



Partnering as a tool for a cost and energy efficient retrofitting of existing buildings – an example from E2Rebuild – Halmstad demonstration project

Stephen Burke,
NCC Construction Sverige AB
NCC Engineering
Östra Varvsgatan 4, 205 47, Malmö
Email: Stephen.burke@ncc.se
Telephone: +46 40 31 70 18

Abstract

There is a growing need to refurbish a specific group of buildings in Sweden referred to as the million program buildings. The building stock is about 40 years old and age is starting to have an effect on the buildings performance. Windows are decomposing and starting to leak; pipes are deteriorating; appliances are outdated; electrical equipment is old; and, in some cases, the indoor environment is becoming worst. In addition to this, energy prices are increasing every year. The result of this is that operation costs are increasing while at the same time rent costs are virtually fixed due to the sub-standard quality of the buildings. The biggest challenge facing the building owners is that they lack the capital to retrofit or even upgrade their buildings.

Within the E2Rebuild project, several buildings were retrofitted to a passive house standard and the remaining buildings to low energy buildings (all are within 30 – 60 kWh/m² year bought energy including heat, ventilation and hot water). One building within the project used an unconventional method of how the retrofit was designed and planned... as a partnering project between NCC and Apartment Bostad AB.

Within this project, several retrofit solutions and their associated costs were proposed and calculated by NCC for Apartment ranging from the minimum required work to ensure that the building was functional (most energy use), to best solution using a combination of new technology and new control systems. The cost calculations also took into account how the renovations would finance themselves and what time frame this could be expected. The proposed solutions had limitations defined by the customer in advance, one being that the facades could not be changed or modified. Each calculation also showed how the specific retrofit could be financed over time.

This paper will present and discuss how NCC and Apartment Bostad AB experienced the retrofit process. The article will also present and discuss the advantages and disadvantages of using Partnering compared to a more traditional retrofit project as well as how this can contribute to a more optimized retrofit project in regards to energy efficiency and cost optimization

Keywords: partnering, retrofit, E2Rebuild

Introduction

There is a growing need to refurbish a specific group of buildings in Sweden referred to as the million program buildings. The building stock is about 40 years old and age is starting to have an effect on the buildings performance. Windows are decomposing and are starting to leak both water and energy; pipes are deteriorating so that there is an increased risk for leakage; appliances are outdated and inefficient; electrical equipment is old; and the indoor environment is even becoming worst in some cases.

In addition to this, energy prices are increasing every year. The result of this is that a building is becoming more expensive to maintain for the building owners, operation costs are increasing and rent costs are almost fixed due to the substandard quality of the buildings. The biggest challenge the building owners face is finding the investment capital to improve their building stock.

Within the E2Rebuild project, several buildings were retrofitted to a passive house standard and the remainder to low energy buildings (all are within 30 – 60 kWh/m² year bought energy including heat, ventilation and hot water). One building within the project used an unconventional method of how the retrofit was designed and executed... as a partnering between NCC and Apartment Bostad AB (hereafter referred to as Apartment).

Partnering has several different definitions [Construction Industry Board, 1997], [Bennet & Jayes 1998], [Nyström, 2007] but the common ground is that it is a method of cooperation within a project where the stakeholders establish a long-term relationship with the project in the centre. The partners involved in a project develop common goals, methods of solving conflicts, and a system for following up goals and measuring improvements. Partners in a project agree to share both the risks and benefits. This relationship is based on mutual trust and teamwork. [NCC AB, 2011]

Objectives

This paper will present and discuss how NCC and Apartment experienced the retrofit process based on the advantages and disadvantages of using Partnering compared to a more traditional retrofit project. This article will also present how partnering was used as a design and decision tool to determine the energy and cost solutions best suited to the customer as well as how this can contribute to a more optimized retrofit project in regards to energy efficiency and cost optimization.

