

## A System for Quality Assurance when Retrofitting Existing Buildings to Energy Efficient Buildings

**Dear Sir, dear Madame,**

In this autumn issue of the SQUARE newsletter we will give you a short summary from the 4<sup>th</sup> and 5<sup>th</sup> SQUARE meetings and study tours in Graz respectively Barcelona, as well as a glimpse of the progress of two of the SQUARE pilot projects in Oulu, Finland and in Alingsås, Sweden.

A number of dissemination activities where information about the SQUARE project, and in particular the SQUARE Quality Assurance System, is presented have been carried out or are planned. For example, the Passive House Conference in Gothenburg, a Seminar on Sustainable Architec-

ture in Barcelona and the Ökosan Symposium in Austria can be mentioned.

Kind regards,



**Kristina Mjörnell**

PhD, senior researcher  
SP Technical Research Institute of Sweden  
Co-ordinator of SQUARE



## BUILD UP - a new web portal

Launched by the European Commission, this free web portal can be used by all building professionals, public authorities or even building occupants to share information about their activities, best practices, tools, publications, news or events related to energy efficiency in buildings.

This new portal aims to become the reference European web portal for energy efficiency in buildings and it already attracted many users since its start.

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AEE Institute for Sustainable Technologies (Austria)

EAP Energy Agency of Plovdiv (Bulgaria)

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Poma Arquitectura (Spain)

SP Technical Research Institute of Sweden (Sweden)

AB Alingsåshem (Sweden)





## ➔ Quality Assurance system in different languages

### QA system translated

The Quality Assurance system developed in the SQUARE project has now been translated into Bulgarian, German, Finnish, Spanish and Swedish. The next step is the application of the QA system in the SQUARE pilot projects in Austria, Finland, Spain and Sweden. Based on the experiences of these projects, the national QA systems will be tailored to national conditions, including regulations, building traditions and climate. This will mainly affect the requirements on indoor environment and energy use.

A support document – a guide on how to implement the QA system – has also been developed. The purpose with the guide is to review and highlight the formally written QA system in a more practical way. A number of useful documents will be included, such as checklists, procedural descriptions and templates, together with guidance on appropriate methods of measurement and instrumentation.

The reports are available at

[www.iee-square.eu/InformationPublications/Reports.asp](http://www.iee-square.eu/InformationPublications/Reports.asp)

### Information material now available in different languages

General information material about the Quality Assurance system have now been translated into Bulgarian, Dutch, German, Finnish, Spanish and Swedish. Brochures and PowerPoint presentations are available at

[www.iee-square.eu/InformationPublications/Brochures.asp](http://www.iee-square.eu/InformationPublications/Brochures.asp) and [www.iee-square.eu/InformationPublications/Presentations.asp](http://www.iee-square.eu/InformationPublications/Presentations.asp)



## ➔ Information dissemination

### Recent events

Two papers from the SQUARE project were presented at the **Passive House Conference in Gothenburg** in April. One dealt with the SQUARE QA system and one with energy efficient measures and the effect on the indoor environment. A study tour was also arranged and among other passive house projects, there was a visit to the pilot project Brogården. In connection with the conference there was the **EnBo09 Exhibition in Alingsås** (energy and housing exhibition). Here the QA system developed in SQUARE was presented for local developers and municipalities.

At a **Seminar on Sustainable Architecture in Barcelona** at Vallés' Architectural High Technical School in June, the paper "SQUARE project: A pilot project of energy efficient renovation of a multifamily building in Barcelona" was presented.

A presentation of the SQUARE QA system was recently made at **Ökosan'09** – an International Symposium in High-Quality Thermal Retrofitting of Large-Volume Buildings – held in **Austria** in October.

### Upcoming events

Information about SQUARE will be disseminated in Finland in November at the **Housing Day**, which has approximately 300 participants. Another suitable event in Finland is the **Indoor Air Fair and Seminar** in March with approximately 800 participants.

At the **Sustainable Building Conference in Madrid** in April a paper about the SQUARE QA system will be presented.

