



Contract number ENER/FP7/260039/BEEMUP

## BEEM-UP

Building Energy Efficiency for Massive market UPtake

### Integrated Project

EeB-ENERGY-2010.8.1-2

Demonstration of Energy Efficiency through Retrofitting of Buildings

### **Deliverable D.2.3: first building in Alingsås retrofitted** Reference: D.2.3.

**Due date of deliverable:** 2012/06

**Actual submission date:** 2012/06/12

**Start of the project:** 2011/01/01

**Duration:** 48 months

**Organisation name and lead contractor:** AB Alingsåshem

**Revision:** final

Project co-funded by the European Commission within the Seventh Framework Programme		
Dissemination Level		
<b>PU</b>	Public	X
<b>PP</b>	Restricted to other programme participants (including the Commission Services)	
<b>RE</b>	Restricted to a group specified by the consortium (including the Commission Services)	
<b>CO</b>	Confidential, only for members of the consortium (including the Commission Services)	

## Deliverable description

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The nature of this document is Deliverable, so it aims to be a justification of the finalisation of the works done in Building “J”, the first of the buildings retrofitted in Sweden.

For such a justification, we include here a picture and a presentation of the works done since the beginning of 2011 up to the end of the works.

If further information is needed by the European Commission for the BEEM-UP Project to justify the finalisation of the works, it will be provided upon request.

Best regards

AB Alingsåshem

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## Chapter 1 Building “J” retrofitted.

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The first building in Alingsås, “J” with the address Knektegårdsgatan 27 A B, has been retrofitted. The building now has twelve flats and two lifts, elevators, that serve all the flats. The building is the first totally smoke free house within Alingsåshem.

The retrofit started in spring 2011 and was completed in January 2012. The first tenants moved in on January 27<sup>th</sup>.

We also enclose photographs of building J, taken during the retrofit (July 27<sup>th</sup>) and last week (June 5<sup>th</sup>).

### 1.1 Pictures

The following pictures aim to show the actual status of the building, after the conclusion of the execution works.



Picture 1: Building J main entrance

# Brogården – Planned renewal

# Brogården

## Ensuring the future



*The tenant of tomorrow?*

The Brogården area (built in 1973) is currently undergoing an extensive renewal concerning both interior and exterior. The aim is to create a good and sustainable living environment suitable for both this and coming generations. This is what we call “ensuring the future”.

The extensive refurbishment of Brogården begun in the spring of 2008. The refurbishment was initially concentrated to one house (House D). The experiences made were meticulously documented and a continuous evaluation was done in order to make further stages in the refurbishment more effective.

The first 16 apartments were ready to receive their tenants in February 2009. Since then a further six houses (House A-G) are completed and the tenants have moved in. Reconstruction is under way in house H, J and K. The whole area, circa 300 apartments, is scheduled to be completed in 2013. The renewal is a work in progress and is very much a living project.



# The directives from our owners

## The municipality's object with AB Alingsåshem

Alingsåshem is continuously striving to offer dwellings that are attractive, secure and pleasant. Our residential areas shall provide social integration and accessibility for everyone, as well as a possibility for elderly people to stay in their neighbourhood. Alingsåshem strives to offer a varied and exciting range of residences that can provide for our customers' different needs for housing.

AB Alingsåshem shall be an example when it comes to a comprehensive view concerning questions of quality, working environment, environment and economy in the operation.



**alingsåshem**

This holistic attitude demands a thorough approach: consideration must be shown for all parts simultaneously, no part can be “glued on” as an afterthought.

### **Our Watch-Words**

- Attractive – Safe – Sustainable
- Integration – Variation – Different needs
- Ecological – Energy efficient
- Long term - Economy



**alingsåshem**



# Alingsåshem's work with planned renewal

## Soul – Qualities – Defects – Measures



Alingsåshem works with planned renewal. Each residential area is studied in order to pinpoint qualities and defects, while the possibilities for development and renewal are evaluated.



### **We work on the basis of the following watchwords**

What is the area's soul?

Which are the area's qualities?

Which are the area's defects?

How can the qualities be kept, while at the same time redressing the defects?



Each part of our work is imbued with the aim to achieve sustainability. Our definition of "sustainability" follows the Brundtland Commission's definition from 1987: "sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs".





# The residential area Brogården

## Description



The apartment buildings in Brogården were drawn by the HSB national association's architect office and were built in three stages between 1972 and 1975. The area proved to be the last project in Alingsås' investment in the Million Homes Program.

The development consists of slab blocks arranged around large courts. The area comprises a total of 300 flats, divided into 16 houses with 2-4 floors each. All flats have a balcony or a patio. The architecture is plain and period-specific with hipped saddleback roofs and façades in yellow brick. The details on the exterior consists of decorative ribbons of lacquered sheet metal, white windows without sashes, and indented balconies with fronts in red, green or brown. The undecorated entrances are indented.



