

## A Passive House project by EURHONET, A/NM/A, LUWOGÉ consult and BASF

- Background
- Project partners
- Common design
- Local adaption
- Sites
- Outcome



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## background

**EU ENERGY SAVING TARGETS UP TO 2020**

- 20 % less energy consumption by increasing energy efficiency
- 20 % less consumption of fossile energy by use of renewable energy
- 20 % less CO<sub>2</sub> emissions

**EUROPEAN HOUSING COMPANIES DID NOT FEEL WELL PREPARED**

- Improvement of internal processes to implement energy efficiency in refurbishment and new construction
- Transfer of necessary knowhow about energy efficient constructions along the whole value chane
- Better availability of high performing technology and sustainable construction material

**Initiated by 4 partners****BuildTog 1<sup>st</sup> GENERATION**

- BuildTog (Building Together) is a European Passive House project initiated by four partners who are engaged in sustainable construction: The European housing companies network EURHONET, the French architect Nicolas Michelin (A/NM/A), the German energy consultancy LUWOG consult and the worldwide leading chemical company BASF.
- The target of BuildTog is to develop a generation of Passive Houses that are in the same time energy and economy efficient and also architectural ambitious. In this sense it is a very practice oriented research project. BuildTog houses will be constructed in Passive House standard. They are very efficient and fulfill the EU energy saving targets which will influence the standard of all new buildings in future.

**Common methodology**

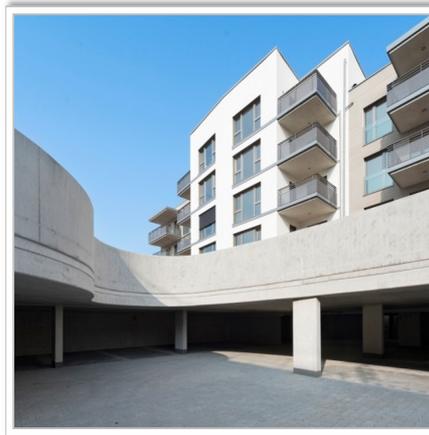
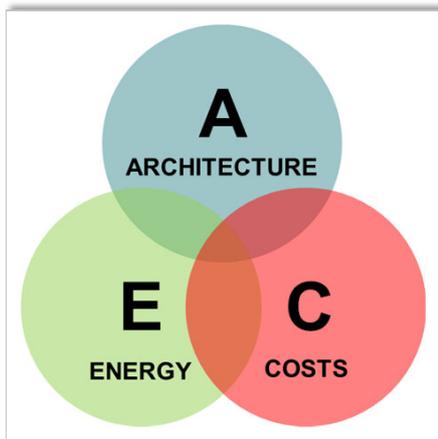
- BuildTog Passive House projects are respecting a standardized planning methodology developed by LUWOG consult during the course of the project to control the detailed requirements concerning energy related specifications and construction costs from beginning on. The first generation (2009-2014) followed consequently the Common Design developed by the French Architect Nicolas Michelin (A/NM/A), which he adapted together with the local planners to each site (Local Adaption).
- To ensure the energy performance and the planning process LUWOG consult attended all projects up to the certification. A/NM/A checked the design in several planning phases and saved the quality of architecture.

## background

**Our companies have the same goals**

To build high energy performed buildings on a large scale at a reasonable price, with similar technical and architectural approaches in our different countries.

Then, why not to build a building on a common basis and compare concretely our different approaches to achieve the same goal? (*EURHONET 2009*)



BASF took care for having available their proved system solutions in all participating countries. The housing companies continuously controled planning, construction and use of their BuildTog´s (monitoring) to optimize the processes. To initiate a smooth know-how transfer and to reach the European energy targets all results will be published on [www.BuildTog.eu](http://www.BuildTog.eu).

**BACKGROUND****EU 20/20/20 strategy**

- The European Union intensifies her energy saving targets in construction sector year by year. By 2020 the CO2 emissions of residential buildings have to be reduced up to nearly zero. Even if the housing companies organized in EURHONET were already engaged in development of sustainable housing concepts they didn´t feel well prepared for the future EU requests.
- That´s why they decided to set up a project to gain experience together in construction of energy efficient apartments and to share their knowledge. Currently EURHONET consists of more than 30 housing companies from 5 European countries (Sweden, United Kingdom, France, Germany, Italy). Together they manage about 700.000 dwellings and construct more than 15.000 new each year.

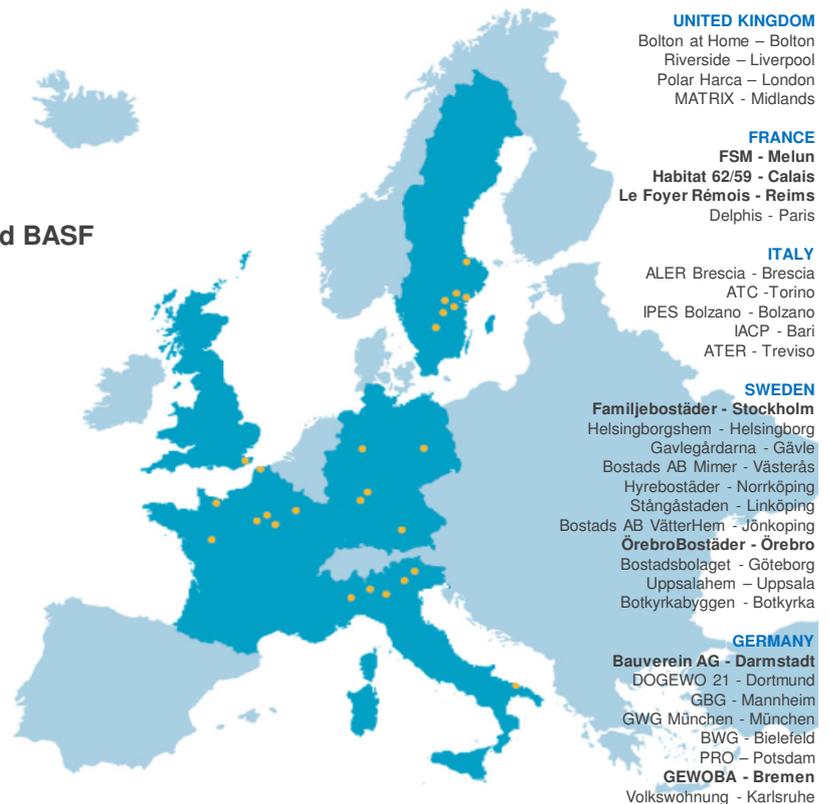
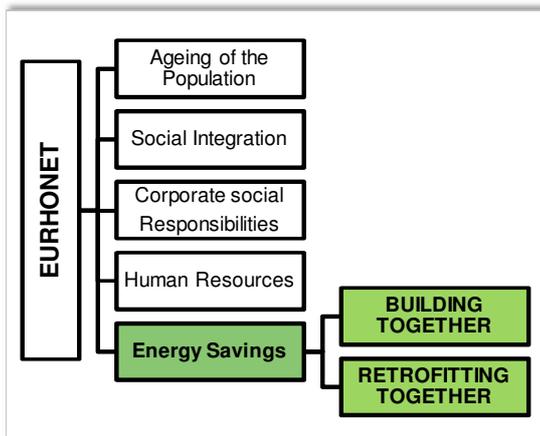
**PROJECT PARTNERS****Sustainable housing**

