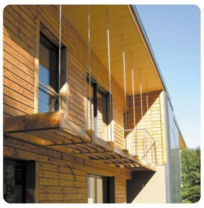
Low-Consumption Building: The Achievement of a Project

Solutions for new, comfortable and energy-saving housing







Guide for the purpose of the building industry professionals

Mieux construire et rénover pour protéger l'environnement

effinergie

Qualité de vie et économie d'énergie

Preface

effinergie for a common action

From 2005, a national working party initiated an **effinergie** *collective, the objective of which was to repeat the successful Swiss and German initiatives with, respectively, « Minergie » and the « three-liter house ». This committee is specifically adapted to the French requirements (construction methods, regulation, standards, climate, market…).*

Unlike the central and northern European countries, it is here impossible to stick to a unique standard that would not take into account the various climate changes in France. A construction on the French Riviera cannot meet the same energy standards than in the North of France or in the Alps. For example, insulation will not meet equivalent requirements in terms of energy saving and comfort. This is therefore necessary for the French regions to get involved in the project in order to co-ordinate the housing stock and its characteristics.

The association plans to promote actively low-energy constructions and to develop referentials in terms of energy performance for new or existing buildings in France. To this end, it groups together the building industry professionals and the local authorities.
effinergie *is working on a set of measures in order to reach a standard for new and renovated buildings that would both respect comfort and quality of life. These measures would also favour a real energy efficiency so that pollution produced by the use of energy could be reduced.*

effinergie *aims at 5 missions:*
Grouping together all the stakeholders of the construction sector for an energy optimisation of buildings: project managers, building companies, industrialists, banks, public local and national authorities… This is a win-win challenge for the construction sector.
Managing and coordinating communication between the building industry professionals and the local stakeholders in order to strengthen synergy, to convey information, to share experiences and to organise necessary trainings.
Managing a countrywide communication to inform about actions and to underline the noteworthy projects, the field staff,…
Introducing a quality certification initiative that would enable to assess and qualify the buildings' energy performance from referentials. It would therefore be more visible and identifiable by all the stakeholders.
Implementing regional strategies adapted to each geographical area in favour of a share of experience, projects assessments and an active dissemination of good practices.

One of the very first actions of **effinergie** *was to develop a first label for new buildings in partnership with the public authorities. This label was introduced by the May, 8th 2007 order published in the Official Journal dated from May, 15th 2007. It is communicated in the sector under the name* **BBC-effinergie**. *This guide provide the technical keys in reference to this label.*
Thank you to the scientists, the professionals and to the politicians who allowed its achievement.

Antoinette GILLET
Chairwoman of the **effinergie** *Collective*
March, 28th 2008

Foreword

The 'Grenelle Environnement' has set ambitious objectives in the building sector. It was immediately aimed at low-consumption buildings rating at 50 kilowatts per hour, per square meter and per year of primary energy. It is now possible to consider the idea of positive energy buildings according to which the beforehand reduced consumptions might be covered by the renewable energy (biomass, photovoltaic solar energy, solar power).

The decision to generalize these generations of buildings - with the 2012 regulation – speeds up the movement into which **effinergie** *is involved.*

It appeared that the construction sector should, from now on, be better prepared and used to this performance level instead of planning intermediate steps. The latter would imply a slowdown of progress and would confirm a will of not going any further. And, above all, it would early enough prevent to consider the technological infeasibility to reach the concept of low-consumption and positive energy buildings.

The conception and construction of these buildings are undergoing radical transformation.
On one hand, they require a new approach of the project management which will necessarily be competent in concurring engineering (decompartmentalization of architects and engineering offices). On the other hand, the use of new construction techniques requires a particular attention to implementation, to which the profession was not accustomed, especially with reference to airtightness and thermal bridges.

In order to find solutions for 2012, several factors must be taken into account, such as the local climatic situations, the local culture prevailing in the construction sector and the locally produced materials.

All these reasons confirm the relevance of an organisation, like that of **effinergie***, which is federated regionally.*
Our organisation is able to consider the plurality of the local cultures and it can rely on the progress forces present in every region.

It can now be concluded that the success of the Grenelle – in the building sector – depends on the effectiveness of effinergie. The Low-Consumption Buildings and the Positive Energy Buildings labels are mapped out by **effinergie** *with the public authorities. In the course of the next four years – before 2012 – the opportunity to perfect progressively the labels is now seized in order to reach a 2012 regulation that would be shared by and adapted to all the stakeholders.*

This **effinergie** *guide comes along just at the right moment to start with the process of the after-Grenelle.*

Alain MAUGARD
Chairman of the CSTB
Chairman of the 'Grenelle Envionnement' operational Committee for the New Buildings
March, 28th 2008

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The reasons for this guide

At the time when the first BBC–effinergie constructions are built, we thought it necessary to write a first guide allowing the share of experiences with some forerunners.

This guide is not meant to be a bible about low -consumption buildings, nor a catalogue listing the solutions or rules to achieve a project.
It aims much more at being a first tool sharing knowledge to better build together.

It successively includes:

This guide is far from being exhaustive. This version particularly deals with new housing whereas the label applies to all the new residential and tertiary buildings and it will soon apply to existing buildings.

It was written by the reference goup of the effinergie association

In the background: *H. Lahmidi (CSTB) (co-editor), P. Prevost* (Legrand), *J.-C. Visier (CSTB) (project coordination, editor),B. Sesolis (Tribu énergie) (consumption calculation), H. Petard (FFTB), J.-Y. Colas (CERQUAL)*
In the foreground: *C. Plantier (ENERTECH) (summer comfort calculation),B. Burger (KNAUF), N. Barbe (FCBA), S. Charbonnier (member of the collective 'Protecting the earth against CO2'),C. Bonduau (Effinergie), E. Bertho (Ajena) (co-editor),E. Billiotte* (CNDB), *D. Ider* (Paris town *council), Y. Jautard (SOLARTE)*
Absentees: O. Sidler (ENERTECH), F. Tiffanneau (CERQUAL)

MEETING THE REQUIREMENTS

Elementary requirements

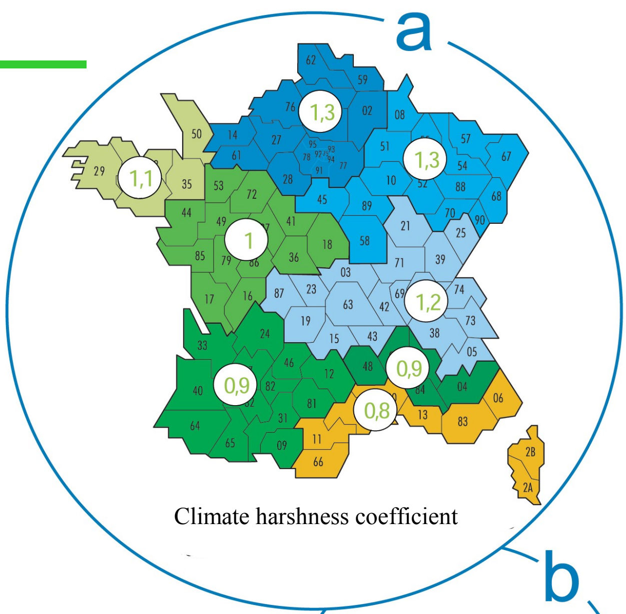
In order to obtain the **BBC–effinergie** label, the main requirement consists in not exceeding a consumption value of: **50 kWhpe per m² of NFA per year**

The calculation is made according to the Th-CE method, which is that of the Thermal Regulation 2005. The results are therefore displayed with the following rate: kWh of primary energy (1) per m² of Net Floor Area (NFA).

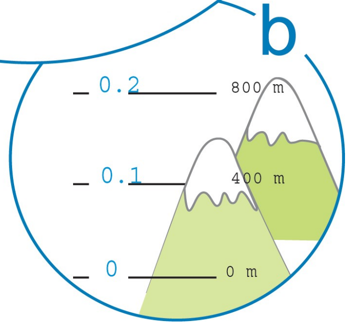
The diversity of climates is taken into account as this value of 50 is multiplied by a coefficient of climate harshness.

As a consequence, the values of this requirement fluctuate between 40 and 65 kWhpe/m²NFA/year according to the regions.
The coefficient of climate harshness is increased by 0.1 if the construction altitude ranges from 400 to 800m and it is increased by 0.2 if the construction altitude is higher than 800m.

Besides, the building air tightness must be measured and be under 0.6 m3/h.m² for a detached house and under 1 m3/h.m2 for apartment buildings (2).



Climate harshness coefficient



(1) The primary energy can take into account the energy loss during the transformation of energy. It corresponds to the energy bought to the energy distributor (named as final energy) which is multiplied by a coefficient equivalent to 2.58 for electricity, 0.6 for wood and 1 for other energies. This 2.58 coefficient for electricity takes into account the heat supplied by the power station. This heat is not used and it is evacuated in the natural surroundings (sea, river…).
(2) This value quantifies the leakage flow going through the building envelope. It is stated as m3/h.m2 of building envelope, under a pressure differential of 4 Pascals, according to the RT 2005 Thermal Regulation

Five energy –using solutions

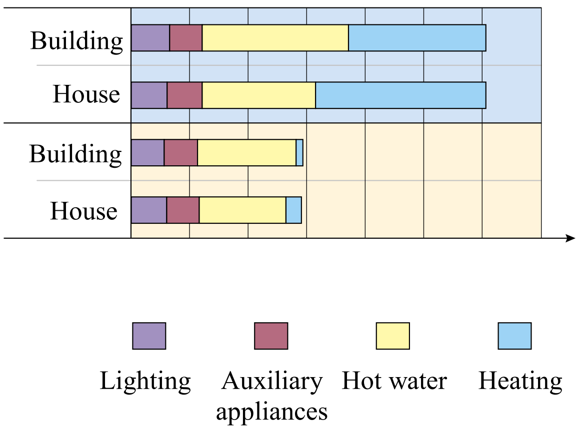
The consumption – that should not be exceeded – applies to the energy utilizations that can be actively influenced from the design of a building:

- Heating
- Hot water
- Auxiliary appliances for ventilation and heating
- Lighting (via natural lighting)
- Air-conditioning

It does not include the other utilizations of electricity (particularly the household appliances, audiovisual equipment…) that are equivalent to more than 50 kWhpe/ m2.year of additional consumption.

Consumptions of different utilizations

(example for 2 buildings and 2 climates)



In cold regions, heating or hot water are mainly used.
In the Mediterranean area, heating becomes insignificant.

A similar calculation to that of the RT 2005

The Thermal Regulation measure is improved by 4 criteria set up in the framework of this label:

1. The CO2 emissions and the proportion of the renewable energies used in a building must be calculated and supplied when the label is duly required.

2. In order to enable an efficient development of solutions requiring firewood heating, the coefficient for the transition from primary energy to wood is equal to 0.6.

3. As one of the objectives consisted in a good thermal performance of the building, the local electricity production (photovoltaic, micro-wind energy,…) is only deducted from the energy consumptions up to a limit of 12 kWhpe/m^2.yr (this value represents the specific average proportion of electricity in terms of consumption stated in kWhpe/m^2.yr for a **BBC-effinergie** project).

4. If the NFA exceeds 20% of the living area, the reference surface will be 1.2 times the living area in order to meet the **BBC-effinergie** requirements.

Regarding the innovative systems and products, a specific procedure is planned: see the **effinergie** collective of your region *on the following website www.effinergie.org in the 'Effinergie dans le neuf' section.* A comprehensive description of the **BBC-effinergie** referential is available in this very same section.

Editor's note

For a better reading of this guide and in order to make comparisons with the objective of 50 kWh of primary energy per m^2 of NFA, per year, all the energy consumptions introduced in this guide are stipulated with the same unit: kWh of primary energy per m^2 of Net Floor Area, per year. For an easier reading, the kWhpe/m^2 NFA.yr unit is written kWhpe/m^2.yr.
We wanted to illustrate this guide with figured examples. They are based upon examples of a detached house and an apartment building. These two buildings have been successively located in Nancy and Nice in order to illustrate the impact of the climate upon the consumptions and the summer comfort.
The provided figures are just instructive illustrations and they only represent very useful orders of magnitude to understand the issues. Under no circumstances, they can stand for the figures mentioned in a survey about a given building.

Managing a new construction project

The quality of a building and its performances in terms of comfort and energy consumption result from common choices and actions initiated by the project owner, the project management, firms, administrators and householders.

For each phase of a **BBC-effinergie** project, a coordination with the stakeholders is all the more essential in order to reach the objective of a comfortable and energy-saving building.
It is therefore crucial for everyone to ask oneself key questions about the different phases from the project to the final management of the building.

Programme phase

- Did I really mention in the programme my will to get a **BBC-effinergie** labelled building?

