Sound insulation in buildings, and control of traffic noise

Autor(en): **Lang, Judith**

Objekttyp: **Article**

Zeitschrift: **IABSE congress report = Rapport du congrès AIPC = IVBH Kongressbericht**

Band (Jahr): **11 (1980)**

PDF erstellt am: **21.07.2024**

Persistenter Link: https://doi.org/10.5169/seals-11203

Nutzungsbedingungen

Die ETH-Bibliothek ist Anbieterin der digitalisierten Zeitschriften. Sie besitzt keine Urheberrechte an den Inhalten der Zeitschriften. Die Rechte liegen in der Regel bei den Herausgebern.
Die auf der Plattform e-periodica veröffentlichten Dokumente stehen für nicht-kommerzielle Zwecke in Lehre und Forschung sowie für die private Nutzung frei zur Verfügung. Einzelne Dateien oder Ausdrucke aus diesem Angebot können zusammen mit diesen Nutzungsbedingungen und den korrekten Herkunftsbezeichnungen weitergegeben werden.
Das Veröffentlichen von Bildern in Print- und Online-Publikationen ist nur mit vorheriger Genehmigung der Rechteinhaber erlaubt. Die systematische Speicherung von Teilen des elektronischen Angebots auf anderen Servern bedarf ebenfalls des schriftlichen Einverständnisses der Rechteinhaber.

Haftungsausschluss

Alle Angaben erfolgen ohne Gewähr für Vollständigkeit oder Richtigkeit. Es wird keine Haftung übernommen für Schäden durch die Verwendung von Informationen aus diesem Online-Angebot oder durch das Fehlen von Informationen. Dies gilt auch für Inhalte Dritter, die über dieses Angebot zugänglich sind.

Ein Dienst der *ETH-Bibliothek*
ETH Zürich, Rämistrasse 101, 8092 Zürich, Schweiz, www.library.ethz.ch

http://www.e-periodica.ch

VId

Sound Insulation in Buildings, and Control of Traffic Noise

Isolation phonique dans la construction de bâtiments et de routes

Schallschutz im Hoch- und Strassenbau

JUDITH LANG
Dr. techn.
Technologisches Gewerbemuseum
Wien, Österreich

SUMMARY
While requirements for noise insulation in buildings exist in most countries, satisfactory calculation methods for the verifying of their fulfillment are not yet available. In addition, test facilities for noise insulation measurements are not described in enough detail, so that it is difficult to compare measurements and put them into practice.
Control of road traffic noise is supported by computer and acoustic models, and noise maps can help planners. Cost-effectiveness analysis of noise control measures alongside roads is important in the decision-making process, yet for this, only limited data exists.

RESUME
Tandis qu'il existe dans la plupart des pays des conditions pour l'isolation phonique des bâtiments, il n'y a pas encore de méthode de calcul satisfaisante pour vérifier jusqu'à quel degré ces conditions sont remplies. De plus, les caractéristiques des instruments de mesure et de contrôle ne sont pas uniformes et les résultats des mesures sont par conséquent difficilement comparables et utilisables dans la pratique.
En ce qui concerne la protection contre le bruit de la circulation, il existe des modèles de calcul à l'ordinateur et des modèles acoustiques. Les cartes de bruit peuvent être aussi très utiles aux projeteurs. Il n'existe cependant que très peu d'informations sur des comparaisons coûts-avantages relatives à la protection contre le bruit, qui seraient si utiles lors de décisions.

ZUSAMMENFASSUNG
Während die Anforderungen an den Schallschutz in Gebäuden in den meisten Ländern bereits festgelegt sind, sind ausreichende Rechenmethoden zum Nachweis der Erfüllung noch nicht vorhanden. Desgleichen fehlen auch einheitliche Einbaubedingungen für Prüfstände, und Messergebnisse sind damit schwierig vergleichbar und in der Praxis einzusetzen.
Für den Lärmschutz an Strassen stehen Rechenmodelle und akustische Modelle zur Verfügung, Lärmkarten können für die Planer wertvolle Hilfe leisten. Für die zur Entscheidungsfindung wichtige Kosten-Nutzenanalyse zum Lärmschutz an Strassen liegen noch wenig Unterlagen vor.

