-1:2014 *Determination and application of measurement uncertainties in building acoustics. Sound insulation*, which provides guidance for handling the measurement uncertainty. The requirements of the ISO 16283 series is simply that the uncertainty should be determined in accordance with ISO 12999-1, but does not specify how much detail should be reported.

These changes to the Standard will not become relevant to many consultants since Approved Document E of the Building Regulations does not currently reference the new Standard.

The new BS EN ISO 16283-2:2015 gives the requirement for impact sound insulation testing in the field. The instrumentation requirement for tapping machines remain largely unchanged. The general requirements for the hammers of the tapping machine are unchanged. The only change is the introduction of a new overall weight limit for the tapping machine of 25 kg. This is to ensure that the any lightweight floors are not loaded. Since any object greater than 25 kg would have manual handling restrictions, this is not likely to be a big issue for consultants or equipment manufacturers.

The biggest change is the introduction of a new source for the testing of impact sound insulation, namely the rubber ball. This is stated as being used for assessing heavy, soft impacts, such as people walking in bare feet or children jumping. The requirements for the ball are given in terms of dimensions and material properties, along with the test procedure. However, the test procedure requires the measurement of the $L_{max}$ sound level in octave bands. However, there is no procedure for deriving a single number quantity from the rubber ball tests. The requirements also specify that the force output of the rubber ball only needs to be checked once after manufacture and as such there is no requirement for periodic verification of the performance of this source, which seems at odds with all other forms of standardised testing.

Since this is a new form of impact sound insulation testing, it is unlikely that many consultants will need to start carrying out this form of testing in the immediate future. Only time will tell if the use of the rubber ball becomes a common test process.

Most of this style of testing carried out by consultants will be for conformance with the Building Regulations. Approved Document E currently references the ISO 140 series Standards, BB93 was updated in February 2015 to reference ISO 16283-1 for airborne sound insulation but still references ISO 140-7 for impact sound insulation, so it may be some time before these changed procedures come into regular use for many consultants. However, it is certainly worth being aware of the requirements for when they come into regular use.

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