- What experience is required for the project management team in terms of low-consumption building? Is it acquainted with the requirements of the label and is there an energy efficiency specialist in the team?

- Did I make provisions for fees that would enable the project management team to complete successfully a work of energy optimization for the building?

- Whom did I put in charge for the creation of the **BBC-effinergie** label application file? Who can give me the right information?

- Did I express the will to implement measures that would give a sense of responsibility to the future users (building user's guide, meters in evidence, consumption control for each utilization,…)?

Arch.:l.GENILLON

Design phase

- Does the thermal engineering office take part in the project from the first design sketches?

- Did I optimize the building and its facilities through a study of all the potential uses (compactness, management of free supplies during all the seasons, indoor spatial requirements, over-insulation, control of the thermal bridges, airtightness, choosing facilities, energy alternatives,…)?

- Did the designer and the thermal engineering office correctly informed the project owner about the impacts of the chosen alternatives upon investment and operating costs, but also about the management and the maintenance of the building and its constituents?

- Do the results of the thermal survey afford to meet the requirements of the **BBC-effinergie** label?

- Do I correctly respect the regulatory requirements in terms of summer comfort?

- Did I plan a hypothesis summary of the thermal survey listing the performances of the results to implement?

- Did I include these performances in the tender enquiries and contracts?

- Are all the details about the implementation – that would finally enable to reach the expected performance (especially with the thermal bridges and airtightness) – correctly notified in the diagrams or annotations?

- Did I mention, in the firms contract, that a test about the building air permeability will be carried out?

- Do the chosen firms have an experience in terms of low-consumption buildings? If so, do they have specific qualifications?

- Do the contracts signed with the firms respect all the instructions about the building energy performance?

- Did I check that all the planned construction alternatives and facilities benefit from recognized performances? Besides, did I correctly check that they were known and recognized by certification bodies? Should the opposite occur, did I consider using the specific procedure of regulatory compliance stipulated in the order of May, 24th 2005?)

Building phase

- Has the staff of the stakeholder firms been trained for the alternatives controlling the air permeability? Are they sufficiently skilled for these structures?

- Is the body – I contacted to measure the building permeability – recognized by the certification body?

- Did I plan to carry out an intermediate airtightness test that would help to implement easily the potential corrective actions?

- Did I check that the performances of the implemented products and facilities were initially mentioned in the thermal survey?

- Did I check that the implemented products and facilities have been correctly evaluated and recognized by the certification bodies?

- Have the notebooks – that mention the details about the execution of the project – been passed on to the concerned firms? Have these details been improved with the firms? Does the achieved work respect these requirements?

- Did I plan an intermediate acceptance of the work before the face-laying and duct sealing in order to observe the quality regarding the laying of the insulating material, the piping and cable transit and the potential airtightness diaphragms?

Acceptance of the work phase

- Was the air permeability of the housing measured and were the possible problems solved?

- Were the flows of the ventilation equipments correctly regulated? Do I have the acceptance report?

- Were the regulation and programming systems of the heating, hot water output and air control equipments regulated? Do they correspond to what was initially planned?

- Was a guide about the building control drawn up for the attention of the project owner? Does it include all the technical information about a regular maintenance of the equipments?

- Was a building user's guide drawn up for the attention of householders?

Utilization and building maintenance phase

A **BBC-effinergie** building is very vulnerable in terms of use and maintenance.

It is necessary to provide the householders with simple information that would help them understanding how they can act upon the equipments in order to adapt the performance to their needs, how they can control comfort and energy consumption and how they can maintain the equipments.

- Did I write a user and maintenance guide(3) for the attention of the householders that includes the energy aspects? Was this guide shown to the householders? Are there pages to fill in in order to note down the control of the equipments?

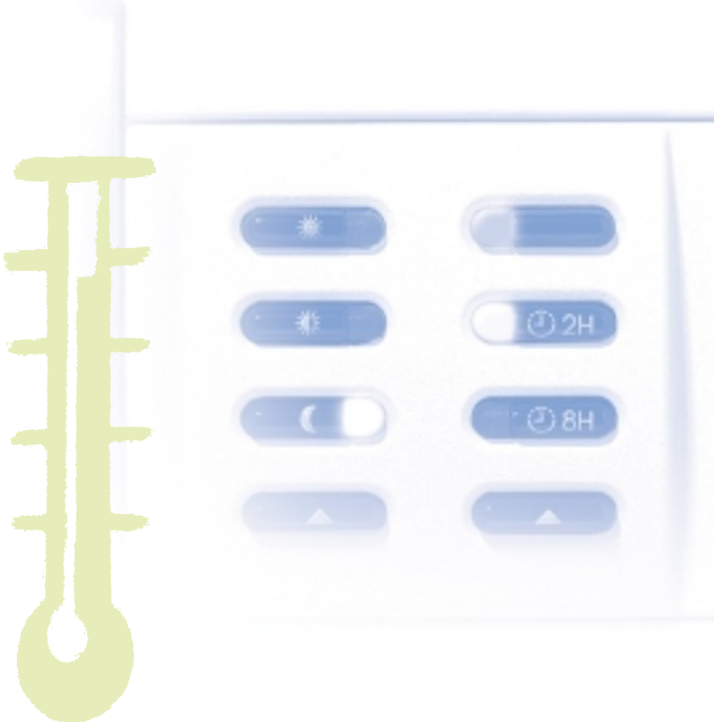
<u>This guide could particularly insist on</u>:

- The control of temperature in the rooms with a description of the equipments and the instructions for use at the disposal of the inhabitants. An increase by 1°C of the indoor temperature contributes to a rise of the consumption of about 2 kWhpe/m².yr in the Mediterranean area and 4 kWhpe/m².yr in a cold area.
- The use of hot water and the energy cost regarding different behaviours. Consumption may effectively treble according to the use. The installation of water economizers is complementary to the hot water production supplied by solar collectors. This is one of the main methods to reduce energy consumptions.
- The control of shutters in winter. In daytime, opening shutters enables to take advantage of solar supplies and their closing at night can reduce heat consumptions.
- In summer, controlling sun-blinds and opening windows offer both a protection from the sun and a natural and free air-conditioning, especially in the night for the latter.
- It is relevant to hang clothes up to dry outdoors, if possible, or in a room that is not heated and correctly ventilated.
- Maintaining frequently the heating equipment and the necessity of a maintenance contract.
- The necessary maintenance of the mechanical ventilation equipments and the necessity to clean regularly the air inlets, and the filters, in case of a bypass system.

Besides, the choice and the use of equipments is predominant for the consumers of specific electricity.

<u>The guide will insist upon the interest of</u>:

- the choice of the household appliances (refrigerator, freezer, washing machine,…) labelled A or A+ energy which are correctly adapted to the needs and they can therefore save around half of these consumptions;
- the choice of the washing machine and dishwasher that can be connected to the solar hot water;
- the use of compact fluorescent lamps in, at least, all the main rooms that can save the 3/4 of their usual consumption;
- supplying – with a socket controlled by an easily reachable button switch – computers, games consoles, DVD players, decoders,… to switch them off when they are not used.



(3) «Guide pour l'élaboration de notices de surveillance et d'entretien des immeubles collectifs de logements ou de bureaux» AFNOR (FD P 05-101 reference), September 2003

CHOOSING ARCHITECTURAL AND TECHNICAL SOLUTIONS

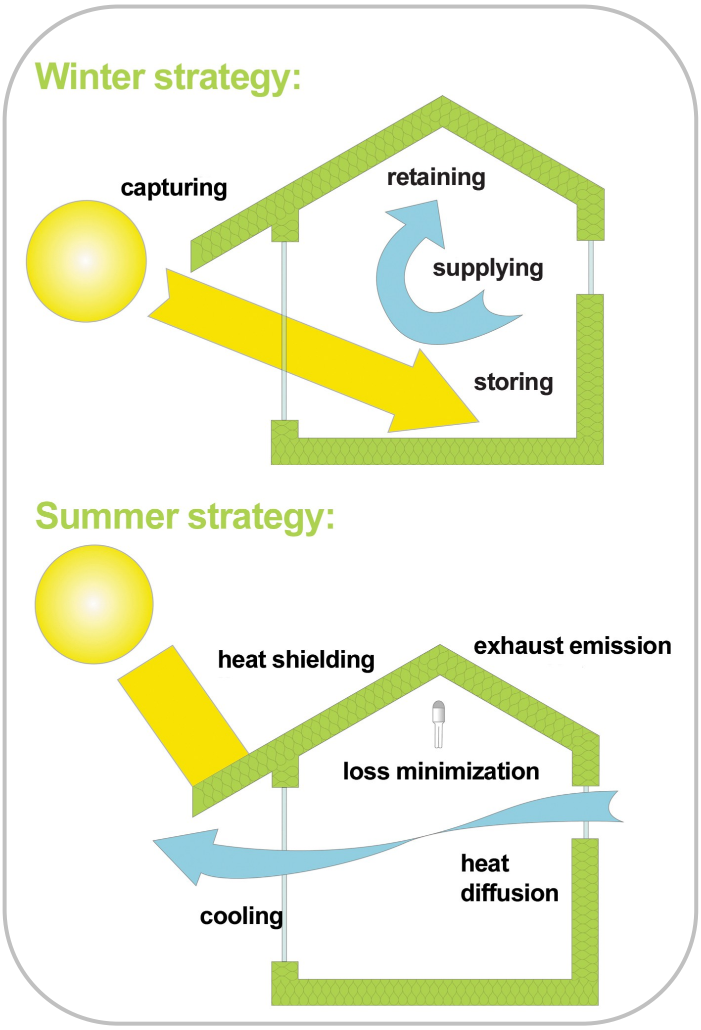
There are many solutions combining architectural and technical solutions to achieve a **BBC-effinergie** building.

This guide does not aim at introducing all these solutions, but rather at giving examples about the different possible solutions, and, above all, at pointing out their assets as well as the precautions to take when choosing the most appropriate options for each project. It is particularly not the accumulation of the most performing products and systems that would make a building less consuming and more comfortable. Yet, the combinations of appropriate and compatible choices must be duly considered in order to aim at the determined objective.

For each building, the designers must make the right choices to determine the combinations of walls as well as their interactions and appropriateness to the equipments and systems. The solutions are chosen according to their best adaptation to the local situation, to the will of partners, to the technical know-how of firms, and to their experiences,…

The solutions are presented here in groups on different themes. The charts present figured taken from computer simulations based on few examples. Their objective is to give orders of magnitude about the impact of different options in terms of energy consumption or summer comfort.

For each building subject to an application for the **BBC-effinergie** label, the thermal surveys – using the methods of thermal regulation – enable to check if the **BBC-effinergie** requirements for a building are correctly fulfilled.

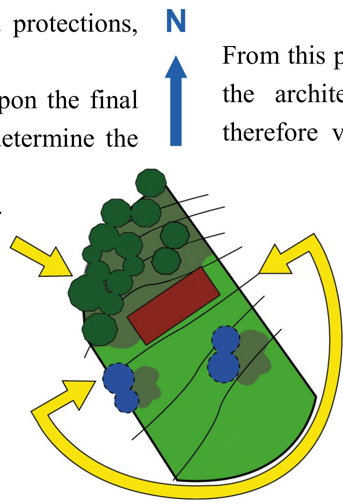


Architectural design

From the very first sketches, the architect starts defining the shape of the building, its compactness, exposure, light opening, architectural facing, caps, loggias, balconies, size and positioning of openings, screenings, wind protections, ….