# The residential area Brogården

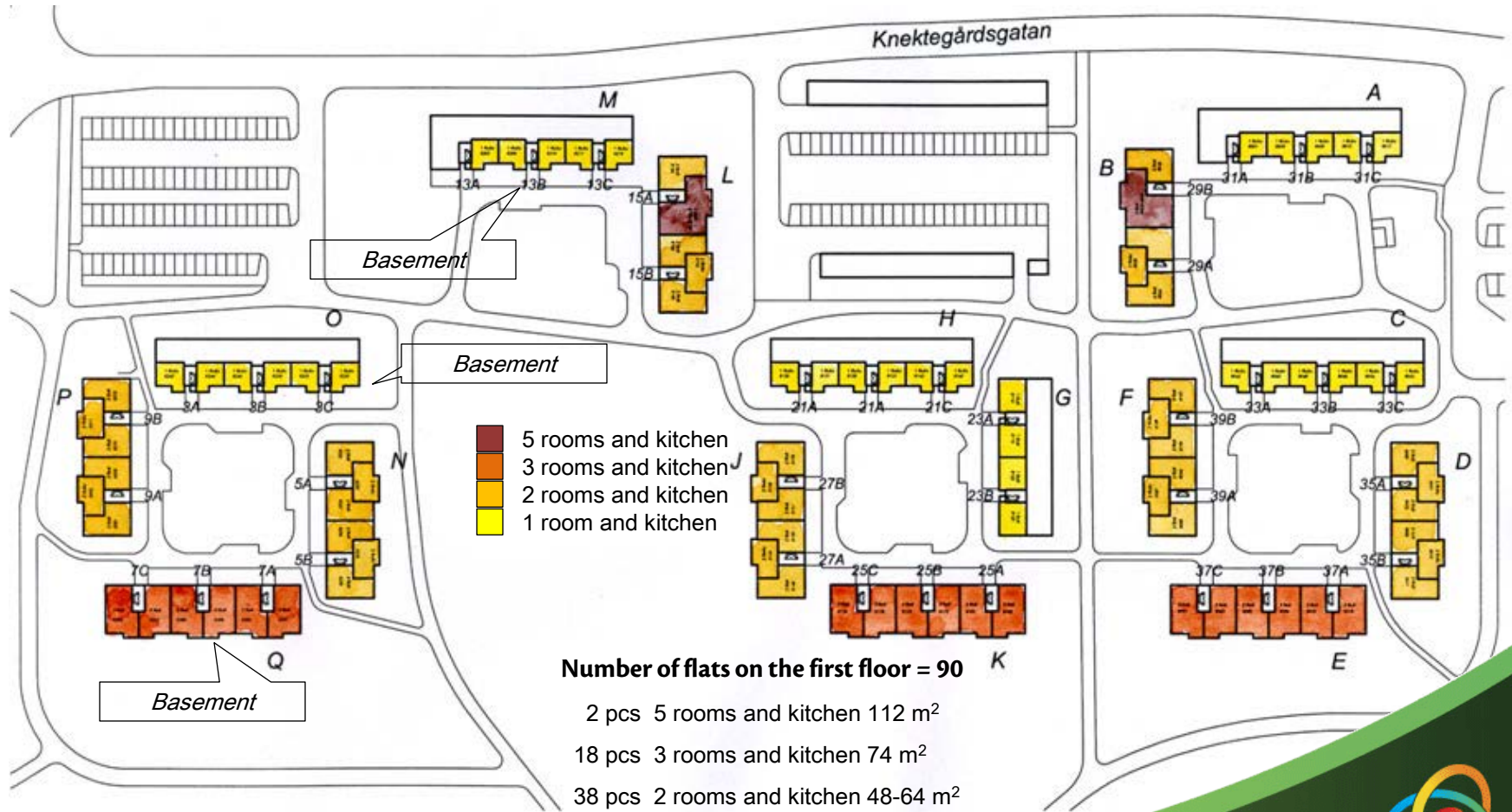
## Site plan





# The residential area Brogården

## Flat distribution – Ground floor

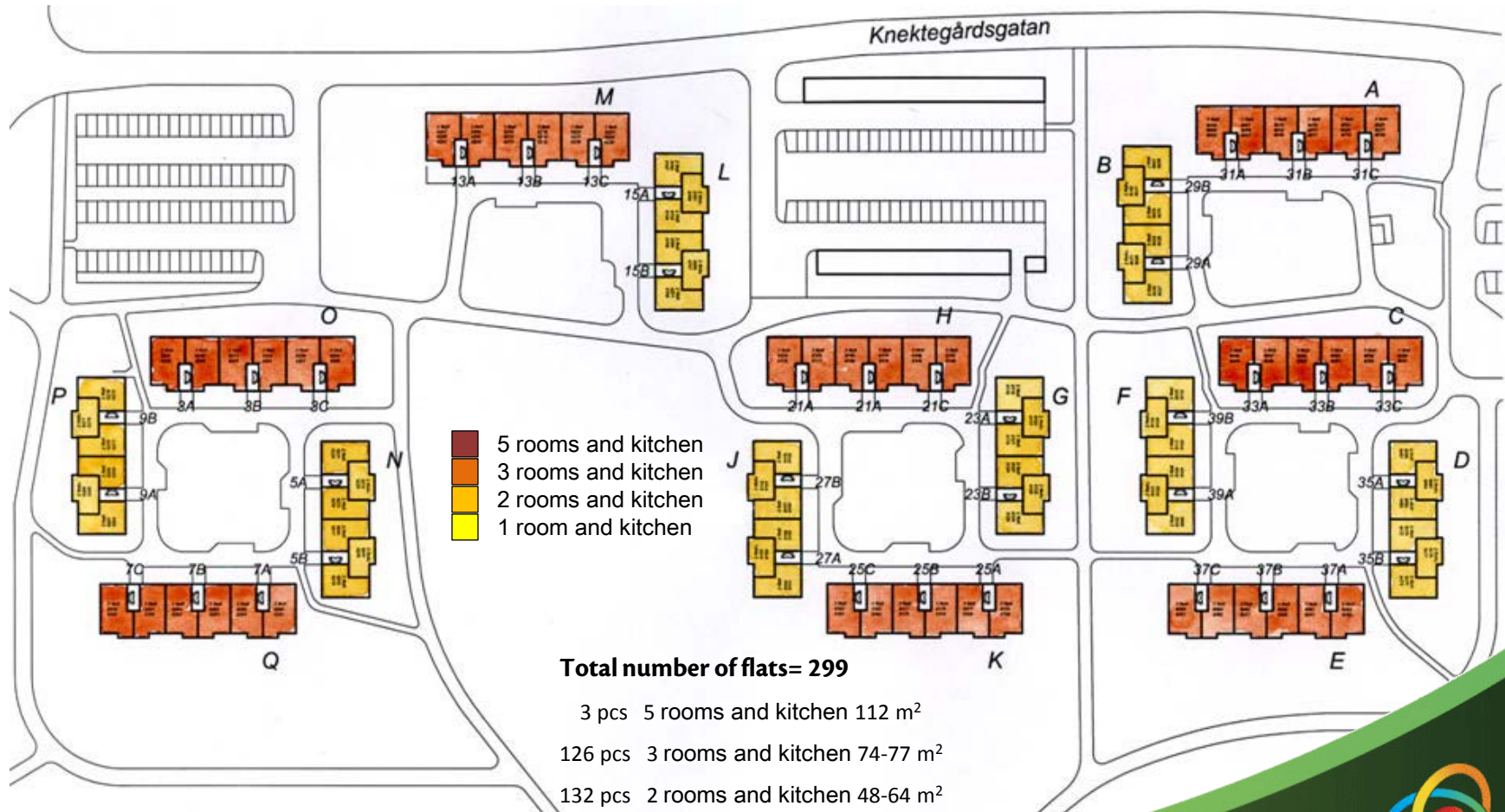


**NB! Applies before refurbishment**



# The residential area Brogården

## Flat distribution – First floor



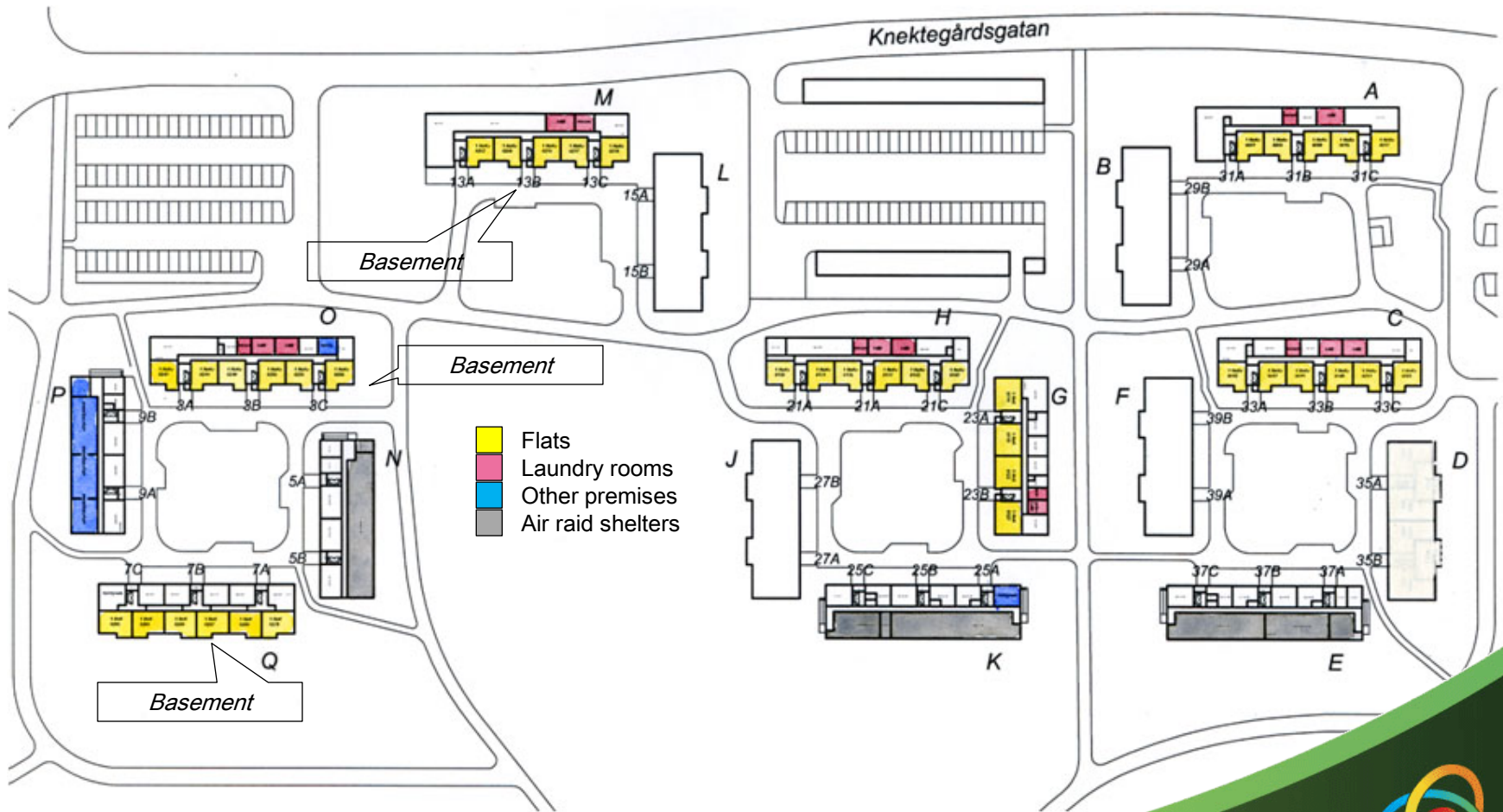
**NB! Applies before refurbishment**



**alingsåhem**

# The residential area Brogården

## Flat distribution - Basement



NB! Applies before refurbishment





# The residential area Brogården

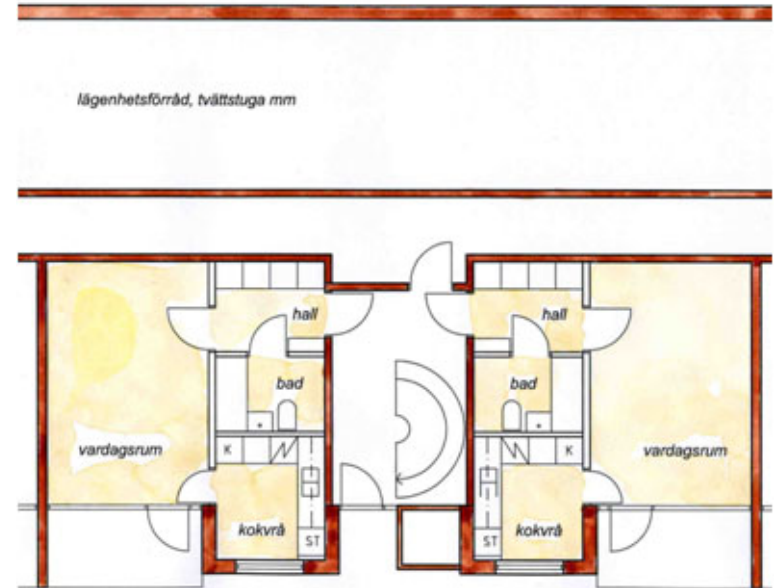
## Typical flats



**2 rooms and kitchen: 64 m<sup>2</sup> / 48 m<sup>2</sup> / 64 m<sup>2</sup>**

House G; floor 2-3

This is also largely applicable on  
House B, D, F, J, L, N and P; floor 1-3



**1 room and kitchen: 35 m<sup>2</sup> / 35 m<sup>2</sup>**

House A, C, H, M and O; ground floor



# Planned renewal Brogården –

## Soul



In 2006 the regional museum of Västra Götaland carried out the project *An inventory of historically interesting buildings in Alingsås, except the city centre*. In their evaluation of Brogården the following is said about the area:

“Apartment buildings with cultural-historical value. The well preserved buildings with their period-specific architecture are a cultural-historical document from the time of the Million Homes Program.”

The Brogården area is thus of a cultural-historical interest for future generations. This is a value that it is Alingsåshem’s task to manage.

## Qualities



Compared to other residential areas Brogården possesses good possibilities to maintain old qualities and add new, as well as redress defects.

- Brogården is a coherent area, situated in close proximity to the city centre, facilities and nature.
- The area is a period-specific and good example of the Million Homes Program and has a documented cultural-historical value.





# Planned renewal Brogården –

## Defects and measures



*Work in progress on the foundations*

### **This is what we are working with**

- Easily resolved obstacles
- Flats with high accessibility
- Larger variation
- The need for larger flats
- Installation of lifts
- Improving laundry rooms
- Shared premises
- Complementary buildings
- Car parks
- Design issues
- Cultural historical value
