BNAM 2026
Baltic-Nordic Acoustics Meeting
May 04 - 06 2026 Gothenburg, Sweden

Practical Experience from Working with SS 25268:2023

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Since the publication of the latest revision of SS 25268 – Sound Requirements for Spaces in Non-Residential Buildings – three years of practical experience have been gained from its application in consultancy projects. Experience of project planning and on-site measurements has highlighted several areas where the current requirements could be improved.

This paper discusses the need for a simplified approach for defining sound insulation requirements in trivial cases. A requirement presented as weighted apparent sound reduction index, R'_{w}, rather than weighted standardized level difference, $D_{nT,w}$, is considered sufficient in such cases, like the approach used in previous versions of the standard. Based on practical experience, requirements of weighted apparent sound reduction index with appropriate margins are proposed.

Regulations defined as standardized level difference instead of apparent sound reduction index has led to the need for increased safety margins when planning sound insulation between small rooms. Results from on-site measurements are presented and the difference between the current and previous version of the standard is discussed. The results show that the corresponding apparent sound reduction index can differ by up to 6 dB, which needs to be addressed early in the planning process.

This paper also discusses the need for a revised version of the room acoustics tables, which in its current form are extensive with several similar requirements. Furthermore, the current layout does not align with the other tables in the standard, where requirements are defined by acoustic room function rather than room designation. A revised table structure, developed for offices, is presented.

Finally, adjustment to room acoustics requirements is discussed, where we propose extended use of specialized room acoustic studies. The paper also addresses a need for clarification that the requirements correspond to calculated Sabine reverberation time and not measured reverberation time T_{20}.

1 Introduction

In Sweden, there are approximately 14,000 schools and preschools, 1,200 hospitals and primary care facilities, 25,000 office premises, and around 2,000 hotels. A common feature of all these types of facilities is that they are subject to acoustic requirements defined in the standard SS 25268, either through regulation by authorities or through established industry practice.

The first edition of the standard was published in 2001 and has since played a central role in shaping the acoustic environment of Swedish non-residential buildings. In 2023, a major revision of SS 25268:2007 [1] was carried out with the aim of better reflecting the complex and varied functional requirements associated with today's building types. The revised standard was therefore intended to provide a more appropriate framework for acoustic planning and assessment.

However, three years of practical consultancy work with the implementation of SS 25268:2023 [2] have made us identify several recurring areas in need of further development. These experiences indicate that the standard, in its current form, shows shortcomings in certain respects and that additional improvements are necessary to ensure its practical usability, relevance, and clarity. Due to the limited scope of a conference paper, the examples presented do not aim to provide a statistical overview, but rather to illustrate recurring patterns we have observed across multiple projects.

2 Simplified Approach for Airborne Sound Insulation

2.1 Consequences when changing from R'_w to $D_{nT,w}$

In the most recent revision of SS 25268 [2], airborne sound insulation requirements are expressed as standardized level difference $D_{nT,w}$, rather than as apparent sound reduction index R'_w. While R'_w represent the built-in performance of a separating construction, $D_{nT,w}$ depends not only on the construction but also on the relation between the separating area and receiving room volume. For designers who prescribe sound classification for separating elements, this has the consequence that the level difference must be recalculated into an equivalent sound reduction index to select building components with sufficient acoustic performance.

The change enables a more differentiated specification of separating constructions, with higher precision in the required values. For example, different wall types can be specified in steps as small as 1 dB. However, such a level of detail is not always requested or appropriate. In many projects, a limited number of wall types, doors, and glazing systems are defined, and these are used in all situations where the acoustic requirements are similar. In these cases, detailed calculations of the resulting airborne sound insulation add little practical value, since the chosen construction will be the same regardless of minor variations in room geometry. It is nevertheless important to emphasize that the resulting calculated airborne sound insulation remains highly relevant when sound insulation measurements are carried out in completed buildings.

2.2 Proposed Annex with Default R'_w-values

To facilitate the design process, we propose that a supplementary informative annex is introduced in SS 25268:2023 [2]. This annex should contain typical default values of the resulting apparent sound reduction index, R'_w, for a selection of commonly occurring room types. Typical default values represent the highest reduction indices that normally arise under normal relationships between the area and volume. The values in the table would therefore lead to requirements that are equally high or higher than the $D_{nT,w}$-values, providing a conservative yet practically useful method for design work based on simplified assumptions. A proposed layout for such table is presented in Table 1.

