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A new Icelandic classification standard for acoustic quality.

Steindór Guðmundsson
Verkis Consulting Engineers, Ármúla 4, IS-108, Iceland, stgu@verkis.is

A proposal for a new Icelandic classification standard for acoustic quality is now in the final stages of preparation. The new standard will replace the existing standard IST 45:2003 – “Sound classification of dwellings”. The proposal will be sent out on hearing in May 2010, and it will probably become a standard in the autumn of 2010. A revised building code is also in preparation, and the plan for the minimum acoustical demands in the building code is simply to refer to the classification standard and state that “class C” is the minimum acoustical demands for different types of buildings. Similarly regarding the next revision of the noise regulation, the plan is to set the C-class demands in the new classification standard as the minimum requirements for different types of buildings.

1 Introduction

In July 2003 the Icelandic standard IST 45:2003 “Sound classification of dwellings” was approved. The standard is in English and it is identical to the Nordic standard proposal INSTA 122:1998, which was prepared by a Nordic working group in 1998.

The acoustical demands in the Icelandic building code have not changed since 1979, but in 1998 sk. “recommended values” were introduced. These values are identical to the C - class demands in the classification standard. The next revision of the building code will probably result in setting the C – class demands in the classification standard as the minimum requirements for dwellings.

The Icelandic code for noise regulation was revised in 2008, and here it is stated for dwellings, that regarding noise from road traffic, it is allowed to refer to the C – class demands in the classification standard.

2 Sound classes for various types of buildings

In 2009 the work started on a new, revised classification standard. The aim of this work was to prepare a proposal for a new classification standard for various types of buildings. This new standard will be in Icelandic, and it will include several different types of buildings:

- a) Dwellings.
- b) Secondary schools, colleges etc. (for students older than 16 years).
- c) Day-care institutions, kindergartens, primary schools (for children up to about 16 years).
- d) Hospitals and nursing institutions etc.
- e) Hotels etc.
- f) Offices.
- g) Other workplaces.

The proposal for this new standard will probably be sent out for hearing in May 2010, and hopefully it will become a standard later in 2010.

A work-group of four people has been working on this proposal, and the group has mainly used the Norwegian [1] and the Swedish standards [2, 3] as references in addition to IST 45:2003. Dwellings are kept in one chapter as in [1], and not moved to a separate standard as in Sweden, but the division between school categories is more similar to the Swedish standard than to the Norwegian one.

In some cases where the Swedish and Norwegian standards differ, some sort of an average value has been chosen, but in other cases the more strict value has been chosen. One example is the demands for kindergartens and primary schools, where the more strict Swedish values have been chosen for reverberation time demands.

For dwellings the demands in IST 45:2003 have been imported almost without changes. The parameters or the format of each chapter (each type of building) has been chosen to be the same as in IST 45:2003, see the description in part 3 below.

Another deviation between the Swedish and Norwegian standards is the choice of parameters for noise level. Similar to the Swedish standard the main parameter in the Icelandic standard proposal is chosen to be $L_{A,eq}$ sometimes supplemented by $L_{C,eq}$ for low frequency evaluation and by $L_{A,max}$ for the evaluation of single loud noise events.

3 Indoor/outdoor sound quality classification

Similar to the present standard for dwellings, IST 45:2008, limit values are set for the following parameters of the indoor sound quality of the building:

- a) Airborne sound insulation.
- b) Impact sound pressure level.
- c) Reverberation time.
- d) Indoor noise levels from building services.
- e) Indoor noise levels from transport sources.
- f) Indoor noise levels from other outdoor sources.

Also, limit values are set for the following parameters of the outdoor sound quality conditions:

- g) Outdoor noise levels from transport sources.
- h) Outdoor noise levels from building services and from other outdoor sources.

4 Changes regarding dwellings

There are only proposed some minor changes in the new standard regarding dwellings. One change still in discussion is regarding the airborne sound insulation between the dwelling and a common corridor. Some minor changes have also been made regarding different sound level parameters and limits.

There have also been introduced more specified considerations regarding noise from air traffic.

5 Changes regarding schools

The most significant changes from the present limits in the building code are proposed regarding the acoustics in schools. The present building code only specifies demands for regular class rooms. The Building Code lists criteria for the reverberation time, the sound reduction index, the impact sound level and the noise level. This is done both for normal classrooms and special classrooms. No special requirements are given for open-plan teaching spaces.

