SERPENTE PROJECT – C3

RETROFITTED PUBLIC BUILDING Malmö

Template for subgroup SCHOOLS *(adapted by DIBA)*

I. Introduction

The purpose of this Public building type template is to identify good practises among renovation of public buildings belonging to the sub-groups: historical buildings, social housing, sports facilities, schools and offices. In this case the template has been adapted for the subgroup schools.

II. How to identify suitable buildings Good Practices?

The two good practice examples (if available) selected and proposed by a partner will have to answer to all of the following criteria :

1. Availability of results (by this, we mean projects already completed which shows concrete upraise of energy efficiency through renovation)
2. Level of Innovation: energy efficient measures.
3. Sustainability: a project reasonably affordable, with sustainable materials,..
4. Building maintenance after the renovation
5. Transferability (meaning = projects have to show a potential for transfer, both from a region to another one and from one function type to another)

III. Work organisation of the sub-groups

1. Work to be done by each partner

Each partner is requested to prepare a fact sheet for each selected Public buildings (schools in this case) example (minimum two) explaining the five exemplary criteria.

2. Working group supervised by the group leader

Barcelona Provincial Council (DIBA) is responsible to adapt, modify, complete the common template and to collect good practices within schools' group.

DIBA as a schools' subgroup leader leads the work of the sub-group. He organizes the exchanges and the meetings between the partners, and assumes the form and the publicity of the exchanges (link with the CC2).

DIBA organizes the analysis of the Fact sheets by all participants in the sub-group in order to validate them, paying particular attention to the transferability criterion.

If, as a result of this analysis, some of the proposed examples cannot be accepted, DIBA asks the partners concerned to complete the fact sheet or, possibly, to find other examples which are more adequate.

DIBA will then analyse strengths and weaknesses and report them to the responsible of Component 3.

IV. Definition of schools in this subgroup

After having an internal debate on how to define schools for collecting best practices in this subgroup we came to the conclusion that it is better to keep a simple definition of schools following the most widespread criteria used. This means that we will focus only on primary education and secondary education taking into account the definition given by the wikipedia, that we summarize below:

A school is an institution designed for the teaching of students (or "pupils") under the direction of teachers. Most countries have systems of formal education, which is commonly compulsory. In these systems, students progress through a series of schools. The names for these schools vary by country, but generally include primary school for young children and secondary school for teenagers who have completed primary education. An institution where higher education is taught, is commonly called a university college or university.
In much of continental Europe, the term school usually applies to primary education, with primary schools that last between four and nine years, depending on the country. It also applies to secondary education, with secondary schools often divided between Gymnasiums and vocational schools, which again depending on country and type of school educate students for between three and six years. The term school is rarely used for tertiary education, except for some upper or high schools (German: Hochschule), which describe colleges and universities

Only public schools are included in this subgroup.
When talking about school building we include spaces used by pupils, by other people from the educational community or by other users of the school. These can be spaces such as the canteen, the schoolyard, the auditorium, etc.

V. Relevance of energy efficiency measures at school

Schools have a huge potential for saving energy and encourage more sustainable habits. Nevertheless, these buildings usually lack of a specific energy policy. Best practices demonstrate the possibilities to improve energy efficiency at schools engaging pupils, the education community and facility managers in a common project towards a more sustainable use of energy. Sometimes it is not necessary to make big renovations in the school building because just with behavioural changes it is possible to make big savings on energy use at school, as an example of this you can take a look at the 50/50 concept that started on German schools and that is spreading across Europe with the IEE Euronet 50/50 project.

Energy efficiency measures at school allow to reduce energy use and CO2 emissions while at the same time can help to improve the environmental conditions of classrooms and other areas of the school building.

