



CASE STUDY

A Historic Monument or one built before 1948 often requires respecting the original structure, appearance, and hygrothermal performance. The use of modern materials (such as traditional concrete) can create imbalances (condensation, rigidity, chemical incompatibility). Bio-sourced concretes such as those made from hemp or cork are therefore interesting alternatives.

We are not going to present a specific company, but rather specific techniques for the renovation of heritage buildings based on techniques prior to 1948.

A historic Norman manor reborn: the Manoir du Bais combines centuries-old architecture with alternative, environmentally friendly renovation methods.



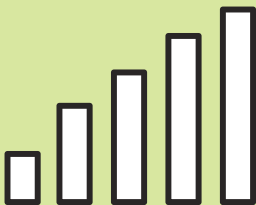
Introduction of the company / project and its sustainability-related goals

Green Concrete Technology and Materials Used

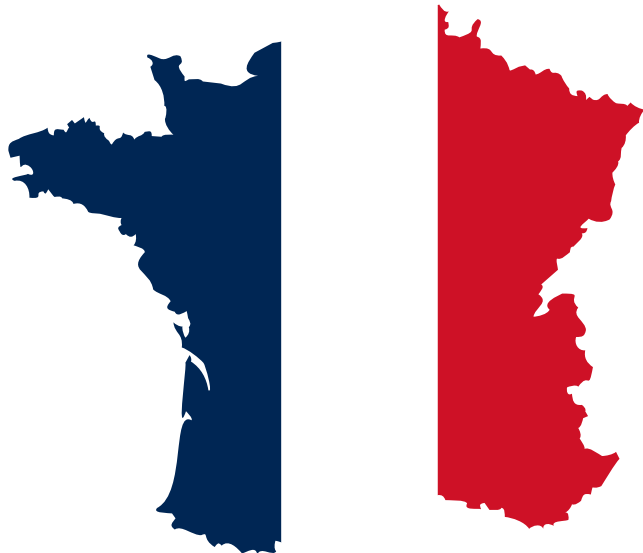


Environmental benefits

Economic and Social Impact



Interviews & Lesson learnt



Manoir du Bais

14340 Cambremer



Introduction of the project and its sustainability- related goals

Renovation of a Historic Monument manor using four innovative techniques: hemp concrete, cork concrete, Roman concrete and hydraulic underfloor heating while respecting the existing building.

The manor “du Bais” is located in the French commune of Cambremer (Calvados department), in the Normandy region.

The Manor is under several patrimonial protections giving it the status of an historic monument. This status protects the buildings of such modifications that could alter their historic, artistic or technical testimony.

In this case, construction works must be approved by state authorities and be works regularly verified (scientifically and technically) by the states services charged with the historic monuments. In return, the owner can ask some state funds.



Manor house du Bais, Cambremer, Normandy

The manor includes three buildings surrounded by a defensive stave. The dwelling house was built at the end of the 15th century and was modified many times during the XVIII and XIX centuries.

The manor also includes a potern (second half of XVI century); the walls are made like a chess board of bricks and stone; the roof is decorated by coloured glazed pottery and tiles. The dovecote, a lord’s privilege, is converted into a amusement hall after the french revolution.

A part of the house and the former dovecote are constructed with the traditional technique of the half timbered framing, a symbol of the architectural identity of the Pays d’Auge. The timber framing is a method of building with fitted and jointed timbers creating a supporting structure. The empty spaces are filled with fine meshing of branches which are recovered by mix of clay, hay and water



Green Concrete Technology and Materials Used

Hemp Concrete

Hemp concrete, also known as **plant-based concrete**, is a **bio-sourced material** generally composed of hemp shiv (the woody part of the hemp stalk), a binder (often Inspired by traditional techniques combining plant and mineral materials, ‘hemp-lime’ or ‘hemp concrete’ is used in the building industry for a variety of applications, in both new-build and renovation projects.

This ‘concrete’, made from a plant-based aggregate, combines two natural products:

- Lime, produced by calcining limestone.
- Chenevotte, part of the hemp stalk once the fibre has been removed, commonly known as hemp.