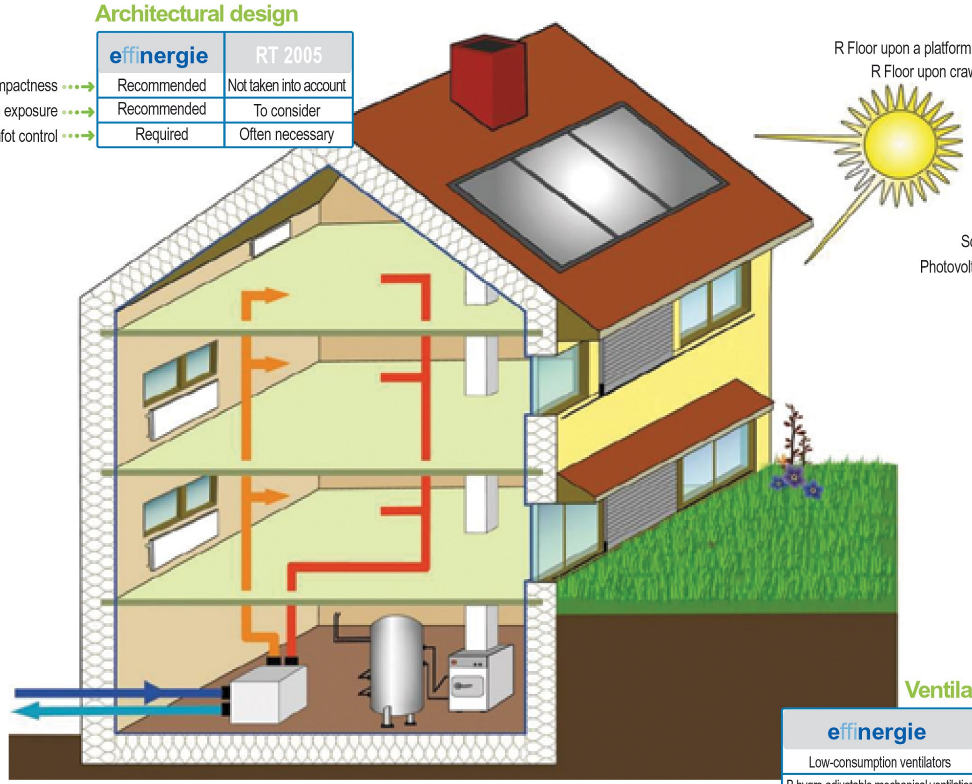
This design phase has a fundamental impact upon the final result of the project. The choices essentially determine the capacity of the building to limit the energy loss in the surface areas, to incorporate the solar supplies, to maintain summer comfort, to promote the use of natural lightning, to incorporate renewable energy equipments,…

This is the bioclimatic aptitude of the building.



From this phase, the exchanges between the project owner, the architect and the thermal engineering office are therefore very important. To this end, the architectural quality, the energy performance, the economic consistency as well as the respect ot the project programme would be efficiently associated

Several common solutions and performances in effinergie projects



Architectural design

	effinergie	RT 2005
Compactness	Recommended	Not taken into account
South exposure	Recommended	To consider
Summer comfot control	Required	Often necessary

Insulation of opaque walls

	effinergie	RT 2005
R Roof (in m†.K/W)	6,5 to 10	4 to 6
R Wall (in m†.K/W)	3,2 to 5,5	2,2 to 3,2
R Floor upon a platform of earth (in m†.K/W)	2,4 to 5	1,7 to 2,9
R Floor upon crawl space (in m†.K/W)	3,4 to 5	2,4 to 4
Thermal bridges	Very low	Medium to low

Solar power

	effinergie	RT 2005
Solar hot water output	Recommended	To consider
Photovoltaic electricity output	To consider	Rare

Bay windows

	effinergie	RT 2005
Uw (in W/m†.K)	1,7 to 0,7	2 to 1,6
Blinds	Required	Often necessary

Heating and hot water

	effinergie	RT 2005
Electricity	HP COP ≥ 3,5	Joule effect (radiant)
Gas or fuel oil	Condensing boiler	Low-temperature boiler
Wood	Automatic wood burner class 3	

Ventilation

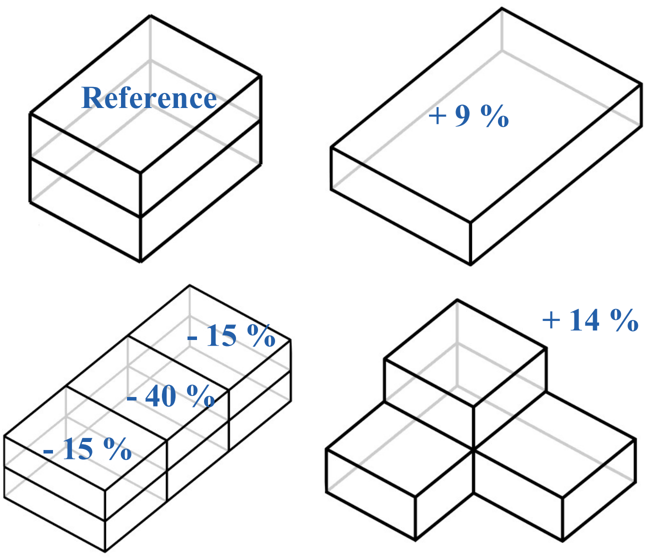
effinergie	RT 2005
Low-consumption ventilators	A or B hygro-adjustable mechanical ventilation
B hygro-adjustable mechanical ventilation or bypass mechanical ventilation with an exchange unit output > 80 %	

The shape of the building

A compact building ?

A compact building is a building with a low ratio between the surface of the outside walls and the living area. Without restraining the architectural design, it is much more economic and advantageous to opt rather for compact shapes to reach a thermal efficiency. This notion of compactness is less important in the Mediterranean area because of low heating consumptions.

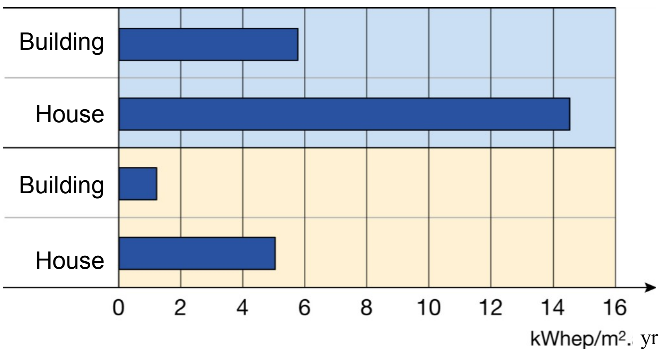
Example of energy loss compared to the envelope for different housing of 96 m²



The energy loss has only influenced the heating consumptions that just represent one of all the consumptions.

Over-consumption for a little compact building

- Building: transition of a ratio S $_{outside}$/NFA from 0,75 to 1,25
- House: transition of a ration S $_{outside}$/NFA from 2,25 to 3,5



A compact building is much more efficient, particularly in a cold climate area.

(4) «Technical solution for the implementation of the RT 2005»

Large windows ?

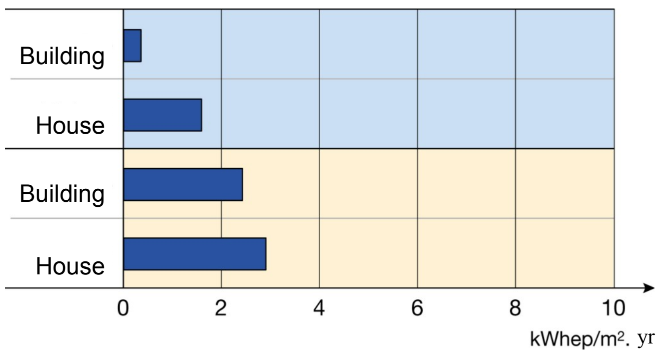
The size of windows was formerly limited in order to avoid the excessive loss in winter. Today, this aspect is no longer valid thanks to efficient windows equipped with high-performance shutters. South-side exposed windows allow to get more solar energy during the heating season instead of wasting heat. Besides, this judicious exposure of the bay windows would enable to restrict artificial lighting.

South-exposed bay window: significant solar supplies in winter

Yet, a particular attention must be paid to summer comfort. Exceeding a glazing rate of 20 to 25% of the living area may prevent a good control of the warming-up through the bay windows and this would create a discomfort in summer, even in the shoulder seasons. Besides, if the building is located in a noisy environment that would prevent to open windows, it would be all the more important to limit the glazing rate and to protect windows from the sun.

Skylights are characterized by a roof slope and this favours risks of overheating in summer. The relevant instruction should respect the chart about the technical solutions of the RT 2005 summer comfort.(4).

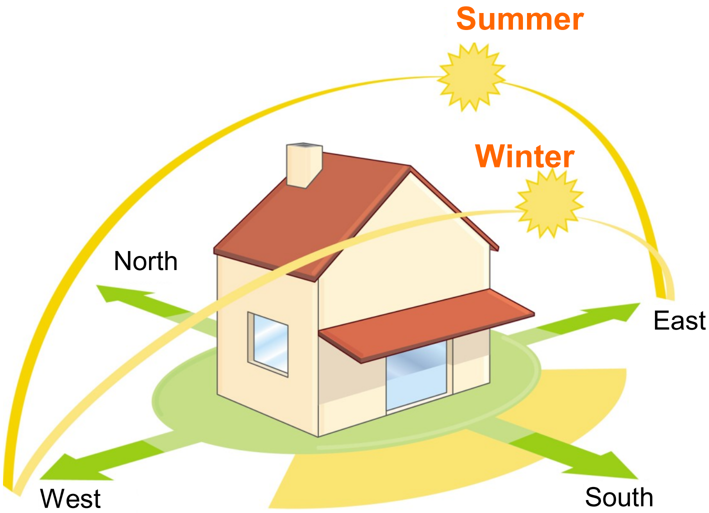
Consumption increase related to too small windows



Reducing the size of windows from 20 to 10 % of the surface

An appropriate exposure of the façades

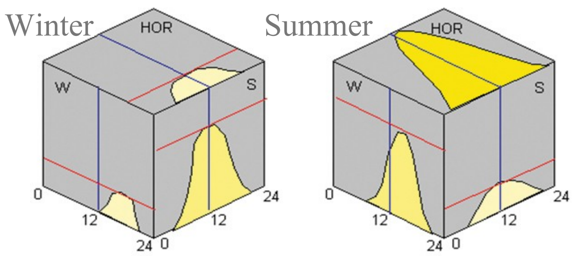
The layout and the foundation of a building will first depend on the site requirements or opportunities. What are the most pleasant sights? The most beneficial exposures for the solar supplies? Where do the prevailing winds come from? Are there any noise, olfactory pollutions?...



Here are the main points for a good exposure in terms of energy supply: incorporating solar collectors (on the roof, on the canopy,...), encouraging an optimal sunlighting of the façades in winter, limiting the glazing on the west side as it is the most problematic point in terms of summer comfort, limiting the winter winds effects and allowing an opening of windows in summer in order to benefit from the cold evening and night air.

From the example of the studied detached house (with an average of thermal inertia), a south-side exposed façade enables to gain about 3 kWhpe/m2.year whatever the climatic area. This represents about 50% of the heating consumptions in Nice and 10 % in Nancy.

The exposure of the main façade upon a noisy street – preventing therefore to open windows in summer – double the time when the temperature exceeds 28 °C.



Sunlighting of the west and south façades and of horizontal surfaces per hour and per season

Sun-blinds

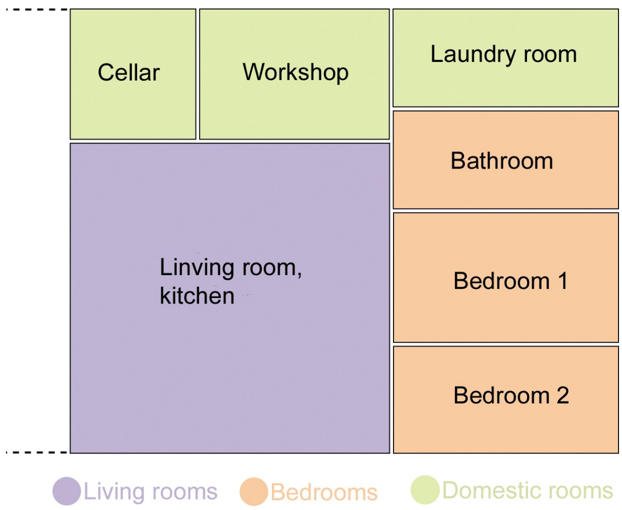
The sun-blinds (especially outdoors) constitute one essential way to reach summer comfort. Thinking about them from the very first phases of the project would be a good solution to integrate them in the building or in the architecture of the façade.

Organization of the indoor space

Some good sense rules may limit energy consumptionwithout any overinvestment:

- favouring a south exposure in the living-rooms;
- giving priority to building materials with a high thermal inertia, especially for the inner walls capturing the winter sunlighting;
- locating the rooms that are not or little heated in the north (garage, cellar,…);
- grouping together the bedrooms (which are generally less heated);
- grouping together the hot water intake points near the output facility.

Example of zoning



In order to reduce summer discomfort in an apartment building, it would be all the more important to give priority to running through flats (with both north and south-side exposures) so that the night ventilation could be favoured with the opening of windows. For all the buildings, it could be better to organize the rooms for a ventilation from one façade to the other.