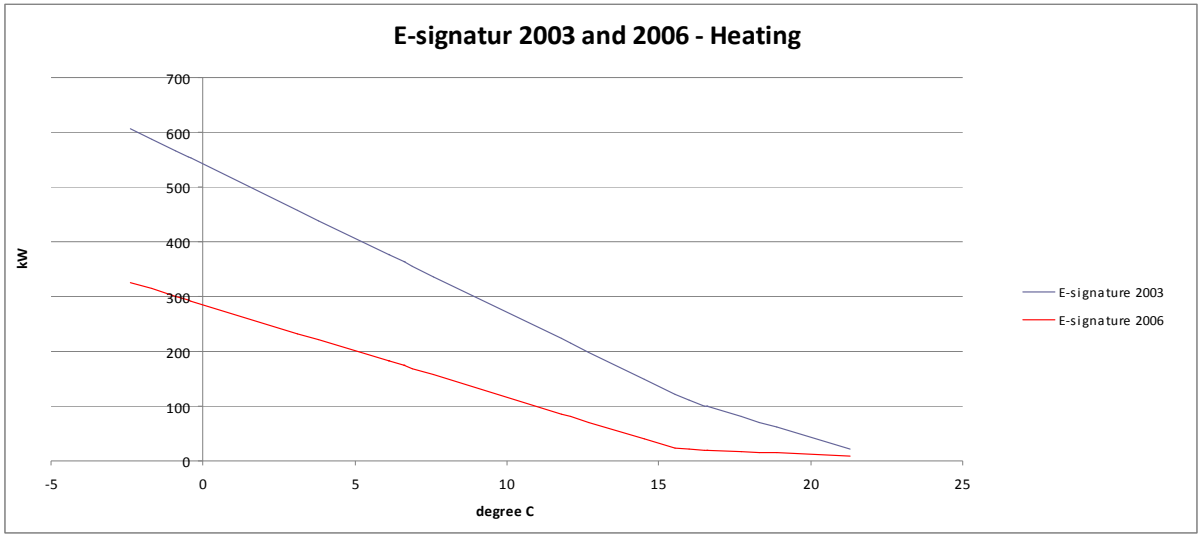
VI. Good practice Retrofitted Public buildings fact sheet

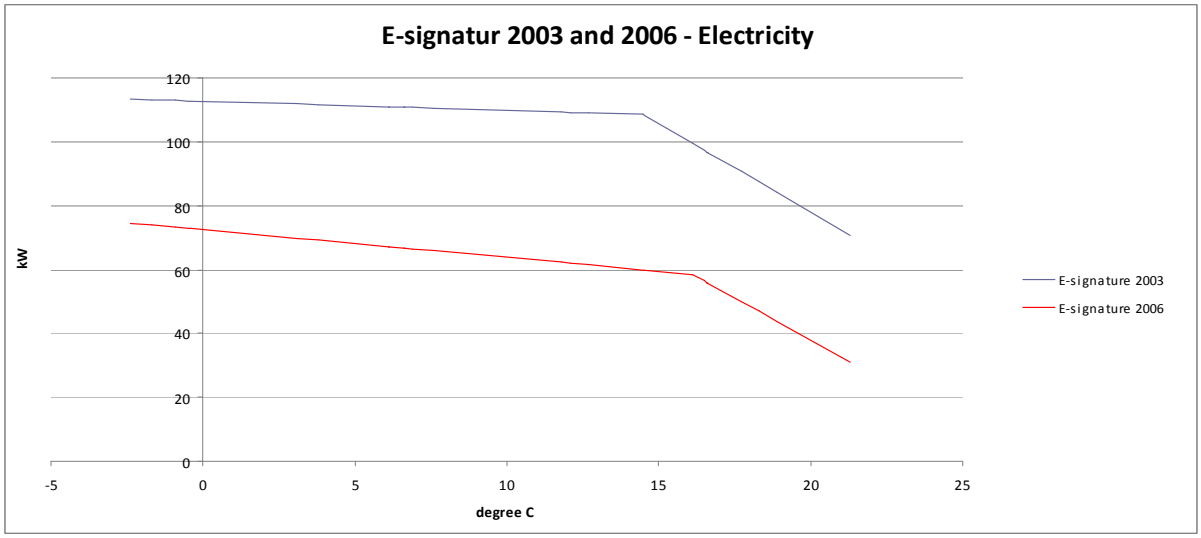
GENERAL INFORMATION		
Name of the public building renovation:		Kroksbäcksskolan
Index of Building Good Practice (ex. BGP n°1 – IT)		BGP n°1 School – Malmö
Sub-group		Schools
Description	Photo	
	Address	Hyllievångsvägen 6, 216 25 Malmö
	Public sector contractor	Malmö Municipal Properties
	Architect Engineering consulting	Design-Bid-Builder for this project: Byggkompaniet
	Characteristics of the building (m2, nº of users, orientation, etc.)	13 013 square meters School, preschool and youth centre
	Date of construction	1971
	Legal aspects	
	Date of renovation	Documents developed for the project: 2003 Building D renovated: 2004 Building A renovated: 2005
	Nature of the work (short description)	The old ventilation system was changed to new HRV systems placed on the roof. Frequency controlled fans was installed. All systems got protected against weather in isolated room. Old radiators were replaced with new, new pressure controlled pumps in the heating system. The old lighting fixtures were replaced with more energy efficient lighting fixtures (T5). New DDC for better control of the systems.

	Budget and source of financement	Approximately €1 300 000, self financed. Many of the systems were in need of renovation.