- EURHONET arranges frequent workshops to optimize the work flow of their member companies in different topics relating housing industry. In the context of their Energy Savings Topic Group the BuildTog project was developed to find a common process for planning and construction of sustainable housing.

project partner - housing companies

- 31 members
- 5 countries
- 700.000 managed dwellings
- 15.000 new dwellings / a
- 750 mio. € / a investment in refurbishment

## Strategic partnership between EURHONET and BASF



- BASF is a strategic partner of EURHONET’s Energy Savings Topic Group. As leading producer of raw material, system solutions and end products for the construction industry the company wants to contribute energy efficient construction and to participate in the development of new innovative solutions.
- LUWOG consult, the energy consultancy of BASF’s own housing company BASF Wohnen + Bauen, is intensively engaged in activities to increase the energy efficiency in refurbishment and new construction since years. In collaboration with international partners know-transfer programs are generated to multiply sustainable building concepts in a large scale.
- A/NM/A, the office for architecture and urban design of Nicolas Michelin, based in Paris, was already working together with some EURHONET members in the realization of French “Eco Quarters”. Within the scope of their building concepts the planners try especially to integrate the local situation into their architectural design and to develop concepts for natural ventilation.

### BUILDING TOGETHER

#### Exchange of experience

- Exchanging intensively their experience in reaching the same targets in construction projects on different European sites the participants want to study, how it is possible to devolve their high expectations to the energy performance of residential buildings economical efficient, without accepting deductions in building design. By the repeated use of a together developed

# BASF / LUWOG CONSULT



project partner - eco efficiency and sustainability



The Chemical Company

- World's leading chemical company
- Intelligent system solutions and high-value products for almost all industries
- Nearly 74 billion € sales (2014)
- More than 113.000 employees (2014)



■ BASF Gruppe

- Housing company of BASF
- Pioneer in energy efficient and sustainable housing solutions
- Social mission - housing offer with low costs for energy
- 8.000 housing units



- Consulting company, subsidiary of LUWOG
- Specialized in energy and economy efficiency and sustainability
- Experience in cooperation with housing companies
- Founded in 2006
- Team with 20 architects, engineers and economists



project partner - architectural quality



ANMA - SOCIAL HOUSING IN DUNKERQUE

methodology it is simple to demonstrate, which influence on the building construction is taken by change of framework requirements. That way the participants are sensitized for details and understand how to contribute the emergence of specific local features for their BuildTog housing. In each country up to three projects will be realized to point out regional characteristics.

## Requirement Profile

- All participants meet three times a year at the different locations. They report about the progress in their projects and deepen their knowledge in energy efficient construction in lectures and common workshops. They become acquainted with the sites, problems and solutions of their fellows and can inspire each other in optimizing their buildings.

## METHODOLOGY

### Common Design

- At the beginning of the project in 2009 the participants analyzed their current housing typologies and looked for analogies. The description of a common building concept resulted out of that. Because the national requirements for building energy performance and their calculations are very different in each country the international respected Passive House standard was defined as target.
- Based on the common specifications in accordance with LUWOG consult ANM/A developed a linear, 4 story building with pitched roof. The 2 middle axes were moved to the front. The façade in this area was slightly angular and clearly heightened. Thereby space for staircases and common

common design - **goal 1**: heating load under 10 W/m<sup>2</sup> or heat demand under 15 KWh/m<sup>2</sup>a, **goal 2**: n<sub>50</sub> under 0,6 / h

## Construction elements

- **Carcass**

Massive construction, concrete and/or masonry, insulation outside of construction to avoid thermal heat bridges.

- **Groundslab**

Mat foundation, concrete basement, pressure-resistant perimeter insulation, subbase, frost-protected base frame.