The requirements for spaces needing speech privacy are divided into two categories, depending on the relationship between the separating area and the receiving-room volume. The threshold value of volume = 3.1 × separating area reflects the point at which $D_{nT,w}$ and R'_w-values are equivalent. This makes 3.1 a suitable limit for distinguishing requirements intended for small rooms from those intended for larger rooms. The requirement between a space with a need for speech privacy and a larger open space has been adapted to a proposed new footnote, where a sound insulation of $D_{nT,w}$ = 42 dB is accepted for separating constructions with a door or glazed section facing a large open-plan office. This footnote is discussed under section 3 below.

Table 1: Minimum weighted apparent sound reduction index R'_w for separating constructions between commonly occurring room types

Type of room	Minimum weighted apparent sound reduction index R'_w		
	From corridor	From large open space	From other spaces
Space that requires speech confidentiality *Examples: head teacher's office, school nurse, psychologist, executive office, hotel guest room between different functional units*	38	48	54
Space requiring speech privacy, with room volume > 3.1 × separating area *Examples: meeting rooms ≥ 50 m², conference rooms, staff rooms in schools*	34	38	44
Space requiring speech privacy, with room volume < 3.1 × separating area *Examples: rooms for consultation, small meetings, telephone*	34	37	48
Space with normal or elevated need for disturbance protection in schools, without requirements for speech privacy or confidentiality *Examples: classrooms, lecture rooms, group rooms, student counselling rooms*	40	40	48
Space with elevated need for disturbance protection in healthcare facilities and offices *Examples: patient rooms for rest and sleep, quiet rooms, treatment rooms*	34	46	48
Space with normal need for disturbance protection in healthcare facilities and offices *Examples: examination rooms, offices, administrative rooms*	34	38	38
Hygiene rooms *Examples: WC, changing room*	30	35	44

2.3 Scope and limitations

In connection with the table, the standard should clearly state that the default values are intended solely for trivial or commonly occurring cases. These values are therefore not intended to replace project-specific calculations in cases where room geometry, acoustic function or other design conditions deviate from typical scenarios. In situations where there is a risk that the resulting airborne sound insulation could exceed the default value, for example in rooms with irregular shape, a full recalculation based on the required standardized level difference must always be carried out. It should also be emphasized that the simplified approach does not remove the need for appropriate safety margins, as discussed further in section 3. The table presented above would significantly facilitate simplified design work and ensure that different companies within the industry make consistent assessments and decisions.

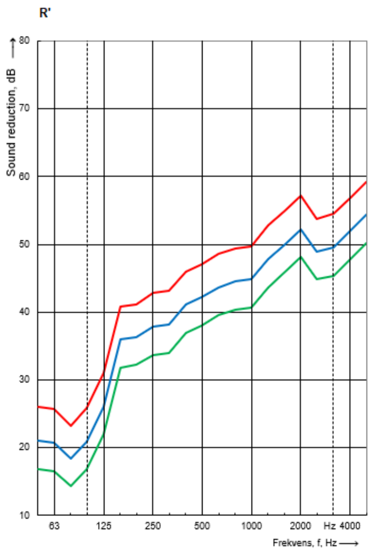
3 Practical Safety Margins for Acoustic Design

3.1 Variation Caused by Volume/Area Ratio

As described in the previous section, the transition from requirements expressed as $D_{nT,w}$ instead of R'_w has led to a situation where the resulting sound reduction index varies depending on the relationship between the separating area and the volume of the receiving room. R'_w becomes higher than $D_{nT,w}$ value when the volume of the receiving room is less than 3.1 × separating area. In practice, R'_w rarely exceeds $D_{nT,w}$ by more than approximately 4 dB, since rooms seldom have a width or depth smaller than around 1.2 m. In rooms with large volumes and short reverberation times, the opposite effect occurs[1]. For calculations involving a large room with ceiling-mounted acoustic treatment, R'_w can be up to 5 dB lower than the required $D_{nT,w}$ value.

These relationships are well known to designers in building acoustics. However, one aspect that can easily be overlooked is that the previous edition, SS 25268:2007 [1], required the separating area to be assumed to be at least 10 m², even when the area was smaller. For very small rooms, this prescriptive value can result in an assumed separating area larger than the actual room volume. This has particular importance for calculations and measurements in very small rooms, here illustrated with a telephone room with typical dimensions of 1.2 × 1.2 m and a ceiling height of 2.7 m. In such cases, using the prescribed separating area leads to resulting sound reduction index values approximately 5 dB higher than if the actual separating area had been used.