AVAILABLE RESULTS	
What were the big problems (in terms of energy efficiency) to tackle?	An old heating system. Many small HRV systems placed outside the buildings without isolation. Old control system. Old light fixtures.
Has this building been already analysed and certified?	Not before the renovation but it has been certified after the renovation.
What are the key innovative energy efficiency measures undertaken through the renovation?	New large weather protected HRV systems instead of many small uninsulated and unefficient HRV systems. Energy efficient fans and pumps. Energy efficient lights.
What are the measurable improvements in terms of energy efficiency in electricity and heating (kWh saved)?	The energy is weather corrected with degree day method: • 2003 heating: 2 800 000 kWh, electricity: 925 000 kWh • 2006 heating: 1 210 000 kWh, electricity: 537 000 kWh • 2011 heating: 1 203 000 kWh, electricity: 625 000 kWh • Reduction 2003 – 2006 heating: 1 590 000 kWh (57 %) • Reduction 2003 – 2006 electricity: 388 000 kWh (42 %) With calculated interest rate: 4,75%, technical lifetime: 20 years, heating price: €0,067, electricity price: €0,133 gives the difference in Net Percent value: -€600 000 and the difference in annuity: -€47 000 when comparing before and after the project. In this calculation have it not been taken into account that multiple installations would have been needed to be replaced no matter whether project was implemented or not.

E-signatures made from average effect / month under one year. Heating and electricity.





ENERGY EFFICIENT MEASURES	
Energy efficient measures of the building envelope	Isolated ventilation room was built on roof.
Energy efficient measures of the heating system	New radiators and pressure controlled pumps. The system got adjusted. New HRV systems with frequency controlled fans.
Energy efficient measures of monitoring	The efficiency of the HRV system is monitored in the DDC. All of the system is monitored centrally by the control system.

energy	
Energy efficient measures regarding behaviour	The ventilation system was adjusted according to the operation hours in the buildings.
Stakeholders' involvement in the energy efficient measures	The school was informed about the project.
Others?	Energy efficient lights were installed (T5). 2007 was a heat pump installed but the heat pump hasn't been in use since 2010.

SUSTAINABILITY OF THE RENOVATION	
Design and choice of sustainable materials?	The ventilation system got weather protected (isolated ventilation room). All material was selected based on good and durable quality.
Sustainable building site management? (sorting waste, water…)	Old building materials have been recycled.
Application of a valuation method (BREAM? HQE? Others?)	No.

BUILDING MAINTENANCE: life of the building after the renovation	
Is the building object of an energy monitoring? Is there a responsible manager?	The energy is monitored every month by the energy section.
Who is in charge of the maintenance of the heating system of the building?	An external contractor is responsible for the maintenance of the heating system.
Who is in charge of the day to day energy management?	The facility manager.
Are there some specific measures to raise energy awareness and to implicate users in energy efficiency?	No.

TRANFERABILITY	
Transferable aspects according to the partner in charge of this example of good practice	**Transferability of planning (forming a partnership, choosing priorities, setting up a renovation building teams, etc.)?** By performing large comprehensive measures is it possible to achieve greater and more cost-effective results than if you just

	focus on small individual actions.
	N/A
	Transferability of results (good solutions, adaptability, change of behaviour, etc.)? HRV systems are very effective especially in cool climate. Combined with energy efficient fans and by adjusting the ventilation according to the operation hours in the building give results on both heating and electricity.
Transferable aspects according to all the partners of Serpente project	The other partners will analyse and validate these good practices. During the process of validation the partners will take on the role of auditors because they will assess and improve the effectiveness and portability of good practices in their context.
	The validation process will promote a systemic approach in local competent public administrations. Moreover, this process of selection and validation is a peer review and entails the mutual role of experts and auditors depending on typology of buildings and partner's expertise.

SOURCES	
Publications	Project documents
Website	
Interviews	The facility manager

GENERAL INFORMATION		
Name of the public building renovation:		Sofielundsskolan
Index of Building Good Practice (ex. BGP n°1 – IT)		BGP n°2 School – Malmö
Sub-group		Schools
Description	Photo	
	Address	Rolfsgatan 8, 214 34 Malmö
	Public sector contractor	Malmö Municipal Properties
	Architect Engineering consulting	Architect: SAR Sture Frölén Prime contractor: Skånska Cement For this project Architect: Arkitektgruppen – Malmö AB Prime contractor: Byggnadsfirman Otto Magnusson AB
	Characteristics of the building (m2, nº of users, orientation, etc.)	Before project: 16126 square meter After project: 12681 square meter
	Date of construction	1948
	Legal aspects (e.g.: protected property)	Restrictions on facade changes
	Date of renovation	2008-12-15 to 2010-12-01
	Nature of the work (short description)	The school has been totally renovated. Parts of the property have been torn down. Total renovation inside the school. All installations have been replaced: heating, ventilation, lights, security. The central heating system replaced. New ventilation systems.