- Planning for passive houses
- Simplicity, repetition, rationality, effective building
- Redress the technical defects

### **Technical defects**

- Thermal bridges by indented balconies
- Crumbling bricks
- Draughty flats
- High energy consumption
- Poor sound proofing



# Planned renewal Brogården –

## Energy consumption



*Bricks affected by frost wedging*

The Brogården houses have been continuously renovated during the last forty years. During this time the façade has been replaced and a third windowpane with PVC-frame (an insulated glazing unit) has been added. The relatively recently changed brickwork of the façade has crumbled due to frost wedging and a mortar that was not compatible with the surrounding material and the environment, making a new replacement necessary. This in combination with major technical flaws – high energy consumption, draughts and thermal bridges – required a decision to be made on how to proceed with renovations.

Following the policy on ecological, economical and social sustainability, Alingsåshem decided on a major internal and external reconstruction using passive house technique. The extra expenses generated by this building method are calculated to be earned in 6 to 10 years due to lower maintenance costs. Measures done during one year's time in the first completed house in Brogården show that the energy consumption connected to heating has been reduced with 80%.

After the refurbishment the electricity and hot water consumption will be metered and paid individually by each flat. Studies show that the consumption has been reduced when the tenants have the opportunity to influence their own costs.



# Planned renewal Brogården –

## Energy consumption, example



*Knektegårdsgatan 37*

Knektegårdsgatan 37 (House D)	Before renovation	After renovation	Brogården's energy aims
Rentable area 1 337 sqm	[kWh/m <sup>2</sup> /year]	[kWh/m <sup>2</sup> /year]	[kWh/m <sup>2</sup> /year]
Heating	115	19	27
Hot water	42	18	25
Household electricity	39	28	27
Residential electricity	20	21	13
<b>Total energy consumption</b>	<b>216</b>	<b>86</b>	<b>92</b>
Excl. household electricity	177	58	65

A correction for the heating need during the unusually cold winter -09/-10 has been made. The heating need for a normal year after correction then equals to 70% of the measured values.