- **Wall**

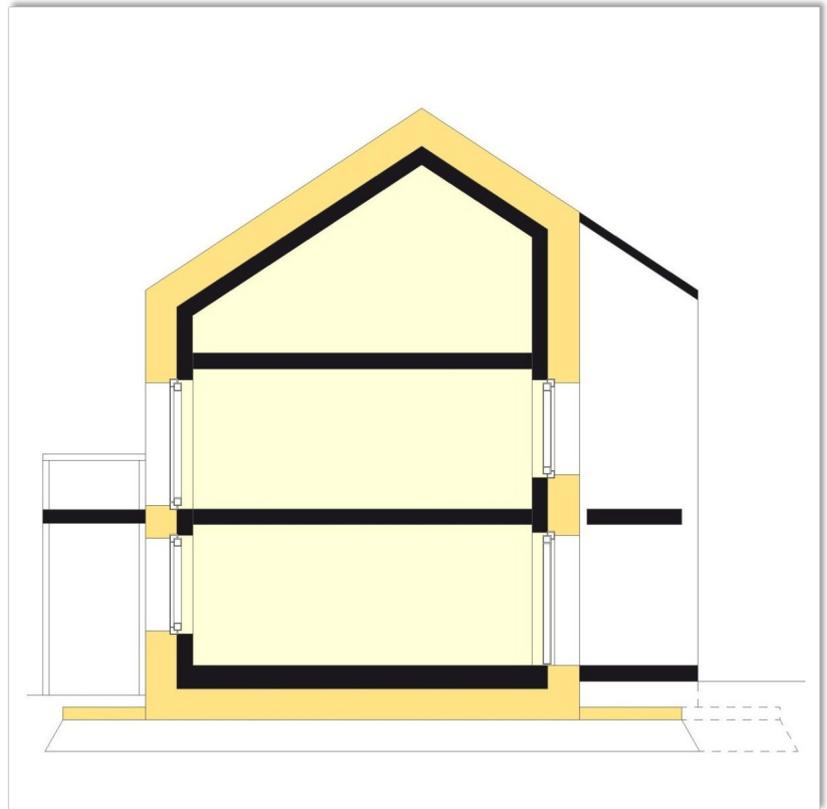
Concrete or masonry, outer wall insulation system, plaster or rear ventilated facade system.

- **Window/door**

Certified Passive House windows/ doors (wood/ insulation, wood/ insulation/ aluminium or plastics/ insulation).

- **Roof**

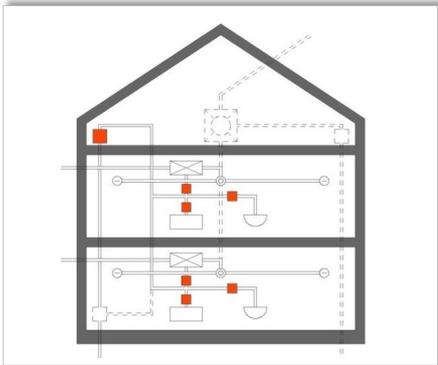
Concrete or wood/boarding, on top of roof insulation, rear ventilation, roof covering.



common design - **goal 3**: primary energy demand under 120 kWh/m<sup>2</sup>a (including domestic electricity)

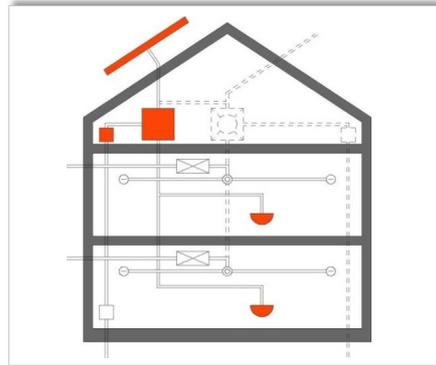
## A. Central indirect heat supply

- Centralized heat generation for hot water, ventilation and heating by district heating (bottom/up), burner or heat pump (up/down).
- Centralized or decentralized ventilation with heat recovery, heat preparation indirectly by heat exchanger, after heating individually, radiators optionally.
- Decentralized hot water generation, indirect supply by heat exchanger.



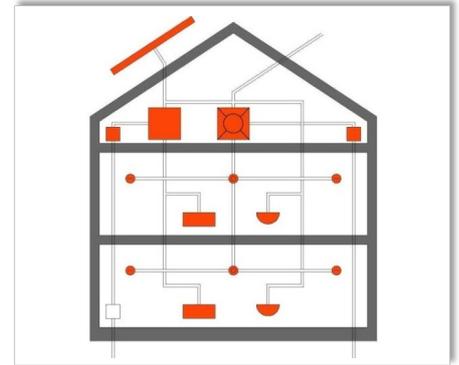
## B. Central direct hot water supply

- Centralized heat generation for hot water by burner or heat pump, solar heat possible.
- Centralized or decentralized ventilation with heat recovery, individual heating by electricity.
- Central hot water generation, direct supply by storage.



## C. Central direct heat supply

- Centralized heat generation for hot water, ventilation and heating by district heating, burner or heat pump, solar heat possible.
- Centralized ventilation with heat recovery for basic heat, individual after heating possible.
- Central hot water generation, direct supply by buffer storage.



infrastructure was generated in the buildings backside and for outside areas next to the apartment in the front.

- In first and roof level there was some space for additional use which could be inside our outside of the thermal volume. Because of reserves to the supposed design restrictions in Passive House planning the participants consciously decided to pass on the optimization of building compactness. Therefore they proposed to construct the buildings without cellar, South - oriented and as far as possible without shading from outside.
- The common design was possible to be realized with four or five dwellings per story, three to four levels plus roof, free-standing or attached. The apartments above were usually planned as duplex to have a varied mix of all together about 15 dwellings with 2 to 5 rooms.

## Local Adaption

- In the context of pre design the teams from A/NM/A and LUWOG CONSULT develop together with the housing companies and their familiar planners a local adaption of the common design. They had to respect numerous aspects like climate, building law, building construction, building technology, culture and others. Because the same type was always basis of the local adaptation the participants also could revert to solutions of their project partners. Thereby the BuildTog could be optimized in an iterative process step by step.

