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NOISE IMMISSION IN CHILDREN'S INSTITUTES CAUSED BY TRAFFIC

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ABSTRACT

Our firm examined 60 schools and kindergartens from the point of the effects of traffic noise. There were 39 schools, where the indoor noise immission was higher than the permitted limit. In these sites the method of the reduction of noise is either the decrease of traffic noise or the increase the sound insulation of the facade. In the psychical investigation we wanted to know the effects of the high noise levels for the loudness of speech during the lessons, for the speech intelligibility and for the fatigue.

1 - INTRODUCTION

In the last few years our firm made some traffic noise control measurements in schools and in kindergartens. The institutes took place in several district of the capital. The aim of the investigations were different, therefore the consideration of the selection of the buildings were also different. There were some schools, where the teachers complained about the large traffic noise, elsewhere the local authority asked for the measuring of all the schools and kindergartens in the district. In spite of these requests the similar measuring method allowed the comparison between the results.

The final aim is the same: to protect the children and the teachers against the traffic noise and to assure the quiet lessons for the pupils and the possibility of the rest in the kindergartens.

In the course of the investigation we examined the outdoor noise immission caused by traffic in front of the facades, the sound insulation of the facades, the noise immission inside the rooms and in the schools from the room-acoustic characteristics the speech intelligibility and the fatigue during the lessons.

2 - OUTDOOR NOISE IMMISSION

The examination of the outdoor noise immission was made in 3 steps.

The first step was to select those institutes, where the environment is quiet, e.g. in the surrounding of family-houses far from the main roads, between residential site, where there are also no heavy traffic. In this step we selected the 29 % of the indicated institutes without measuring.

The second step was to select the buildings, where there is no noise complain, because of the good ground-plan. In these buildings the windows of the rooms look out on the quiet garden, and only the dining hall, gym, the corridor, the kitchen or engine rooms looks onto the main road. These were the 22 % of the all.

In case of the other 49 % of the institutes in the third step we made instrumental measurements for the determination of the indoor immission where the environmental noise was higher than 60 dBA.

This measuring method was worked out specially for schools and kindergartens, where there are very short periods, when the building is quiet and the rooms are empty – but the volume of the traffic is characteristic for the day-time (8am – 4pm).

We measured the noise immission in different levels and different parts of the noisy facades outside in front of the windows by 2 m and in the rooms for 15 minutes parallel. We carried out the measurements in all situation in two times, so we got information for the average sound insulation of the whole facade. In the same time we determined the short-time-equivalent-levels (15 minutes) of the traffic noise between 8am and 4pm on a reference point, which was assign in front of the building on the level of the street,

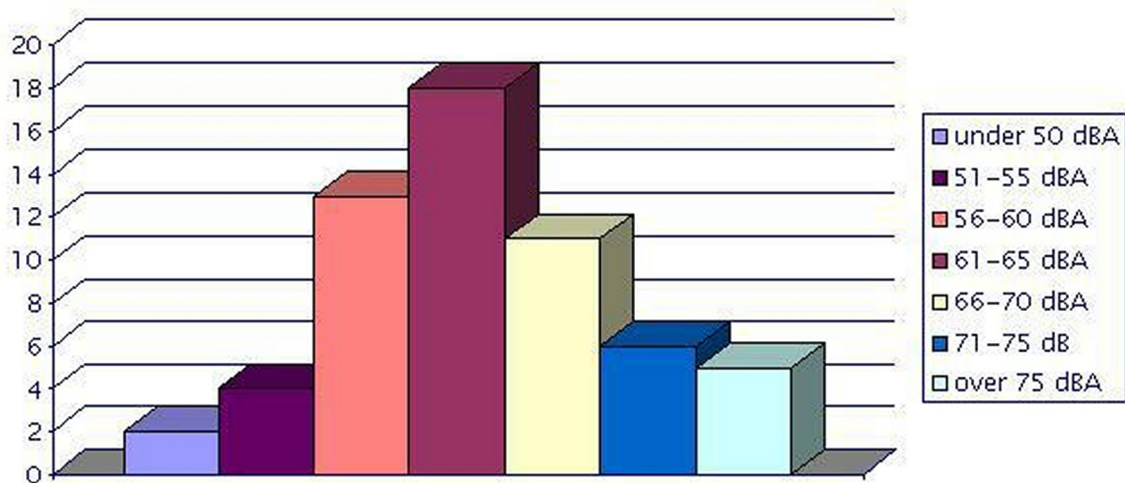


Figure 1.