Figure 1 illustrates an example from practice: airborne sound insulation between two horizontally adjacent telephone rooms with the dimensions described above. In SS 25268:2007 [1], telephone rooms were defined as spaces with moderate confidentiality requirements and were, in this example, assigned the requirements of sound class C, corresponding to a minimum requirement of $R'_w = 44$ dB from the adjacent space. In SS 25268:2023 [2], the corresponding room is assumed to be classified as a space with a need for speech privacy and normal disturbance protection, which results in a basic requirement of $D_{nT,w} = 44$ dB.



	blue	red	green
f [Hz]	R' [dB]	R' [dB]	D' [dB]
50	21,1	26,0	16,9
63	20,8	25,7	16,6
80	18,4	23,3	14,3
100	20,9	25,8	16,8
125	26,1	31,0	22,0
160	36,0	40,9	31,8
200	36,3	41,2	32,2
250	37,9	42,8	33,7
315	38,2	43,1	34,0
400	41,1	46,0	36,9
500	42,2	47,1	38,0
630	43,7	48,6	39,6
800	44,5	49,4	40,4
1000	44,8	49,7	40,6
1250	47,9	52,8	43,7
1600	49,9	54,8	45,8
2000	52,2	57,1	48,1
2500	48,9	53,8	44,8
3150	49,6	54,5	45,4
4000	52,0	56,9	47,8
5000	54,3	59,2	50,2

blue	R´w =	45 dB
	Area	3 m2
	Room volume	4 m3
green	DnT,w =	41 dB
	Area	1,3 m2
	Room volume	4 m3
red	R´w =	50 dB
	Area	10 m2
	Room volume	4 m3

Figure 1: Measured airborne sound insulation, evaluated as level difference and as apparent sound reduction index using two different separating areas

The example illustrated in Figure 1 shows that, although the requirement is 44 dB in both editions of the standard, the differences in calculation assumptions lead to substantially different assessments of the same separating construction. Under SS 25268:2007 [1], the construction would have been judged to satisfy the requirement of $R'_w = 44$ dB with a margin of 6 dB. When evaluated according to SS 25268:2023 [2], the same construction now falls short by 3 dB. This means that a separating construction that just meets sound class C according to SS 25268:2007 [1] must, in this example, be designed with a sound reduction index 10 dB higher than before to satisfy the basic requirement in SS 25268:2023 [2].

This difference has practical consequences for design and construction choices. An increase of 10 dB in sound reduction is considerable and can, for example, require thicker walls, different types of framing systems, and changes to how wall junctions can be constructed.

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[1] For larges spaces, Annex C of SS-EN ISO 16283-1 [3] states that the volume of the receiving room shall be limited to the part of the room where the sound pressure level is no more than 6 dB below the level measured at one meter from the separating construction, thus limiting the R'_w-value.

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3.2 Effects in Small Rooms

Under SS 25268:2007 [1], it was common practice in the industry to apply the corridor requirement also to separating constructions with doors facing larger open spaces. For small telephone rooms adjacent to an open-plan office, this interpretation resulted in a minimum requirement of $R'_{w} = 30$ dB and a resulting requirement of $R'_{w,10m^2} = 25$ dB. In SS 25268:2023 [2], it has been clarified that an open-plan office is not a corridor and should therefore be handled in the same way as any other adjacent room, with the additional condition that the volume of the office space must be limited to 10 × the separating area. For a telephone room requiring speech privacy, this leads to a requirement of $R'_{w} = 39$ dB towards the open-plan office, which is 14 dB higher than the resulting requirement under SS 25268:2007 [1].

$R'_{w,10m^2} = 25$ dB is insufficient, but at the same time, the current requirement of $R'_{w} = 39$ dB represents a substantial increase compared to previous practice, having consequence that doors and glazed walls need to be selected with significantly higher sound-insulating performance than what has traditionally been used in office environments[2].

3.3 Proposed Footnote for Sound Reduction from Open-Plan office

Although the effect described above is most pronounced in very small rooms, the transition to $D_{nT,w}$-based requirements also increase the corresponding R'_{w} for larger rooms adjacent to open-plan offices. Thus, the resulting requirement of R'_{w} = 39 dB is significantly higher for all spaces requiring speech privacy, even if the relative increase is less substantial in large rooms. Based on this, it is proposed that a new footnote be introduced in the table for weighted standardized level difference for office buildings. The table value of $D_{nT,w} = 44$ dB, from a space requiring speech privacy to a receiving space with a normal need for disturbance protection, would be supplemented with the following footnote:

"For a separating construction with a door or glazed section providing visual oversight of activities outside the room, and where the adjacent space is a large open area intended with low speech levels, a value of $D_{nT,w}$ = 42 dB is acceptable."