Method

The information for this article was gathered through observations and correspondence with the various actors and an organised interview with NCC Construction, Halmstad municipality and Apartment which was conducted within Work Package 3,1. The interview was led by Sonja Geier (HSLU), Gustav Malm (White), Viktoria Walldin (White), Simon le Roux (AALTO), Carl-Magnus Capener (SP) and Thomas Heim (HSLU). Additional information was obtained from Ulf Eriksson and Henrik Ivarsson, Apartment Bostad AB by the author.

Results and Discussion

Partnering

As mentioned above, Partnering has a few definitions depending on which author you look at. NCC uses a modification of Nyström's definition which is based on a core of trust and mutual understanding between the involved parties [Nyström, 2005] which puts the good of the project before the good of the individual partners [NCC 2011].

Some of the additional parameters within NCC's definition include open economy, common goals, common organisation, constant improvements, the right team, common economic interests and problem solving. This combination of factors allows, and even encourages, the partners to be more open in regards to technical solutions and economics. If one of the partners has a technical problem which can cost the project money, it is easy for one of the other partners to provide assistance in the form of resources or solutions since the problem will most likely affect everyone involved in the project sooner or later. Everyone loses by not cooperating.

In practical terms, partnering is a method of doing business in larger and more complex projects where cost is not the focus of the project. The main goal with partnering is getting best value for your money and not necessarily the cheapest bid. This means that all parties involved in a project must sit down together at the beginning of the project and define what it is they want to accomplish with the available resources (financial, technical, competence, etc.).

In a traditional building process, the project begins with the client deciding on what requirements the projects has. Next the project is designed by architects and engineers before a call for tendering. After the supporting documents are produced the client calls for tenders. Usually, but not always, the cheapest bid is accepted for production. Once the contract is signed production begins.

In a partnering process, the project also begins with the client deciding on some basic requirements. However, a call for tendering is put out almost directly for a partner in the project (if there is none from the beginning). The process of setting requirements and designing continues after the partner is chosen. At this point, all work is the result of collaboration between the partners. In some cases, production can begin before the design phase is complete. Because of these overlaps in the partnering process, this usually means that a partnering project can be completed in a shorter timeframe than traditional projects.

In a partnering project, the stakeholders all have a say in all parts of the project. This is because everyone stands to gain or lose if the project goes well or poorly. Very little details are available at the beginning of a partnering project, contrary to a traditional project where much of the project has already been defined by the building owner and an entrepreneur is brought in to execute the idea for the agreed upon sum. It is also important to point out that in a traditional project; the building owner is the party taking the largest risk. A project can go poorly for the owner but still be profitable for the entrepreneur(s).

Halmstad Giganten

In the Halmstad project, Apartment decided that Giganten 1 & 7 needed to undergo refurbishment. They identified several key components which needed to be replaced or upgraded including water and sewer pipes, windows, heating system and some electrical works. Apartment made a list of the minimum required renovations and asked NCC to calculate the associated costs. NCC provided this along with several energy savings scenarios with associated costs and return on investment (ROI) calculations. NCC even suggested ways of financing the renovations through, for example, increased rent from certain strategic improvements and saved energy per year. Note that the increased rent was based on the new market value of the partly refurbished apartments (new kitchen and bathroom) and the tenants association had to approve this rent increase otherwise the project would have been a no-go. This preliminary work was paid for by Apartment before an entrepreneur was officially contracted.

In a traditional bid-build project, the building owner or client asks for a price for specific work to be done. The client does not usually receive advice on how to finance the retrofit, it is expected that they have the finances already.

After receiving this, Apartment had the choice of stopping the project, getting tenders from other construction companies for whichever option they wished or they could sign a contract with NCC to continue the project. Apartment chose to continue with NCC as a partner and wanted them as a total contractor.

NCC and Apartment sat down and developed a renovation strategy based on the various calculations NCC provided Apartment during the first phase. Apartment decided, after being accepted into the E2Rebuild project, to choose the most aggressive energy savings renovation. This included a new advanced heat-pump (in combination with district heating) heating system (both outdoor air and extraction air heat pumps), new energy efficient windows, a custom control system for the heating system based on weather prognosis, low-energy occupancy controlled lighting in the garage, insulation in the attic and deactivation of redundant systems.

