

HANDBOOK 47 – A PRACTICAL TOOL FOR ESTIMATION OF FACADE INSULATION?

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ABSTRACT

Handbook 47 (H47) [1] from the Norwegian Building Institute (NBI) contains a simplified calculation method for insulation against external noise together with data for sound insulation of different building elements (external walls, windows, ventilation inlets and roof constructions).

The Norwegian public authorities have settled that H47 and its construction data shall be used in calculations of facade insulation in Norway. This means that the method is widely used by acoustic consultants, planners, etc. You will find an extensive number of constructions in the book, but it is rather complicated to find practical solutions when you look for improved versions of your basic construction. Sometimes you will conclude that it is not possible to find one good answer using H47.

Norwegian acoustic consultancies have realised that the construction base in H47 is not a practical tool in its present shape and have worked out individual platforms with H47 and other relevant literature as a starting point. As a conclusion the existing database in H47 should not be used as a single basis for specification of an improved solution. It is a need for a practical and simple tool which is correlated to the accuracy of the inspections of the buildings. The database in H47 should be extended and systematized to act as a platform in evaluation of special cases.

1. INTRODUCTION

Lightweight building materials made of different wooden products are commonly used in Norwegian houses, especially outside central city-areas. Houses built before 1960 often lack thermal insulation and the sound insulation properties are rather poor.

The Norwegian public authorities have started insulation programs to reduce the day and night equivalent noise level down to 35 dBA in residence rooms having a noise level to day above 42 dBA (assuming ventilation inlets kept shut). In addition insulation programs also have to be carried out as a part of new road construction projects. In these cases it is the aim to achieve 30 dBA in residence rooms.

Each project may include evaluation of a few number of houses, up to several hundreds of houses. The construction of the houses varies from case to case. It is common practice to carry out inspections inside and outside the houses, go through building drawings and interview the owner of the house to get sufficient background information for calculations of façade insulation. It is not common practice to open the constructions for inspection of insulation, sheathing, etc. Façade insulation measurements are carried out just in a few cases.

H47 from the Norwegian Building Institute gives a specification on how to carry out calculations of façade insulation together with data for sound insulation of different building materials.

2. ABOUT H47

The calculation method is widely used by acoustic consultants, planners, etc. As the method is simple and straight on this is often a typical job for junior personnel and personnel without heavy acoustic background experience. To facilitate the calculations different spread sheets and data programs are available, both

commercial and non-commercial versions. With regard to corrections for area (window, wall, and roof) and room volume different persons in charge hardly will come up with diverging results. However the method opens for significantly diverging evaluations with regard to reverberation time, incident sound, shape of the façade, window size and corrections for type of noise/screening situations. The authorities/NBI has not carried out Round-Robin tests to verify what variations one may expect from case to case.

As regards insulation data you will find an extensive number of constructions in H47, but there are some problematic holes especially when you look for improved versions of your basic construction. Because of the great number of constructions you also have to spend some time to find the best choice and sometimes you will conclude that it is not possible to find one good answer using H47. Different persons will also here make different assumptions and present different answers - this was doubtfully not the intention of the authorities.

3. HOW TO MAKE A SIMPLIFIED AND EASY-IN-USE METHOD

You are normally not able to verify all construction details based on half an hour inspections and interviews, and therefore it should not be necessary to consider all the choices in H47 in each case (187 walls and roofs, 177 windows, 27 ventilation inlets). However it is important to prevent underestimation of the situation.

The aim is to achieve an answer which is within ± 2 dB compared with real value (as measured). Considering a mean value for a number of cases the calculations should not underestimate the facade insulation.

Norwegian lightweight wooden constructions can be divided into timber walls, half-timbered walls and walls with light framework. These timber- and framework constructions may include a layer of insulating material and one or more layers of sheathing. Windows have normally single glazing or double/triple layer glazing for thermal insulation. You may also find windows with separated or coupled frames.

It is not possible to evaluate leakiness around windows and junctions based on visual inspections. Consequently it is necessary to base the assumptions on experience.

In practical work it suffices to divide among approximately 10 main groups of existing walls (including heavy walls), some fewer groups of roofs, a few types of windows and ventilation inlets.

In the repair situation it suffices to divide among inner or outer remedial actions on walls and roofs including insulation thicknesses up to 150 mm and double sheathing. In special cases it may be necessary to specify lightweight steel structures or vibration isolating devices to optimize the results.

In combination with these measures windows will normally be of a single framed sound insulating type, ventilation inlets of a simple passive sound attenuator type, unless it is required to consider a completely new ventilation system.

The paper "handbook 47 – control measurements of calculated facade sound insulations" [2] presents results from field measurements showing the agreement between measured and calculated façade insulation using these types of simplified evaluation methods.

4. CONCLUSIONS

It is experienced that the present calculation method and data base in H47 open for some possible systematic mistakes and include several holes with regard to practical constructions and improvements.

It is a need for a practical and simple tool which is correlated to the accuracy of the inspections of the buildings. The calculation method should be more specific than the present H47, giving field sound insulation data for a few typical constructions and improvements. The method should be more precise as regards corrections for reverberation time, incident sound, shape of the façade, window size and corrections for type of noise/screening situations. Field measurements prove that simplifications can be made without going beyond the aim of a calculation accuracy of ± 2 dB. The database in H47 should be extended and systematized to act as a platform in evaluation of special cases.

5. REFERENCES

- [1] Norwegian Building Institute: “Isolering mot utendørs støy”. NBI, Håndbok 47, 1999 (*Norwegian text*)
- [2] Falch, E. Handbook 47 – Control measurements of calculated façade sound insulations. *Paper presented at BNAM 2004*