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The Importance of Building Physics in Improving the Quality Control of Buildings – The Role of Public Authority

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Abstract

The Building Supervision Offices (BSO) grants building permissions in Finland and take care, that buildings are built according to building codes. BSO in Oulu has taken more active role in aim to increase energy efficiency and quality control. BSO has also participated in several R&D-projects. BSO in Oulu created a moisture management procedure for buildings in the beginning of 2000, because of very tight timetables of new construction and moisture damages already occurred. The goal was to decrease moisture problems by systematic control in the building site, and the companies took this procedure into use. The moisture related damages have been reduced. The next step was to create a quality classification procedure for one-family houses, applied in Oulu Housing Fair 2005. Special attention was paid to air tightness. The average level in Oulu area before the BSO actions was approximately $n_{50} = 4,0$ 1/h and when BSO begun to develop the air tightness guidelines by voluntary base, the recent air tightness level is 1,0 1/h, best value has been 0.08 1/h.

BSO has done various instruction cards, now more than 50, published as a guideline available for new and existing buildings and organized continuous training events and workshops on average 1/week. Latest card is building commissioning (Cx) including all measures in takeover-stage. The latest project is “Drychain10”-concept together with all participants in whole building process funded by Finnish Ministry Environment (1. award in Building Physics-seminar Tampere-2015).

At the moment, there are more than 1000 on-line measuring sensors in pilot buildings in Oulu. These results can be exploited in building physical modelling of constructions. The goal is to improve the performance of buildings and verify the level which should be better than the level based on the codes. In this presentation, the role of public authority and results of quality control efforts are introduced.

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1. Introduction

In Finland, the building permits are granted by the local Building Supervision Office (BSO) of the municipality. The building plans must meet the requirements set in the building code and must be made according to the city plan. In addition to the task of granting building permits, the BSOs should also take a wider role to both steer and guide the building project. This will also allow BSOs to develop quality control, energy efficiency and performance of buildings. Due to the new Energy Performance of Buildings Directive (EPBD) the building branch related building codes were changed significantly in Finland.

Buildings in Finland must have an energy efficiency clarification which includes an energy certificate. Although there are several regulations related to the building sites and construction, especially in the case of single-family houses, BSO is not able to control that all regulations are followed and thus the main responsibility of complying with the rules lies always with the building developer and the organization hired by the builder.

The energy efficiency as well as technical and building physical performance is determined mainly in the design phase. Possible mistakes made during the construction phase have also effect on these. During use the technical equipment may function incorrectly or they may be operated incorrectly. The maintenance of the house technique and the structures is often neglected. As an end result of the previous the building may not function as designed.

During the last ten years, the BSO-Oulu [1] has systematically been developing the quality management of primarily single-family houses, concentrating mainly to the design and construction phase. Builders have participated on the trainings organized on these topics on voluntary basis. At the moment, the BSO-Oulu is preparing activities to cover the quality management of the whole building process to make sure that the building will function as designed [2].

In existing building stock, in one-family homes and other buildings, different damages and indoor condition environment problems can be found. Mostly the question is about moisture and the problems resulting therefrom. The worst case is that problems become apparent until long period of time, causing various symptoms for the users and can lead to having to leave the premises, decreasing ability to work or to getting sick. The cause may be the planning, implementation, operation, or all of them. The renovation debt – the costs to improve the performance to an acceptable level compared with the funding available – can be too high.

In design and in construction general shortcomings can exist, which can be emphasized by false use. It is extremely important that the new buildings should perform “as planned” and the design intents and plans should be properly carried out. The climate change will set new challenges for design, too. The building physics – physical facts – are not well understood or applied to planning, especially in the case of one-family houses. It is important to know which factors are essential in heat and mass transfer and how do they call for the plan of structures and in particular the structural details.

2. The role of building supervision in Oulu, “BSO-Oulu model”

Because in Finland every new building and most renovations need a building permit granted by the building supervision office, the BSOs are in contact with every builder when they start to design their project and before they can start to build. BSO thus has excellent possibility to provide the builders with the information that they consider important. We can fairly speak about some kind of momentum.

BSO-Oulu tries to use this momentum effectively. The goal of BSO-Oulu is to:

- produce measurable added value to our customers and to the City of Oulu and help customers,
- to have the courage to give advice and to have willingness to be co-operative, to use public media
- to create network with local and national actors and collaborate together with designers and builders.

The following roles are however not included in the job description of Building Supervision:

- to act as condition researcher, not to act as designer and not to act as responsible foreman
- to act as research institute and not to give basic studies

Examples on these activities are introduced in the next chapters.

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