Source: SP





# Passive house technique –

## Description



*Protection against damp air*

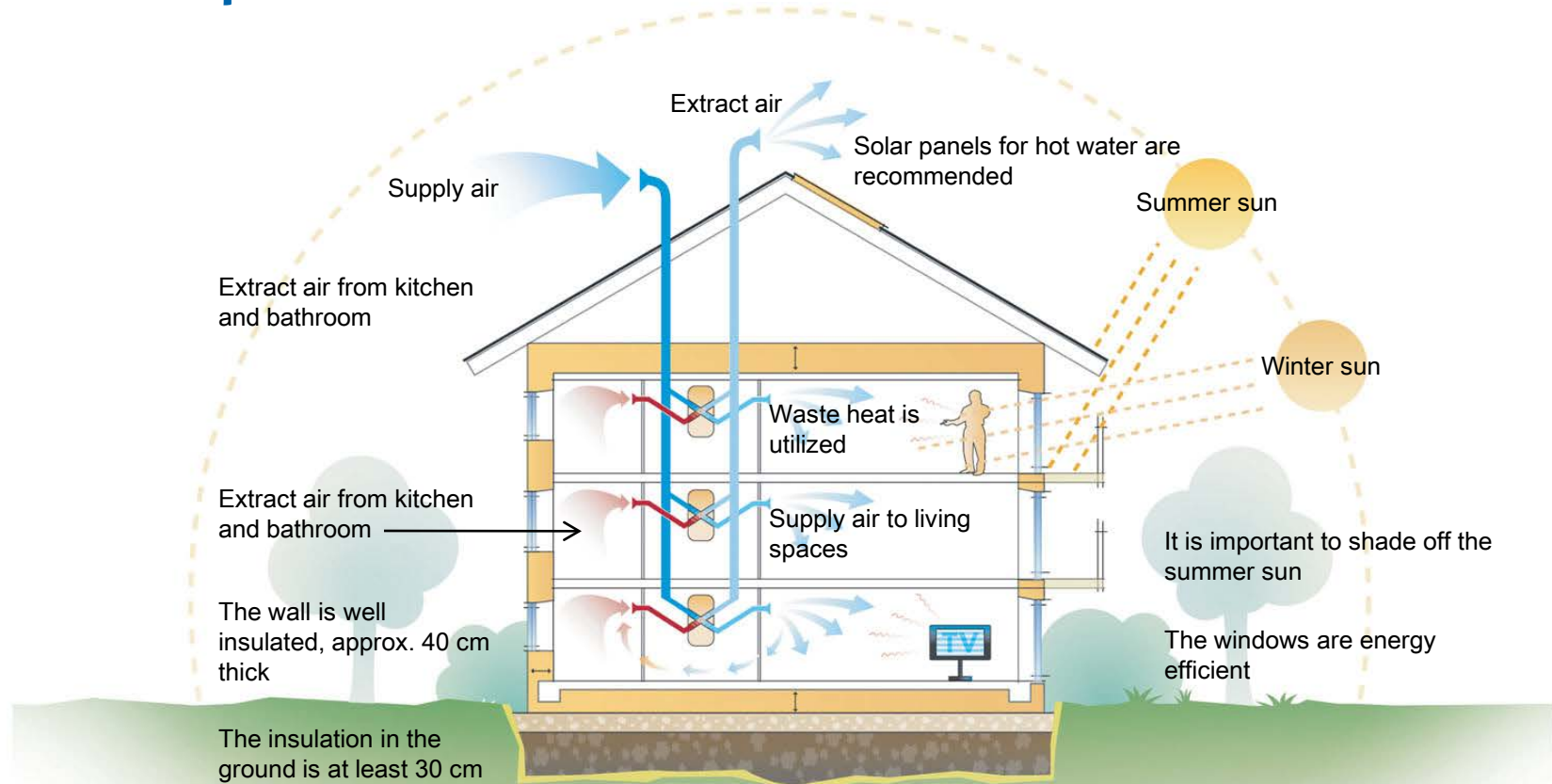
The passive house technique means that the houses are very well insulated and only require a minimum of added heat. By building an airtight climate shell and using a heat exchanger for ventilation, the heat in the outlet air can be utilized to warm up the fresh, cold intake air.

During most of the year the heat generated by the household equipment, light fittings and the tenants themselves is sufficient to keep the house warm. On the coldest of days, a small district heated heating element in the exchanger is used to slightly preheat the incoming ventilation air.

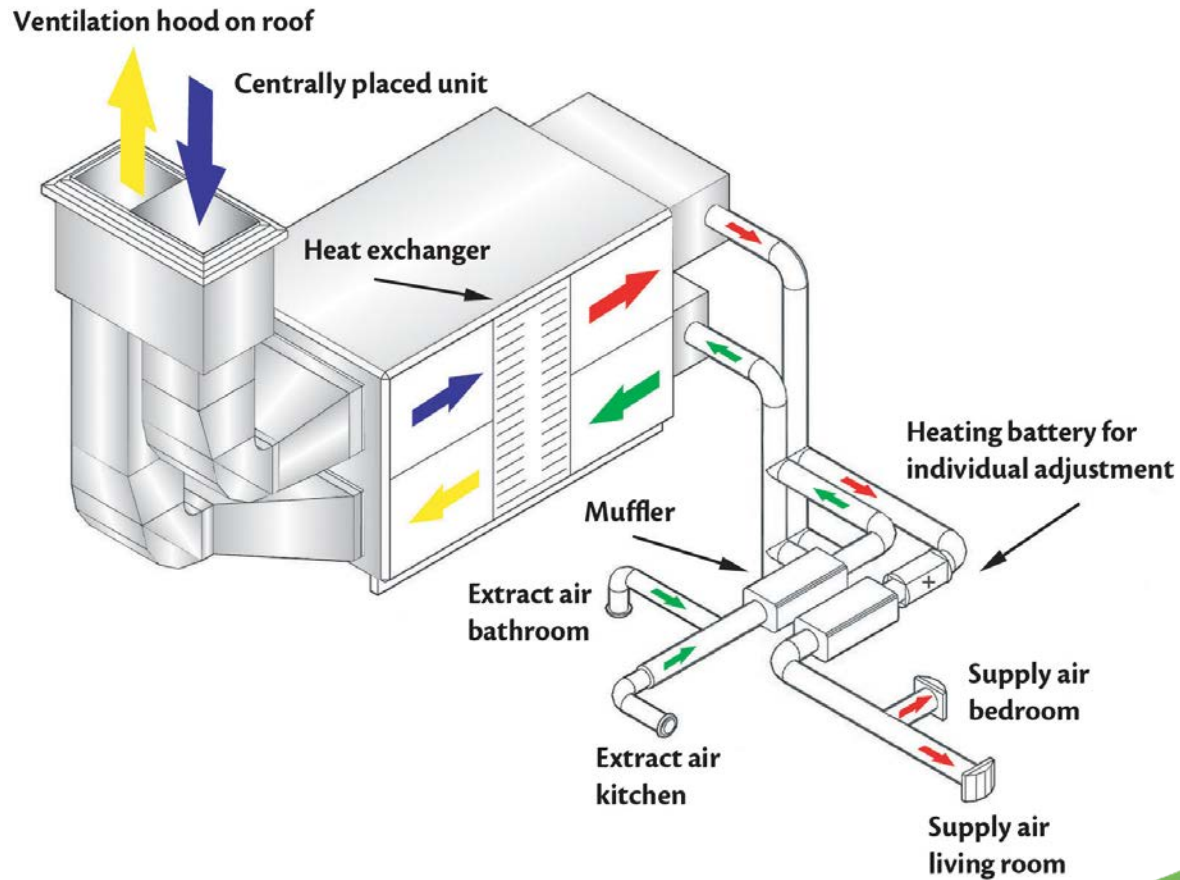
To renovate according to the passive house method puts demands on all stages in the building progress, among other things moisture must be kept from penetrating the building components. Windows and doors must also be accommodated to the passive house standard – they are required to have a low U-value. The U-value denotes a material's heat transfer coefficient.



# Passive house technique – Description



# Passive house technique – Heat exchanger



# Passive house technique – Brogården



*Mineral wool insulation*

In connection with the refurbishment with passive house technique, not only the old bricks but all of the old curtain walls have been torn down. A completely new wall with 48 cm mineral wool insulation has been erected against the existing concrete frame in the first house. Thanks to the technical development in materials, the following houses will have 44 cm insulation but keep the same U-value.

The new facade material is tiles mounted on horizontal support profiles, which gives a back-ventilated and damp proof construction. The tiles consist of a hard-burnt light yellow clinker stone or brick that aesthetically gives an impression similar to the original. The original indented balconies caused thermal bridges and draughts, because of this they are replaced with externally mounted balconies with screens on the short sides and a roof even on the topmost balcony. All windows are in accordance with passive house standards and the ground slab has been insulated.

The flats at Brogården will not attain full passive house standards for new housing constructions, but energy consumption will still be drastically reduced.