This corresponds to a resulting sound insulation requirement of $R'_{w} = 37$ dB, which makes it possible to fulfil the sound requirements with a reasonable margin. $R'_{w} = 37$ dB also matches the resulting requirement in the opposite direction, from the open-plan office to the telephone room, provided that the sound level from speech in the office is low and that the room in question has a normal need for disturbance protection. The proposed footnote therefore does not change the level of disturbance protection provided to the smaller room.

It does however stand in conflict with some extended requirements: In the extended requirements of SS 25268:2023 [2], it is stated that open-plan offices shall be assumed to generate normal speech levels. This means that the requirement from the open-plan office to adjacent rooms is higher than under the basic requirements. For the telephone room used as an example here, and assuming a need for speech privacy, this results in a corresponding apparent sound reduction index of $R'_{w} = 41$ dB, which exceeds the condition specified in the proposed footnote of $D_{nT,w} = 42$ dB. The proposed footnote is therefore not compatible with the extended requirements these must therefore be reformulated.

Taken together, these findings show that the transition to standardized level difference in SS 25268:2023 [2] affects which constructions need to be selected and what must be considered during the design process, particularly for small rooms. At the same time, the same conversion principle means that separating constructions between large rooms can, in many cases, be designed as simpler constructions than before. If the proposed footnote is introduced in the table concerning standardized level difference for office premises, doors and glazed sections corresponding to long-established industry practice can continue to be used, without increasing the risk that sensitive information is unintentionally disclosed to adjacent open-plan office areas.

4 Simplification of Room-Acoustic Tables

4.1 Limitations in the Current Tables

Our experience is that room-acoustic design is carried out differently by different acoustical consultants. Some undertake detailed investigations and ray-tracing analyses, whereas others mainly rely on simplified design approaches. This often leads to varying outcomes. The current structure of the room-acoustic requirements lends itself to divergent interpretations

[2] In many cases, such high-performance components are considered unnecessary, not least because workstations in an open-plan office are often located several meters away from the separating construction. Further: higher sound insulation requirements increase the need for silencers and duct separation, which can influence both costs and space requirements.

and results in inconsistent practical design solutions, and the tables are difficult to read because they contain many rows with very similar requirements.

A major issue is that it is unclear how the requirements are intended to be verified. Although the standard states under Section 6 that verification shall be carried out through calculations, it is not sufficiently clear that the requirements refer to calculated Sabine reverberation time and not to measured reverberation time. This information must be stated in direct proximity to the tables. As part of this clarification, it also needs to be specified which standardized furniture layout should be assumed in the calculations. This is particularly important because the measured reverberation time in a large, unfurnished room is often significantly longer than the calculated Sabine reverberation time. To avoid misunderstandings, all instructions related to reverberation-time measurements should be removed from the standard.

When SS 25268 was revised, there was a stated ambition to abandon room names as the primary basis for requirement specification and instead focus on the intended acoustic function of each space. This shift has not been implemented in the room-acoustic tables, where requirements continue to be defined largely by room names. Where room function is specified, the terminology used differs from the wording employed in other parts of the standard. The result is extensive and difficult-to-navigate tables in which several rows describe similar, or practically identical, requirements. This complicates both interpretation and application.

4.2 Proposed Function-Based Table Structure

To address these issues, we propose a simplified table structure based on the principles described above:

- **Fewer rows**: in the example for office buildings, the previous 15 rows are reduced to 5.
- **Requirements based on how the space is intended to be used**, rather than on its room designation.
- **Clear specification that the requirement refers to calculated Sabine reverberation time**.

An example of such a table is shown in Table 2. On the second room, specialized room acoustic assessment is mentioned. This concept was introduced in SS 25268:2023 [2] and refers to an advanced analysis that goes beyond a simple reverberation-time calculation. This will be discussed further under Section 5.

