

# English resume

## ENPIRE Local Project Report for Albertslund, Denmark

### Project context

The Danish Housing company, BO-VEST, is responsible for the largest and most costly renovation plan for social housing in Denmark where approximately 2200 industrialised concrete housing units from the 1960'es, in the municipality of Albertslund, will go through a costly urban renewal renovation at an estimated cost of not less than 180.000 Euro per unit. In all around 360 Mio. Euro. Besides there is also childcare facilities, institutions for elderly people, a school, a library and a shopping centre. At BO-VEST and City of Albertslund there is a real devotion to ensure that the most healthy, cost effective, energy efficient and sustainable renovation design is identified and implemented.

### Existing situation

The dominating part of building stock is from the period 1960-1980. The main part of the mentioned housing schemes consist of one storey one-family housing units with a little courtyard for each dwelling and approximately 25% of the area is 2 storey row houses. The current energy demands are quite high, 150 kWh/m<sup>2</sup>/year.

Until now heating and domestic hot water have been secured by help of district heating where the district heating pipes have been placed under the dwellings in a crawlspace which is not secured concerning moisture transfer by a membrane towards the dwellings. Due to this it is expected to move new district heating pipes to an area in front of the dwellings and insulate the crawlspace and floors. A rather expensive part of the renovation.

Besides it has been recognised by a quality assessment study that the roofs will have to be replaced since they are not raintight and are filled with fungus. In addition there is also very frequent problem with poor indoor air climate in the dwellings, in many cases with fungus problems, mainly due to poor ventilation. This is by the housing company seen as the most important quality problems which need improvement.

### Stakeholders

Master Plan South is the overall plan for retrofitting the whole southern part of Albertslund and created in a partnership between City of Albertslund, BO-VEST and tenants organisations. "Samrådet" is the coordinating forum among these three partners taking care of the regeneration process of the whole area.

At BO-VEST and in the municipality, there is a big interest to optimise the renovation approach and include a low energy renovation design with improved indoor air climate which is combined with an optimised energy supply solution which includes renewables like solar heating and PV used in local building integrated power roofing designs, and

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where the district heating losses are reduced considerably so they have a reasonable size compared to the need for heating and domestic hot water, (max. 30% of this).

There has been created several forums and projects to create a process for obtaining a low energy renovation of the building stock of BO-VEST involving several professional as consulting companies, Architects firms, engineers, contractors, building material producers and utilities.

The ambitions of the Municipalities is to renovate the building stock to the Danish *low energy class 1*, which is the energy demand for new built buildings in Denmark. This means an energy demand on less 40 kWh/m<sup>2</sup>/year. This goal is supported by BO-VEST and tenants if it can be done to affordable prices.

### **Legislation, standards and policies**

The national legislation on energy demands in renovation are quit weak, but if more than 25% of the area of the building envelope are renovated it has to be renovated with certain demands on insulation if the pay back time is less than 5 years.

At the same time the national foundation for financing renovation of social housing associations can not finance energy measures other than those demanded from the legislation. More advanced energy measures has to be financed by the association and the tenants. In general it lead to the situation where only those energy measures that can be financed by the expected cost reduction by lower energy consumption is implemented.

The local authorities are not able to set up local demands on low energy measures, they are only able to negotiate with the association and make embedded agreement, which have done in Albertslund.

The policy of City of Albertslund is very clear:

If most of the building stock has to be renovated during the coming 10-20 years it has to fulfil future demands. It is essential for the survival of the City and it's ability to attract new generations of families. And future demands also include high demands on saving energy and use of renewables related to the buildings.

After the building stock has been renewed in the coming years there will probably go on for other 50 years before the next regeneration will take place, and energy prices can be an important competitiveness factor in the future so it has to be done now.

This policy has led to great interest from the Danish building sector to learn new methods and develop their knowledge on low energy measures for the future market situation.

### **Ambitions for energy/CO<sub>2</sub>**

The overall ambitions on energy and carbon reduction were formulated by the City of Albertslund. Their view is, that if the building stock has to be renovated, and for sure it has, it has to fulfil future demands also on energy performance.

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The precise energy frame was chosen by using the energy demands in the national building regulation for new build buildings. The municipality and BO-VEST agreed on reaching the best standard for new build or better in the renovation of their building stock. The Danish regulation has the existing demands and low energy class 2 and 1, which will be minimum demands in year 2011 and 2016 (which is 25% and 50% energy reductions compared with existing).

