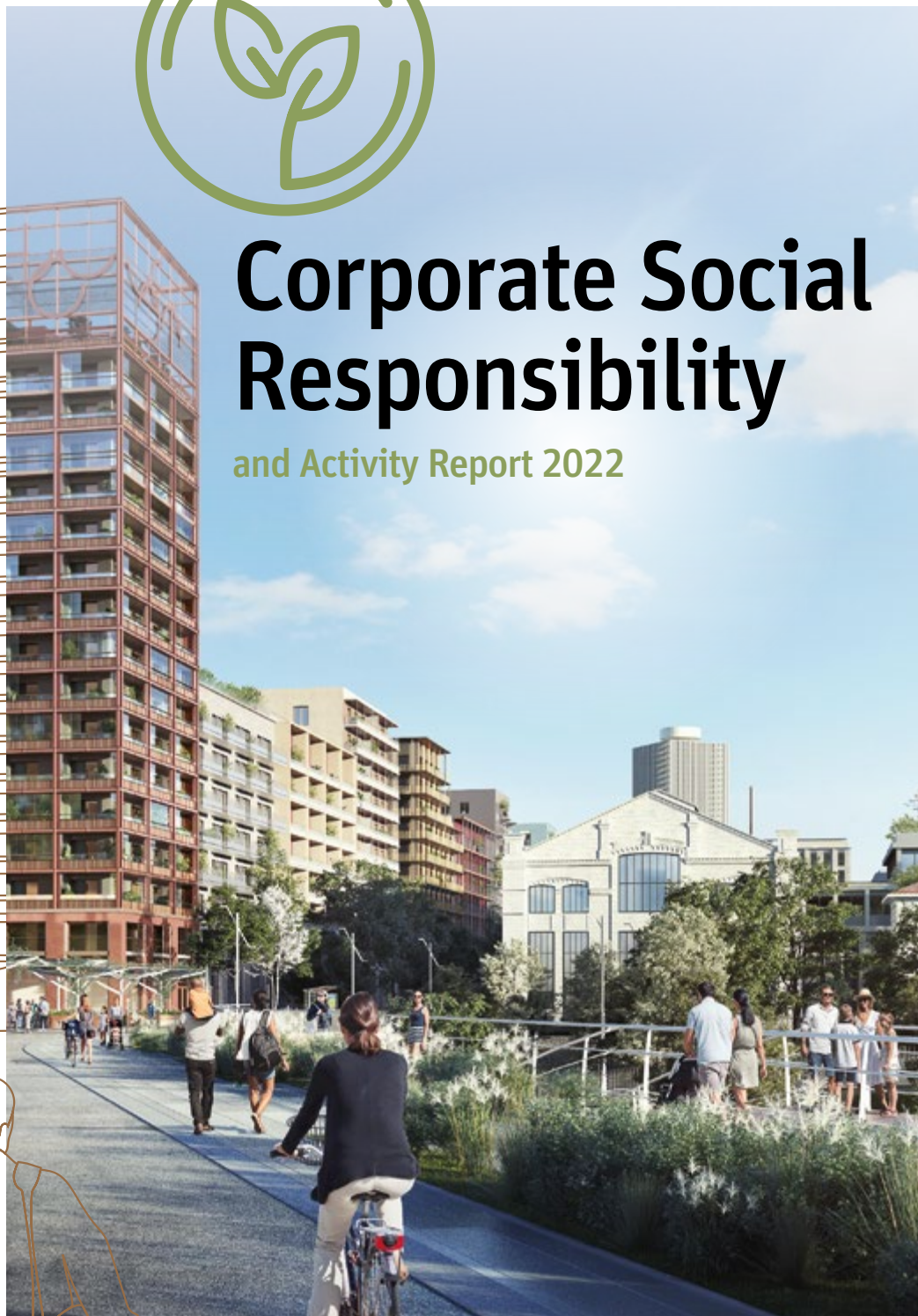




Corporate Social Responsibility

and Activity Report 2022



CSTB

LE FUTUR EN CONSTRUCTION

Editorial by Étienne Crépon / 04

A word with Sylvie Ravalet / 06

A word with Hervé Charrue / 07

“ Anticipate the buildings and cities of tomorrow while supporting and securing sustainable construction and renovation projects, to improve the quality of life for users. ”



Research at the CSTB

Three questions for...

Sophie Moreau / 10

Alexandra Lebert / 11

Romain Mège / 12

Alexandra Lebert / 13



The CSTB's social commitment

Taking action for our planet and future generations / 16

Nurturing human capital and placing it centre stage / 26

Asserting ourselves as an independent ethical group / 36



Snapshot / 46



Scientific and technical roadmaps: Vision 2030 / 50



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// The CSTB fully intends to wholeheartedly play its role as a hub of scientific and technical knowledge in the construction sector.

ÉTIENNE CRÉPON
CEO OF THE CSTB

The world is in full transition, the construction sector is responding

For several years now, our world and our country in particular have been undergoing a transition towards a future that is asking questions and bringing about structural changes that we have long since identified. In the disruption of the seasons and the emergence of extreme phenomena, we are beginning to see the first effects of climate change that are only going to increase in the coming years. Our collective efforts are helping to limit greenhouse gas emissions and global warming, but they need to be stepped up.