Cork Concrete

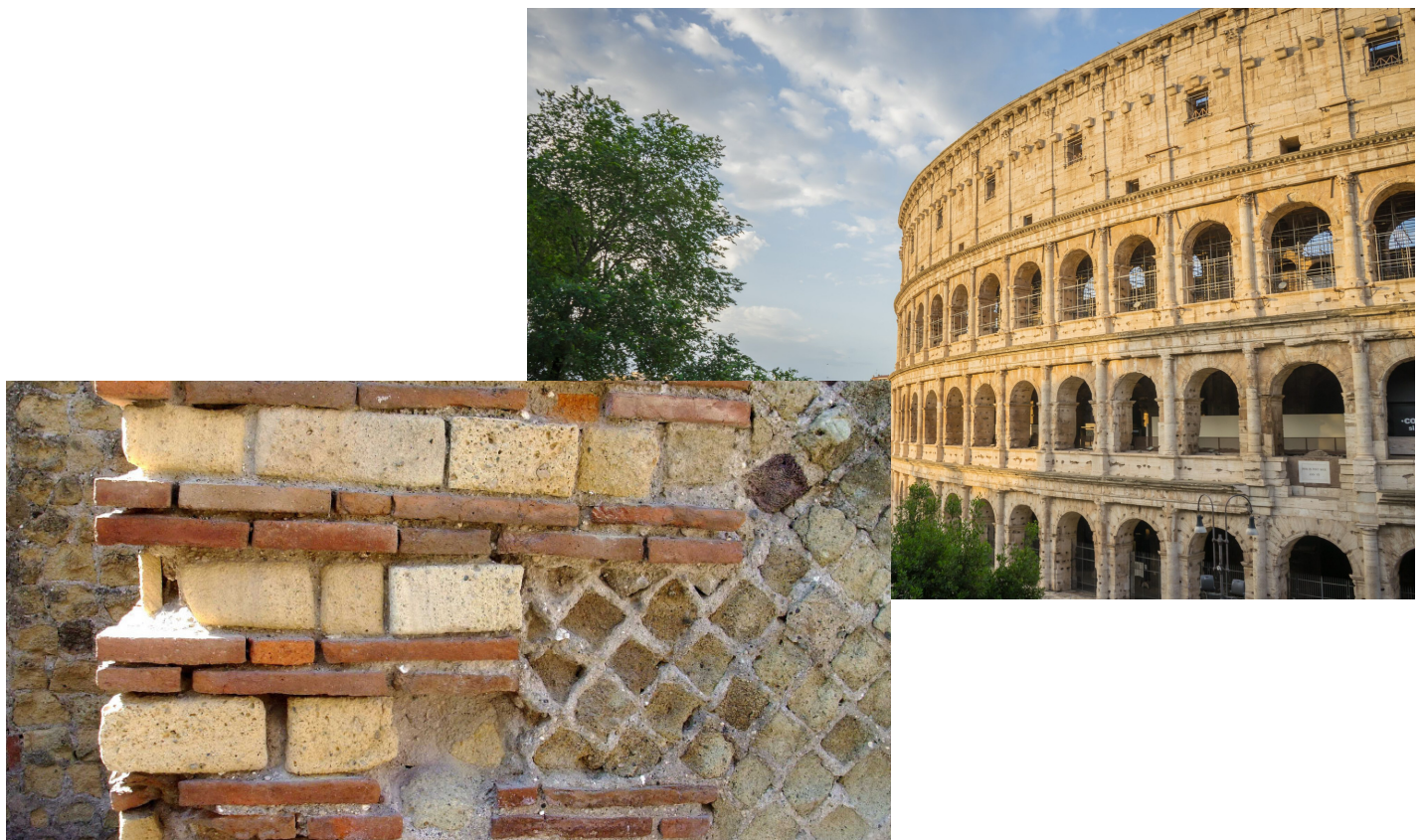
A little-known process, **cork concrete** is made from crushed corks mixed with lime. An insulating material for the walls and floors of buildings, with a low carbon footprint. Cork concrete (sometimes called lightweight cork concrete or cork insulating concrete) is an **environmentally-friendly** building material that combines expanded cork aggregate with a binder (often cement, lime or sometimes more natural binders). Cork concrete is particularly well-suited to older buildings, as it combines lightness, insulation and the ability of older walls to breathe. It is often used in heritage or ecological restorations, where the aim is to avoid damp, respect the original materials (stone, brick, unbaked earth) and limit additional loads.