A properly insulated building

Insulating properly the walls and handling all the thermal bridges

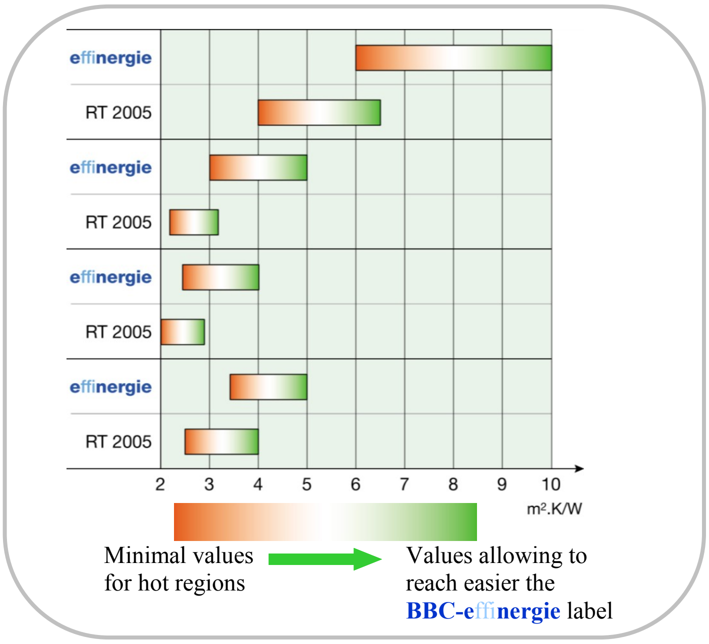
A **BBC-effinergie** building should be better insulated (walls' surfaces and connections) than the current buildings A **BBC-effinergie** building should be better insulated (walls' surfaces and connections) than the current buildings.

The opposite chart represents orders of magnitude about heat transmission resistances, per opaque wall, in order to reach the BBC – effinergie label. The values respecting the RT 2005 are mentioned for reference.
The performances and choices of systems need, of course, to be adapted to each climatic area. Insulation will be generally different in the Alsace region or in a mountain region from the Mediterranean Sea.

Besides, whatever the construction or insulation systems, it is essential to be watchful regarding the handling of the structure thermal bridges as well as those which are connected to the installation of balconies, roller-blind hoods, bay windows, loggia,… during all the phases of the project.

Four important families of insulation techniques are considered. For each of them, specific requirements would have to be integrated. A particular care would have to be taken in terms of implementation and finishing of the walls so that the gained performance level corresponds to the estimates.

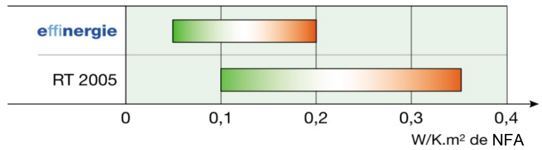
The whole insulation techniques use different kinds of insulating material, either organic-, mineral-, vegetable- or animal-based. The construction systems in terms of walls insulation match two main families: terra-cotta or cellular concrete monomur.

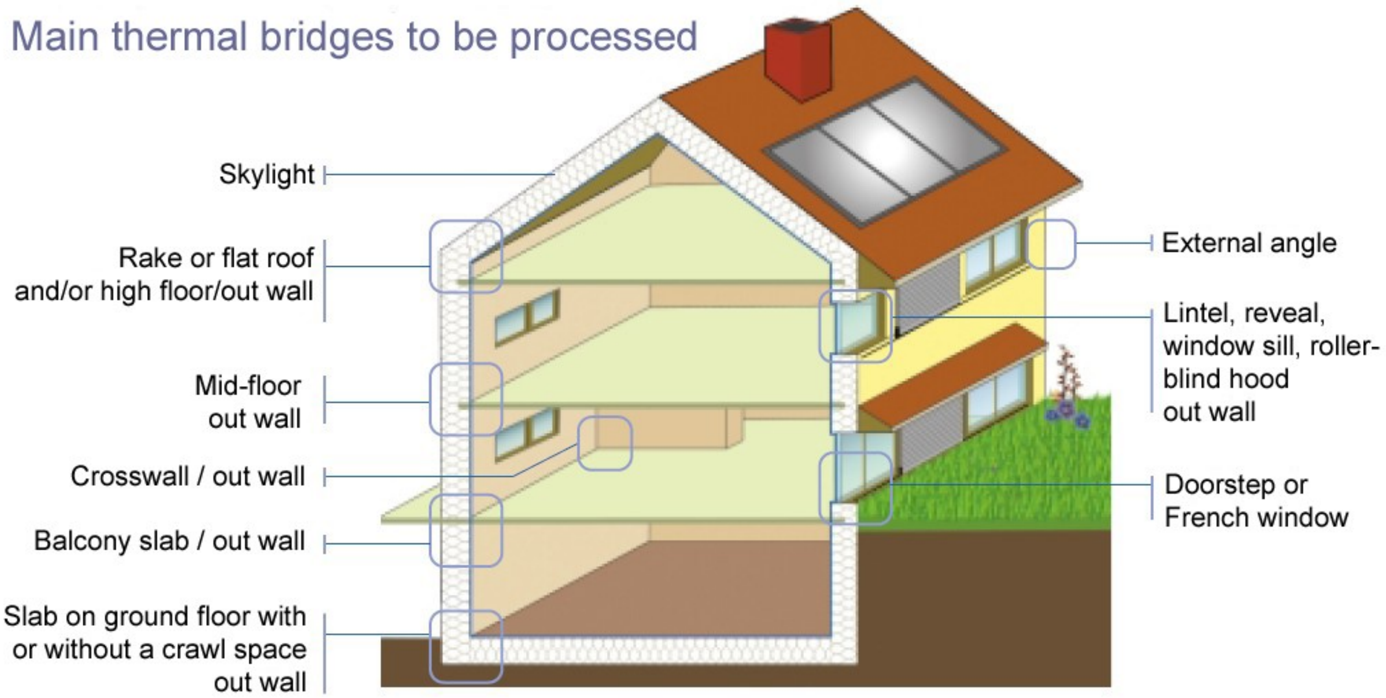


Some ratios to assess the projects

In addition to Ubat (total thermal loss of a building), we calculate:

- The Ht coefficient represents the sum of the surface and linear loss expressed in m² of NFA. It both renders account of the insulation and compactness of the building.
- The sum of the thermal bridges loss - expressed in m² of NFA – may also represent the thermal process.
  In fact, each construction system has its own thermal bridges. The calculation – carried out by the engineering office – of the global value for the whole building will indicate the process quality of these thermal bridges.





Indoor insulation system

Today, it is the prevailing technique in France. It consists in the implementation of thermal bridges in the mid-floors and that of bricked crosswalls.

In a detached house, the weight of these thermal bridges is quite limited because there are simple processing solutions such as temperature limit switches, crosswalls separated from the peripheral walls, light floors,…)

Yet, as the number of levels progressively increases, the processing of mid-floors thermal bridges requires much more complex solutions of temperature limit switches or solutions integrating a thermal processing.

The indoor insulation enables an easier process of the junction with the joinery work, doors, balconies,… as well as with the insulation of the attic and roofing.

In order to respect the summer comfort conditions – as the volume of walls has no close interaction with the indoor volumes, it will be relevant to work with heavy inside walls (bricked crosswalls, reinforced concrete slabs, heavy partition walls,…).

Outdoor insulation system

The outdoor insulation system enables to remove the thermal bridges located in the mid-floors and in the crosswalls. This system can also benefit from the thermal inertia of walls in order to collect the solar supplies in winter and to reduce discomfort in summer.

Yet, this kind of insulation (plaster-depth, wall panel, cladding, …) implies specific requirements in terms of implementation. It would therefore ensure a thermal processing of the junction with the ground floors, window frames, doors, loggias, balconies,… and the acroterions of the flat roofs or attics. The 'Groupement du Mur Manteau' described processing solutions about some specific points of insulation from the outside.

Construction system including a wall insulation

The construction systems, that include a wall insulation, enable to reduce the thermal bridges of the mid-floors structure and crosswalls. They also enable to take advantage of the walls thermal inertia to collect the solar supplies in winter and to reduce discomfort in summer.

In a building that meets the **BBC-effinergie** label requirements, the thermal performance levels of the common walls should be chosen according to a compliance of all the walls and thermal bridges with the values of heat transmission resistances and thermal bridges described above. A particular attention should be paid to the walls thickness and to their level of insulation.

Framed construction systems

Timber- or steel-framed construction systems allow to get a significant insulating material thickness without increasing considerably the total thickness of walls. They are very frequently used in low-consumption buildings projects, in countries using traditionally these technologies.

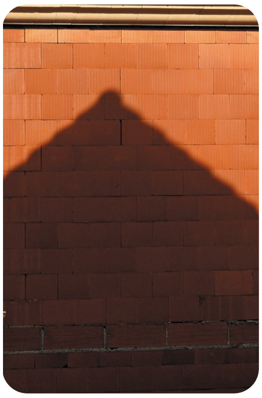
The airtightness processing and a controlled management of the whole building water vapour are essential. A particular attention must be paid to the sound insulation performance - with regards to external noises-, to the processing of structural thermal bridges (particularly for the steel frames) as well as to the respect of summer comfort conditions.

The ground floor must be particularly taken into account from a thermal viewpoint(5).

The «Construction de maisons à ossature bois»(6) Guide will give relevant elements.

(5) «Dalle Bois - Guide de conception et de mise en œuvre, du gros œuvre aux finitions» - ISBN : 978-2-9530638-0-6
(6) «Construction de maisons à ossature bois» by Yves Benoît and Thierry Paradis - ISBN : 978-2-212-12047-9






Roofing

It is necessary to define an important insulation thickness and this would have an effect of reducing significantly the thermal loss in winter and bringing a better thermal comfort in summer.

Besides, the processing of the potential thermal bridge for the wall-roofing connection is imperative as well as a light management of the airtightness which is often sensitive at this place.

Insulation in the unused attic area

There is no particular problem for reaching the required insulation levels through important thickness. Yet, be careful to ventilate sufficiently the attic.

Rake insulation under roofing

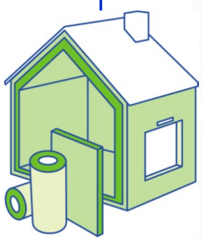
With a roofing that captures an important quantity of sunlighting, summer comfort can be problematic. A particular care must therefore be taken into account, especially with the windows installation.

In every instance, strong insulating heat transmission resistances will be implemented, either between and under rafters, or – from the outside – over the roofing, roof cladding: sandwich panel insulation or roofing caissons.
Another solution to improve summer comfort: thinking about increasing significantly the ventilation of the space between the roofing and the insulating elements.

Flat roof

Important heat transmission resistances also need to be implemented. In case of an insulation from the outside, acroterions, the configuration of which enable to insulate completely their edge, are required from the design phase.

Besides, a particular attention will have to be paid to choices in terms of design so that the flat roof insulation could be combined with the insulation systems of the walls (inside, outside or wall insulation).



Ground floor

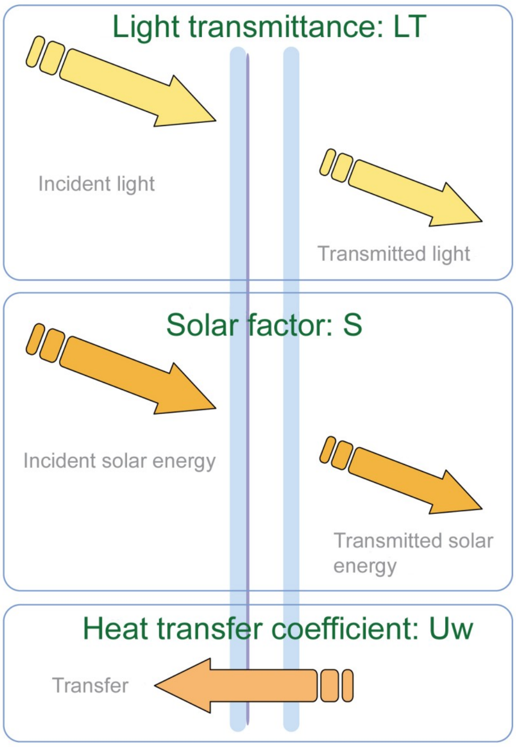
As the values of heat transmission resistances are stipulated in the chart (page 15), it is important to have a low thermal loss on the ground floor.

The insulating material is laid out either under a floating slab, or under a platform slab (layout of outside and inside insulating material, or insulating structural floor units or insulation under the bottom slab), or under both slabs. The insulating material must be carefully chosen: the chosen product must be certified in conformity with the DTU standardization relevant to slabbing and floating slabs. In case of a frame ground floor (on piles), the insulating material could be laid inside the frame. Therefore, thicker insulating materials could be chosen.

Another important point: taking particularly care of the thermal bridge situated at the floor end. For each floor construction system, a solution must be planned from the design phase of the ground floor. It will be particularly appreciated to have at one's disposal a notebook drawn up by the construction team about the execution details.

Choosing the bay windows

In a **BBC–effinergie** building, choosing windows, doors, French windows is very significant in terms of visual comfort, energy consumption and summer comfort.
In order to get the **BBC–effinergie** label, the thermal loss coefficient for the bay windows (glazing and joinery work: Uw) will not exceed 1.7 W/m².K and could reach a ration up to 0.7 W/m².K.