Our country is soon going to enter into a demographic transition that will significantly impact the labour market through the ageing of the population, and is therefore likely to lead to a decline in the productive forces of building trades.

All these changes and transformations will affect the construction sector, a sphere of long-term, labour-intensive activity, the leading consumer of energy and the second largest emitter of greenhouse gases.

However, positive signals call for us to remain optimistic and demonstrate that the sector is taking on board current and future challenges. Innovation is leading to the emergence of new products and buildings with a low environmental footprint and ever higher performance.

The digital transition is making it possible to optimise productivity and streamline the use of raw materials, while the industrialisation of certain off-site and modular processes is making life easier at the building site and reducing the time it takes to complete construction projects.



Scientific excellence

To meet these challenges, the CSTB has been undergoing change for several years and is now fully capable of responding to the issues facing public authorities, and, more broadly, the entire construction sector and real estate community.

Thanks to its knowledge and expertise, the CSTB fully intends to wholeheartedly play its role as a hub of scientific and technical knowledge in the construction sector. It is humbly and calmly taking on the status of adviser, assigned to it by the law and the government, in order to mobilise all forces and provide solutions to the problems that the different actors will have to face. It intends to develop, maintain and make available scientific projects and assets to achieve this goal. It is also with this perspective in mind that, together with the entire sector, it has developed the French National Buildings Database (BDNB), which contains several hundred items of information for every building in mainland France.

Beyond the assets that the CSTB is able to mobilise for the research projects in which it participates, this pivotal role can only be envisaged if it maintains its level of scientific excellence. It has organised its activities around four strategic areas of action:

- **an ambition:** buildings and neighbourhoods that promote harmonious living;
- **an imperative:** buildings and cities facing climate change;
- **projects:** renovation, making the act of building more reliable, and innovation;
- **resources:** the circular economy and resources for the construction sector.

For each of these areas, following extensive consultation, the CSTB has developed a scientific and technical roadmap that defines the knowledge to be developed and the tools to be created in the coming years. A total of 21 research programs have been launched for this purpose.

// Innovation is leading to the emergence of new products and buildings with a low environmental footprint and ever higher performance. //

The importance of innovation

Societal transformations will enforce a certain frugality and austerity upon us, far removed from the years of abundance that we have known in recent decades. This will require a new way of thinking, and indeed has already been initiated by all players. Experience has shown that the “price signal” alone often leads to rejection and to a new divide in an already weakened society. This frugal approach will only be tolerable and acceptable to society if it is introduced gradually, and explained well.

However, the environmental and societal emergency is already upon us. Collectively, we will only be able to really grasp what frugality means by designing other more sober ways of doing things without dramatically degrading the quality of each other's personal or professional lives. How can this be achieved? Through innovation. **The CSTB intends to mobilise all its resources to support players wishing to innovate so that new ways of building and renovation emerge, and so that construction techniques, products and systems can evolve to reflect this new context.**

The world is changing, so our points of reference also need to evolve and adapt. What was good yesterday may be much less so in an environment that takes upcoming transitions, and thus the environmental impact and ease of implementation, into account. The CSTB has long been one of the main certifiers of construction products and systems, attesting to their suitability for use as well as to their ability to be incorporated into buildings and to participate in the safety of properties and people. It will continue this mission of enhancing performance and promoting trusted third parties within an ecosystem flooded with information that is unverified and therefore not necessarily very reliable.

Gradually, and after consultation with the players in this ecosystem, the CSTB would like to upgrade its certifications so that they continue to attest not only to the product's suitability for use, but also to its ability to contribute to addressing the major environmental and societal challenges that we will collectively face in the years to come.

In light of the importance of structural transformations linked to our living environment, the CSTB is harnessing its strengths and will continue to mobilise its efforts for the future that we're building. //

// All of us need to take human and environmental issues into account in order to have a positive impact on all our projects and actions.

SYLVIE RAVALET

DELEGATE GENERAL DIRECTOR - DEPUTY CEO

Who are we?

The CSTB - windows, properties, wood?

We may well have our fingers in many pies, but we are one united company - the CSTB - with a single focus on the values adopted in 2022 by the Board of Directors: attentiveness and customer service, openness, scientific and technical excellence and rigour, impartiality and transparency, social and environmental responsibility.

This is what motivates the 1,000+ employees of the CSTB, serves as the foundation for all our actions, and gives us our sense of pride.

These values and corporate social responsibility, in particular, are reflected in our commitment to our policy of enhancing our human capital.

The CSTB is proud of its teams, proud of their wealth and diversity (age, culture, professions), and proud of their expertise and know-how. It strives to support them throughout their career with the company, in particular, through training and sharing. As a learning company, we are developing a knowledge management approach to more easily share and transfer our knowledge and know-how.

