inter.noise
HAMBURG 2016

Acoustics and noise in Iceland; Regulatory environment

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ABSTRACT

There have been extensive changes in the regulatory environment regarding acoustics and noise in Iceland over the last decades. In this paper there will be presented an overview of the changes, and the authors experience regarding design, production of building elements, measurements (field testing) and satisfaction of the users. A brief comparison is made between regulatory classification and requirements from environmental standards. The author presents a few examples from his work as a consulting engineer in the field of acoustics and noise control.
The presentation will provide a brief overview of a classification criteria for various building types in Iceland. How is the classification and its labels used today? The new Icelandic Building Code will be reviewed and how resent changes will influence the acoustical quality of buildings.

Keywords: acoustics, noise, regulation, standards, requirements.

1. INTRODUCTION

Over the last decades, there have been several updates and changes in the regulatory environment regarding acoustics and noise control in Iceland. These updates and changes have put Iceland from being “behind” to being “experienced” regarding requirements and user satisfaction.

Requirements mainly come from three sources, Regulation on Noise, Building Code, and Sound Classification Standard, ÍST45, having four classes of quality, A, B, C and D. Class C defines minimum requirements for new buildings and renovations of buildings. It defines sets of requirements for different types of buildings, e.g. schools, hospitals, apartments, hotels etc. This standard is similar to Sound Classification Standards in other Nordic countries.

The chances have been considerable in the last 20 years, first in 1998 with the building code, then in 2005 with ÍST45, 2011 with updated ÍST45, 2012 with a new building code and in 2016 with updated ÍST45.

Requirements for environmental noise is a bit behind, with regulation updated in 1999 and in 2008. Lately there has been a demand for updated noise regulation.

2. RECENT CHANGES IN THE HOUSING ENVIRONMENT IN ICELAND

Following the financial crisis in 2008, many house owners in Iceland had to downsize, e.g. move from a single family home to a flat in an apartment building. Property prices have gone up – a lot.

Younger people have experienced severe trouble buying their first property, both because of higher property prices and unfavorable loaning conditions. The debate over rising property prices has partly revolved around greater building costs as a result of higher demands on buildings, e.g. in the general quality of residential housing, office buildings and schools regarding lighting, air quality, acoustics, sound insulation and noise.

3. USER OPINION

3.1 Sound Insulation

For the last century, concrete has been a large part of building materials used in Iceland. This has

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resulted in partitions with high sound insulation except for in elements with windows or doors. This has also made Icelandic people used to robust and quiet floors – that is with minimum of the hollow sound or squealing in timber floors.

Due to this, Icelandic people are quite used to high insulation partition, and that has been reflected in strong requirements in the building code.

In a way, this might have had the drawback that less emphasis was made on reverberation time, since there was minimum disturbance from adjacent rooms. Today, gypsum and other lighter building constructions, have gotten more common, with increased emphasis on reverberation time and special solutions for sound insulation and noise control.

3.2 Reverberation time

Before, requirements for reverberation time were few and mild and did not ensure user satisfaction at all. Part of the building industry in Iceland had realized this, and recognized the use of a Sound Quality Classification Standards from Sweden as a reference. In 2008, on behalf of Reykjavík city, there was made a research project, looking into the relationship between reverberation time and user opinion of the acoustics in teaching facilities. Swedish requirements were used as guideline when new requirements were set in the updated Icelandic requirements.

For some types of buildings/rooms there have not been any requirements over the years, even though there has been user dissatisfaction. This applies for example to cafés and restaurants, where people sometimes do not return to after the first visit due to noise and long reverberation time. Users in Iceland are overall quite well aware of reverberation time and it´s affects.

3.3 Noise from equipment

It is quite often that noise from technical equipment is a cause of annoyance. It of course depends on the circumstances what is the cause, but it can be noise from air handling unit, piping noise, but also loose equipment like projectors, refrigerators and computers.

4. DESIGNERS OPINION

4.1 Sound Insulation

In some aspects, the requirements to sound insulation have been a bit too strict. This has resulted in the trend of only the lowest requirements being fulfilled (classification C), and only a very few clients have the ambition to aim for higher quality classification, A or B. This has been especially the case with partitions of glass, or partitions with doors, whereas high insulating doors have hardly been available in Iceland, until now. The maximum has been $R'_w = 40$ dB, and these doors have been a lot more expensive than “regular” doors.