The next step was to develop a cost effective concept for renovation the buildings to these very high energy standards and find solutions to finance the energy measures.

Several initiatives has been launched to find the precise ambitions and concept for renovation. By doing 9 full scale renovations projects to find the actual solutions and the most cost effective low energy renovations method's.

The process is ongoing and three projects has been done and two partly evaluated in close dialog with the tenants and their organisations.

The experience until now is that the tenants do not pay so much attention to the energy measures. They pay more attention to the general improvement of the dwellings which means windows, bathrooms, kitchen and lay out of the dwellings. The things that can be seen which is logical because they do not have experience yet by living in the apartment.

From a professional point of view the building process, the actual products and the energy measures can be improved and optimised.

The two evaluated cases is build to energy class 2 (25% better performance than the demand for new build) and building cost seams to be 20-30% too high due to all the selected solutions and not only because of the higher energy class.

Dialog and workshop processes has been run during 2009 with the professionals to find the state-of-the-art energy optimization in renovation in combination with cost effectiveness. Next step is the tendering procedure 6 dwellings in a row in spring/summer 2010 to see if the theory can be fulfil by the market.

### **Analysis of energy options**

The Analysis in the Enpire project have focus on how to obtain an improved indoor air climate using a new type of building integrated low cost balanced heat recovery ventilation design, and different levels of low energy designs in combination with optimised energy supply solutions which also included the use of renewable energy. It have included focus on passive house design with only 10 kWh/m<sup>2</sup>, year in room heating demand as the most advanced solution. Also CO<sub>2</sub> neutral housing designs where PV-modules are used to provide an electricity contribution similar to the yearly electricity has been tested tested.

The analyse of energy options had taken place in close dialog between all experts: professionals from BO-VEST and the municipality, the utility, building consultants, a group of the most important building material producers and contractors.

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Most attentions has been pay to the process to develop the state-of-the-art method of energy optimization in renovation dwellings. Two Parallel to the processes has been running with ENPIRE in Albertslund:

One process with the pilot project Hyldebjerg. Hyldebjerg has in full scale tested the-state-of-the-art energy optimization solution with prefabricated façades and roof elements and the special solar prism. The project has been in one row house unit in Hyldebjerg. Hyldebjerg is a social housing association in the North of Albertslund also administrated by BO-VEST.

Another process has been based on the two first pilot projects in Albertslund South. These has been used as a plat form for develop a more optimised process for the coming projects.

The process started with a day conference where the project goals and all parties were presented.

Then there has been to excursions to see low energy renovation: One to Gothenburg and Allingsås in Sweden and one to Breda, Tilburg and Roosendaal in the Netherlands. The purpose was to learn from others experience and get team spirit in the expert group.

The process in south has run one session in to groups to identify the most promising options, to reach energy class 1. with low cost. All experts has participated: Housing association, experts from the municipal, advisors and consultants, contractor and producers of building materials.

The tool in the sessions was: BE06 – the Danish tool used in the energy building regulation.

## **The results**

The results from the two session were quit equal:

- Good building envelope, 200-250 mm extra insulation
- Low energy windows – triple glazing
- Sun shading
- Air tightness – high demands
- Heat recovery ventilation system with high effect and low electricity consumption
- Solar energy - PV
- Other technical features and design FX. better heat exchanger for district heating

Technical expert groups were the established to evaluate the result, make more cost effective solution and specified drawing and technical descriptions. Consultants and the building contractor vent in to close dialog with the building materiel producers Rockwool, VELFAC, VELUX and Danfoss during Autumn 2009.

These material will be a part of the coming tendering material.

At the same time the builders and the experts got practical experience form the-state-of-the renovation of Hyldebjerg. Theory was confronted with practical building experience.

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The process led to very useful experience which will be used in the coming tendering procedure in South.

### **Implementation and evaluation**

Implementation will take place in the coming year and depend very much on the tendering procedure, and 6 row houses in of social housing and two private (single family house and a row house) will be renovated.

Energy class 1 will be the ambitions for the private houses and the 6 row houses will be done to six different levels of energy, to get precise knowledge of the renovations cost.

It is very likely that the process will lead to experience that can fulfil energy class 1 for the large scale renovation, and there has been now attempts devaluated the energy ambitions.

Financing seems to be the main obstacle but with a very hungry building market the goals hopefully will be reached.

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