# Passive house technique –

## Energy facts

### Heating

District heating via the ventilation system

### Ventilation

Mechanical extract and supply air with heat exchanger (FTX), temperature efficiency 85%

### Exterior walls

44 cm insulation, U-value 0.09

### Roof

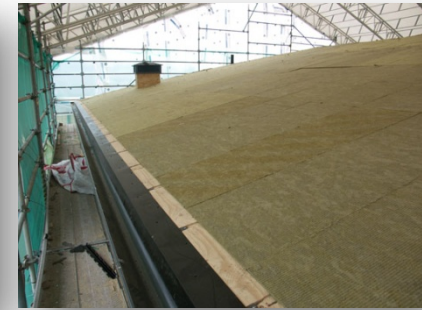
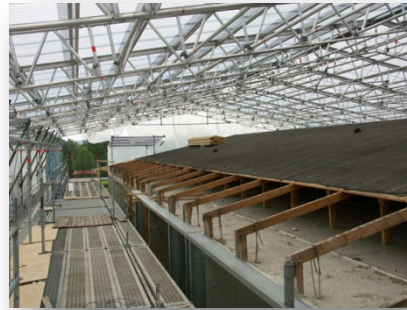
40 cm insulation, U-value 0.10

### Floors/ground slab

12-20 cm insulation

### Windows

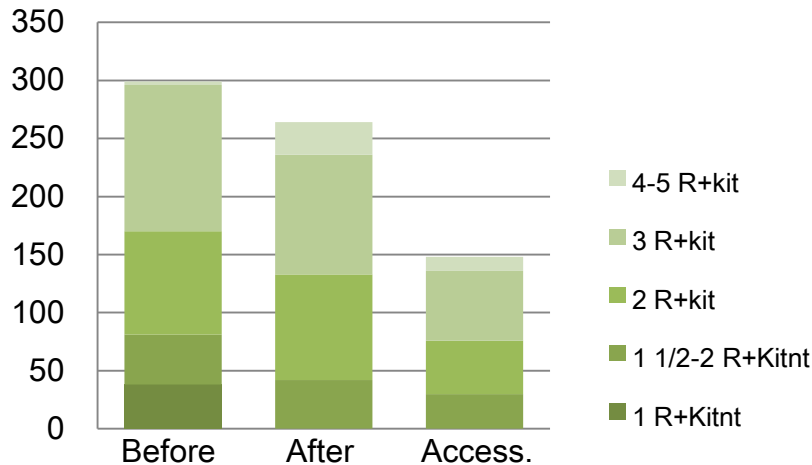
Krypton gas filled, U-value 0.85



# Planned renewal Brogården –

## Set of flats

A summary of Brogården's flats



Rooms	Before	After	Accessible
4-5 R+kit	3	28	12
3 R+kit	126	103	60
2 R+kit	89	91	46
1 1/2-2 R+kitnt	43	42	30
1 R+kitnt	38	0	0

Alingsåshem has made a decision to rearrange the available volume of flats in connection with the refurbishment. The lack of versatility in the set of flats is changed towards a bigger variation and an increased number of larger apartments.

The houses will be more accessible to people with disabilities: the share of accessible flats will increase to 60%.

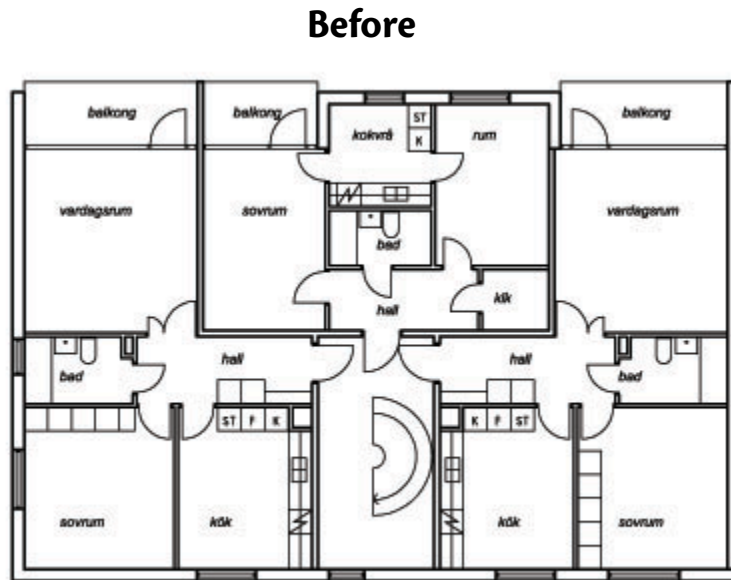
The tables show the existing estate before and after refurbishment.

### Abbreviations

R = room  
 Kit = kitchen  
 Kitnt = kitchenette

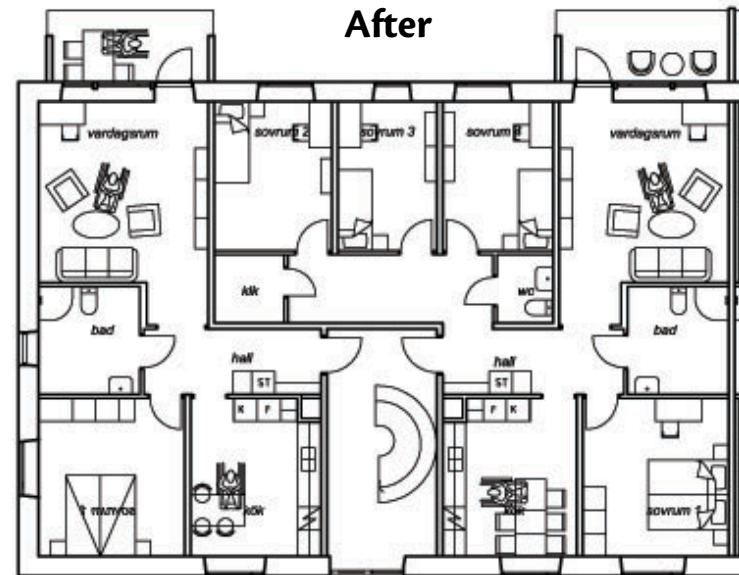


# Planned renewal Brogården – Set of flats, example



**2 rooms and kitchen:**  
**64 m<sup>2</sup> / 48 m<sup>2</sup> / 64 m<sup>2</sup>**

House G; floor 2-3  
This is also largely applicable on  
House B, D, F, J, L, N and P; floor 1-3



**2 rooms and kitchen : 69 m<sup>2</sup> +**  
**5 rooms and kitchen: 121 m<sup>2</sup>**

House G; first floor



# Planned renewal Brogården –

## Accessibility for people with disabilities



*Newly installed lift*

Alingsåshem's aim is that people with disabilities shall be able to apply for flats in the usual set of apartments and under the same conditions as everybody else. The accessibility must therefore be dramatically increased.

This means for Brogården that we are planning for a high level of accessibility and usability in the outer environment, at the entrances and in the flats. A total of 16 lifts are planned for.

The accessibility and usability will be drastically increased in the flat, accessing the flat and in the joint premises as well as in the outdoor environment.

The arrangements in the flat will be designed in a way that is to the advantage of all and form a natural part of the planning of a practical and beautiful home.



# Planned renewal Brogården –

## Accessibility for people with disabilities

### Flat

- A carefully designed construction plan, including the placing and hanging of doors
- Easy furnishing solutions and spaciousness for wheelchair access
- No thresholds or difference in level between rooms in the flat
- Very low thresholds leading to balconies and stairwells
- Good connections between rooms (including the connection bedroom – bath)
- Spacious bathroom with room for wheelchairs and helper
- Space in the bathroom available for a washing machine, a baby dressing-table, a cupboard etc
- Plenty of hooks at different levels – for children and people seated in wheelchairs
- Plenty of daylight and sunlight as well as the possibility for everyone to look out of the windows
- Accessible, spacious and usable balconies suitable for glazing

### Stairwell

- Newspaper shelf and letterboxes within easy reach for children and persons seated in wheelchairs
- Each house will have a shared storage room intended for prams and walking frames
- Elongated banister
- A marking on the first and last step

### Entrance

- No level-differences
- Suitable surface covering
- Markings in the glass partition to facilitate for the visually impaired
- Distinct sign in contrasting colour
- Important objects are lit
- Easy access for connection vehicles at all entrances
- Entry phone accessible and usable for everybody
- Automatic opening of the door





# Planned renewal Brogården – Accessibility for people with disabilities



*New letterboxes*



**Before**



**After**



# Planned renewal Brogården –

## Sheltered housing



Sheltered housing is a term that covers living spaces as well as shared premises for the tenants' meals, hobbies, recreation and social interaction. There is staff on hand that can support the tenants during set hours of the day. The primary target group is people aged 70 or over. The flats have a high accessibility which gives good conditions for independency. As a tenant one has access to shared premises where one can socialize with the other tenants in the house.