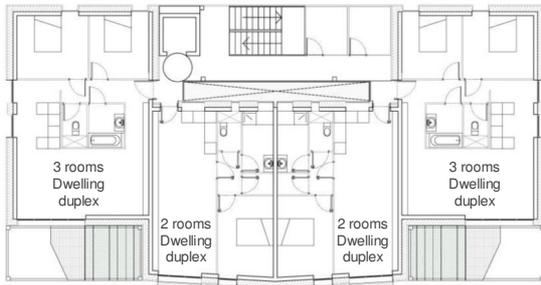
## Quality Assurance

- To assure the quality of planning LUWOG CONSULT attended all BuildTog projects up to their finalization and supported the local planners according to

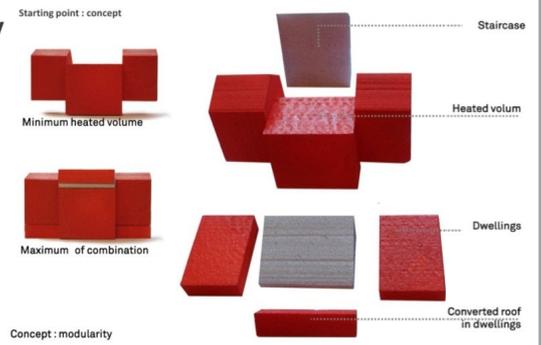
# BUILDING CONCEPT

## common design

### • Structure



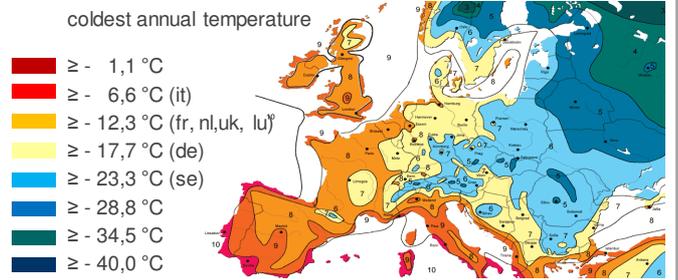
### • Typology



### • Design



### • Energy (Passive House Standard)





local adaption

• **Labeling**

certification

national

**Passive House**

DGNB

BREEAM

LEED

• **Project attendance**

local + international

Information

Moderation

Consulting

Planning

Quality management

• **Monitoring**

evaluation + optimization

1. Maintenance by regular site visits
2. Permanent control by local stations
3. Internet based data documentation
- 4. Control for technical optimisation**
5. Analysis of user behavior



	I	II	III	IV	V	VI	VII	VIII	IX
I	●	●	●	○	●	●	●	●	●
M	●	●	●	○	●	●	●	●	●
C	●	●	●	●	●	●	●	●	●
P	●	●	●	●	●	●	●	●	●
Q	●	●	●	●	●	●	●	●	●
M	●	●	●	○	●	●	●	●	●

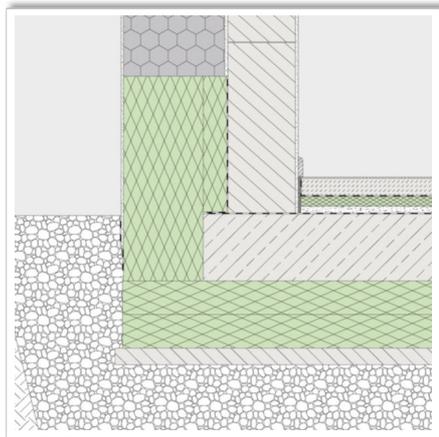


local adaption

## • Basement

pressure resistant insulation

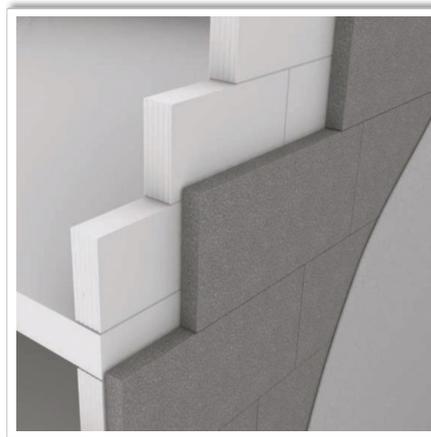
foundation on top of  
STYRODUR®,  $\lambda=0,039$  W/mK



## • Wall

high efficient insulation

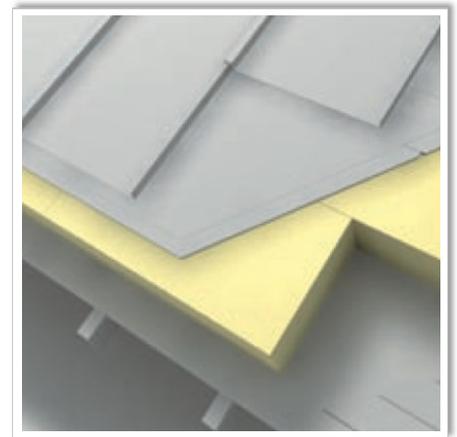
EIFS with  
NEOPOR®,  $\lambda=0,032$  W/mK



## ▪ Roof

high efficient roof insulation

metall roof with  
ELASTOPOR®,  $\lambda=0,026$  W/mK



## Certification

- The Passive House certification is prepared by LUWOG consult and enforced by Passive House Institute, Darmstadt. Also the certification process is going to be optimized in replication.

## Monitoring

- Already during the planning phase the housing companies agreed on a common monitoring concept to be able to compare the results based on the same kind of data. In main focus is the optimization of the technical equipment in running process. Those who have no experience in measuring user behavior in Passive Houses will also work on that.

## SITES

- Originally it was planned to construct BuildTog houses without cellar, South-oriented, free standing in the green fields only. Very soon it was clear that other things are more important to choose a site than energy related topics. Meanwhile there are designs for BuildTog houses under various boundary conditions. So it is possible to demonstrate that energy efficient buildings can be constructed in nearly every situation.
- In Germany and France two BuildTogs are already completed, three more are in planning in France, one in Germany and another one in Sweden. Moreover there are contacts in additional countries to partners outside from EURHONET. Requests from further countries are very welcome.

## BuildTog++ NEW GENERATION

### NEW! open design + refurbishment

- Based on the positive experiences from the first BuildTog phase between



# LOCAL ADAPPTIONS

sites - 2 BuildTogs completed, 6 in planning or under construction



Common Design

Reims / France  
Stockholm / Sweden  
Treviso / Italy

project start in 2009  
common design / local adaption  
8 sites / 12 buildings  
16.000 m2 floor area  
3 of 5 countries started  
(Sweden, France, Germany)



Séart / France



Châlons / France



Arras / France



Darmstadt / Germany



Bremen / Germany



Örebro / Sweden

2009 and 2014 the project framework will be improved for a wider future dissemination. The adaptation of a common design on 7 different sites was very helpful to get a clear understanding of the most critical issues in Passive House planning. The results can be compared and evaluated on a common base now which leads to general awareness about affordable, efficient but also well designed constructions.