It is an interesting phenomenon that building acoustics, which was the prevalent topic in acoustics and noise control congresses in the fifties and sixties,is now only scarcely covered and it seems that there are no problems left. However some of still existing problems are mentioned in the following and ask for contributions. Moreover, problems on road traffic noise are mentioned which have got high priority in the last years.

1. Sound insulation requirements in buildings

Requirements on sound insulation in residential buildings exist in most countries and have been reported (1) (2). However requirements on other types of buildings as e.g. hospitals, schools, hotels exist only in few standards and little is prescribed on sound insulation in offices; especially for landscape offices or even landscape classrooms there are no general requirements. In Austria an inquiry in subjective assessment of sound insulation and comparison with measuring results in schools and offices is now started.

2. Calculation of sound insulation in buildings

While the principles of sound insulation of building elements and sound propagation in buildings are known, it is still not possible to calculate exactly the sound insulation between two rooms taking into account all flanking elements and their interaction with the partition element; we only make rough calculations based on mass ratios. Flanking transmission, if taken into account at all, is covered in standards and guidelines on sound insulation by requirements on minimum mass depending on the mass of the partition element, e.g. (3) (4).

With regard to the importance of flanking transmission on the one hand and the little information on its rules on the other hand, building acoustic has to work more on these problems.

3. Sound insulation measurements

Since many years sound insulation of walls and floors is measured in test facilities and is being reported. It was and is usual to say that a certain construction has a certain sound insulation; but is this true? The result depends, as we now know, highly on the conditions of the test facilities and the kind of connection between these and the test object. We can define "bauübliche Nebenwege" and measure with these, we can define test facilities without or with very little flanking transmission, but how can the results be transferred to practice?

The "bauübliche Nebenwege" defined by the transmission loss measured with a 400 kg/m^2-wall do change when we measure a light weight construction. The "maximum possible transmission loss" measured with a 400 kg/m^2-wall is not the "maximum possible transmission loss" with the light weight construction, the latter being much lower. Fig. 1 shows the measuring result on the sound insulation of a light weight construction of gypsum boards, which is quite different for different test facilities. It is obivous that the sound insulation measured with "bauübliche Nebenwege" may be too small; it is also obvious that the high sound insulation measured in the test facility with small flanking transmission will not exist in all condition in practical buildings.