Green Concrete Technology and Materials Used

Roman Concrete

Roman concrete is a building material used by the ancient Romans, famous for its durability and strength. It is a concrete made from lime (lime mortar) and aggregates (stones, crushed bricks, etc.), often reinforced with a material called 'pozzolana'. Pozzolan is a volcanic rock rich in silica and alumina, which reacts with lime to form a hydraulic gel, giving concrete exceptional water resistance and durability. Roman concrete revolutionised construction by enabling larger, stronger structures, influencing architectural development right up to the present day. Their skills were lost but rediscovered in the 18th century, giving rise to modern concrete.



Hydraulic underfloor heating

Hydraulic underfloor heating is a very low temperature underfloor heating system. It consists of a network of tubes through which hot water circulates. Unlike older systems, modern underfloor heating systems do not make your legs swell. The water circulated through the system is heated by a boiler, solar panels or a heat pump to a temperature of between 31 and 45°C. The heat radiated by the floor generally does not exceed 21 to 24°C, a temperature that poses no danger to blood circulation. The temperature of the water underfloor heating system is regulated by an electronic thermostat connected to an outdoor sensor. Most of the time it is programmable, allowing you to set a specific temperature for different time slots. However, the inertia caused by the thickness of the concrete slab must be taken into account when programming. With hydraulic underfloor heating, when you change the setting on your control device, the heat in the room does not change immediately.



Environmental benefits

In the current context of ecological transition and the fight against climate change, the four techniques used within the manor house are innovative and they highlight major environmental benefits:

Hemp Concrete

Hemp concrete is considered an eco-responsible solution for sustainable construction. Hemp concrete has a much lower environmental impact than traditional concrete.

- **Biosourced & renewable materials:** Hemp is a fast-growing plant (3-4 months) that can be cultivated without pesticides or chemical fertilisers. It also requires less water to grow than other crops, making it an environmentally-friendly option for sustainable construction
- **Reducing CO2 emission :** Hemp concrete has the ability to regulate humidity in a building, absorbing excess moisture from the air and releasing it when the air becomes drier. This helps to maintain a healthy, comfortable indoor environment
- **Insulation and energy savings:** Hemp concrete provides excellent thermal insulation, reducing the need for heating and cooling in buildings. This translates into energy savings and a reduction in greenhouse gas emissions.
- **Recycling and composting:** Hemp concrete can be recycled or composted at the end of its life, reducing waste and environmental impact.



Cork Concrete

Cork is a 100% natural insulating material with exceptional thermal and acoustic properties. Its characteristics make it an ecological, high-performance insulator that is being used more and more, particularly to improve the comfort and energy efficiency of homes.

- **Derived from the cork industry:** cork is a naturally durable material that can withstand intensive use and the bark of cork oaks is renewable without felling the tree.
- **Low carbon footprint:** The cork oak captures and stores carbon throughout its life. When the bark is removed (without felling the tree), the cork retains this carbon.
- **Very good thermal and acoustic insulation**
- **Moisture and mould resistant:** Cork reacts very well to humidity because it is rot-proof. It is therefore particularly suitable for areas of the house that are most prone to damp.

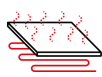


Roman Concrete

Because of its durability, Roman concrete could reduce the need to manufacture new materials, prolonging their use and reducing the overall ecological footprint.

- **High durability:** Roman cement is extremely durable and resistant to erosion. In fact, it has the ability to strengthen over time, unlike modern cement, which tends to weaken with age.
- **Thermal performance:** Roman cement has an excellent thermal performance, which enabled it to regulate the temperature of the structures in which it was used. This property is due to its porosity and its ability to store and release moisture.
- **Fewer CO₂ emissions:** this ancient concrete generates far fewer harmful air pollutants, such as nitrogen or sulphur oxides. This is partly because the Romans heated the limestone with wood (such as oak or fir), rather than fossil fuels.

