

## Energy use in buildings – Case study Lerums municipality

### *Differences between designed performance and measured energy use*

#### Background

To reach the EU targets on reducing the carbon emissions in society, the Directive on the energy performance of buildings (EPBD) was launched in 2002. Following the enforcement of the directive in 2006, the Energy Performance Certificate (EPC) were introduced in Sweden in October 2006. The first energy experts qualified for issuing the EPCs were certified in the summer of 2007 and the first EPC was registered in September 2007. Up till June, 2014, there are 507 263 EPCs registered in the national database. Contrary to most countries in the EU, the Swedish EPCs are based on the measured energy use.

When a building permit is issued, the forecasted energy use should be calculated. The calculated energy use should then be verified by measurements of the energy use which are performed during at least 12 and up to 24 consecutive months after commissioning. The measured data should also be corrected to a reference year and for normal usage in the building. However, there are many examples of buildings where the measured and forecasted energy use deviates substantially. In fact, a study by Boverket in 2014 showed that out of the buildings constructed 2007-2012, only 40% performed according to the current energy regulations, i.e. with a specific energy use under the BBR demand. The cause for the deviation between the forecasted and measured energy use has mainly two causes; errors in the input data (wrong heated area in the building, changes made to the original design not taken into account and differences related to the use of the building) and errors in the energy use measurements.

#### Case study

The municipality of Lerum gathers all the energy use calculations that have been handed in to the municipality when building permits are issued. The forecasted and measured energy use can be compared and by using the original energy use calculations the deviations can be explained and quantified.

#### Aim

The aim is to find the factors that make the energy use deviating between forecasted and measured energy use in buildings. This will reveal important uncertainty factors that need to be further investigated to increase the quality of the forecasted energy use and EPCs.

#### Methods

The thesis project incorporates different research methods

- literature study of energy performance certificates in different countries,
- investigations of the energy use calculations and of construction drawing,
- study visits to buildings to follow up the EPCs

#### Expected results

The thesis should describe the involved uncertainties and accuracies of the input data used to issue energy performance certificates (EPCs).

### Required qualifications

Good knowledge of building technology and heat transfer in buildings. Good analytical and numerical modelling skills in Matlab and Comsol.

### Relation to the research

The thesis will contribute to the on-going research project QUALICHeCK "Towards improved compliance and quality of the works for better performing buildings" which is co-funded by the Intelligent Energy Europe Programme of the European Union.

### Potentials for expanding the thesis work

The project could be expanded to other municipalities or building types.

### Number of students in the project

This project is for two students

### Time plan

School year 2014-2015

### Supervisor and examiner

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### Co-supervisor

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### Industry partners

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