Apartment wanted a renovation process where the tenants could remain in their apartments. Therefore the entire retrofit process was planned around this. The tenants lived in their bed and living rooms during the renovation and were provided with temporary facilities when their bathrooms and kitchen were being renovated. One stairwell at a time was renovated and each stairwell would only be renovated for a maximum of four weeks. Tenants lived rent-free in their apartments during these four weeks as compensation for the disturbance.

The retrofit also included new elevators. The old elevators were disabled for three of the four weeks. To make life easier for the tenants, they were provided with additional help if requested such as help carrying groceries up the stairs, help with mobility and various other services.

NCC was also given the responsibility of facilitating communication with the tenants and this was done by partly by appointing a full-time representative who could listen to complaints and answer questions from the tenants, and partly by holding meetings for the tenants where they could attend and speak directly with the project managers and Apartment. NCC and Apartment experienced this as a positive way to keep tenants informed.

All parties had a positive experience working with Giganten 1 & 7. The renovation work was almost on-time. One complication occurred during the installation of the new heat pumps where one of the main electric lines was deemed dangerous. The line had to be replaced all the way to the main before the system could be turned on. While this did not affect the renovations in the apartments, it did delay the project. After the heating system was taken on-line, there were technical issues (programming problems) with the control systems which took a little over a year to solve.

Advantages and Disadvantages

One of the advantages with partnering reported by Apartment was the fact that the risk was shared 50:50. If the project was under budget, the extra funding was split 50:50. If the project was over budget the costs were also split 50:50. This meant that NCC also had a financial interest in the well-being of the project.

Apartment also liked the open process. The project was much more transparent to them and because they were a partner, they became more involved in the building process. They also said that this involvement also required less effort from them compared to a traditional project because they did not have to create a project description where they dictate all the conditions of the project in advance. The partners agree on the project conditions as a part of the project.

Apartment thought that one of the biggest advantages with partnering was that they could ask NCC to solve problems that Apartment usually had to solve within a traditional project (for example dealing with tenants). This helped Apartment free up time that was spent on other areas of the project.

Apartment also felt that NCC had better communication with them and their tenants compared to the entrepreneur in a traditional construction project. The improved communication between client and entrepreneur is due to the fact that Apartment is also a partner in the project and it is expected that they contribute just as much as any other partner. The improved communication with the tenants was a result of Apartment's desire that the tenants be informed directly from NCC so that they get real information from the people who know what is going on instead of second-hand information.

NCC fulfilled this wish by appointing a tenant representative who had the job of informing, dealing with complaints, organising extra help, and dealing with inquiries from curious tenants who were interested in the project. In this way Apartment saved a lot of time answering phone calls about complaints and from tenants wondering what NCC was doing, when they would be working in their apartment, etc.

Apartment also benefitted from knowledge transfer from NCC. Since all the problems affected both parties, this information became more open to Apartment, including the solutions. Apartment stated that if this project would have been a traditional project (where they defined the project in advance) their building would not have achieved the energy savings that they realised because they lacked knowledge about newer technical solutions. They also could make use of NCC's experience with different systems and how they have functioned in the past so that the whole building could be optimised instead of just parts of the building. Apartment also said that, based on their experience, they could not have had a better project through external consultants.

Both parties stated that they experienced a smoother process and a good working climate. Apartment said that they liked that the process was defined and worked through by the partners before work was even started. Everyone knew what had to be done and how long it should take, including the tenants.

Some of the disadvantages with partnering are that the project can cost more than traditional projects and that late changes, or items are missing from the drawings, can result in extra costs later in the project.