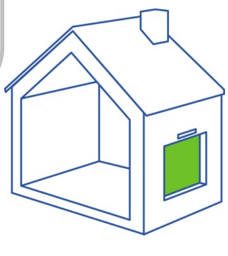
Usually, the analysis of the windows is only carried out on the basis of this heat transfer coefficient (Uw) which only takes into account the loss of heat through the window. The capacity of the bay window to capture the sun heat and daylight is seldom taken into account.

For a **BBC–effinergie** building, the windows will be consistently chosen according to their Uw coefficient, solar factor (S) and light transmittance.

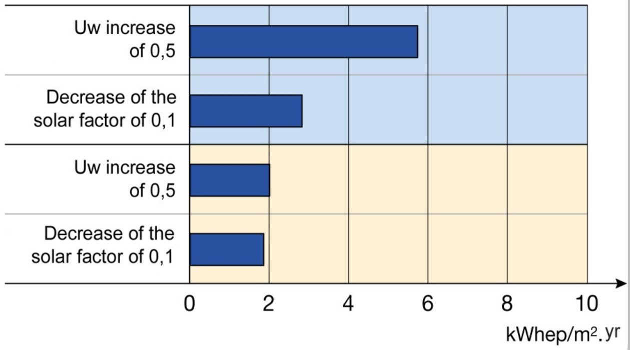
The solar factor and daylight transmittance depend on the type of glazing and on the respective surface of the frame and glazing. The thermal analysis will have particularly to take all these different elements into account.

Example of windows' characteristics

	Uw	S
Usual window RT2005	1,8	0,45
Efficient double-glazing window	1,4	0,45
Triple-glazing window	0,8	0,38



Consumption increase linked to the quality of the window



Similar incidence of the solar factor S and of the heat transfert coefficient Uw

Besides the whole part set up by the window (joinery work and glazing), its summer shading device as well as the winter screening must be considered so as to combine energy low-consumption, winter and summer comfort. A central locking system enables an optimization of the solar supplies and of loss by a control of all the screenings.

The windows, combining a highly efficient triple-glazing and joinery work, appear sometimes as one of the solutions that highly reduce the heat loss, with a Uw coefficient generally inferior to 1.

Yet, today, these windows bring about extra costs and a little reduction of the capacity to capture the solar energy and to diffuse light.

Some of their exposures or a cold climate may be better appreciated (little sunlit walls, north-side exposure). There are also useful if we seek to reduce drastically the power of the base load heating in order to get rid of a traditional heating system with a distribution network for a passive house.

Such windows are not useful in the Mediterranean area.

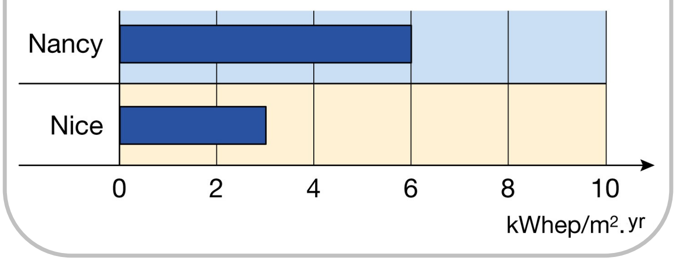
Air permeability

A building, the airtightness of which is of a low quality may have increasing heating requirements of several kWhpe/m².year compared with an implementation of quality. A bad airtightness has a particularly important impact on the energy, especially if the climate is cold or windy.

Besides, when using a double flow ventilation system, its production can be considerably reduced as the air goes through the holes and no longer by means of the exchange unit. When buildings are less compact, the airtightness quality is much more important.

Consumption increase linked to a high permeability

(example of a detached house - change from 0.6 to 1.3)



Airtightness faults result from interfering air infiltrations and they have an impact upon the heat loss, comfort, health, acoustics and efficient ventilation systems.

They are mainly situated at the junctions level: outside joinery work, transit of electric cables and electrical installations, trap doors and elements crossing the walls, façades-floors and façades-roofing connections as well as roller-blind hoods. In the frame construction systems, the main parts of the envelope may also have many leakages if the layout does not comply with the DTU technical documents.

To get a good airtightness, it is necessary to think about it from the design phase, particularly by restricting the quantity of permeation in the envelope and by describing precisely the diagrams about the execution details. The designer could use many products and systems that are specially designed to ensure a good command of the airtightness (diaphragms, vapour barrier, vapour brake, precompressed joints, pass cables and pass ducts, long-life bonding materials,…). In case of a use of roller-blinds, a particular attention will have to be paid to guarantees supplied by the manufacturers.

The quality of implementation is also essential. It is therefore important to increase the firms' awareness and to give them clear construction and execution details. The project manager must ensure a strict control about the processing of trouble points during all the construction. It could be judicious to finalize the construction details of these particular points with the firms.

In order to benefit from the **BBC-effinergie** label, you will imperatively have to set an objective of permeability (I4) inferior or equal to 0.6 m3/h.m² for a detached house and 1.0 m3/h.m for an apartment building. You will also have to check that you reached this objective before the acceptance of the work.

If it turns out that you exceed this limit, it will be necessary to apply corrective measures regarding faults.
It is generally judicious to carry out a mediate test – before sealing the facings and ducts – in order to identify the leakage and make potential adjustments without any dismantling.

The air leaks at the junction levels are visible on these infrared pictures

Roller-blind hood and joinery work — Roofing / wall — Floor / out wall — Sockets — Skylights — Trap door

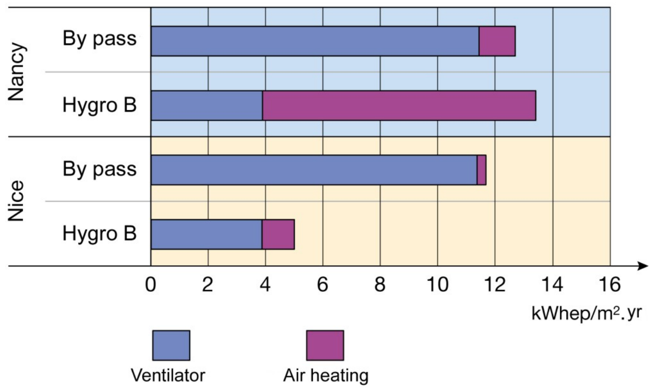
Measure of the air permeability of a building with the principle of the blower door

Ventilation

Ventilation is essential to get a good air quality, to evacuate the water vapour produced by the house (7) itself and to ensure the durability of the building. It can represent some kWh/m2.yr to more than 15 kWhpe/m2.yr. The main role of a quality ventilation is therefore to guarantee a healthy quality of air while reducing the energy consumptions of the heating and the use of ventilators.

Energy consumptions linked to ventilation

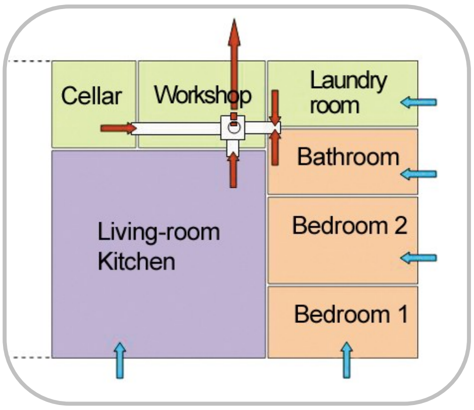
(example of a building)



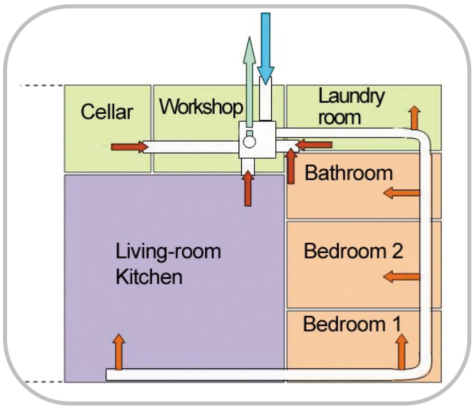
In by pass system, the energy consumption - used to heat fresh air - disappears practically completely. Yet, it is compensated for an increase of the ventilators consumption. The consumption of ventilators is independent from the climate.

In association with an efficient airtightness of the ventilation networks – which are ensured with a certain quality on the long run, especially with rigid ducts, two significant options enable to aim at this objective in the framework of the **BBC-effinergie** label:

1) **Regulating the air flow rate** according to the occupancy of the housing. The ventilation will be activated during the periods when the housing is pretty regularly occupied and there will be less ventilation during the periods of limited occupancy. The system - widely useable and efficiently supplied for such a utilization – is a controlled mechanical ventilation, hygro-adjustable type B. The air influx and exhaust are adapted according to the inside moisture (with the exception of any others pollutants). This system is particularly adapted to the housing, the occupancy of which may vary during the day or the week. It is also well adapted to mild climates where people live with windows wide open practically all year long.



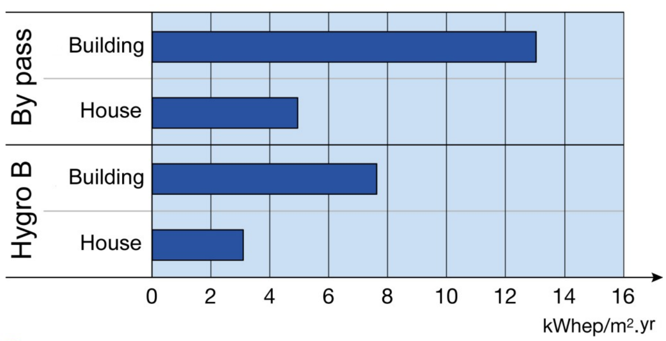
2) Ventilating while **recovering heat from the exhaust air** in order to preheat the air influx.
A **bypass system with an exchange unit** recovers heat from the exhaust air in order to preheat directly the clean air in the housing. Besides, this facility can improve the quality of the air influx thanks to a filters system which needs to be regularly cleaned in order to remain efficient. The main air ducts and the exchange unit must be easily reachable for a better maintenance.



The market of heat recovery systems expands. They are particularly well-adapted to housing which have an important and stable occupancy on the long run and/or in which people live rather with the windows closed. This is particularly the case in the polluted or noisy areas.

As the ventilators of the ventilation systems work all year long, less electricity-consuming systems with efficient ventilators will be used. The installation of two ventilators may currently make that the bypass will be less efficient in terms of consumptions whereas a hygro-adjustable type B system is already optimized. The evolution of the systems efficiency could allow a correction of this effect. The output of the exchange unit must therefore be of 90% in order to compensate the impact of the additional consumption to the maximum.

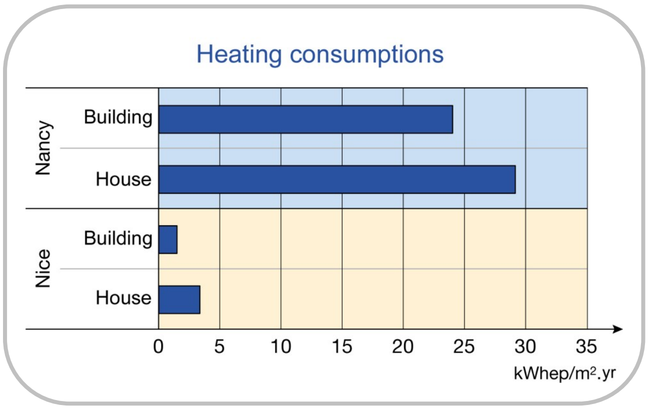
Difference of ventilators consumption between the market products



(7) A family of 4 generates around 12 litres of water vapour per day.

Heating systems

Heating is a significant facility regarding the housing consumptions. For a BBC-effinergie building, it may represent from 20 to 30 kWhpe/m2.yr in the coldest climatic areas, but it is much more lower in the Mediterranenan area where it can be inferior to 5 kWhpe/m².yr.



To meet a need of comfort with a reduction of consumption leads to choosing the best technologies on the market and giving priority to renewable sources of energy.

An attention must be paid to the heat production, distribution, emission and balance when the system is designed.
In the framework of the BBC-effinergie label, one of the following techniques will be used for the heat production:

• **The gas or fuel oil condensing boiler**. Thanks to the latent heat recovery that is exhausted by the combustion products, it output goes beyond 100%, provided that the transmitters operate at a low temperature.