Alingsåshem strives to increase the freedom of choice, the dignity and the security in the housing for elderly people: the opportunity to decide and govern one's own life must be given to the elderly as well. Sheltered housing combats loneliness and creates opportunities for social interaction. To make it possible for elderly to remain in their neighbourhood is an important part in providing for our costumers' need for different kinds of housing, and it means that we contribute to an increased integration. This is pivotal to a sustainable social approach.





# Planned renewal Brogården –

## Balconies



*Externally mounted balconies*

Indented balconies are characteristic for the period during which Brogården was built. In order to avoid the thermal bridges caused by such a design solution, the original indented balconies will be replaced with new externally mounted balconies with screens on the short sides. The new construction will have a roof even on the topmost balcony.

The new balcony rails will feature elements of coloured Formica to retain some of the aesthetic impression of the original. The same coloured Formica also forms decorative elements around some of the window sections. The changed layout of the balconies will retain the main features of the houses at the same time as they provide shelter against rain, wind and view.

The problems with thermal bridges and draughts are solved simultaneously, and the newly created extra space in the flat allows for a possibility to enlarge the bathroom. This is an obvious example of the added values made possible by a thorough and carefully planned renewal: the changed design of the balconies is more energy efficient, at the same time as it gives more space in the flat, which in turn increases the accessibility. Consideration is thus given to both ecological and social sustainability, as well as the economic sustainability.



# Planned renewal Brogården – Balconies



After

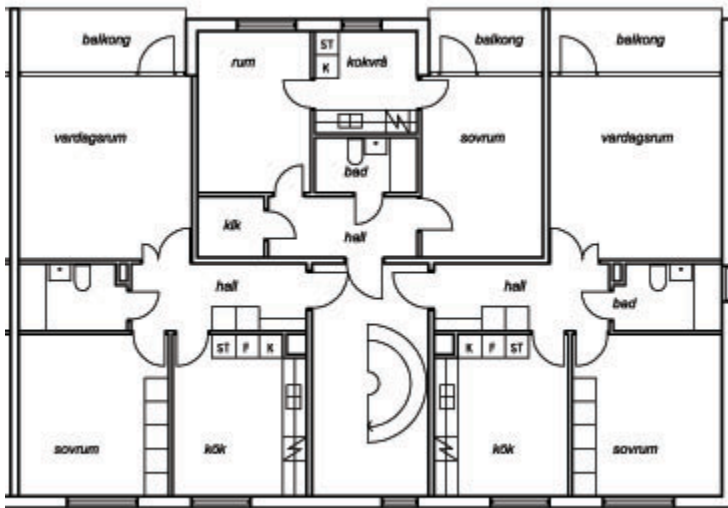


Before



# Planned renewal Brogården – Balconies

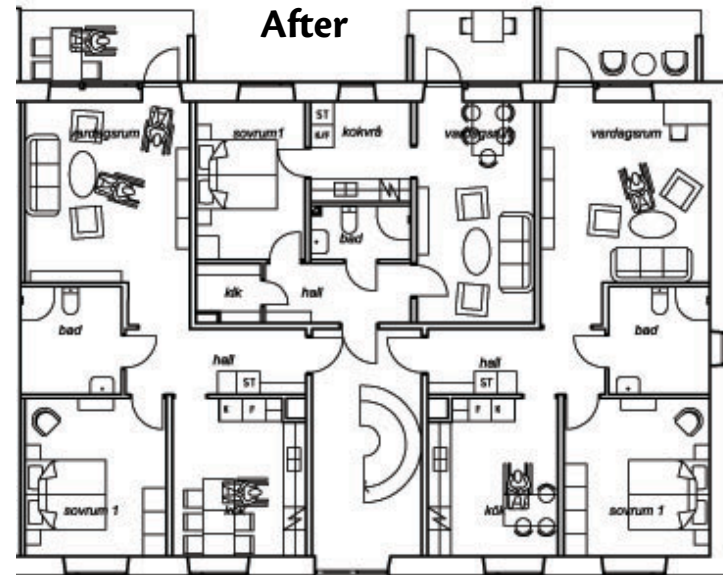
Before



**2 rooms and kitchen: 64 m<sup>2</sup> / 48 m<sup>2</sup> /  
64 m<sup>2</sup>**

House G; floor 2-3  
This is also largely applicable on  
House B, D, F, J, L, N and P; floor 1-3

After



**2 rooms and kitchen: 68 m<sup>2</sup> / 50 m<sup>2</sup> /  
68 m<sup>2</sup>**

House G; first floor





# Planned renewal Brogården –

## Bathroom and kitchen

- Water- and waste pipes are replaced
- New kitchen fittings with the possibility for the tenants to choose colours and design
- New enlarged bathrooms with accessibility for people with disabilities. Prepared fittings for washing machines and tumble dryers. The tenants can choose colours and design.



## Other improvements

- Improved sound proofing
- New interior doors
- New electricity, water and waste water fittings



# Planned renewal Brogården – Bathroom and kitchen/ Other improvements



The bathroom is prepared for a washing machine and a tumble dryer. The units can be placed next to each other in order to achieve higher accessibility.



# Planned renewal Brogården –

## New functions

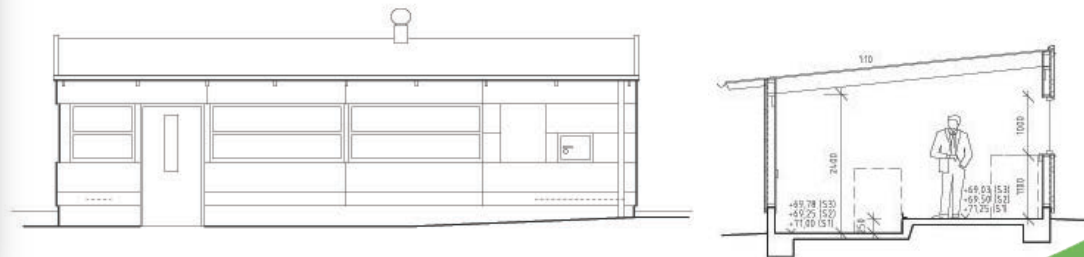
- Complements to flats
- Shared social premises
- Shared technical premises

The existing building volumes will be rearranged to accommodate for shared social premises for meals and social interaction. There will also be shared technical premises for lifts and fans, and new storages for walking frames, wheelchairs and prams.

Three new “environmental houses” to facilitate waste sorting, will be built. The houses will be adapted for people with disabilities. How the environmental houses are going to be used and managed, will be decided in a joint project with The Swedish Union of Tenants.



*Shared storage*

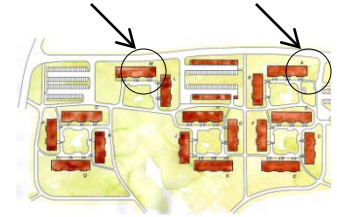


*Proposed plan for the environmental houses*

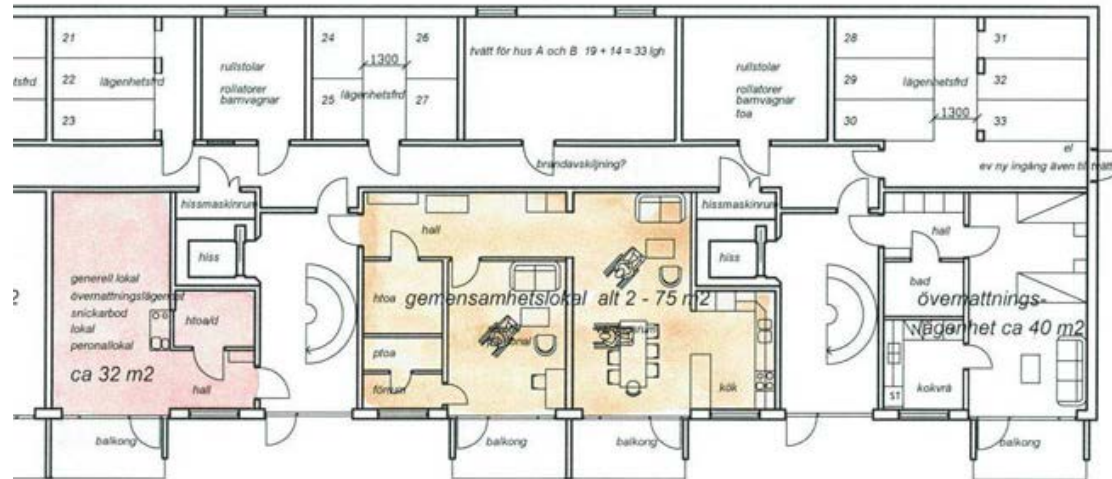




# Planned renewal Brogården – Shared social premises



Proposed plan for House A and M



The aim with the shared social premises is to create meeting places and communal activities for the tenants at Brogården. The premises are intended for tenants with different interests and ages. There is however reason to put focus especially on the older tenants who are expected to stay in their own homes for a longer period of time than what is the case at present.