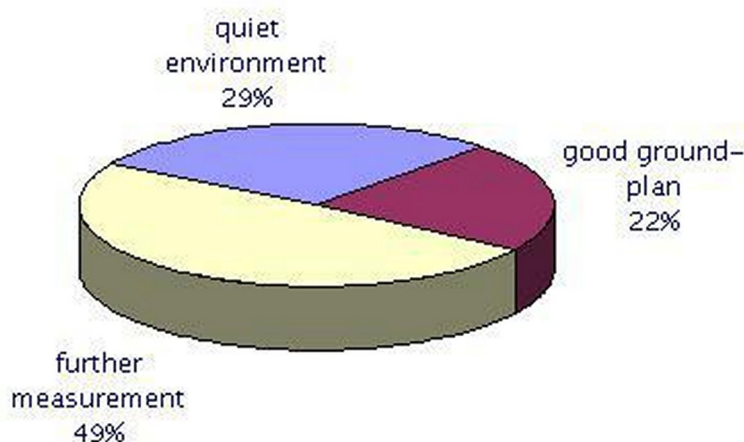


Figure 2.

mostly 7,5 m far from the centre of the outside line. From these data we could calculate the equivalent level of the traffic noise for the whole measuring period (8am-4pm).

We corrected the indoor noise immission with the difference of the level before the window and on the reference point – so we got the average equivalent noise level in the rooms behind the examined facade for the whole measuring period.

We found that the indoor noise level is 41 % higher than the permission noise level at the indicated institutes, which is 65 % of the measured ones.

3 - TYPE OF WINDOWS

We examined the type of the windows in the measured buildings. Most of the windows belong to the following three types: common framed windows 19 %; old type, 71 %; or windows with thermal insulation glassing 10 %. All the types were carried out with double-layer glass.

The sound insulations of the different types are shown in table 1. The measuring results remained from the laboratory data to a great extent, because of the different conditions of the windows.



Figure 3.

Type of the window	Noise insulation ΔL_A [dB]	Sound reduction index in laboratory R_W [dB]
Common framed window	17-22	27
	21-29	37
W. with thermal ins. glassing	21-25	35

Table 1.

4 - ROOM-ACOUSTIC MEASUREMENTS

In the second part of the investigation we examine the effects of the high indoor noise immission on the attentiveness of the pupils and the teachers in schools. We selected 2 schools with very busy traffic and another from quiet environment. First we wanted to find out, if the pupils and the teachers speak louder in the noisy classrooms or not. How has the loudness of the speech changed between the first and the last lesson.

The second experiment was that in one class from each school children from the age of 13-14 filled out special tests. We wanted to know if the high traffic noise in the classrooms has any effect on the capacity of concentration or not. We also made experiments to examine the fatigue: the pupils made the same type of test in the first lesson at 8 o'clock, and in the last lesson at 3.

Unfortunately the results of the experiments are under treatment at present. Inquirers can examine our poster in Nice, where the results will be shown.

5 - CONCLUSION

In the end of the investigation we established that the noise immission caused by traffic noise is mostly in schools is higher than the noise level limit. The improvement can be laid out in two ways.

The first is to decrease the outdoor noise immission by the reduction the noise of the traffic (diversion, traffic light, speed limit, no heavy traffic, better road surface, etc).

The other way is to increase the sound insulation of the facade especially the windows because they are the weak point in the sound insulation. The most simple ways for the repairing of the windows are the application of the insulator bands or triple-layer-glasses. The disadvantage of this method is that the decrease of the indoor noise immission is ensured only in the case of closed windows.

The conclusion of the psychical effect will be shown only in Nice.

REFERENCES

1. **A. Schick, M. Klatte, M. Meis**, Die Lärmbelastung von Lehrern und Schülern - ein Forschungsstandsbericht, *Zeitschrift für Lärmbekämpfung*, Vol. 46/3, 1999
2. **R. Guski, U. Felscher-Suhr**, The concept of noise annoyance: How international experts see it, *Journal of Sound and Vibration*, Vol. 223/4, 1999
3. **R. Hörger**, Zur wirkung von sprachlichen Hintergrundschallaen auf mentale Informationsverarbeitungsprozesse, *Zeitschrift für Lärmbekämpfung*, Vol. 44/5, 1997

4. **Póta, I. Dombi**, Increasing of sound insulation of windows in existing buildings, In *InterNoise 96* , pp. 1817, 1996