## SQUARE workshop

**"Energieeffektivisering vid renovering"**  
**12 November, at Chalmers in Gothenburg, Sweden**

At the workshop the SQUARE Quality Assurance (QA) system will be presented. The QA system focuses on improvement of indoor environment and energy performance when retrofitting multifamily houses.

Other results from the SQUARE project, such as application of the QA system in the Swedish pilot project Brogården, will also be presented.

This workshop will be held together with a Swedish project called Milparena, which also concerns energy efficient renovation of multifamily houses. In addition, a study tour to the renovation projects at Hisings Backa in Gothenburg will be made.

Housing companies/associations, municipalities, consultants, contractors etc are especially welcome!

Program available on [www.iee-square.eu](http://www.iee-square.eu)

Interested? Send a mail to [ann-marie.boren@sp.se](mailto:ann-marie.boren@sp.se)



## ➔ The Finnish pilot project - Student house Pohjankaleva

**The Finnish pilot project is located in Oulu, 600 km north of Helsinki. A student house with 33 flats built in 1970 will be renovated. The goal is to reach passive house standard level, which for northern Finland is 30 kWh/m<sup>2</sup> per year for heating energy.**

The student house was built in 1970, and partially renovated in 1993. The building has eight floors and a typical room has 15 m<sup>2</sup> floor area. Kitchens, WC's and showers are shared. The owner of the building is PSOAS (Student Housing Foundation of Northern Finland). It operates and develops homes for 7500 students.

### Technical evaluation of the building

During the renovation in 1993, the windows were replaced by three pane windows with fresh air slot vents, and now have a U-value of 1.7 W/m<sup>2</sup>,K. The external walls are made from aerated concreted with an U-value of 0.55 W/m<sup>2</sup>,K. The technical condition of the building is still relatively good. The estimated urgent renovation costs during the coming years up until 2017 are 120 €/m<sup>2</sup>. During the last years there have been increasing problems to occupy all rooms. During summertime, half of the rooms have been empty and during semesters still 20 % of the rooms are empty.

### Occupant survey and performance of ventilation

The main problem related to the indoor air quality is too high indoor temperatures during spring and summer according to the occupant survey. The fresh air slot vents in the upper frame of the windows are also causing a lot of draught complaints.

All rooms are connected to a centralized mechanical exhaust ventilation system. When the exhaust air flow rates were measured in 2009 the average exhaust air rate had been reduced by approximately 20 %. In individual rooms exhaust air flow rates varied from 20 to 120 % of the design value. The opening of windows increased the exhaust air flow rate in a single room by 40 %. The air tightness of the external walls was not bad.

### Energy analysis

The building is connected to district heating systems where heat is co-generated with electricity. The main fuel is peat. The heating energy consumption is 140 kWh/m<sup>2</sup>, which is lower than the average value of 210 kWh/m<sup>2</sup> in buildings built at the same time in the Oulu area.

### Targets and solutions

The main goals are to provide modern and attractive flats for students with high energy efficiency. Each flat will have its own small kitchen and bathroom. The size of a single flat will be between 25 and 36.5 m<sup>2</sup>. All flats will be equipped with a balcony which will also reduce incoming solar radiation to the flats. The goal is to

reach passive house standard level which in northern Finland is 30 kWh/m<sup>2</sup> per year for heating energy.

A new solution for external insulation developed in the so called TES (Timber based Element System) project is utilized in this pilot project.

The targets for the renovation are:

- To reach a U-value for the external walls of 0.07 - 0.10 W/m<sup>2</sup>K
- To reach a U-value for the roof of 0.06 - 0.08 W/m<sup>2</sup>K
- To reach a U-values for the windows of 0.6 - 0.8 W/m<sup>2</sup>K
- To have a good air tightness of the building envelope, with a n<sub>50</sub>-value of 0.6 1/h
- To have efficient heat recovery from the ventilation air by installations of heat exchanger
- To eliminate overheating caused by sun radiation, by using passive sun protection solutions
- To reach indoor climate targets according to class 3 of the Finnish indoor climate guidelines (see "Classification of Indoor Climate 2008, Target values, Design Guidance and Product Requirements, FiSIAQ, 2009").