## Architectural quality in process

- The new BuildTog++ generation will follow a common methodology without strict design rules. The architectural quality will be ensured by the project process. Other building sizes, typologies or uses are possible to be implemented from now on. It is also planned to consolidate the Euronet energy saving groups for new construction and retrofit to adapt the process for building optimization also to refurbishment.
- In the beginning of 2015 the application for a deeper research in the framework of HORIZON 2020 was initiated. BuildTog++ then has to be improved into plus energy standard on a district level by the use of renewable energies. The already existing pilot projects demonstrated that it is possible to construct a similar building from 115% up to 85% of the average construction costs depending on the project boundary conditions.

## Conscious and appropriate action

- Conscious and appropriate action is hindered in the very complex integrated planning and construction process by a huge lack of knowledge on all decision maker levels. Therefore a clear methodology with simplified and easy to use methods and instruments has to be developed and offered.

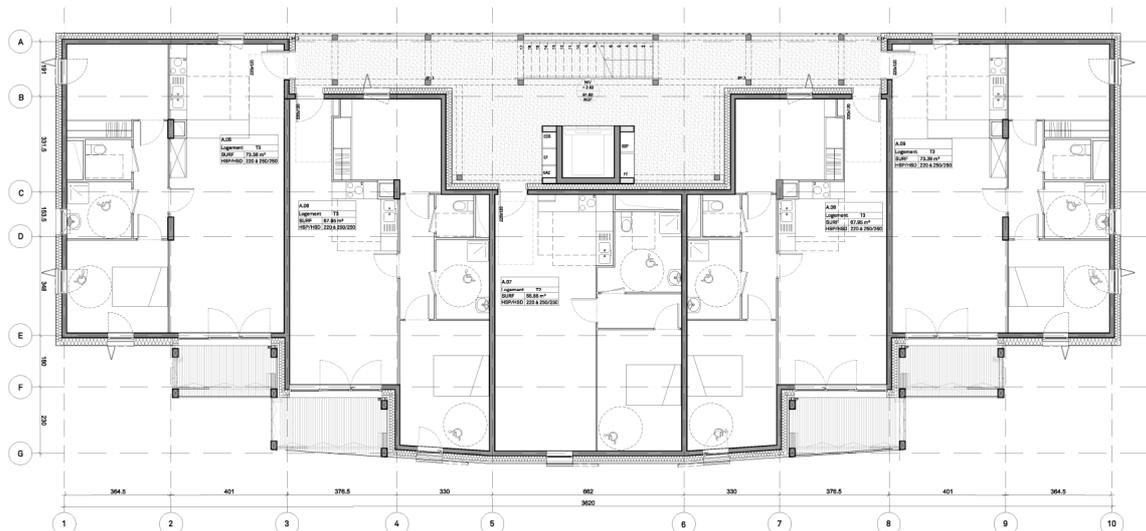
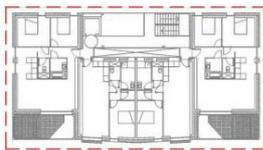
## sites - local adaption phase IX / certification

**Project owner** FSM - les Foyers de  
Seine-et-Marne  
**Architect** A/NM/A



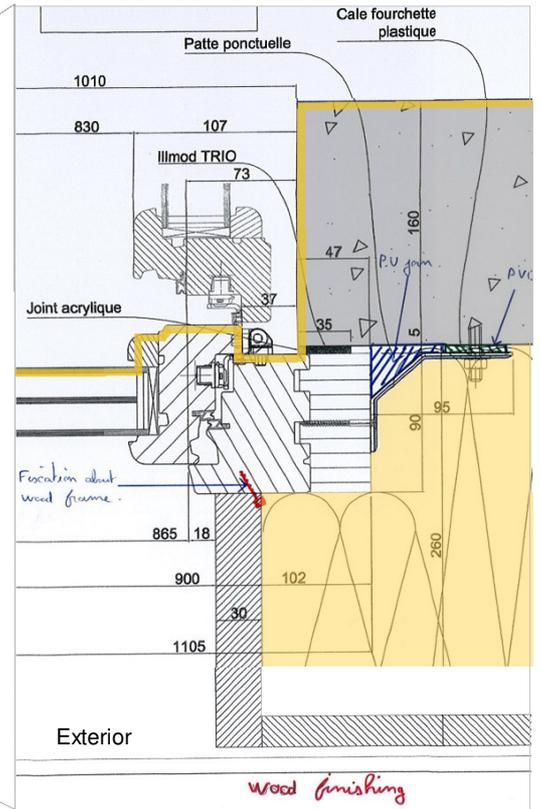
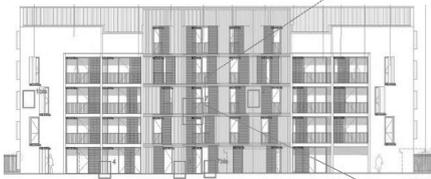
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## sites - Sénart / building A