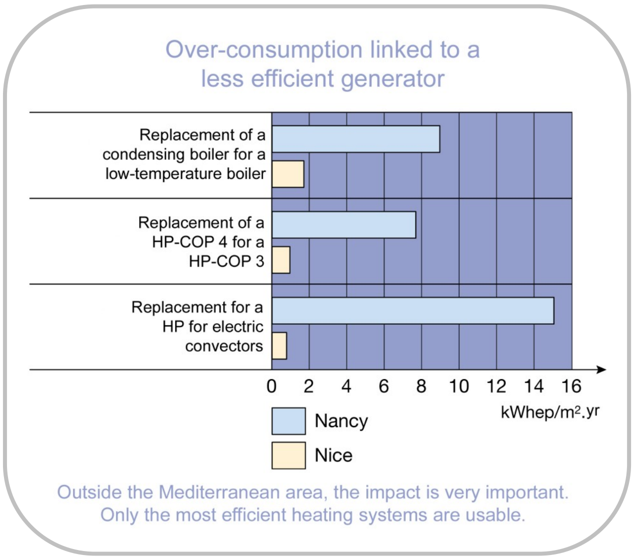
• **The heat pump with an annual COP**(8) higher or equal to 3.5. With the transfer of heat from the outside (air, water, earth) and its return inside the building through a system of low-temperature emission, it offers various solutions according to the location of the project.

• **The automated wood burner**, class 3, employs renewable energy. By means of its automated system, it guarantees a controlled and optimized combustion according to the needs. In an apartment building (because of its low efficiency), another system with a higher capacity of power modulation could be associated.

• **The solar heating**, combining solar panels and a storage system (over-insulated tank or thick slab) with a low-temperature emission, can ensure 30 to 60% of the heating needs. It would be used jointly with another system.

• The connection to **a heat network** using renewable energies and/or a combined system (combined heat and power production).

•**The direct electric heating** could be sometimes considered in the Mediterranean area, especially if a particular attention is paid to other elements, such as insulation to have a passive house.

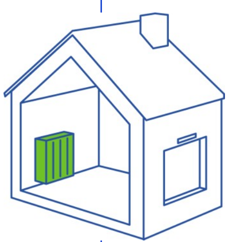


In practice, the energy generation systems must be analyzed according to the following parameters: adaptation to the building's characteristics (including its use), their energy efficiency, their environmental impact (especially the carbon footprint) and the long-term availability of the resource.
Other solutions may also be considered. Some will require the use of a particular procedure of statutory conformity stipulated in the order of May, 24th 2005 (www.effinergie.org, in the 'effinergie dans le neuf' section).

The choice of an efficient generation of energy must always be associated to a good dimensioning. In fact, an over-dimensioning of the generation leads to a useless over-investment and generally to an efficiency loss.
Setting the generator on the 'heated volume' position allows to reduce the consumptions noticeably. In an apartment building, choosing a centrally-mounted location enables to reduce lengths and, therefore, the distribution loss.
A good insulation of the distribution network, particularly except for the heated volume (minimum class 3), and a length optimization of the latter must be taken into account.

These systems will be all the more efficient when they will be installed with low-temperature transmitters: floor heating panels and low-temperature radiators.

In a BBC-effinergie house, an efficient control of the heat transmitters is essential to benefit from solar and inside supplies that may meet more than 50% of the heating needs. It could be also advantageous to change the traditional thermostatic taps for electronic regulators – per room – with a precision value of the control inferior to 0,8°C(9). This would enable to gain 1 to 2 kWhpe/m2.yr.
A programming that would manage the absence of the householders is also necessary.



(8) annualCOP is the average annual coefficient of performance of the heat production system, including its auxiliary units. It can be very different from the COP mentioned by the builder.
(9) List of products and values of the control precision (CA) on http://www.eubaccert.eu/licences-by-criteria.asp

Production of hot water

The hot water production – if it is optimized and if it employs solar energy – will represent a consumption of 10 to 25 kWhpe/m2.yr.
This consumption is equivalent to that of the heating in the cold climatic areas and it is clearly higher in the Mediterranean area. With a bad optimization, hot water – alone - can therefore lead to energy consumptions that are incompatible with the **BBC-effinergie** label.

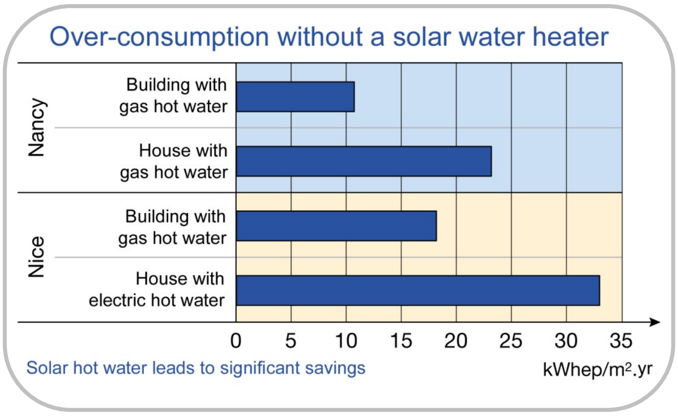
The energy consumption for water heating may be doubled if we do not use a solar water heater. It is recommended to anticipate the incorporation of solar collectors as architectural elements (roof, canopy,…) from the design phase.
Other production solutions may be also considered:

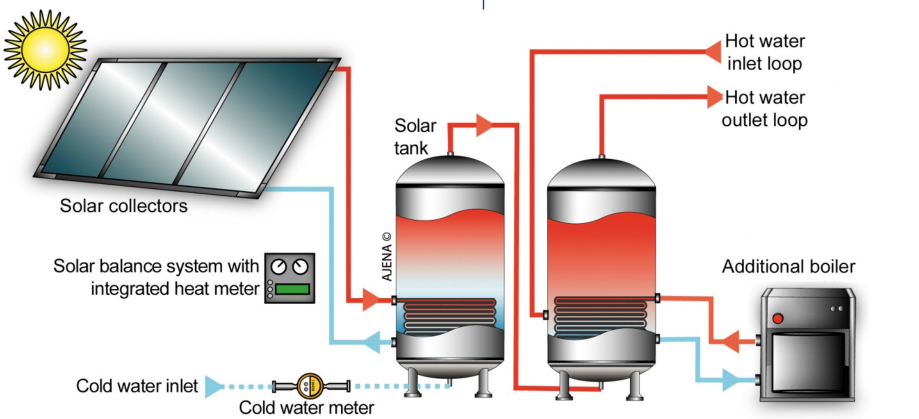
- **Thermodynamic hot water**: hot water is supplied by a heat pump, especially optimized for this utilization, with an annual COP at a minimum of 3.
- **Heat pump** on extract air/water: air extracted from the house may be used for the heating of hot water by means of a heat pump which employs this exhaust air as a heat sink. This system enables to recuperate the extract air without using a bypass system.

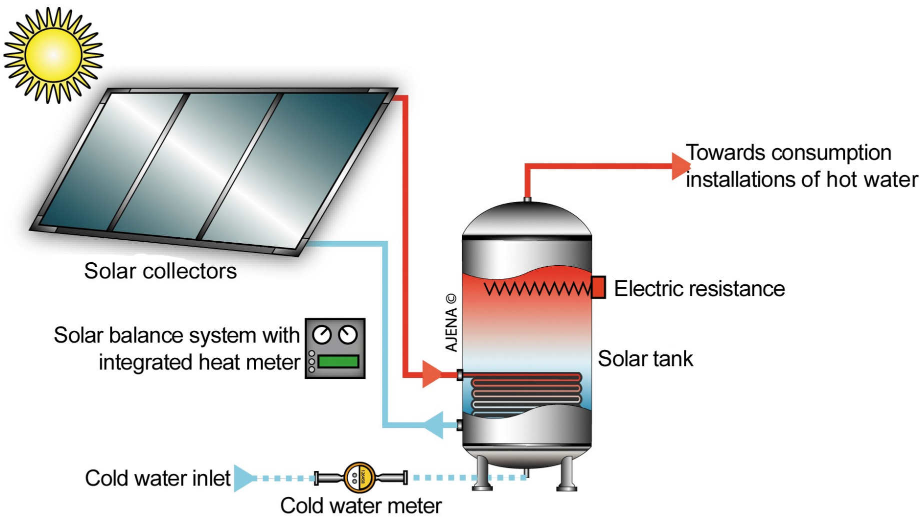
The storage tanks represent significant loss and they will absolutely have to be considerably insulated or fitted in completely insulated closets. In fact, the loss of a tank may represent 6 to 15 kWh of primary energy per m² and per year. In a standard building, part of this loss is used for the heating whereas, in a **BBC-effinergie** building, which does not require a lot of heating, the loss result in a significant waste and in risks of overheating in summer.

In order to avoid an over-dimensioning of the installation, the needs for hot water must be calculated according to the occupancy, and not according to the living area. Besides, the use of flow controllers on the plumbing fixtures will enable to reduce significantly the consumption.

As mentioned in the paragraph about the architectural design, an architectural optimization of the drawing points – in comparison with the water production - is sought from the design phase in order to limit the loss of the water distribution networks.





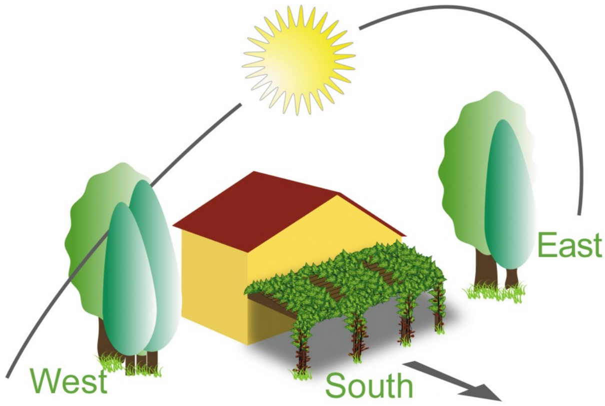


Summer comfort

The **BBC-effinergie** label referential does not plan additional requirements regarding the thermal regulation in terms of summer comfort. It simply means that the chosen solutions – to reduce consumption – must lead to a summer comfort which is at least as good as in a standard building.
A particular attention must be paid to this subject. In fact, an important insulation – implemented to reduce the heat consumptions – result in a significant increase of the inside temperature if a specific care is not considered from the design phase.

During the phases preceding the project, the efficient solution to adopt in terms of summer comfort, will be that of the RT 2005(10). The latter enables to define satisfying inertia/shading device couples for each room according to the climate and noise.

Besides, a **BBC-effinergie** building must have a highly reduced energy consumption compared with a standard building. So the use of an active cooling system may be very penalizing whereas it can always practically be avoided by the use of the six following elements:

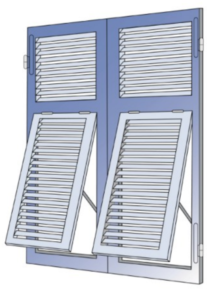


The shading device of the building

In a **BBC-effinergie** building, the shading device of the glass walls is an essential element. It can be said that it is as important in summer as insulation is in winter.

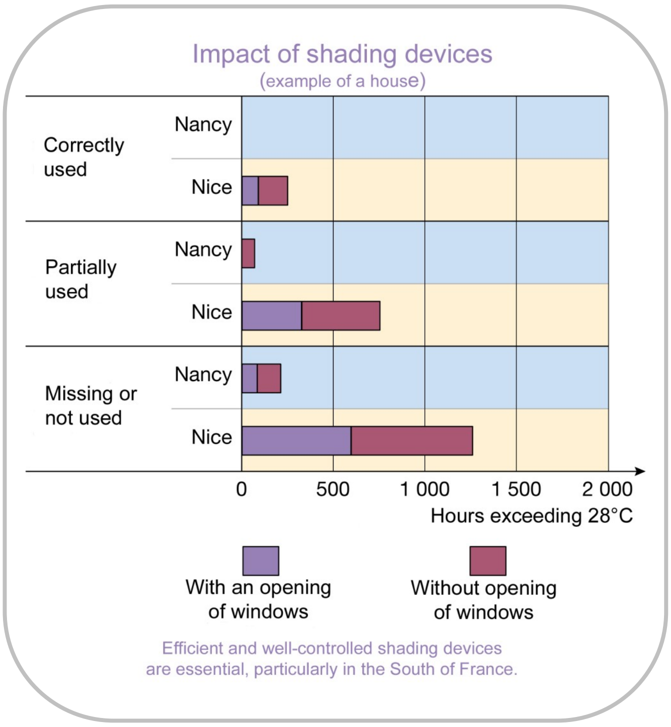
The technical solutions regarding the implementation of the RT 2005 mention – for detached houses – shading devices for different types of windows, especially for skylights, according to the climate, the noise and the housing inertia. They also specify the cases in which a shading device is not sufficient.

In order to be effective, a shading device can reduce the heat supply with a benefit from a natural lighting that is sufficient in daytime. In addition to the « caps » adapted on a south-side façade, the prior solutions consist in outside mobile shading devices such as shutters or blinds which may be improved by deciduous vegetable shading devices .