### Renovation schedule

The main partners have been selected and the construction work will be started during winter 2010.

### Research partner

The pilot project is co-operating with the TES project. (more information on [www.tesenergyfacade.com](http://www.tesenergyfacade.com))

**Contact person: Jari Palonen**, TKK Helsinki University of Technology



*The Finnish pilot project*



## ➔ The Swedish pilot project - Brogården

**The municipal housing association Alingsåshem is renovating an area of houses, called Brogården, according to passive house principles. The houses that were built in the 70's, are experienced as draughty and "outdated".**

### Energy use of the buildings

The energy use of Brogården is 216 kWh/m<sup>2</sup>, of which 115 kWh is for heating. The large consumption is due to large thermal bridges and the leaky construction. Through major renovations, the standard will be raised to that of new buildings, resulting in attractive and energy efficient buildings, which are also adapted for disabled people. In addition, the renovated buildings have an increased zone of comfort, larger rentable space and an energy use of 92 kWh/m<sup>2</sup>, of which 27 is for heating. The total renovation cost is about half the construction cost for a new building.

### First phase completed

The first pilot building, which included 18 out of the 300 apartments, was completed six months ago. About 80% of the tenants chose to move back to their renovated apartments, rather than to stay in the temporary apartments which were made available to them during the renovation. One of the strongest reasons to choose renovation rather than demolition was that the housing area is the tenants' living environment, which includes social networks. These networks take time to build up. After some minor adjustments of the heating distribution system (the area has been connected to the existing heating plant, whose operation was adjusted to the area's previous heating demand), a good indoor environment has now been achieved in the apartments. At the moment there are ongoing measurements in the building.

### Experiences considered in second phase

The second phase is now under way. After considering the experiences of the pilot building, the renovation project has been changed in this step. Efficiency improvements have been made regarding methodology, construction and work environment. For example, the work with the external walls has been carried out 18% more efficiently by using a simplified construction and materials that are easier to handle. At the same time, the last and final phase of the project is designed. The idea is that in this phase, the use of prefabricated elements will be used to a larger extent, and thereby the process will be streamlined further.

To work on improvements of processes and visions is an exception in the daily work of a housing association. Mostly, the company is working with slow-moving processes, where improvements and adjustments only are made



Before renovation

within a given framework. Most of the routines needed deals with customer care, check-ups and the work environment. Routines regarding these aspects are well acquainted to the company. Larger projects, in particular renovation projects, are so unusual that there exist no clear procedures for how they should be managed and documented in a coherent way. However, once a large project is started/carried out, it gives the organisation a good foundation to build on. During the course of the current renovation project, changes have gradually been introduced in the process description, and a distinction between processes dealing with new constructions and those dealing with renovations has been made. The supplements that are presently made concern primarily the analyses carried out at the early stages of the process as well as the transfer of information in the various steps of the process.

This means that a reporting tool, which will serve as a checklist as well as a record, is being developed. The tool will also generate two reports during the project, one from the first analysis of the planned project and one before the brief (planning) stage. Besides this, the tool is helpful, at a later stage, when results are to be followed up. The reports from a project will be available in Alingsåshem's project portal.

### Further needs and steps in building a quality system

Above all, Alingsåshem is today in need of improving the flow of information between projects and between different parts of a project. A developed information flow will help the introduction of a rational methodology for renovation, control and check-ups of projects. There is also a need to get a better overview of both individual projects, as well as the entire process flow. Today the association is vulnerable due to that the knowledge is held only by certain key employees. A systematic quality work can make the knowledge and methods available to others in the organisation. Moreover, there is a need for a stronger link between the company's directives, policies, objectives and strategies, so that they provide a stable basis for annual action plans. A proposal for better suited policies has been suggested to the management.

Feedback of experiences from the construction process is mainly collected at weekly meetings where carpenters and subcontractors present their ideas and objections. The feedback is relatively unsorted written down in a document. Before each new step is taken, each comment is brought up for discussion. In order for the experiences to be useful in other projects, they need to be compiled and generalised, as well as included in the routine description. A credible method for this is the next step in building the quality system.