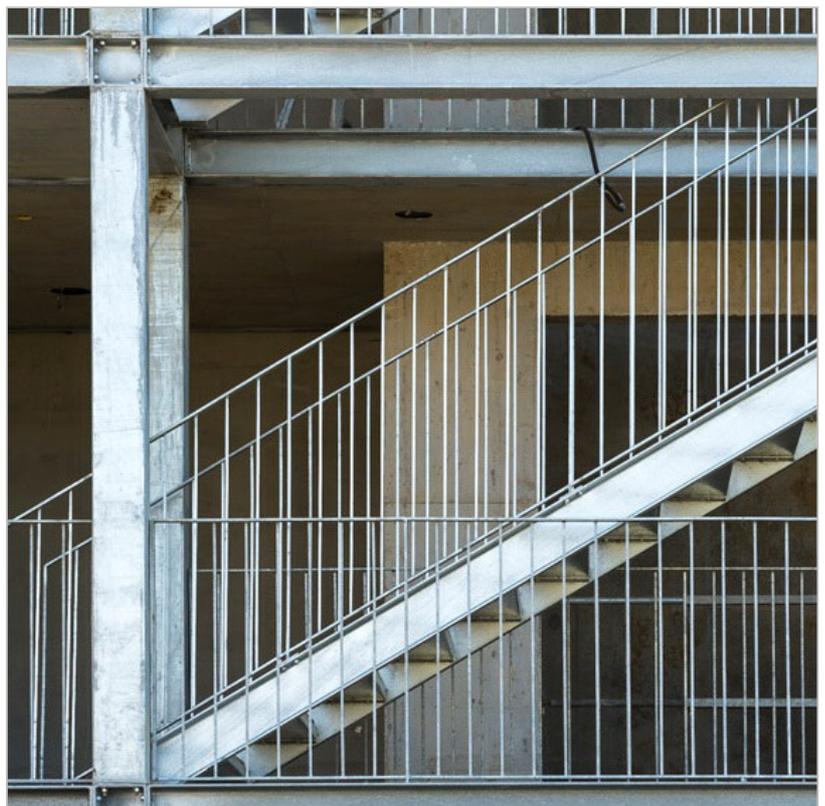


sites - Sénart

optimisation process	compactness	orientation South	shad. neighbours	window surface	window g-value	window u-value	insulation	thermal bridging	air tightness	heat recovery
location	geometry	envelope	tec.							
saving potential										
FR - Sénart +2										

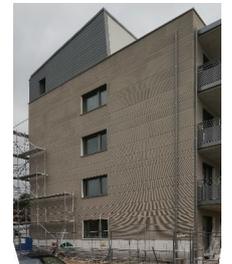
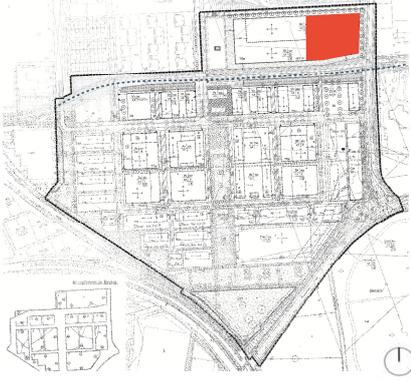


sites - Sénart



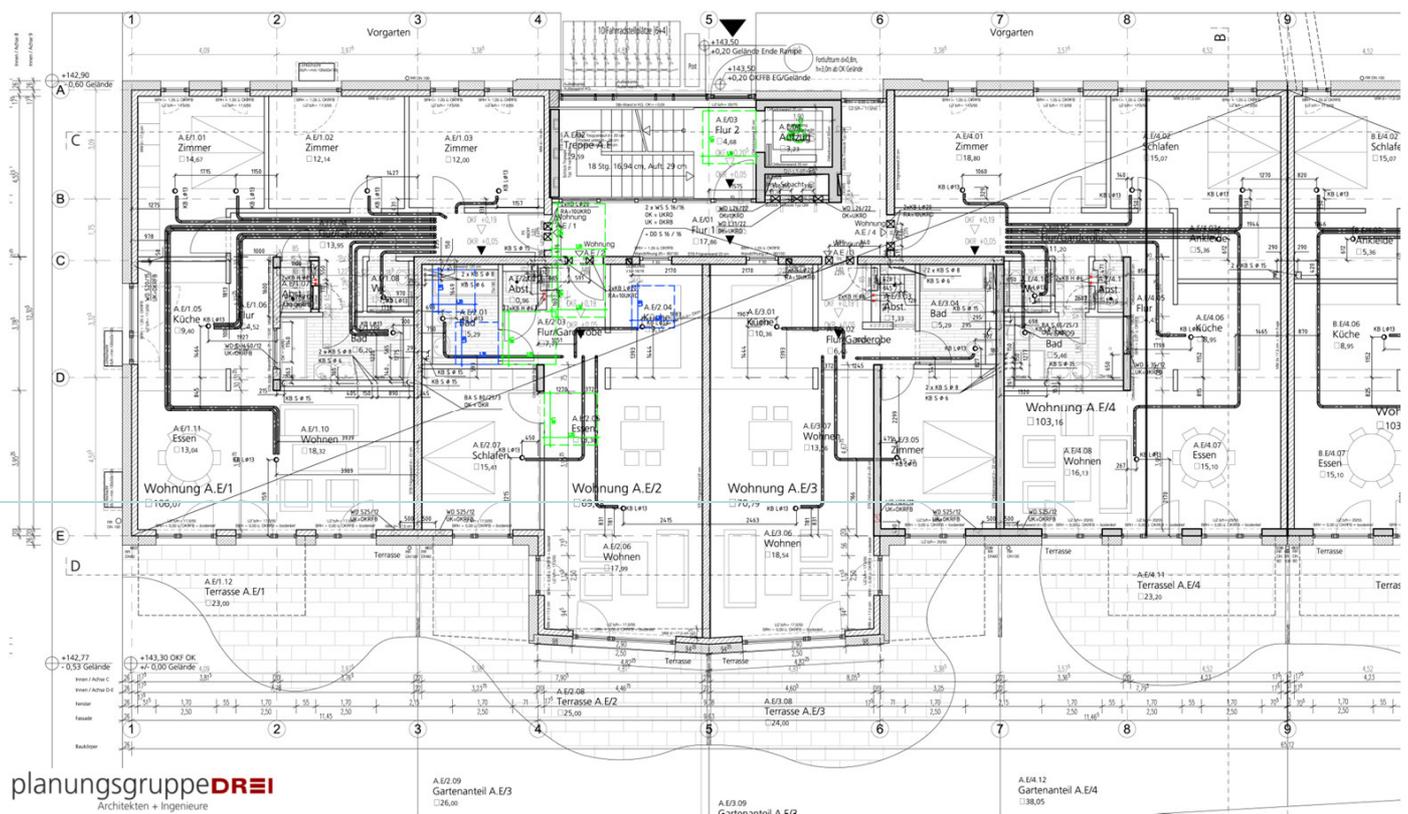
sites - local adaption completed / Passive House certified