Shutters for all exposures

They let heat enter in winter and prevent it from entering in summer. For the ground-floor rooms, the shutters will be burglar-proof.



(10) « *Technical solution for the implementation of the RT 2005»*
http://www.rt-Batiment.fr/fileadmin/documents/acceslibre/st_confortete%20finale.pdf

Reduction of the inside input

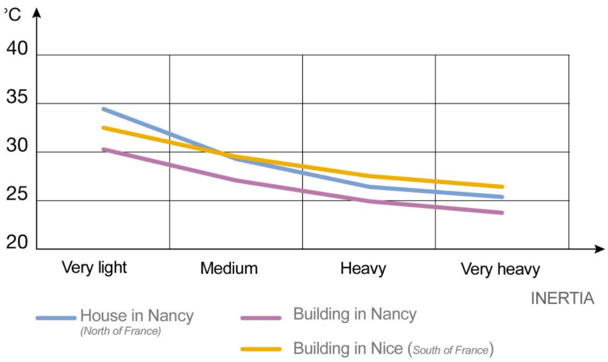
The inside input linked to the utilization of the building can result in an additional supply of 3 to 5°C. It is therefore necessary to restrict to the maximum of these unwanted caloric intake, by choosing especially efficient electrical household appliances as well as an energy-saving lighting,…

Thermal inertia

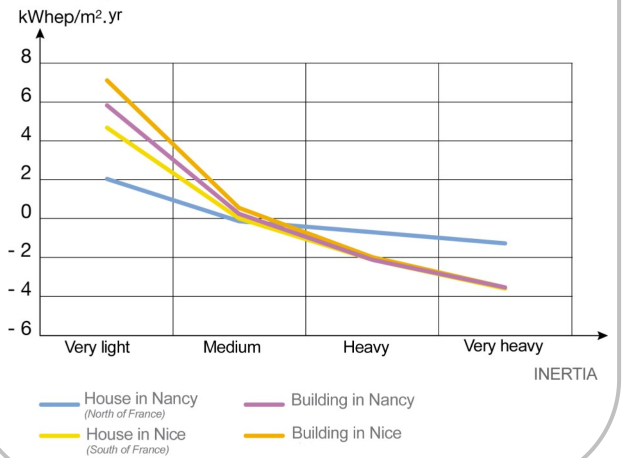
Thick stone or voluminous walls of old buildings allowed to keep a cool and comfortable environment – even during hot days – taking therefore advantage of the night coolness.
To benefit from such an effect, it is necessary to use the volume of the building structure (walls, floors) to increase inertia.

The usefulness of inertia can be only proved if there is a ventilation all night long in order to evacuate the calories stored up in daytime and to keep the night coolness.
Thermal inertia will have also a positive role in winter that would allow to store the sun heat, leading therefore to a reduction of the energy consumptions.

The summer maximum temperature decreases when inertia increases



Consumptions decrease when inertia increases



Using the evening and night coolness

During practically all the summer period, the outside air can be a source of coolness from evening to morning. So, in the case of a building with an important inertia, a night over-ventilation enables to evacuate the heat stored up in daytime.

This natural source of coolness could be used by simply opening the windows when it is possible during the night.
order to cover all the living area – this night ventilation will be clearly much more efficient. And it is supposed that there is no noise nuisance or risks of house-breaking.

Otherwise we could think about a ventilation system that would highly increase the air flows during the summer nights, without letting the noise enter.

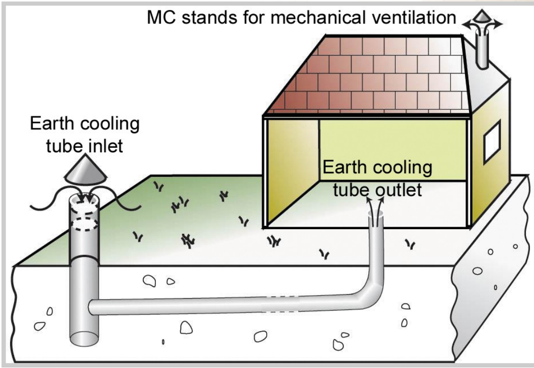
Size and exposure of The glass walls

Be careful to large glass windows – capturing heat in summer and winter – which can therefore lead to a significant discomfort in a hot season if they are not obscured.

A ratio of 1 m² of glass window for a living area of 5 to 6 m² will not be exceeded. Larger windows will only be considered if the building inertia is important and if the windows can be easily opened in order to benefit from the evening and night coolness.
The calculation will absolutely comply with the design initially planned.

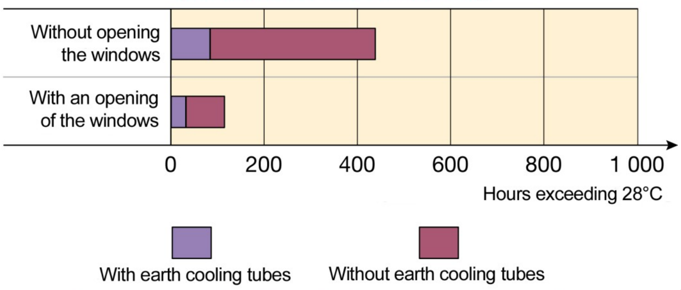
Using the earth coolness

The earth remains much more cooler than air in summer. This coolness can be used by means of earth cooling tubes. It is made of an underground tube through which goes the ventilation air. It is reheated in winter and cooled down in summer.



An earth cooling tube must be correctly designed for a good efficiency and for an easy maintenance in order to avoid any health risk regarding the quality of air.
A thermal survey will have to be systematically carried out in order to dimension the tube, the ventilation flow and to define the management of its use.
If it is correctly respected, summer temperature could be reduced of several degrees, including in noisy areas where opening windows may become a problem(11).

Duration of discomfort with and without an earth cooling tube
(detached house in Nice - South of france)



An important reduction of discomfort with no need to open the window

(11) Use of earth-to-air heat exchangers for heating and cooling of the buildings – Thesis by Pierre Hollmuller, University of Geneva, 2002

Control of consumptions

The control of consumptions in terms of heating and hot water enables to check if the **BBC-effinergie** requirements are met. In the case of an electrical system, it is recommended to install under-electric meters for the heating and hot water.

Using energy differently

The **BBC-effinergie** referential – in its 2007 version – takes into account the energy consumptions linked to the building and to the heating and ventilation facilities. Yet, it does not include the consumptions of the equipments used by the householder: cooking and household appliances, television set, … It is also important to control consumptions so that the energy invoice for a **BBC-effinergie** housing may be effectively reasonable.

Habits play an important role on these consumptions. Yet, some choices relevant to the design have also a significant influence.

<u>Some examples of questions to ask oneself from the design of the buildings are mentioned b</u>elow:

- Are the outside lightings controlled by automatic systems (clock, motion detectors,…)?

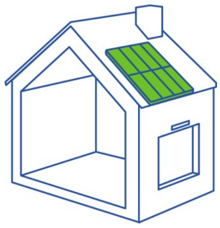
<u>In the common property of the apartment buildings</u>:

- Does the lighting of the corridors – at each floor – operate independently?
- Are the premises – that are briefly used – such as the garbage storerooms, corridors, parking lot,… equipped with time switches or motion detectors? Is their adjustment correct?

<u>Inside the housing</u>:

- Does the kitchen layout allow to place the fridge far from any heat source (cooker, dishwasher, radiator,…)?
- Is there a place to hang clothes up to dry? In summer? In winter?
- Is there a place for the freezer in a non-heated room ?
- Is the television set socket commanded by a button switch?
- Are the equipments, that work permanently, controlled by a time switch?

For positive energy housing



The construction of low-consumption buildings represents the first step to positive energy housing.

The photovoltaic installation in a building, that has already reached the BBC - effinergie level allows to get to positive energy buildings.

In fact, once the envelope and the systems optimized – required therefore less energy – choosing a photovoltaic installation will enable to obtain a much more important energy recovery.

Today, the technological supply for buildings is various and it is constantly improving. The photovoltaic collectors can be integrated in the buildings in various ways: on the roofing, on a façade, on a canopy or on a shading device. They may be part of the structure, of the wall or simply juxtaposed.

In order to transform a building which, without a photovoltaic installation, would simply comply with the **BBC-effinergie** label into a positive energy building, it could be necessary to install a photovoltaic system. This system would include to the minimum 1 m2 of panel for around 3,5 m² of living area in the Mediterranean area and to the minimum 1 m2 of panel for around 2 m2 of living area in the north and east regions of France.

The photovoltaic installation would enable therefore to produce more energy than the energy consumed by the building itself, including the use of household appliances and television sets,… which represent approximately 25 kWh of final primary energy per m² of NFA, corresponding to 65 kWhpe/m2 NFA.

Other local productions of electricity are developing and may be considered (micro-wind, microhydraulic, …).

effinergie is working upon a referential about positive energy building. The relevant information will be given on our website, www.effinergie.org

THE ECONOMICS OF THE PROJECT

A different Economic balance

The economic balance of a **BBC-effinergie** building must be strictly analyzed compared with the economics of a standard project.

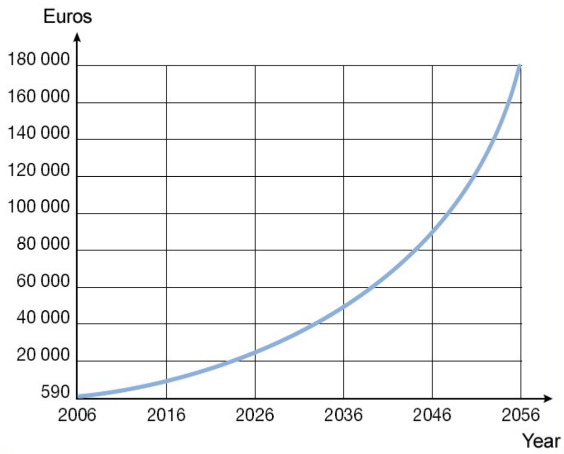
Economics aspects of a construction life

Phases and duration	Stages	% global cost
Organization of the process Financial, legal and commercial 1 to 2 years and more	DESIGN	2 to 4 %
Contracting project Programme, budget, planning, analysis of the global cost 1 to 3 years and more		
Project management Design, tender enquiry 1 to 2 years and more if phasing		2 %
Construction Follow-up of the building site, authorisation, control and coordination, technical supervision 2 to 3 years and more if phasing	CONSTRUCTION	15 to 20 %
Management Maintenance, administration, large-scale repair work, deconstruction and reconstruction	FINAL USE 50 years and more	75 to 80 %

The project owner has to free himself from the idea of constantly looking for a minimum investment. This short-term argument leads to a disproportionate cost of the building management all its life long.

So, analyzing the cost of a project, including all the elements pertaining to the project during all its life cycle (especially the service charges or the risk of delinquent rent, long-term property value,…) enables to anticipate future in the choices made today.

Combined annual energy expenditure of a French household for an increase of the energy cost of 6% per year, based on an invoice amounting to 590 € in 2006 (12)



(12) 590 € = average energy expenditure of a French household in 2006 – INSEE Source

Very different overinvestments according to the approch

A **BBC-effinergie** building could be considered as a standard building in which we would have simply used more efficient products. This would necessarily lead to significant overinvestments.
The recommended approach consists in thinking differently with regards to the design of the housing to aim at the objective.
A better exposure of the building, a restriction of the setbacks, a more compact construction,… are architectural elements that may induce a significant reduction of the costs as well as a better energy performance.
Reducing the loss of the building will enable to reduce the size and, therefore, the cost of the heating system. We can even choose – like the stakeholders of a passive construction – to over-insulate to such a point that we no longer need a distribution network and heating transmitters that go through ventilation. There can be a source of saving.
On the other hand, a bypass ventilation, triple glazing and a hot water production require overinvestments that will have to be optimized according to the specific needs of the housing.

In order to reach intelligent compromises for each process, a more comprehensive thermal analysis will have to be financed. This preliminary investment guarantees less important and well-adapted overinvestments.

Financial and banking approaches of a **BBC-effinergie** *project*

A **BBC-effinergie** property development project has different financial characteristics from a standard project.
In fact, the **BBC-effinergie** label is often justified because of its attractive global cost. Based on a higher initial investment than that for a standard project, this investment is largely compensated by a saving of expenses and utilization (water, energy,…). This saving is higher with regards to this same standard project and it is pretty important with time.

The financial approach may be delicate. In fact, it is based on the investment point in order to estimate the indebtedness of the project initiator. Besides, the saving of expenses are estimated as from the project and not during and after the project that minimizes its impact (the evolution of the energy costs are not taken into account). A **BBC-effinergie** project may be estimated – for the project initiator – as a property development project requiring an additional investment compared with a standard project. It implies a more significant indebtedness for this project initiator and it is particularly risky for the project.