Table 1: Proposed New Layout for the Room Acoustics Requirements Table for Office Premises

Acoustic function	Examples of room designation	Maximum calculated reverberation time, T [seconds]	
		125 Hz	250 Hz – 4 kHz
Acoustic complex spaces	Lecture hall, open-plan offices < 100 m^2	Specialized room-acoustic assessment required	
High requirements for speech intelligibility and disturbance control[a]	Small consultation rooms for 1-2 persons	0,5[b]	0,4[b]
Thus, in large open spaces intended for office work[c]	Open-plan offices > 100 m^2	0,6[b]	0,4[b]
Elevated[a] or normal requirements for speech intelligibility and disturbance control[d]	Rooms for meetings, dining or staff, offices, quiet rooms	0,7[b]	0,5 [b]
Low requirements for speech intelligibility and disturbance control	Corridor, lift lobby, cloakroom, changing room	-	0,6 [b e]

a In rooms smaller than 10 m^2, the room's walls shall be fitted with sound-absorbing surfaces corresponding to at least 8 % of the total wall area, with absorption class A according to SS-EN ISO 11654, or equivalent. These absorbent surfaces shall be mounted at ear height for occupants and on at least two non-parallel walls.

b The reverberation-time calculation shall be performed according to EN 12354-6:2003, Section 4.4. In rooms smaller than 20 m^2 with many enclosing walls constructed of concrete, stone, or other heavy materials, an additional 0.2 s is permitted at 125 Hz.

c The ceiling absorption shall be at least $\alpha_w = 0.9$ and $\alpha_{125\ Hz} = 0.35$. Furthermore, at least one room suitable for private conversations shall be available for every 50 m^2 of open office area.

d In rooms with a ceiling height greater than 3 m and less than 4 m, and in rooms exceeding 200 m^3, an additional 0.1 s is permitted.

e In spaces used solely for passage, such as stairwells and connecting corridors, the maximum reverberation time shall be $T_{20} = 1.2$ s.

The purpose of the function-based table is to clarify the structure of the requirements without reducing the level of detail. An updated version of the current Annex B in SS 25268 [2] could provide valuable guidance on how traditional room designations can be interpreted in terms of acoustic function.

4.3 Minor Adjustments to Requirement Values

The requirement values in the proposed table structure are largely consistent with those in the current standard. The most notable change is that standard office rooms are proposed to receive a single unified requirement of 0.7/0.5 seconds, instead of retaining the separate row for single-occupancy offices with the value 0.8/0.6 seconds. The difference between these values is small and is not judged to justify a dedicated row, especially in a model that aims to clarify functional categories rather than specific room types.

In addition, the new Note a in the proposed table includes a relaxation of the requirement for small rooms with enclosing walls of heavy materials, such as concrete, where an additional 0.2 seconds is permitted at 125 Hz. The rationale for this relaxation is that achieving compliance with the current Sabine-based requirement often demands extensive wall treatments, and these measures are not considered proportionate to the acoustic needs of such rooms.

To comply with requirements for standardized calculations as stated in Note b, the section 5.3.5 in SS 25268:2023 [2], which provides additions and clarifications to the room acoustics requirements, should be extended with instructions on preferred calculation assumptions. In particular, the treatment of furniture must be specified. This may be done by adding the following addition: *In all spaces except those with low requirements for speech intelligibility and disturbance control, calculations shall assume a standardized furnishing with α = 0.2 over the floor area for octave bands 125 Hz to 4 000 Hz.*

With minor adjustments, the same structure could also be applied in healthcare facilities and educational buildings, where the requirements are currently divided across several similar room types.

5 Specialized Room-acoustic Assessment

5.1 Purpose and Applicability

An appropriate acoustic design is influenced not only by reverberation time and the amount of sound absorption. When analysing speech intelligibility, masking noise, furnishing density, and other relevant parameters, a wide range of design solutions may be satisfactory or appropriate. We therefore argue that the standard should allow greater flexibility for qualified experts to deviate from the tabulated requirements, provided that a thorough assessment is carried out and that the deviation is agreed upon with the client, tenant, and other relevant stakeholders. Such a deviation should be documented in the form of a specialized room-acoustic assessment that describes room functions and user flows with attention to the overall acoustic performance. This approach is particularly suitable in refurbishment projects, where conventional acoustic solutions may be technically difficult to implement and is also relevant in situations where the client requests an acoustic environment that differs from a traditionally "damped" room.