Fig. 1 sound reduction of gypsum board double walls

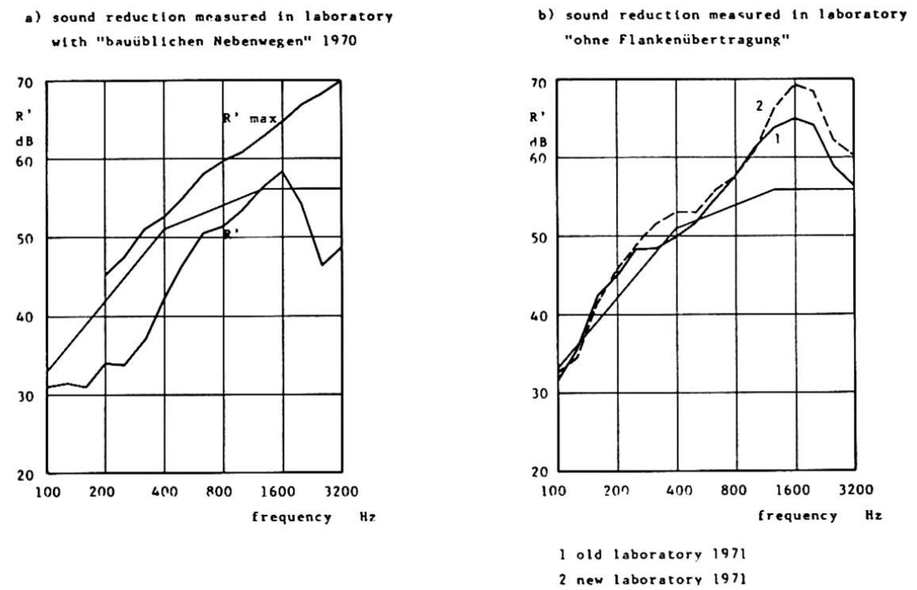
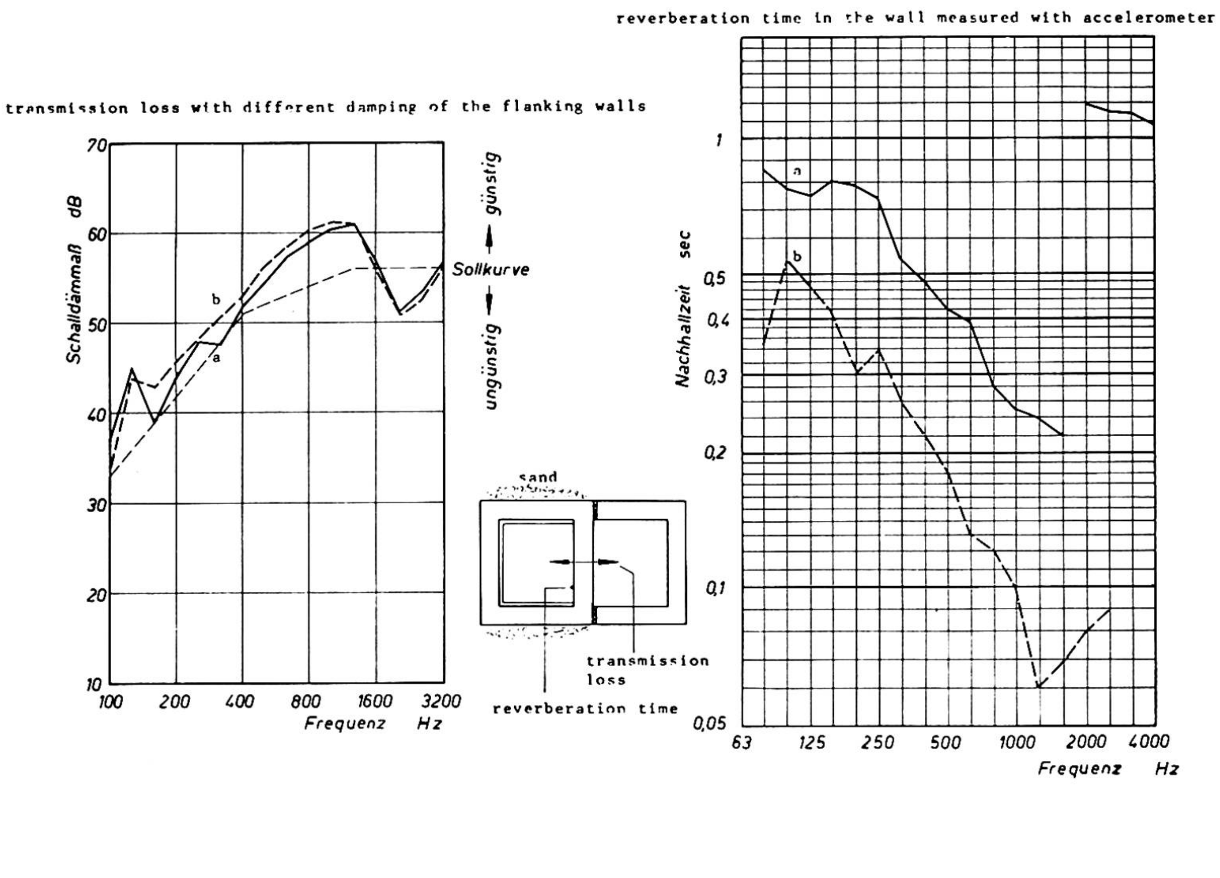


Fig 2: Influence of damping on transmission loss



If we measure sound insulation in test facilities without flanking transmission the values obtained may be too high and therefore unrealistic. However the results of measurements without flanking transmission could be better compared with each other and be introduced into calculations. But even these results may differ caused by different damping (inner loss). Fig. 2 shows the results of measurements on the same wall (430 kg/m^2) in a test facility with small flanking transmission for two different grades of damping (caused by sand outside the flanking walls) which is described by the reverberation time measured with accelerometer in the wall.