Environmental benefits



Hydraulic underfloor heating

Water or hydraulic underfloor heating is not only a more comfortable way of heating your home, it's also a much more energy-efficient method of heating than traditional systems.

- **Energy efficiency & thermal comfort:** operates at a low temperature (30–40°C instead of 60–70°C for radiators), which reduces energy consumption by up to 35%.
- **Durability:** underfloor heating is renowned for its long service life and above all it does not require little of maintenance and less waste à long waste.

The table below summarises the main advantages of the techniques used at Le Manoir :

Techniques	CO ₂ / Energy reduction	Resources & Renewability / End of life	Durability	Insulation / Efficiency
Hempcrete	Absorbs CO ₂ during cultivation	Hemp = a fast-growing, renewable, recyclable and compostable agricultural resource	Good	Very good thermal and acoustic insulation
Cork Concrete	Storing CO ₂ thanks to cork forests	Cork = a renewable natural resource that does not require cutting down trees and is biodegradable	Good	Very good thermal and acoustic insulation
Roman concrete	Lower energy consumption than modern cement	Uses natural local materials and Recyclable as aggregate	Exceptional durability (2000 years+)	Good thermal inertia
Hydraulic underfloor heating	Low temperature = less energy	Compatible with renewable energies (heat pumps, solar, biomass) Low waste, sustainable installation	Very long life, low maintenance	Homogeneous heat, reduced losses

Economic and Social Impact

The traditional techniques of timber framing and bricks are a testimony of the art of building in the Pays d'Auge since Middle Ages.

The farms and the manors, surrounded with grasslands and orchards, are a landmark for the inhabitants but also an identified landscape for the visitors.

As local products (cheese, cider, apples, etc.), the built heritage is a part of the cultural identity of the Pays d'Auge. Preservation of this typical architecture is an asset for the touristic promotion of the territory. Tourism development could encourage economic activity.



Preservation of heritage and landscape is also paramount for the sense of belongings of local communities and sustainability of traditional craftsmanship.

Therefore the manor rehabilitation also provides an example of a specific method matching sustainable techniques inspired from tradition, and contemporary housing comfort within a strong will to perpetuate the vernacular architectural identity.

This opens up possibilities for the rehabilitation of more modest housing, but also for sustainable new constructions where health and comfort are a real priority. Restoring, here, means understanding, experimenting, and transmitting: a gesture of the future as much as a tribute to the past.

Restoring a manor house is more than just restoring an old building: it can have a significant social impact, depending on how the project is designed and integrated into its surroundings. In effect, the manor house becomes a witness to local history and culture, and it also helps to showcase local craftspeople in particular.

Here's an example from Patrice Leu, a heritage mason for over 40 years, who is very committed to preserving the knowledge and ancestral calculation techniques that enabled great builders to construct the buildings that today constitute our built heritage, using local materials.

Interviews and Lessons learnt



Interviews

You can [watch the Manoir video](#) on our YouTube channel. It features an interview with Antoine DE MONTS, owner of the Manoir du Bais in Cambremer and also an interview with Sylvie CORBEL, Secretary-General of CAPEB Calvados, in which they explain that the manor house is a perfect example of how traditional building techniques can provide sustainable solutions for our times. Thanks to the use of local materials, time-honoured craftsmanship and environmentally friendly methods.



Lessons learnt

Balancing Heritage Preservation and Modern Needs:

It is possible to combine historic authenticity with modern comfort and energy efficiency. By using bio-sourced and compatible materials (hemp, cork, lime), the building retains its original appearance and performance while meeting today's environmental and comfort standards.

Environmental and Energy Lessons :

Heritage buildings can become models of ecological renovation. Integrating low-carbon materials and energy-efficient systems (like hydraulic underfloor heating) demonstrates that environmental performance and heritage preservation are not contradictory.

Social and Cultural Value:

Restoring heritage sites strengthens community identity and local pride.



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