These elderly tenants have a special need of social interaction, meals, activities and service within easy reach.

A certain amount of flexibility is planned, so that flats can be used as shared social premises and vice versa.





# Aesthetics

## Architecture



*New entrance*

The planned renewal aims at simplicity in the architecture. Among other things, this means that no disrupting additions for fans, lifts etc will be added. It is of great importance to keep the original character of the architecture at the same time as a more modern look is introduced.

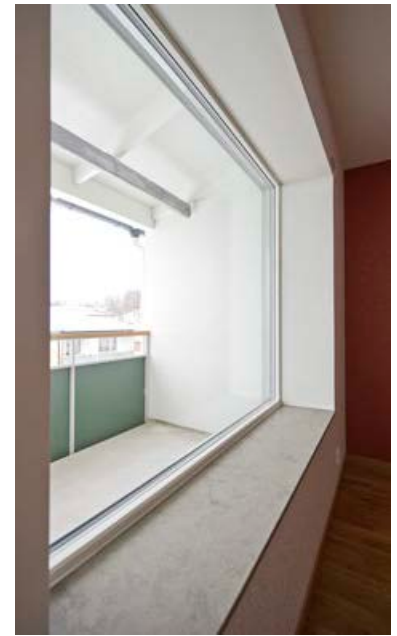
The renewal of the area is planned as a whole where the period-specific character is kept and enhanced. Uninteresting entrances are given a new design with canopies, lighting installations and landscaping. A more open plan gives better accessibility.

The buildings are given a new cladding material of tiles mounted on horizontal support profiles and the simplicity in the architecture with coloured balcony rails against the yellow façade is kept. We have sought to use beautiful and functional materials outdoors as well as indoors. The materials are chosen to keep well for an extended period of time.



# Aesthetics

## Architecture



*Before/After*





# Aesthetics

## Outdoor environment



*External light fittings*

The well planned courts, where all entrances face the own court, are kept. The environment is complemented with meeting places, new equipment, light fittings, paved surfaces and planting.

The east-western path through the area is reinforced with meeting places, new equipment, light fittings, paved surfaces and plants. Moreover, the environmental houses and the shared social premises are situated near the path, in order to add even more life and action to the area.

### **Lighting – beauty, safety and energy efficiency**

Extra consideration has been put into the lighting design in order to add new values of beauty to the area, increase the safety and save energy by choosing the right fittings, directing the light and illuminating what needs to be illuminated.





# Aesthetics

## Outdoor environment





# Partnership procurement –

## Description



The proprietor Alingsåshem is refurbishing the residential area Brogården in partnership procurement with the contractor Skanska. The collaboration means that experiences made during the project are carefully documented. It is possible to do continuous corrections and improve the efficiency during the planning stage as well as under the building stage itself.

Partnership procurement is a structured form of cooperation where builder, consultants, contractors and others are solving a building task together. The concept is based on a trusting collaboration, where all parts are playing with “open cards” and everybody’s skills are complementing each other during the run of the building process.

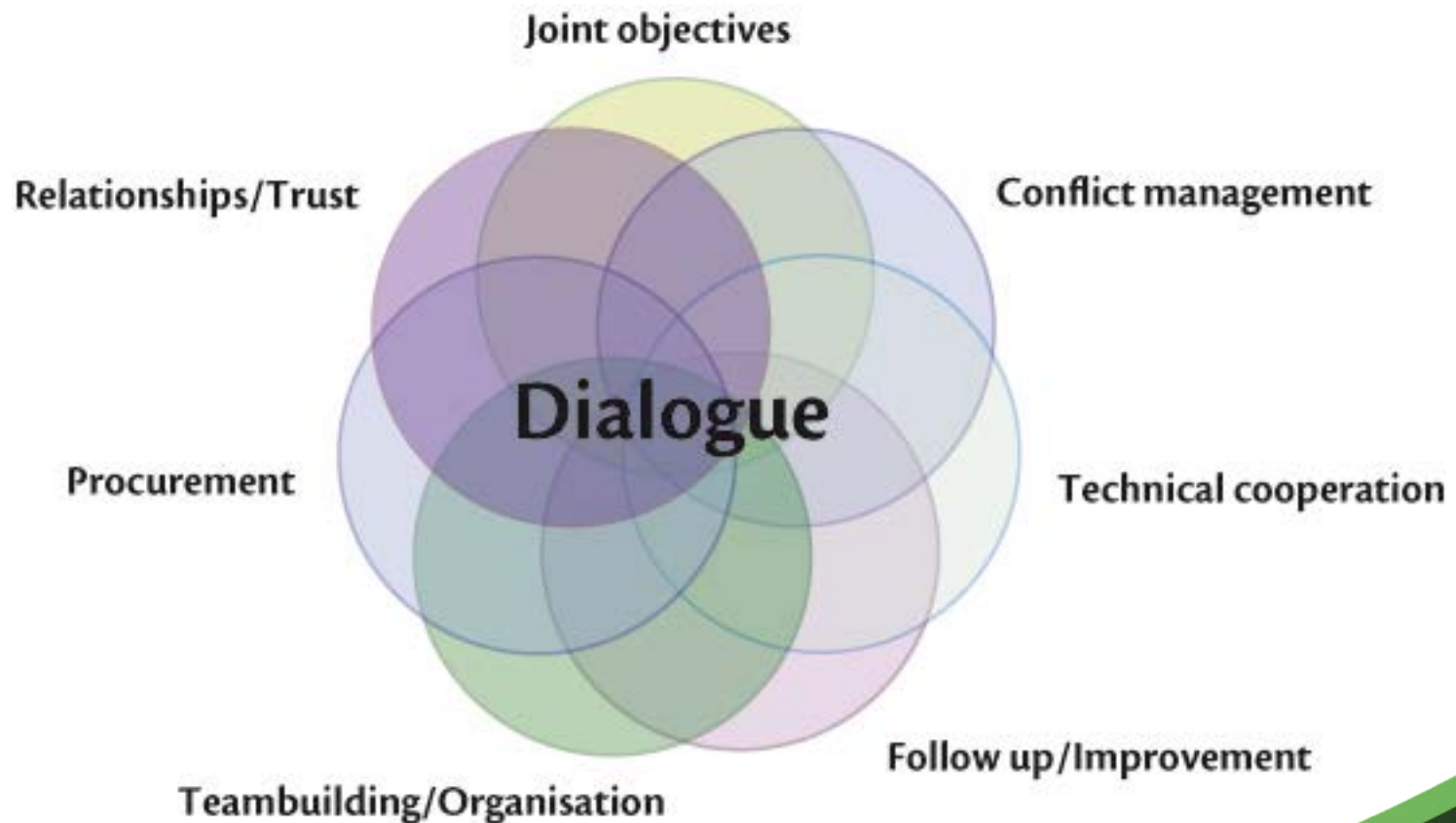
The basic idea is that the builder, at an early stage in the process, collects all the competence that is required to realize the project. This way it is possible to avoid the traditional relay race, where different contractors are in the process for a limited period of time. In partnership procurement everybody works together from start to finish.