A special problem lies with measurement of impact sound insulation. We know on the one hand that the tapping machine does not provide the best method to describe the impact sound insulation of floors, but on the other hand do we have a better method until now? The change to a new method would mean the loss of a great number of results on impact sound insulation. So it seems best to keep the existing tapping machine if we can prove that it is not too bad (5).

With the growing importance of sound insulation against traffic noise the importance of measurements on windows grows. Here also problems are left; how do we measure the glass alone, as we know that the type of frame and the type of niche has a great influence on the result (6). How does the sound insulation depend on the airtightness?

4. Control of road traffic noise

Road traffic noise has become the most important noise and very much work has been done in this field in the last years. While the method of measurement is nearly the same in all countries the limits of admissible noise are different, although all of them are more or less close to the ISO recommendation R 1996. A great number of investigations on subjective response and objective criteria have been carried out. Differences between urban and rural districts seem to be important, but have been neglected until now.

As the most important task is to control noise from new roads calculation methods to predict the sound levels near roads have been developed and have been introduced in regulations and guidelines. The different methods have been compared recently (7). Large computer models exist to calculate noise levels taking into account buildings topography a.s.o. Experience on how calculation corresponds to practice would be interesting.

Beside the calculation methods also acoustical models have been developed which especially can work in complex situations where calculations are impossible. A block diagram of such a measuring equipment is shown in fig. 3 (8). Comparison between results of model and practice are carried out as soon as the road is opened.

A lot of noise maps have been drawn in the last years; for city planners noise maps may be of use. Experience in this field would be of interest.

Noise control measures alongside streets cost a lot of money; on the other hand also annoyance of people may cost money in one or another way, but this is not known. Modern decision making is asking for cost-effectiveness or similar, and relevant data should be prepared for this. A first investigation has just been finished in Austria; it showed that people themselves invest a lot of money in (more or less effective) noise control