**Project owner** Bauverein AG Darmstadt  
**Architect** Planungsgruppe DREI



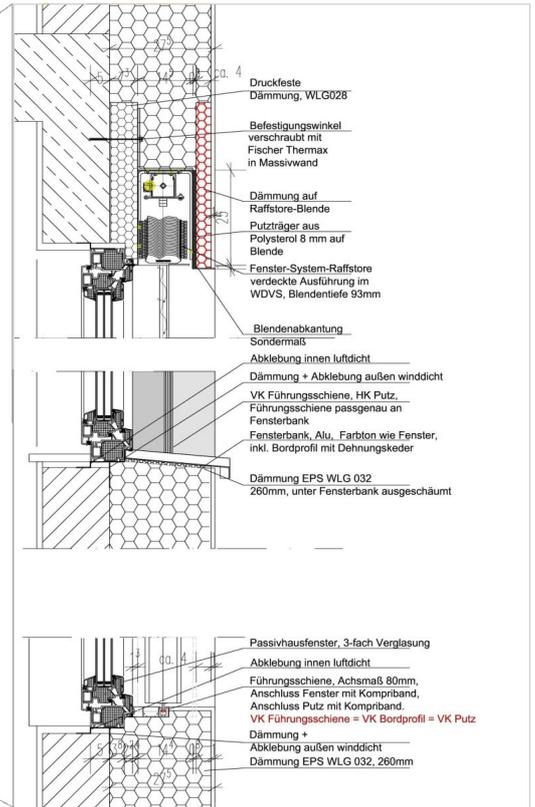
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sites / Darmstadt

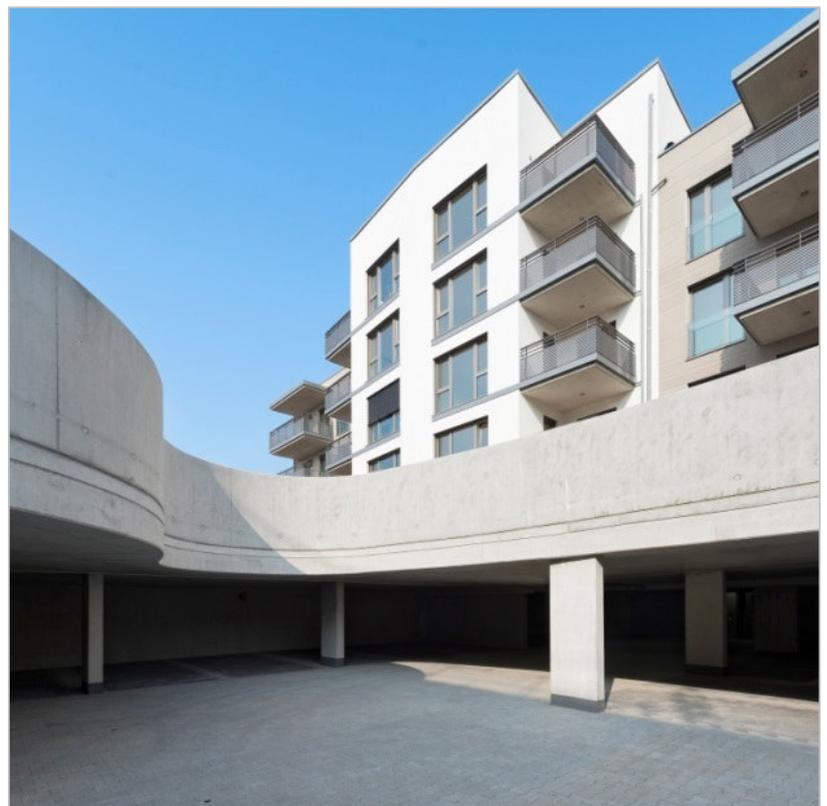


sites - Darmstadt

optimisation process	compactness	orientation South	shad. neighbours	window surface	window g-value	window u-value	insulation	thermal bridging	air tightness	heat recovery
location	geometry		envelope				tec.			
saving potential										
DE - Darmstadt +8										



sites - Darmstadt



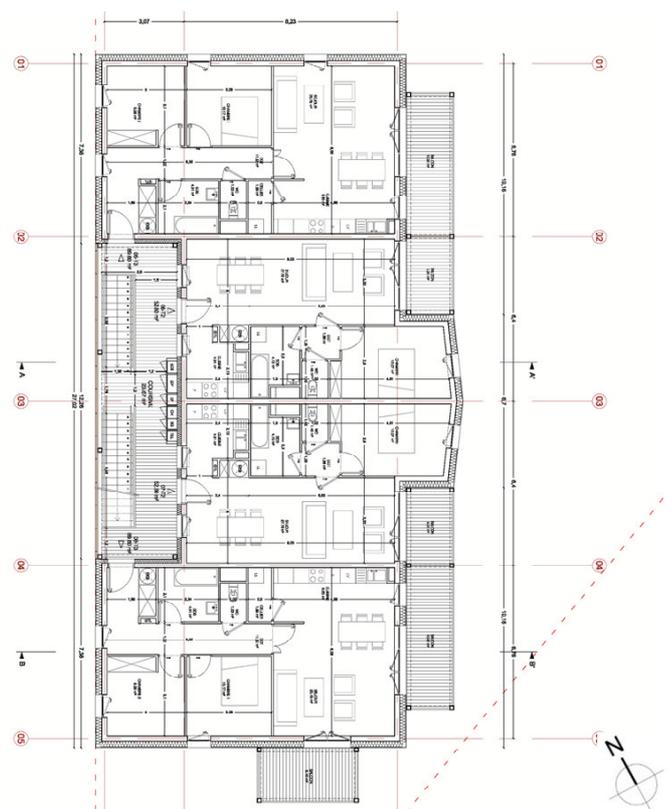
sites - local adaption phase VIII / construction