### **Key properties in partnership procurement**

- Common objectives
- Common activities
- Common economy



# Partnership procurement – Description



# Partnership procurement – Objectives in the Brogården project



*Sign outside the site*

Before the project started everybody involved were called to a meeting where the project was described and the guidelines was drawn up for how the partnership was supposed to work. During this meeting four common objectives for the project were decided upon. After about a month an evaluation was done to access if the objectives were achieved, and what could be done if an improvement was needed. This type of evaluation will be repeated continuously until the project is done.

## **Our common objectives at the workplace Brogården, stage 1:**

1. Working climate – We will have a good working climate at the site. We will reach this goal through communication, information and by respecting each other as persons and professionals.
2. A clean building site – We will have a clean building site with a good and dust-free indoor climate where it is easy to get rid of and to sort waste in the right fractions both at the build and in the establishment.
3. The working environment on site – We will have a good structure at the site concerning the storage of materials, deposits, tool containers and anti-theft devices.
4. We will have a good planning on site. This goal is reached by good long-term planning concerning materials, deliveries just in time, and the right drawings at the right time.



# Dialogue –

## Tenant interaction



*Open house in the show apartment*

A continuous contact with the tenants is upheld during the entire project at Brogården. Throughout the project information to the tenants is distributed in a planned manner. Alingsåshem, The Swedish Union of Tenants and the tenants at Brogården are in this instance working together in a continuous process.

A show apartment has been established in the area since before the building works began. The tenants are invited to the show apartment to receive information on what will happen to the area and their flats, as well as practical and economic issues concerning evacuation and resettlement. In the show apartment the tenants and Alingsåshem meet to sign contracts and to browse choices and options for the flats. The show apartment is also used for regular and well attended “open house”-arrangements. It is an appreciated social activity that offers an opportunity to share information and give feedback. The show apartment has made it evident that there is a need for shared social premises, and we are planning for a continuation and development.

To ensure that all concerned tenants receive the right information, Alingsåshem cooperates with The Swedish Union of Tenants to produce the newsletter “Brogårdsbladet” that is published six times a year. The newsletter is distributed to all letter boxes in the area, and is also available at the Alingsåshem web site.





# Summary

## A holistic view – sustainable renewal



*Waste sorting*

- The renewal's economy is focusing on total economy and life cycle assessment.
- The renewal of the area is planned using a holistic approach where existing qualities are kept, new are created and defects are redressed.
- A sustainable renewal means an economically, ecologically and socially viable and long-term sustainable living environment for the people of today as well as for future generations.
- The project is done in partnership procurement with engaged collaborators. This means that continuous improvements are made during the planning stage as well as during the building stage of the process. Experiences and opportunities for improved efficiency are taken care of.



# Awards – Brogården



NBO ("The Nordic Cooperative and Public Housing Corporations") has awarded the renewal price for 2010 to Alingsåshem with the explanatory statement:

"Several good improvements are achieved thanks to the ongoing refurbishment, including the creation of a more varied range of flats; shared social premises are planned for; and the flats are soundproofed and supplied with new kitchens and bathrooms. The panel of judges has taken into special account what the refurbishment will achieve concerning accessibility and sustainability. The refurbishment will achieve fully accessible flats with access to lifts in 60% of the stock.

The outdoor environment is also adapted to create accessibility for tenants as well as visitors with disabilities. Energy savings are made when the buildings get extra insulation and are reconstructed using passive house technique. In the houses that are renovated, the energy consumption during the first year after completion is reduced with 80%. The panel of judges finds this impressive.

The awarded sum is 50 000 DKK for the suggested use in measures that contribute to an increased sustainability seen from an economical, ecological and social perspective."



# Awards – Brogården



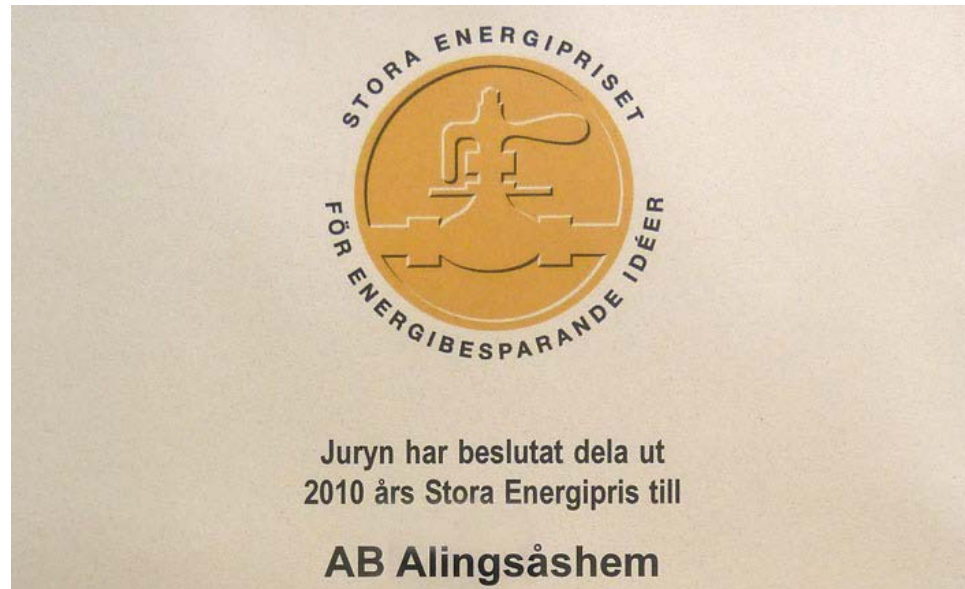
Svenska kommunaltekkniska föreningen (The Swedish Association for Technology in the Public Sector) has awarded Alingsåshem the distinction “The Public Sector Technology Project of the Year 2010”. Alingsåshem is awarded the distinction for the work with the 1970s residential area Brogården. The explanatory statement reads as follows:

“The renewal of the area has been planned and executed with a holistic approach. Existing qualities have been preserved and new ones have been added, at the same time as defects have been redressed. In collaboration with the tenants the run-down buildings from the 1970s have become passive houses with good accessibility, shared social premises and an appealing look. The different branches of the technology of the public sector have been united in a brave way, so that a sustainable renewal has been achieved and can contribute both to an economically, ecologically and socially viable area and a long-term sustainable living environment.

The award consists of a diploma and a commemorative stone.”



# Awards – Brogården



Swedish consulting engineering company Sweco has awarded Alingsåshem and managing director Ing-Marie Odegren “Stora Enerpris 2010”. The award is granted for the project at Brogården and the refurbishment using passive house technique. The explanatory statement reads as follows:

”Stora Enerpris 2010 is awarded to AB Alingsåshem. The housing company has, using a structured quality management, developed the passive house concept and shown the value in coordinating energy efficiency with other measures in a refurbishment. The company has with great precision achieved both their ambitious aims for the energy efficiency and other technical and social advantages. The project at Brogården is a good example of how houses, characteristic for the Million Homes program, can be refurbished for the future and serves as an inspirational model to other property owners in Sweden.”

The award consists of a diploma and a statuette.





# Collaborative partners

**Architect, refurbishment:** EFEM Arkitektkontor AB, Creacon AB

**Contractor:** Skanska Sverige AB

**Construction:** WSP Sverige AB

**Heating:** Andersson & Hultmark AB

**Electricity consultant:** COWI AB



# Sources

## Brogården

Photographers: Patrik Skoglöw, Kerstin Nilsson, Jenny Bengtson, Alingsås Museum, Alingsåshem

Area blueprints: Kerstin Nilsson, Lennart Johansson

Old blueprints: HSB

Illustration, passive house: ArtCon/Passivhuscentrum

Illustration, heat exchanger: Andersson & Hultmark AB

Figures, energy consumption: SP Technical Research Institute of Sweden

Alingsåshem 2011



## Annex

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The retrofit has been executed in the way that is described in our presentation Brogården (“Brogarden ENG.pdf”; enclosed).