We have encountered several cases where the client or end-user has explicitly requested qualities other than those achieved by following the current guidance given in SS 25268. A common example is when an absorber ceiling is not desired for architectural or functional reasons, which often leads to difficulties to fulfil the calculated maximum reverberation time. When designers then inform the client about the possibility of making "deviations" from the standard, considerable uncertainty often arises, since many clients request documentation confirming compliance with the standard without reservations. A specialized assessment resolves this by allowing other acoustic qualities to be considered, resulting in a holistic judgement where the solution may still be regarded as fulfilling the intentions of the standard, even if it does not meet the tabulated requirements directly. Verification is then performed according to the methodology defined in the specialized room-acoustic assessment.

5.2 Required Methodological Standards

We propose that a statement should be included above the room-acoustic requirement tables, clarifying that:

The requirement values may always be deviated from if a specialized room-acoustic assessment demonstrates that the intentions of the standard can be met through alternative acoustic objectives or design criteria.

As specialized room-acoustic assessment gain increased importance within the standard, the underlying concept needs to be further defined. The current edition of SS 25268:2023 [2] does refer to the term, but only states that such an assessment must be "professionally executed." In future revision, more explicit conditions are needed to ensure the quality and reliability of such assessment. We propose that the following formulation be added under Section 5.3.5.2, which describes specialized room-acoustic assessment:

The assessment shall clearly present the assumptions, limitations, and uncertainties of the method. It shall be carried out by an acoustician with documented competence in room-acoustic modelling and prediction. Furthermore, the assessment shall be based on one or several advanced room-acoustic analyses that go beyond a Sabine calculation of reverberation time. Examples include ray-tracing-based modelling of sound propagation, evaluation of early reflections using parameters such as C50 or D50, or predictions of speech intelligibility using STI. The methodology shall be based on the acoustic needs of the room function and shall lead to clearly formulated target parameters that can be verified according to relevant standards. To avoid inappropriate use, a specialized room-acoustic assessment should only be applied when clearly justified and documented, and not to bypass standard requirements.

With this methodology, the assessment provides a decision-making basis that is at least as reliable as the tabulated requirements, while also allowing the acoustic performance to be adapted more precisely to the specific conditions of the room in question.

6 Conclusion

The practical experiences presented in this paper show that several opportunities exist to improve SS 25268:2023 [2] without compromising the overall intentions of the standard. Implementing the proposed changes would make the requirements more consistent across different categories while also being more practical to apply in real projects.

Introducing a normative annex with default values expressed as apparent sound reduction index R'_{w} would simplify airborne sound insulation design. These values would support designers in routine cases while ensuring that detailed calculations are carried out only when acoustics are justified. This approach reduces design time and limits the risk of inconsistent interpretations.

The proposed footnote regarding requirements between spaces needing speech privacy and large open-plan offices would allow the continued use of conventional doors, glazed sections, and ventilation solutions commonly applied in practice. At the same time, it maintains sufficient protection against unintended disclosure of sensitive information. Compatibility with the extended requirements in the current standard would, however, require further clarification.

The review of room-acoustic tables indicates that the present structure is difficult to navigate and prone to differing interpretations. Organizing the tables based on acoustic function rather than room names would align them more closely with the principles applied elsewhere in the standard and substantially reduce the number of table rows. This would create a clearer and more user-friendly format. Minor adjustments to certain requirement values are also justified, particularly for small rooms with heavy enclosed walls where the current requirements may be disproportionate to acoustic needs.

Finally, there is a clear need to strengthen the role of specialized room-acoustic assessments. Providing clearer guidance on when such assessments are appropriate, and what methodological requirements they must fulfil, would help designers and clients choose solutions that both satisfy acoustic needs and support the intended function of the space.

Through these adjustments, SS 25268 can be developed into a more robust and practical tool that better supports acoustic design and quality assurance, while also facilitating clearer communication between clients, designers, and practitioners.

References

[1] SS 25268:2007. *Acoustics – Sound classification of spaces in buildings – Institutional premises, rooms for education, preschools and leisure-time centres, rooms for office work and hotels.* Swedish Standards Institute (SIS), Stockholm.

[2] SS 25268:2023. *Building acoustics – Sound requirements for spaces in buildings – Healthcare premises, rooms for education, preschools and leisure-time centres, rooms for office works, hotels, and restaurants,* Swedish Standards Institute (SIS), Stockholm.

[3] SS-EN ISO 16283-1:2014+A1:2017. *Acoustics — Field measurement of sound insulation in buildings and of building elements. Part 1: Airborne sound insulation.* CEN/ISO.