**Contact persons:** [Ing-Marie Odegren](#), Alingsåshem and [Anders Kyrkander](#), Passivhuscentrum



After renovation



## ➔ 4<sup>th</sup> meeting & Study tour

### March 2009 in Graz, Austria

At the SQUARE **project meeting and workshop** the QA system for energy efficient retrofitting was presented. The meeting also dealt with discussions on different energy efficient measures with good potential and how to evaluate these with respect to energy savings and the effect on the indoor environment.

### Study tour

In connection with the meeting in Graz a study tour was arranged by AEE Institute for Sustainable Technologies. The first visit was to the **SQUARE pilot project Dieselweg**, which consists of buildings with a total of 49 apartments, built in the 50's and 70's that are retrofitted to energy efficient buildings using prefabricated façade elements. The improvement will be in terms of thermal insulation, new windows, new balconies and installation of central radiator heating systems, solar thermal systems for hot water and installation of heating and ventilation systems with heat recovery. The retrofitting will be done with the tenants remaining in their apartments. The only interference in the apartment is the removal of the old windows.

The second visit was to **the Friedrich Stiller student homes**. Extensive renovations have been made to the buildings that were built in the early 70's and contain 141 apartments. Façade integrated solar collectors have been added to the already existing roof collector system. The solar system is used for producing domestic hot water as well as contributing to the space heating.



*The Friedrich Stiller homes for students. The TRECO group and SQUARE group in front of the building. Façade with integrated solar collectors.*



*The Austrian pilot project Dieselweg*

### Successful event...



7. - 9. Okt. 2009

#### The International Symposium on High-Quality Thermal Retrofit of Large-Volume Buildings

At the conference, which was organised on by AEE INTEC and Stadtgemeinde Weiz, different topics on the renovation of the existing building stock were discussed from a political, economic and technical/research point of view. The event was held on the 7 – 9 October 2009, in the City of Weiz, Austria and had 458 participants from 11 different countries!

Proceedings and presentations will soon be available on [www.aee-intec.at](http://www.aee-intec.at)



## ➔ 5<sup>th</sup> meeting & Study tour

### September 2009 in Barcelona, Spain

In conjunction with the fifth meeting there was a **workshop together with the TRECO group**, where the SQUARE partners presented their experiences from the implementation of the QA system in the pilot projects. Anders Kyrkander, representing Alingsåshem, stressed the importance of thinking in terms of methods instead of routines. Most likely, it is not the same person who makes the same thing over and over again. Especially when it comes to routines connected to retrofitting which is not done very often. However, it is not unusual, that housing associations trust on the skills of a single person who knows how to do things and do not think about what would happen when he is not there anymore.

An important issue, raised during the workshop with TRECO, was the general scepticism to quality assurance systems. Is it better to talk in terms of methods for continuous improvement and methods to follow up requirements etc., which point out the positive things with a QA system rather than the negative picture of a heavy administrative system.

Examples were also shown of how different routines, included in the QA system, have been use in the retrofitting process of the pilot projects in Oulu, Finland, in Graz, Austria and in Barcelona, Spain.



*Sonja (from AEE Institute for Sustainable Technologies) presents experience from using the QA system in Austria at the SQUARE-TRECO workshop.*



*Interior design of Spanish pilot project - small, but efficiently used living space*

### Study tour

The afternoon was reserved for a study tour to **the Spanish pilot buildings in Barcelona**. The group went through the streets of Barcelona by bicycles (sustainable transportation!) and finally reached the red brick building originally built in 1890, now retrofitted into a low energy building with improved indoor environment. The building has six apartments, which are quite small but the living spaces are very efficiently used. The building has smart technical solutions for heating, ventilation, heat recovery etc., but is at the same time nicely renovated with a lot of the original charm preserved.

This is the perfect "compact living" for young, "climate conscious couples"!



*Façade of the Spanish pilot project*

### Interested in more information?

**Contact Kristina Mjörnell, Co-ordinator**

SP Technical Research Institute of Sweden

E-mail: [kristina.mjornell@sp.se](mailto:kristina.mjornell@sp.se), Tel: +46 10 516 57 45

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