**Project owner** LA RENAISSANCE IMMO-  
BILIERE CHALONNAISE  
**Architect** EXP architectes



© EXP architectes

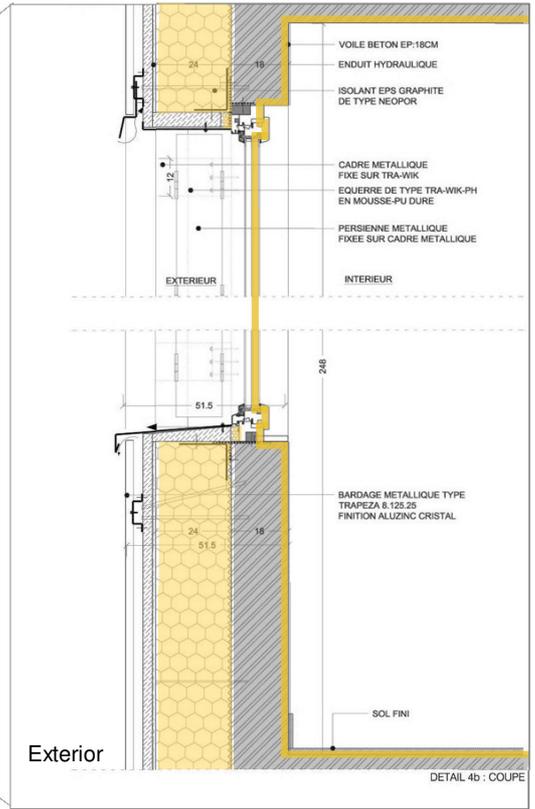
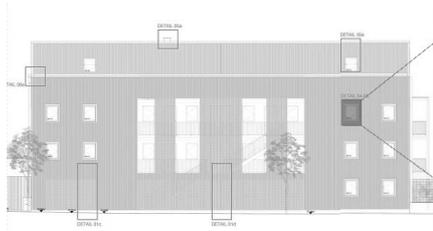
sites - Châlons



# FACADE | VENTILATED METAL CLADDING

sites - Châlons

optimisation process	compactness	orientation South	shad. neighbours	window surface	window g-value	window u-value	insulation	thermal bridging	air tightness	heat recovery	
location	geometry		envelope				tec.				
saving potential											
FR - Châlons +3											



# DETAIL

sites - Châlons

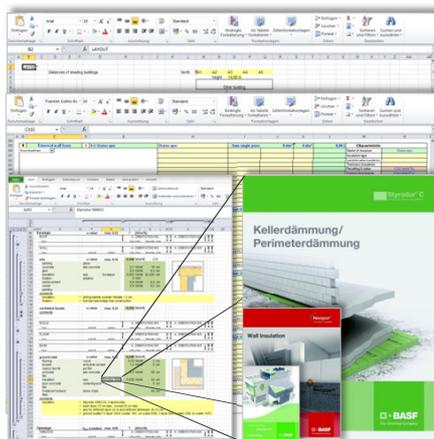


communication, organisation, information

## COMMUNICATION TOOL

- Energy supply calculation
- Geometry assistant
- Data input
- Evaluation of variants
- Detailed analysis
- Cost estimation
- Economic calculation
- Life cycle assesment
- Eco efficiency analysis
- Legal energy verification
- Know-how-transfer
- Construction details
- Thermal bridging analysis
- Product catalogue

## Internet application



SELECTION PHASE 2 - IMPLEMENTATION PLANNING - SEMESTER 1/14 - 10/10/2011

**EAVES**  
thermal bridges - specification detail

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SELECTION PHASE 2 - IMPLEMENTATION PLANNING - SEMESTER 1/14 - 10/10/2011

**FOUNDATION**  
thermal bridges - specification detail

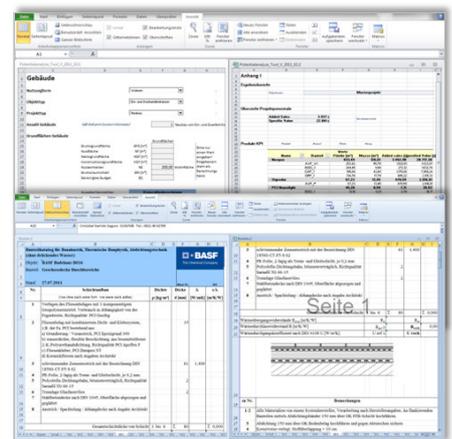
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SELECTION PHASE 2 - IMPLEMENTATION PLANNING - SEMESTER 1/14 - 10/10/2011

**EXTERNAL INSULATION**  
building envelope

specific space heat demand = 15 kWh/m<sup>2</sup>/a

component	description	material	thickness [mm]	lambda-value [W/mK]
ROOF	roof of construction	concrete	200	2.020
	piece of insulation material	EPS	200	0.028
	roof slab construction	metal	no part of thermal envelope	
EXTERNAL WALL PLASTER	external plaster	plaster	15	0.250
	construction material	concrete	180	2.020
	insulation material	EPS	200	0.028
	external surface	plaster	15	0.250
EXTERNAL WALL WOOD PANELING	external plaster	concrete	180	2.020
	construction material	concrete	200	0.028
	substructure paneling	wood	no part of thermal envelope	
	wood paneling	wood	100	0.140
BASEMENT	way of foundation	concrete	300	2.020
	piece of insulation	XPS	100	0.030
	insulation material	horizontal	1000 x 200	0.040
	base layer	bed preparation	no part of thermal envelope	
	building ground	bearing strength		



## JOIN BUILDTOG

- For all EURHONET members the main benefit of participating in BuildTog is to become skilled in applying high energy performed buildings to be prepared for the future European nearly zero energy standard from 2020 on.
- We are looking forward to hearing from further housing companies or investors interested in joining our BuildTog project.
- For further information about the BuildTog project please visit our website or contact one of our partners named in the inside cover of this brochure.

[www.BuildTog.eu](http://www.BuildTog.eu)



with friendly support of

