

THE ENERGY CERTIFICATION AND INDOOR ENVIRONMENT QUALITY IN A SCHOOL

Prof. Dusan Petras, Ph.D.

Slovak University of Technology, Civil Engineering Faculty, dept. of Building Services, Radlinskeho 11, 813 68 Bratislava, Slovakia, dusan.petras@stuba.sk

Sabikova, J.

Slovak University of Technology, Civil Engineering Faculty, dept. of Building Services, Radlinskeho 11, 813 68 Bratislava, Slovakia, sabikova@svf.stuba.sk

Summary

The paper deals with the results of energy certification and environmental evaluation of a basic school in Bratislava.

It describes the method of the evaluation, and the results. But also includes the results of some indoor climate measurements (thermal parameters) supported with subjective evaluation by pupils. Focuses on a particular energy saving tool, the replacement of windows by new ones, and its possible influence on indoor air quality.

Keywords: indoor environment, school

1 Introduction

The energy and environmental evaluation of a school building was done as a part of an international project with ENSI, Norwegian institute in Oslo. The first step in the audit included evaluation of the existing building, its thermal properties of the peripheral walls, including windows and the building services system (water, heating and ventilation systems.). Next step consists of the evaluation and suggestions of the tools for possible energy savings. Last step, which was done as a part of diploma work, is a theoretical evaluation of indoor air quality after window replacement.

2 Methodology

2.1 Description of a Building

The audit of the school was done in 2009, during winter/spring season. Building is located in Bratislava (Fig.1), built in 80-ies in the last century, in a accordance to the standards valid at that time. Evaluation includes energy and environmental audit. The environmental audit focuses on 2 classrooms with western-northern orientations (limited by schedual, teachers and pupils age). All three methods for evaluations are used – subjective, objective and standard ones. The same approach was used for the evaluation of an indoor swimming pool.

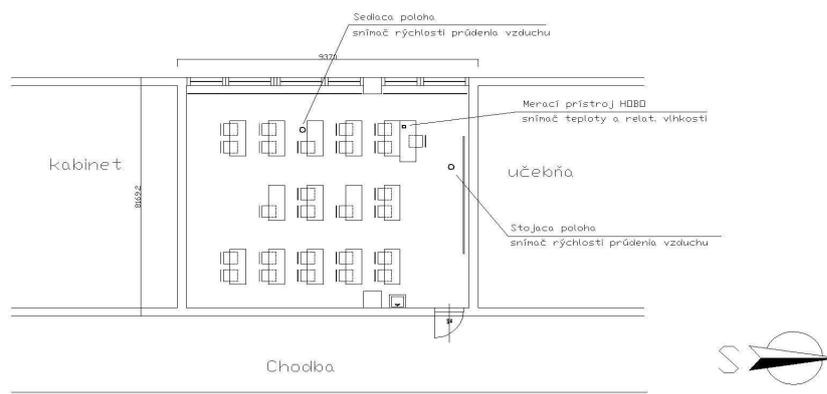


Fig. 1 Layout of the evaluated classroom (2)

2.2 Measurements

The school classrooms and indoor swimming pool are evaluated within 1 day, where measurements are done during the class hours. Indoor climate analyzer and 2 data loggers are used in both cases. Example of the measuring points are given in Fig.1. As far as the vertical stratification is concerned, they are measured at 3 levels. Operative temperature, indoor air temperature, humidity and air speed were logged.

The subjective evaluation is done in accordance to STN EN 15 251:2008 standard (Prof. Fanger scale is used), by pupils and teachers.

3 Results

Based on the objective evaluation, the air temperature in both classroom varies between 20 – 21 °C, humidity is about 47%. Minimum measured air speed is 0,08; the maximum 0,31 m/s. Subjective evaluation shows acceptance of the pupils with the environment, not only thermal but also as far as the illumination and acoustics are concerned. Example of the temperature variations is given in Fig.2.