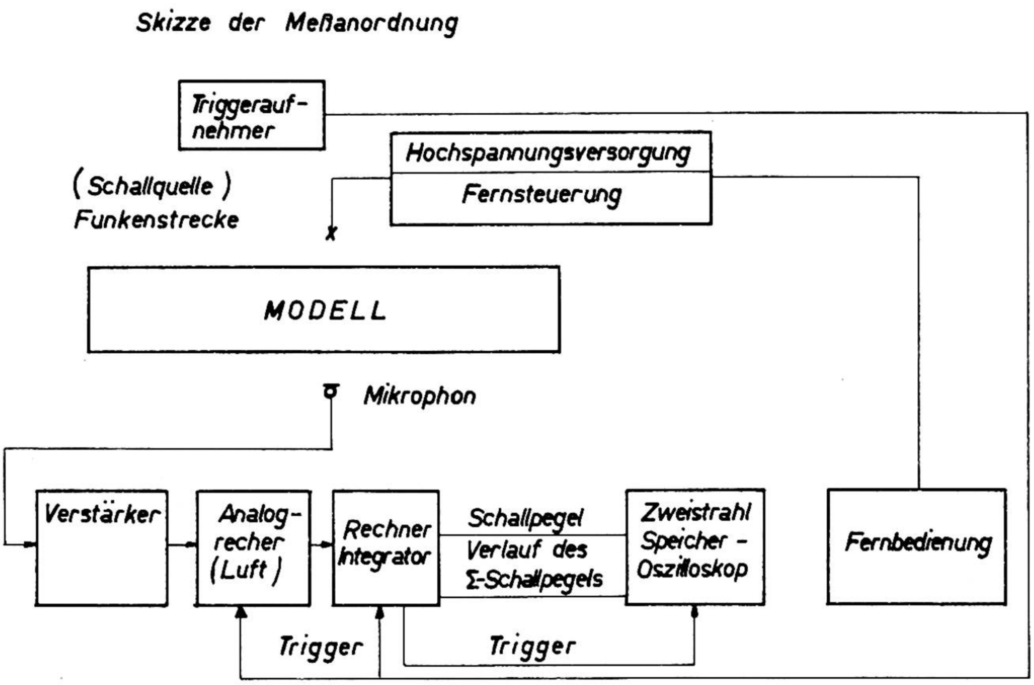


Fig. 3: Block diagram of measuring equipment for acoustic models

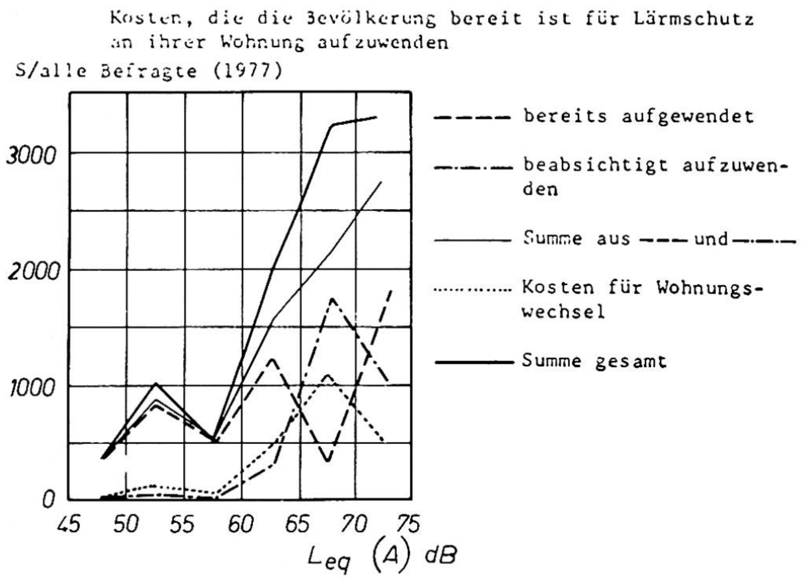


Fig. 4a: Amount of money people invest for noise control measures versus traffic noise level

measures for the dwellings and that prices of houses or flats are highly affected by roads. Fig. 4 shows a table on the change of prices and the amount of money people invest for noise control measures, depending on the equivalent sound level of the traffic noise (note that the amount is per all people living in the area and not only per those people who feel annoyed!) (7) A comparison showed that effective noise control measures alongside roads are much more economic than measures people install or do not install on their houses. Further data from different countries would be interesting.

Wert-(Preis-)unterschied für Wohnobjekte mit und ohne Verkehrslärm

	Prozentueller Wert(Preis-)unterschied zwischen Wohnobjekten mit und ohne Verkehrslärm		
Mittelwert von 83 Realitätenfachleuten	Hauptverkehrsstraße	-35 %	gegenüber Lage an Wohnstraße
	Autobahn mit Anschluß	-10 %	
	" ohne "	-30 %	
	geplante stark frequentierte Straße	-20 %	
Mittelwert von 379 befragten Personen	ruhige Lage	+22 %	gegenüber Lage im starken Verkehrslärm
Aussage von 72 in starkem Verkehrslärm in Wien wohnenden Personen	-5 bis über -20%		durch Verkehrslärm

Fig. 4b: Difference in prices for residential buildings with and without traffic noise

5. Call for papers

The short comments showed some interesting points; you are kindly asked to present your results or your opinion on these or related problems at the IABSE-Congress.

6. Literature

(1) T.J. Schultz: Noise Control in Building Codes: Europe and USA. 9. ICA Madrid 1977.

(2) D.E. Commins: Classes of Acoustical Comfort in Housing. Inter-Noise San Francisco 1978.

(3) DIN 4109 "Schallschutz im Hochbau"

(4) NPR 5070 Nederlandse praktijk richtlijn "Geluidwering in woongebouwen. Voorbelden van wand- en vloerconstructies"

(5) J. Lang: Vergleichende Messungen des Trittschallschutzes von Gehbelägen und schwimmenden Estrichen mit verschiedenen Methoden. 8. ICA London 1974

(6) K. Gösele u. B. Lakatos: Zur Messung der Schalldämmung von Glasscheiben im Laboratorium. Bericht BS 25/77 Institut für Bauphysik, Stuttgart

(7) J. Lang: Lärmbelastung an Straßen, Wirksamkeit und Kosten von Lärmschutzmaßnahmen. Straßenbauforschung, zur Zeit im Druck. Summary: ÖAL-Fachtagung Wien 1978

(8) M. Stani: Verkehrslärmprognose für komplexe Bebauungssituation - Modellmessungen. ÖAL-Fachtagung Wien 1978