Sound Classification of Dwellings

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Several countries have national standards that allow a choice for the acoustic quality of dwellings, but New Zealand does not have an equivalent. Ken McGunnigle, on behalf of the New Zealand Acoustical Society, has been finding out what equivalent system could work here.

Several years ago Gib® Noise Control for Homes was a major national promotion and soon afterwards I set up an international e-mail work group to find a suitable framework for the acoustic quality for homes.

The German guidelines issued by the German Institute of Engineers VDI 4100 were translated into English and distributed to the overseas and local members. A copy of the English version of INSTA 122:1997 (Nordic standard) was also obtained and distributed.

A survey of the work group members asked three basic questions:

Do we need to do a local survey of a need for acoustic quality for homes?

Should New Zealand have an acoustic quality guideline document for homes?

Which standard or guideline document to use as a base?

The feedback from the survey was that there was no need to carry out a local survey, that New Zealand does need an acoustic quality document and that the most favoured document to use as a base was INSTA 122:1997.

The reason for the international input was that we do not have experience in New Zealand of an acoustic quality standard for dwellings and we would need to have guidance from those persons in other countries who have this experience so that they are able to guide us appropriately.

The purpose of the local input was to ensure that the guidelines for acoustic quality meet the requirements of the New Zealand Building Code, that local forms of construction can meet the performance and better awareness of any local difficulties with the acoustic concepts.

The intent at this stage is minimal change to INSTA 122:1997 and only modify as necessary in order to comply with the measurement parameters of the New Zealand Building Code Clause G6 Airborne and Impact Sound, which is in the process of being revised and amended [see page 9 of this journal].

I believe that a guidance document should not be introduced at this time in the absence of the corresponding building regulation. However, this extract will serve to give an outline of the intent for an overall framework into which the revised and amended NZBC Clause G6 will ulitimately become an integral part.

From observation of the German example with VDI 4100 (Institute of German Engineers), which was adopted 5 years later by DIN (German Standards Organization), it is probable that an appropriate form of action would be to provide guidelines in the first instance, perhaps via BRANZ or BIA or the New Zealand Acoustical Society, and then once the classification system is established then perhaps Standards NZ may become involved and secure funding from industry to provide a National standard.

It is most probable that a document for sound classification of dwellings would promote research and development of best practice acoustic insulation products and systems.

Experience in Norway showed that the construction industry welcomed the INSTA 122:1997 acoustic quality standard and it gave them a challenge to improve their performance so that they could realise an opportunity and get exports into Europe.

The opportunity for market growth and product development is an attractive aspect which must be emphasised during this process of promoting the sound classification of dwellings document.

A similar preliminary document for "star rating" the acoustic quality of apartments and townhouses has been introduced in Australia by the Association of Australian Acoustical Consultants.

The following is an extract from the Nordic standard INSTA

Type of space	Class A $R'_w + C_{50\text{-}3150}$ (dB)	Class B $R'_w + C_{50\text{-}3150}$ (dB)	Class C R'_w (dB)	Class D R'_w (dB)
Between a dwelling and premises for work or service with noisy activities or common garage	68	63	60	55
Between a dwelling and other spaces outside the dwelling	63	58	55	50
Between at least one habitable room and other spaces in the same dwelling	48	43	-	-

Table 1 – Airborne sound insulation. The lowest values of the weighted apparent sound reduction indices, R'_w or $R'_w + C_{50\text{-}3150}$

122:1997 on sound classification of buildings.

Introduction

The building regulations of the Nordic countries specify minimum requirements for sound insulation, noise levels from different sources and for reverberation times in dwellings. The minimum requirements do not guarantee inhabitants to be undisturbed, and in many cases a better sound climate should be the aim.

The purpose of the standard was to make it easier for building designers to specify a standardized sound climate in dwellings, and to promote constructors to improve the acoustic qualities of dwellings so that not just minimum requirements are satisfied. The standard may also be used by the inhabitants, contractors, consultants, authorities etc. as a base for contracts or as guidance on how to obtain a better sound climate in dwellings.

Scope

The standard specifies a sound classification system with four classes A, B, C and D for dwellings and its outdoor areas.

The classification includes limit values for airborne sound insulation, impact sound pressure level, reverberation time, sound pressure levels (noise levels) in the dwellings from indoor or outdoor noise sources, like building services in the same building or buildings nearby, transport, industry or other sources.

In this article only airborne and impact sound are covered.

Classification

Sound class A

Sound class equivalent to an especially good sound climate where the inhabitants only occasionally will be disturbed by sound or noise.

Sound class B

Sound class corresponding to a considerable improvement of the sound climate compared to the minimum requirements given in class C. Inhabitants may be disturbed in some cases.

Sound class C

Sound class intended as the minimum requirements for new buildings.

Sound class D

Sound class intended for older buildings with a less satisfactory sound climate, e.g. for renovation. Not intended for new buildings.

Airborne sound insulation

The limit values of the sound classes for airborne sound insulation are shown in Table 1

Impact sound pressure level

Table 2 gives the limit values of the sound classes for impact sound insulation.

Summary

The following conclusions may be drawn on the condition that the age distribution of inhabitants and other sociological parameters in a living area are statistically normal.

It can be expected that the step of 5 dB from one sound class to the next is about equivalent with an increase of the percentage of satisfied inhabitants by 20 %, and that the percentage of dissatisfied inhabitants simultaneously decreases by 20 %.

Within each sound class the percentage satisfied or dissatisfied inhabitants may differ somewhat from one acoustic criterion to another.

The following grouping of expectations is mainly based on the subjective assessments of airborne sound between dwellings and impact sound from adjacent dwellings.

Sound class A:

It is expected that more than 90% will evaluate the acoustic

conditions as good or very good.

Sound class B:

It is expected that 70 to 85% will evaluate the acoustic conditions as good or very good. Less than 10 % will evaluate the acoustic conditions as poor.

Sound class C:

It is expected that 50 to 65% will evaluate the acoustic conditions as good or very good. Less than 30 % will evaluate the acoustic conditions as poor.

Sound class D:

It is expected that 30 to 45% will evaluate the acoustic conditions as good or very good. Between 25 and 50 % will evaluate the acoustic conditions as poor. ❑

Type of space	Class A $L'_{n,w}$ and $L'_{n,w}+ C_{I,50\text{-}2500}$ (dB)	Class B $L'_{n,w}$ and $L'_{n,w}+ C_{I,50\text{-}2500}$ (dB)	Class C $L'_{n,w}$ (dB)	Class D $L'_{n,w}$ (dB)
In habitable rooms from premises for work or service with noisy activities	38	43	48	53
In habitable rooms from other dwellings	43	48	53	58
In habitable rooms from a stairwell, corridor, access balcony or similar, and from sanitary accommodation in other dwellings	48	53	58	63
In at least one habitable room from another space in the same dwelling	58	63	-	-

Table 2 – Impact sound pressure level. The highest values of the weighted normalized impact sound pressure levels, $L'_{n,w}$ or $L'_{n,w} + C_{I,50\text{-}2500}$