Most important lesson from Giganten 1 & 7

Because of the positive experience with partnering in Giganten 1 & 7, Apartment decided to use partnering in their next retrofit project, Giganten 6 with is another million program building next door to Giganten 1 & 7. They have not changed their work method significantly from that above, however they have decided to put a little more focus into informing tenants. One of the most important lessons from the first project was the importance of informing the tenants and showing them the demonstration apartment before any work is decided. All the tenants could see how the apartments would look before work began. They could also personalise their apartment, to some extent, by choosing some optional parameters such as colours. If the tenants are well informed, are given opportunities to give feedback to the project (and feel that they are taken seriously) and feel that they are also getting something from the retrofit, there will be very little resistance from them.

Conclusions

By becoming partners, both companies have a financial stake in the project. If it goes good, both share the benefits; if the project goes bad, both share the costs. In a traditional bid-build project, the building owner takes all of the risks. Even if a project goes bad the entrepreneur(s) can still make a profit at the expense of the building owner. This does not make the entrepreneur(s) interested in the success of the project to the extent that they would be in a Partnering project.

Using partnering allowed NCC and Apartment to develop a renovation strategy which was win-win for both partners. Apartment received prices for the minimum amount of work they needed for their building plus ways of reducing their energy use with suggestions on how to finance these extra renovation costs within their defined ROI. They could also choose to get prices from other companies after this and switch construction companies if they preferred with no penalty.

NCC was able to show Apartment alternative sources of funding which allowed for the project to be larger while still falling within Apartment's ROI requirements. NCC also kept open communication with the tenants, which helped the renovation process by making the tenants positive towards the work. They were shown a demonstration apartment before work began and they were allowed to choose some of the colours. They could live in their apartments during the retrofit and were given one month rent-free. They felt more involved and were kept up-to-date about what the current status was. This resulted in tenants who were positive about the renovations and did not cause any problems.

Apartment thought that the partnering process was better than a traditional process and saw many advantages with using partnering. Some of the advantages they stated were:

- Smoother process since everything was planned in advance.
- They were more involved in the planning of work.
- They were better informed.
- They did not need to define every detail of the project in advance.
- They did not have to solve all the problems they normally have in a traditional project, it was OK to ask NCC to solve some of them instead.
- They could make use of NCC's experience and knowledge to improve the project without significantly increasing their costs.
- They did not have to deal with tenants during the retrofit because NCC had a representative on-site to deal with inquires and complaints.
- No problems with tenants at all in this project.
- They felt that they got a more energy efficient building for their money than if they had used external consultants to help define the project and technical solutions.

Apartment was satisfied with the partnering project and chose it for the next renovation object, implementing lessons learned from their first partnering project.

Reference section

[Bennet & Jayes, 1998] Bennet, John & Jayes, Sarah, The Seven Pillars of Partnering: A Guide to Second Generation Partnering, University of Reading (1998)

[Construction Industry Board, 1997] Construction Industry Board, Partnering in the Team, Thomas Telford Publishing, London (1997)

[NCC AB, 2011] NCC AB, Teampayer - a handbook in Partnering, NCC AB, Solna (2011)

[Nyström, 2005] Nyström, Johan, Partnering; definition, theory and the procurement phase, Licentiate Thesis, Report 5:64, Building and Real Estate Economics, Royal Institute of Technology, Stockholm (2005)

[Nyström, 2007] Nyström, Johan, Partnering : definition, theory and evaluation, PhD Thesis, Building and Real Estate Economics, Royal Institute of Technology, Stockholm (2007)

Glossary

AALTO: Aalto University School of Arts, Design and Architecture

HSLU: Lucerne University of Applied Sciences and Arts – Engineering & Architecture

ROI: Return on investment

SP: SP Technical Research Institute of Sweden

Acknowledgement

This article presents results documented by other members of the E2Rebuild project. Thanks go to everyone within E2Rebuild for all their hard work. I would like to thank Ulf Eriksson and Henrik Ivarsson for sharing their experience of the building process with me from Apartment's perspective. I would also like to thank Sonja Geier for writing the transcript and leading the interview with NCC Construction, and Apartment Bostad AB. This is useful in remembering what happened a few years ago!