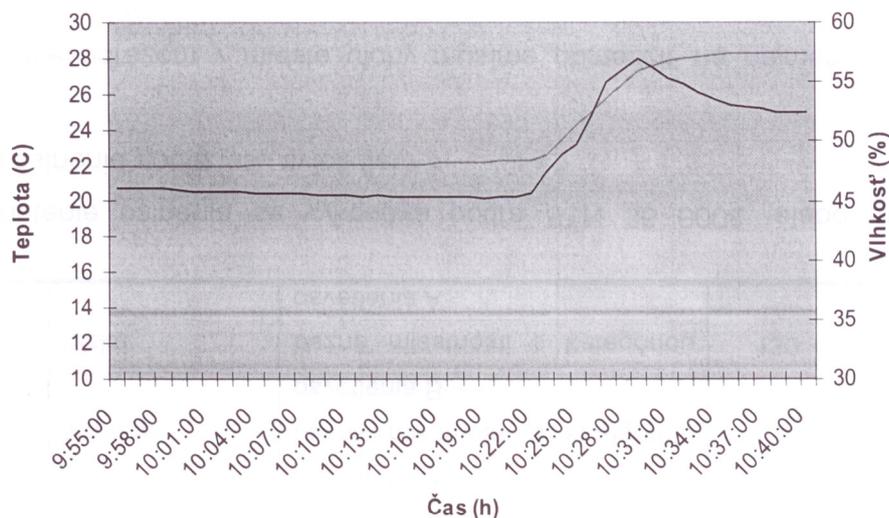


Fig. 2 Air Temperature and Humidity in a evaluated classroom (2)
 teplota=temperature; čas = time, vlhkosť = humidity

4 Analysis

Based on the measured data the school environment is acceptable, according to the STN EN 15 251 the classrooms would be in the category II and III. But based on the discussion with the students and teachers, during the “true winter days” (cold windy weather) the thermal comfort is not provided. Complains are mainly due to the infiltration through the old windows.

So one of the energy saving tool is to replace the windows by new, of better qualities ones. At the same time the environmental evaluation, considering the effect of windows on the infiltration, is included, too. This, theoretical, calculated evaluation is given for existing windows and compared with three new alternatives (Fig.3).

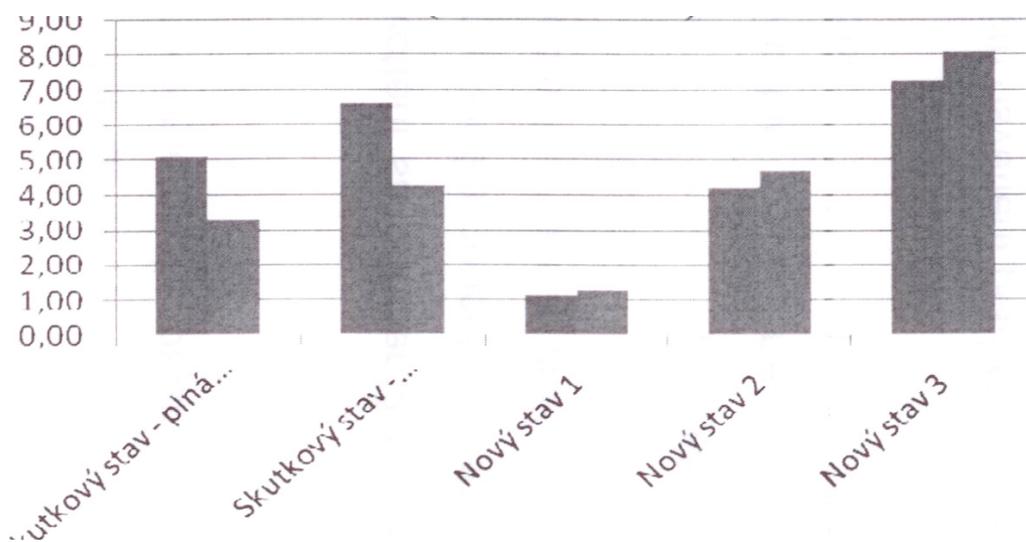


Fig. 3 Calculated infiltration for existing and 3 alternatives of new windows (2)
skutkový stav = existing windows, nový stav = new window
(two columns means two methods used for the calculation)

5 Conclusions

Based on the school building environmental audit “in situ”, the building would compile with the EU standard on indoor environment, category II and III. Considering the possible energy savings, there are many possibilities for its improvement, including window replacement. This just calls for careful considering its quality, since this might be the key point for improvement or deterioration of its indoor air quality.

References

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