Some requirements for sound insulation are very strict and hard to fulfill, and that comes from the high expectations of Icelandic users – who are mainly used to concrete partitions over the decades.

4.2 Reverberation time

In all requirements before 2011, there was a severe lack of requirements for reverberation time. Like previously mentioned, part of the building industry was therefore started to use the Swedish Sound Classification Standard, as reference in design and renovation of buildings. With ÍST45:2011 this changed a lot, and now the requirements are even better in the recent version ÍST45:2016.

4.3 Noise from equipment

The challenge here is to involve HVAC designers more in what requirements apply to their designs, and have the client understand the importance of the selection of quiet equipment in buildings.

4.4 Guidelines in Appendix

In the newest version of ÍST45, there are guidelines in the Appendix for acoustics in open plan teaching rooms and open plan offices. In some cases, use of these guidelines can be important. It is the authors hope, that in the next version of the standard, these guidelines will become requirements instead of only guidelines in the design of open plan offices and open plan teaching facilities.

4.5 All requirements in the building code

The building code is available online, and is free of charge. The ÍST45 standard on the other hand is charged for, and is therefore not as commonly in use by designers as the building code. Therefore it would be preferable that all acoustic requirements be put in the building code, for enhanced usability.

4.6 ÍST45 and the Regulation on Noise no. 724/2008

It can be quite complicated having requirements in more than one document (Regulation on Noise and ÍST45) and in more than one ministry (Ministry for the Environment and Mannvirkjastofnun). Today, requirements for noise in the environment, e.g. traffic noise, are in Regulation on Noise no. 724/2008. These requirements are also reflected in the ÍST45 standard. The requirements are mostly the same, but their layout is quite different, and there is a one less severe requirement in ÍST45 that can take over Regulation on Noise, if confirmed by authorities (for each area). This can be quite complicated for urban planners and architects to work with without help from specialist in environmental noise.

4.7 ÍST45:2016 – Latest changes

Couple of changes were made in the newest version of ÍST45. New chapters were added with requirements for acoustics and noise in restaurants, stores, receptions, lobbies, hallways, corridors and connecting buildings, transport centrums, culture buildings and sports halls. There were also changes made to the requirements that were already in the standard, and the most severe change was regarding sound insulation between apartments and hallways.

5. RESPONSIBILITY FOR BAD ACOUSTICS?

5.1 Design

There have been a lot of changes regarding the process of determining who is responsible for bad acoustics and/or when requirements are not met. Before, responsibility was very unclear, and building projects could be made from A-Z without acoustical design. Today, requirements are more extensive, and it is hard for designers other than acousticians to realize and understand all requirements made to acoustics and noise control. On top of that, authorities now demand that designers sign for every aspect of the building design that they are responsible for. In general, the main designer (architect) is responsible for acoustical design and noise control, unless he assigns this responsibility (and design) to someone else. If the main designer does not do this early on in the design phase, he could end up with the situation that no acoustician is willing to take on the responsibility.

In the design phase, two reports on acoustical design are preferred for authorities. The first one is mandatory where the requirements for the project are stated along with a description of intended solutions to fulfill the requirements.

5.2 Suppliers responsibility

It is sometimes hard to get reliable data from suppliers. Quite often, the designer must interpolate/calculate measurement results from suppliers, to estimate the qualities of the products they are selling. A resent example is a statement that parquet underlay fulfilling impact noise reduction of 28 dB in $L'_{n,w}$ values. When investigated, the product only gave a 19 dB reduction, when used with a concrete slap – which is prevalent in the Icelandic building market.

5.3 Construction phase and field testing

In the construction phase, all finishing details are vital for proper sound insulation. Having a good design does not thereby ensure good sound insulation or acoustic. Design data must be very precise, and contractors must be aware of that fulfilling adequate finishing details is involved in the construction. It is authors' experience, that all involved can learn a lot from field testing. It can be valuable to conduct field testing with the construction manager present, so he/she can learn in the process about the importance of finishing. Field testing can also be very important for designers as an quality check for their design, in terms of sound insulation, reverberation time (and modelling) and noise from technical equipment.

6. CONCLUSIONS

It is expected that with the new version of the standard, ÍST45:2016, along with more emphasis on responsibilities of designers, suppliers and contractors that the acoustical quality of buildings will rise in the next years. There is however a need for all involved to take responsibility and work together to achieve the mission. It is important to enhance continuous development and look for new aspects and challenges in acoustics and noise control in Iceland.

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