In fact, a longer period of return on investment can present freezing risks for the financial part in a **BBC-effinergie** project. To compensate this freeze, the local authority may sometimes subsidize the project to reabsorb the extra costs of the construction. These subventions are allocated according to each project and they initiate pilot projects.

Besides, a more important investment has an impact upon the sales conditions of a housing, with a m2 cost higher than that of the market which is risky for the market as the housing is sold at a loss.

The bank response for new housing:

The proposition of the bank – for new ecological **BBC-effinergie** housing – is generally quite recent and it is presented by some pioneer banks.
In order to facilitate the housing construction and marketing for the project initiator, these banks offered adapted financing like the low-interest loans. A private buyer can therefore obtain a loan at a preferential rate compared with the market. This financial system reabsorbs all or part of the overinvestment linked to the housing. The Banque Populaire group (for the private buyers) and the Consignments and Loans Fund (for the local authorities) are the first banks to offer this kind of loan for new housing. Few banks still announce today ecological loans for new housing. It is therefore important to agree with his banker about an adapted offer that takes into account the characteristics of the market in order to facilitate the sale of these properties.

It is also possible – in the case of a new housing – to combine these loans with other bank financing initiated by the regional councils, or local authorities or the 1% housing institutions. Their characteristic consists also in low-interest loans that better reabsorb this longer period of return on investment. Some regional councils or other local authorities begin to extend these low-interest loans in association with banks for the new housing. These loans concern renewable energies and/or insulation.

In the case of an apartment building, it can be useful to work long before with the syndic of co-owners. The latter – implied in the project before the deposit of the building permit – can be well-informed about the maintenance of the new equipments. A plan of third-party financing may be also studied by the syndic of co-owners in order to finance separately, for example, the part of the energy equipment. In other cases, the part of the photovoltaic is studied separately from the remainder of the financing.

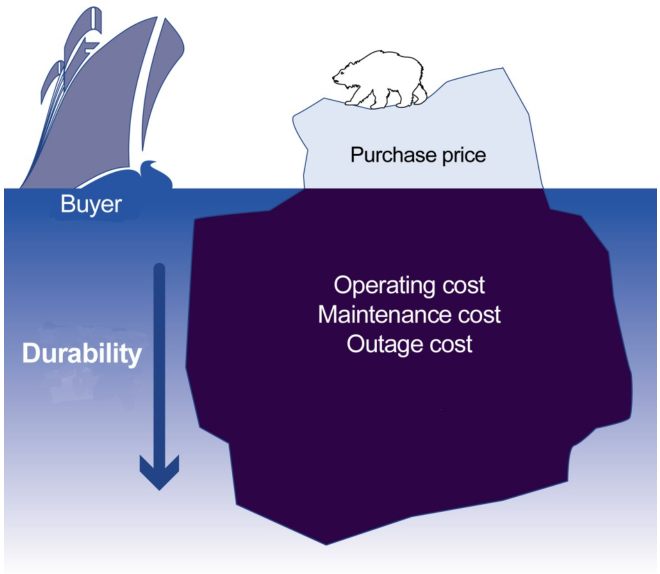
The ADEME (Agency for the Environment and Energy Management) a set up a system that compares the propositions of banks on www.ademe.fr.

Financial assistance from the Government and the region councils

At the time of the editing of this guide, there are now talks – in the framework of the Grenelle Environnement – about a a financial assistance that will be associated to the construction of a **BBC-effinergie** buildings.
Many Region Councils have initiated regional requests for proposals in partnership with the ADEME in order to experience the implementation of the **BBC-effinergie** label and to compensate part of the investment extra costs.
The **effinergie** website keeps up to date recent information on the subject.

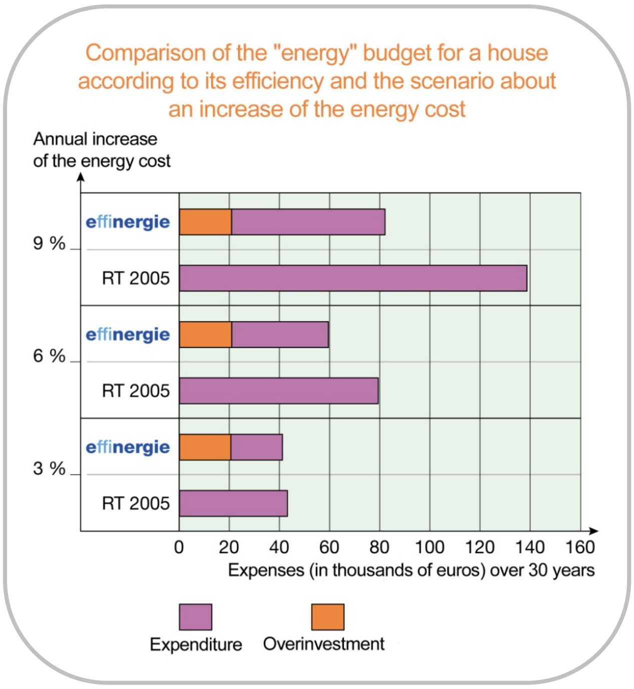
Significant expenses saving

The energy saving admitted by a **BBC-effinergie** housing lead to a reduced operating cost for the housing.



Example of an economic approach for a detached house of 120 m² :

A house generally becomes a “low-energy” one thanks to an overinvestment of 150 €/m² of living area. With a 10-year ecological loan (percentage rate of 3,8%), the total amount to refund would be about 22 000 € for a 120 m² house.
At constant euros and according to three scenarios regarding an annual increase of the energy cost of 3, 6 to 9%, the saving made in the « energy » budget for a period of 30 years – between a house in conformity with the Thermal Regulation 2005 and a **BBC-effinergie** house – vary from 25 000 € to 75 000 €, for an average energy cost of 0,07 €/kWhpe for the first year (see the diagram).
A household owner would make therefore a good transaction as from an increase of the energy cost of 3% (lower rate compared to the rate noticed for fuel oil for during the last years).



A less expensive and easy to find building lot

Getting the **BBC-effinergie** label allows to benefit from an increase of the land coefficient (COS). To this end, you can build an identical house with a lower expenditure for the building lot, or you can build a larger surface area on a given building lot.

Some town councils or developer contractors have specific requirements about the quality of buildings. It may still be easier to have access to real restate for **BBC-effinergie** housing.

Less turn-over and a lasting Solvency of the tenants

The increase of the energy cost may imply financial problems for most of the tenants and this can increase the risk of delinquent rent.
Renting **BBC-effinergie** housing limits considerably these risks and the turnover of the tenants which is oftenly met when the housing is not comfortable and/or the charges are too important.

An opportunity of rescale and a significant rise in value

The increase of comfort and quality gained lead to a higher housing value at the time of the resale. In Switzerland, bankers think that the Minergie® housing (Swiss equivalent of **effinergie**) have a resale value 2 % higher than a standard housing, for an average investment extra cost of 6%.

Besides, the **BBC-effinergie** housing are better adapted to the evolution of demand and it will be easier to rent or resale them because of the energy, increasing regulations and a better readability of the energy performance of buildings (energy label).

A regular source Of income

Nowadays, the implementation of photovoltaic systems connected to a network will enable to resale electricity at a rate fixed in advance.

The agreed overinvestment – for the installation of such a system – may be considered as an investment. Its rate of return has a value similar to the investments in banks.

Arch.: J-L Abt

Managing a new construction project

Certification bodies: A guarantee of seriousness and quality

The effinergie association does not aim at delivering the BBC – effinergie label. It relies on four certification bodies recognized by the government and accredited by COFRAC that will use the label effinergie® for the certification at a BBC level:

Certificateur	Type of construction	Certification label	Certification field	Further information...
Cequami – CErtification QUAlité Maison Individuelle	Detached houses on isolated lot	High Energy Performance Label BBC - effinergie issued in the framework of the certifications "NF Detached House", "NF High Environmental Quality detached House" and "High Performance House"	Granted to the builder for all its production for the NF Label and per operation for the BBC - effinergie label	www.cequami.fr
CERQUAL	Houses on isolated or grouped lots Apartments buildings	High Energy Performance Label BBC - effinergie issued with the option of the "Qualitel" et "Habitat & Environnement" certifications	Multicriteria certification granted per operation	For a private individual: www.bienvivrechezmoi.com For a professional: www.cerqual.fr
CertiVéA – Partenaire certification acteurs et ouvrages construction	Tertiary buildings	High Energy Performance Label BBC - effinergie issued in the framework of the certifications "NF High Quality Environmental Tertiary Buildings" et "NF Tertiary Buildings"	Multicriteria certification granted per operation	www.certivea.fr
PROMOTELEC	Detached houses on isolated and grouped lots Apartment buildings	High Energy Performance Label BBC - effinergie issued in the framework of the "Performance Label"	Granted operation after operation according to the energy performance	www.promotelec.com www.2ideesalafois.com www.labelperformance.promotelec.com

For any further information: www.effinergie.org

Phases of the project	CERQUAL	CEQUAMI	PROMOTELEC
Labels	Qualitel Habitat Performance	NF and NF High Environmental Quality detached House High Performance House	Performance label
Pre-requisites		- Building having the right to employ the NF Detached House Label - House with a certificate of conformity with regards to the requirements of the NF referential	
Programmes 1- needs requirements 2- audit for a renovation 3- programme planning	Application for the certification—Definition of the house equipment Certification application Option BBC - effinergie	Application for the accreditation and validation of eligibility for Cequami	Application for the accreditation on paper or online on the website: www.labelperformance.promotelec.com Administrative examination of the file Technical examination of the file based on the thermal survey and the construction plans
Summery design	Preliminary study		
Deposit of building permit Detailed design	Issuing of the land coefficient (COS), if required		
Tender documents Tender enquiry	Temporary appraisal		
Conclusion of contracts	Final appraisal about the tender enquiry before starting the constructional work. The certification Qualitel or H&E, with the optional BBC – effinergie		
Opening of the Building site		Appraisal of the file based on the thermal survey (standard summarization) and on the technical survey	
Works		Control during the constructional work	Visit on the building site (optional)
End of work	- Measure of permeability by an authorized engineering office - Minutes issued - In Situ control	- Measure of permeability by an authorized engineering office - Result' minutes issued	- Measure of permeability by an authorized engineering office - Result' minutes issued - Final visit - Analysis of the end of works survey report
Acceptance of the work		Certificate of conformity to the HPE label with a mention of the BBC-effinergie label	Performance label with a mention of BBC-Effinergie

For further information

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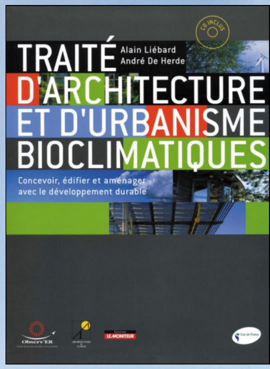
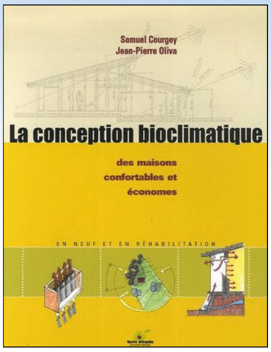
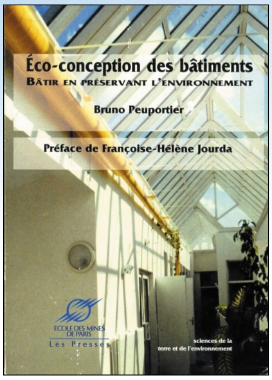
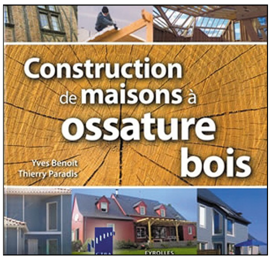
Websites

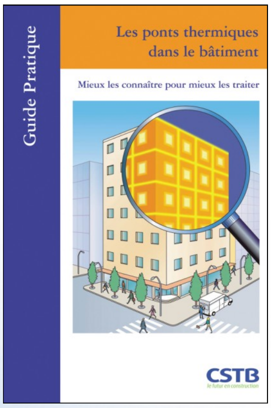
The reference website addresses may change, you can easily find them on our effinergie website:
www.effinergie.org

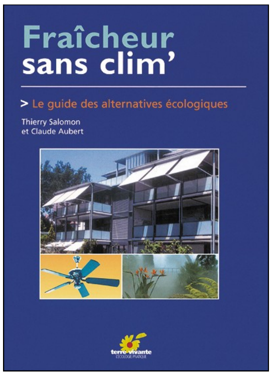












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