		Photovoltaic installed. Additional insulation of foundation and roof joists.
	Budget and source of financement	Approximately €15 000 000 financed by Malmö City. Part of the photovolitic installation was financed through the solar contribution from the provincial government: approximately €68 000.

AVAILABLE RESULTS	
What were the big problems (in terms of energy efficiency) to tackle?	Old building, old installations, old ventilation system, all in need of renovation.
Has this building been already analysed and certified?	Yes.
What are the key innovative energy efficiency measures undertaken through the renovation?	New installations, light, heat, ventilation. Additional insulation.
What are the measurable improvements in terms of energy efficiency in electricity and heating (kWh saved)?	Since parts of the property have been torn down both total energy and energy/square meter will be reported. 2005 years energy use is compared with July 2011 – June 2012: The energy is weather corrected with degree day method: • 2005 heating: 2283257 kWh, electricity: 636769 kWh • 2011/12 heating: 1210438 kWh, electricity: 553389 kWh • Reduction 2005 – 2011/12 heating: 1072819 kWh (47 %) • Reduction 2005 – 2011/12 electricity: 83380 kWh (13 %) The energy in kWh/m2: • 2005 heating: 141,6 kWh/m2, electricity: 39,49 kWh/m2 • 2011/12 heating: 95,4 kWh/m2, electricity: 43,64 kWh/m2 • Reduction 2005 – 2011/12 heating: 46,2 kWh/m2 (33 %) • Increase 2005 – 2011/12 electricity: 4,15 kWh/m2 (11 %)

ENERGY EFFICIENT MEASURES	
Energy efficient measures of the building envelope	Additional insulation of foundation and roof joists.
Energy efficient measures of the heating system	The central heating system replaced. New ventilation systems, FTX. New heating system, low temperature.

Energy efficient measures of monitoring energy	New energy meters installed for monitoring the energy use connected to the new DDC system.
Energy efficient measures regarding behaviour	Occupancy sensors. Timers on ventilation.
Stakeholders' involvement in the energy efficient measures	The school was involved in the renovation.
Others?	Light measures, new DDC system.

SUSTAINABILITY OF THE RENOVATION	
Design and choice of sustainable materials?	Design and choice of material has been made to make the installations protected against vandalism and durable.
Sustainable building site management? (sorting waste, water…)	Yes, old building materials have been recycled.
Application of a valuation method (BREAM? HQE? Others?)	No

BUILDING MAINTENANCE: life of the building after the renovation	
Is the building object of an energy monitoring? Is there a responsible manager?	The energy is monitored every month by the energy section.
Who is in charge of the maintenance of the heating system of the building?	An external contractor is responsible for the maintenance of the heating system.
Who is in charge of the day to day energy management?	The facility manager.
Are there some specific measures to raise energy awareness and to implicate users in energy efficiency?	There is a special building demonstrating energy production from geochemical, wind and solar energy. This was built before the renovation. Energy production from the installed photovoltaics in the project is presented on a display in the main building too.

TRANFERABILITY	
Transferable aspects according to the partner in charge of this example of good practice	Transferability of planning (forming a partnership, choosing priorities, setting up a renovation building teams, etc.)? Energy efficiency measures are great to combine in a renovation.

	N/A
	Transferability of results (good solutions, adaptability, change of behaviour, etc.)? When making a big renovation of a building, it is cost efficient to reduce the energy use at the same time.
Transferable aspects according to all the partners of Serpente project	The other partners will analyse and validate these good practices. During the process of validation the partners will take on the role of auditors because they will assess and improve the effectiveness and portability of good practices in their context.
	The validation process will promote a systemic approach in local competent public administrations. Moreover, this process of selection and validation is a peer review and entails the mutual role of experts and auditors depending on typology of buildings and partner's expertise.

SOURCES	
Publications	Project documents Gunnarsson Pia, "Nya Sofielundsskolan, ANTIKVARISK DOKUMENTATION INFÖR RIVNING", Malmö museer, 2009
Website	http://www.malmo.se/Medborgare/Forskola--utbildning/Grundskola/Grundskolor/Sodra-Innerstaden/Grundskolor-i-Sodra-Innerstaden/Sofielundsskolan.html
Interviews	Project leader from Malmö Municipal Properties.