In the new classification standard, the demands in class C are somewhat stricter regarding reverberation time in normal classrooms and the same is true in rooms for young children in kindergartens. Also there are guidelines for the acoustic design of open plan teaching spaces, referring to [7] and [8] in an appendix. Here the recommendations for class C are as follows in the table below. These same demands are recommended for classes A and B, except for the reverberation time, which is 0.3 sec in classes A and B but 0.4 sec in class C.

Table 1 The recommended criteria for the acoustical design of open plan teaching spaces

Parameter	value
Reverberation time	0.3 - 0.4 sec
SPL reduction between study groups	> 15-20 dB
STI within each group	> 60 %
STI between groups	< 20 %

Table 2 The recommended limits for the reverberation time in day-care institutions, kindergartens and primary schools (for children up to about 16 years).

Type of space	Class A <i>T</i> (s)	Class B <i>T</i> (s)	Class C <i>T</i> (s)	Class D <i>T</i> (s)
Spaces in kindergartens where children stay for longer periods	0.3	0.4	0.5	0.6
In normal classrooms and meeting rooms	0.5	0.5	0.6	0.8
In classrooms for song and music.	0.8	0.8	0.8	0.8
In classrooms with noisy applications	0.4	0.5	0.6	0.8
Dining halls and multi-purpose halls (see note)	0.5	0.6	0.6	0.8
Common areas and corridors in kindergartens	0.5	0.5	0.5	0.8
Common areas and corridors (see note).	0.6	0.8	0.8	1.0
In stairwells	0.8	0.8	0.8	1.0
Large classrooms and lecture halls (see note).	Special design recommended	Special design recommended	Special design recommended	Special design recommended
Open plan teaching spaces ¹⁾ (see note).	0.3	0.3	0.4	0.5
Gymnasium ²⁾ with a volume ≤ 6000 m ³	1.0	1.2	1.2	2.0
Swimming hall ²⁾ with a volume ≤ 2000 m ³	1.0	1.2	1.5	2.0
<p>1) The acoustics must be adapted to suit people with diminished capabilities (sight and hearing) in the teaching environment according to international recommendations [9]. See also the note.</p> <p>2) In gymnasiums and other sports halls with a volume larger than the limit in the table the reverberation time limit may be increased by 0.05 s for each 1000 m³ increase in volume up to an upper limit of 2.5 s.</p>				

NOTE In large classrooms / lecture halls / open plan teaching spaces and multi-purpose halls, special acoustic design is recommended. The purpose is both to ensure that speech is transmitted sufficiently clear and understandable, and also

to ensue the qualities of different other acoustic parameters or aspects. Therefore limiting values of reverberation time are depending on the actual use of the space, and it must be noted that the reverberation time alone is not a sufficient acoustic parameter. For more information and further guidelines see [7] and [8] and also appendix B.

6 Conclusions

The new Icelandic classification standard will introduce many new demands regarding the acoustic quality in many different types of buildings.

When the new demands in class C have been introduced as regulation demands in both the building code and in the noise regulation, there will hopefully be fewer inhabitants and users of different buildings, which regard the sound quality not good enough.

Also by introducing two defined classes with better sound quality, buyers and users hopefully will be able to have the choice of buildings with a good or excellent acoustic environment, not just sufficiently good.

References

- [1] NS 8175:2008 Lydforhold I bygninger – Lydklasser for ulike bygningstyper
- [2] SS 25268:2007 Ljudklassning av utrymmen i byggnader – Vårdlokaler, undervisningslokaler, dag- og fritidshem, kontor och hotell
- [3] SS 25267:2004 Ljudklassning av utrymmen i byggnader – Bostäder.
- [4] DS 490 Lydklassifikation af boliger
- [5] IST 45:2003 Sound classification of dwellings (in English)
- [6] preIST XX:2010 Acoustics. Sound classification of various types of buildings (in Icelandic), a standard proposal
- [7] D. Hoffmeyer, Lydforhold i undervisnings- og daginstitutionsbygninger, *SBi Anvisning 218*, Hörsholm, 2008
- [8] Byggforsk, Lydregulering i skoler og barnehager, *Byggforskerien 527.305*, 2006
- [9] American Speech-Language–Hearing Association (1995): Guidelines for acoustics in educational environments. ASHA, 37 (Suppl. 14); 15-19