Sound insulation quality in Dutch dwellings

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Introduction

In the context of the EAA symposium on *Building acoustic quality*, an overview is given of the current situation in Germany, Belgium and the Netherlands. The topics considered are the current common building techniques, the legal minimum requirements, the desirable acoustic quality and the building techniques to achieve a higher acoustic quality.

Current common building techniques

The current building techniques for dwellings uses generally heavy building elements. Typical separation walls are made of brick or concrete of 500 to 600 kg/m^2 and separation floors are concrete floors of 450 to 600 kg/m^2. For row-houses also cavity walls are used, typically 2x 200 to 350 kg/m^2, but this is a minority nowadays. To fulfil the legal requirements with these walls and floors, certainly the lighter ones, not all types of connected building elements are allowable as inner walls or facades. Much of the dwellings comply with the guideline NPR 5070, which specifies the allowable connected elements depending on the type of separation wall; see example in Figure 1.

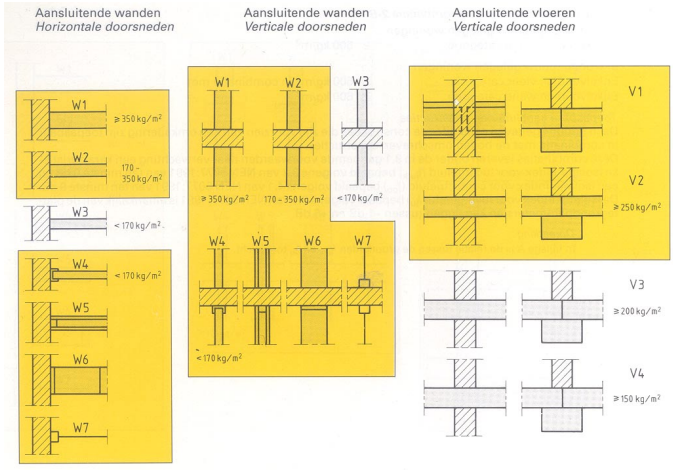

Figure 1: Indication of allowable connected elements (yellow) to a given type of separation wall; connection details specified also in the guideline NPR 5070.

Legal minimum requirements

The legal minimum requirements are specified in the Building Code (Bouwbesluit) on the basis of the former standard NEN 1070, using specific Dutch single number ratings not for a room but globally for the average of rooms on one building level. Table 1 gives these requirements with a global translation in European single number ratings using the spectrum adaptation terms.

Acoustic aspect	*Dutch requirement*	*translated requirement*
Airborne sound	$I_{lu;k} > 0$ dB	$R_A=R_w+C >53$ dB
Impact sound	$I_{co} > 0$ dB	$L_{n,A}=L_{nT,w}+C_I <59$ dB
Outdoor sound (noise load B)	$G_{A;k} >$ B-35 dB	$R_{Atr}=R_w+C_{tr} >$B-32 dB
Equipment sound	$L_{IA;k} < 30$ dBA	$L_{nT,A,max,S} <$25-30 dBA

Table 1: Legal minimum requirements for dwellings.

The permission to start building belongs to the local authorities that can also check afterwards. A few local authorities only do actual measurements; most of the time those are focussed on the sound insulation of the façade in order to check whether the subsidized improvement has been indeed achieved. However, from various studies it shows that nowadays normally these legal requirements are met for new built houses.

Acoustic quality classes

The renewed version of NEN 1070 specifies five quality classes using the European single number ratings with spectrum adaptation terms. The insulation requirements for each class are deduced from the acceptable received sound level, taking into account the type of sound, temporal variations and subjective rating. Table 2 gives these requirements for two classes, III and II.

Aspect, quantity		*Class III*	*Class II*
Airborne sound	$D_{nT,A}=D_{nT,w}+C$	>52	>57
Impact sound	$L_{nT,A}=L_{nT,w}+C_I$	<53	<48
Outdoor sound	$D_{g,Atr}=D_{2m,nT}+C_{tr}$	>B-23	>B-18
Equipment sound	$L_{I,A}=L_{nT,max,S,A}$	<30-35	<25-30

Table 2: Requirements of renewed NEN 1070 for two Classes.

The current legal requirements correspond with the Acoustic quality class III. One could say that this is apparently considered as '*sufficient*', the standard specifies that this class '*gives protection against unbearable disturbance under normal behaviour of the occupants, bearing in minds the neighbours*'. At least one class higher quality (class II) would be desirable, which could be called '*good*', giving '*normally a good protection against intruding sound without too much restraints on behaviour of the occupants*'.

Needed building techniques for better quality

Many consider now the acoustic quality class II as the preferred acoustic quality for future sustainable buildings. This requires about a 5 dB better insulation than the current legal level. This is of course possible but does require improved building designs, details and accuracy of production. A new version of the guideline NPR 5070 is in preparation, which also specifies constructions for this higher quality level. Typical separation walls must be preferable cavities walls or otherwise be at least 650 kg/m^2. To a basic floor of 550 to 650 kg/m^2 a floating floor have to be added with at least $\Delta L_{lin} = \Delta L_w + C_{\Delta I} > 10$ to 13 dB. The guideline will have to give much attention to details for the junctions and details for the floating floor construction in order to avoid the bad experience with this type of floors in the sixties and to really realize the higher quality. Since the adaptation terms give more attention to low frequencies, German floating floor experience cannot simply be 'exported'.

References

[1] NPR 5070, *Noise control in buildings – Examples of partition walls and floors*, The Netherlands, 1993 & draft 2003.

[2] NEN 1070, *Noise control in buildings - Specification and rating of quality*, The Netherlands, 1999.