The CSTB is committed to equal opportunities and warmly welcomes work experience trainees and work-study students of all ages to help them discover and join the world of work; not to mention recruiting around twenty new PhD students every year.

A scientific enterprise in the construction sector and yet gender equality in the workplace? The effects of the actions taken to ensure gender equality in the work place can be seen in our shared spaces. The results are measured by the increase in the company of the portion of women, or the positive development of the various indicators that make up the professional gender equality index with a 2022 score of 92/100.

For several years now, the CSTB is proud to have been recognised as one of the 100 best companies to work for in France according to the list of winners of the magazine "Capital", and also to have obtained the "Happy index at work" label by ChooseMyCompany.

These values are also evident in our commitment to the environment and to our promotion of well-being in the building sector.

This commitment is of course reflected in our research projects and in the development of new offers that you will discover as you read this integrated report.

This concern is also at the very heart of our activities and the operation of our sites. Involved in the major thermal renovation programme at the Champs-sur-Marne, Grenoble and Sophia Antipolis sites, the teams went far beyond the scope of project management and their own needs to focus on meeting the needs of the "user" through experiments (Quality, Safety and Environment methods - "QSE et Sereine"), with pull-off tests on the tiles that still existed in Kairos, the renovated administrative building, and also by monitoring the installation of bio-sourced insulation and the reuse of materials. It may not always be simple, but we are unwaveringly committed to maximising the profitability of uses of geothermal energy - low-carbon energy - and the (re)use of rainwater or vegetation to optimise summer comfort.

Environmental responsibility also includes the measures that we take to conserve energy and water. To this end, we will continue to analyse the energy consumption of our processes in order to improve their efficiency.

In 2023, we also intend to focus our actions on recycling our waste, and to paying particular attention to reducing waste at source.

A collective commitment, driven by our brand and our employer brand.

Kind regards from CSTB! CSTB & You! //



// Due to their intrinsic complexity related to the various risks that they must protect us from, buildings represent a highly challenging object of research, right from their very conception.

HERVÉ CHARRUE

DEPUTY CEO IN CHARGE OF RESEARCH AND DEVELOPMENT

Austerity! In the middle of July 2022, it sounded somewhat incongruous to talk about reducing winter energy consumption when Europe was about to experience the hottest summer on record, potentially superseded by the summers of 2023 and 2024. It may well have been rather surprising. But on the contrary, it was merely an anticipation of the future, based on realistic forecast data in the face of the relative availability of electricity, the rise in the price of fossil fuels, and more than probable data concerning climate projections. It has become obvious that the recurrence of extreme events, particularly in the summer, calls for a collective awareness that is now shared by the majority. As a result, each and every one of us felt concerned by such events, even if we were not all directly affected by them. However, the result lived up to expectations, and aided by an adaptation of uses, an undeniable change in behaviour started to emerge following the different crises and their economic impacts. However, mainly because of global warming, extreme winter events are more a feature of the last century.

The IPCC has repeatedly referred to austerity in a very broad spectrum of analyses that go beyond the energy issue, by addressing the behaviour and uses that accelerate the greenhouse effect. Its recommendations, the main one of which is the need to reduce consumptions of all kinds, will one day be obligations. But often with constraints comes opposition. So I prefer to use the term "sufficiency", which, of course, could also be misunderstood to mean the very opposite of what I am intending. However, the term "sufficiency", in the sense in which I am using it, reflects more clearly and more positively the necessary, yet not compulsory commitment that each of us is going to have to undertake. And we need to start right away.

What role can buildings play in this transformation of behaviour and, more broadly, of society? Because we spend more than 80% of our lives in them, we take buildings for granted and only remember to think about them when a crisis hits.

To a certain extent, buildings are a form of "sufficiency" in themselves, in other words, we only pay a "sufficient" amount of attention to them, not to say no attention at all. And this is reflected in the research that the construction sector is willing to invest in.

Due to their intrinsic complexity related to the various risks that they must protect us from, buildings represent a challenging object of research, right from their very conception, as we are reminded in our scientific and technical research roadmaps, which are at once multi-scale, multi-physical, sociological and behavioural, not to mention economic. Understanding the various interactions and how they can be addressed through multi-objective optimisation is in itself a call for sufficiency. Admittedly, so far, the wealth of resources, energy and materials has not yet led to an optimised approach to using them in buildings. To its credit and benefit, however, oversizing compensates for implementation specific to this sector.

Right from the design stage, including within their urban locations, in their construction and operation, beyond their use and throughout their entire life cycle, buildings are a key factor, not to say a driving force, of sufficiency. However, basic individual actions, while necessary and uncompromising, will not be enough to meet the requirements of the Paris agreements or to tackle the 4°C scenario. This is why research needs to open up new paths, both technical and socio-economic, to enable informed political choices, supported by citizens, to be made on a daily basis.

While the 21st century has never been more promising in terms of innovation and inventions, by contrast, it always trails with it, like an antique, the historical spectrum of wars, conflicts and inequality between people, so we need to rethink sufficiency within a perspective of austerity that is at once joyful and pragmatic, respectful of the planet, and also, and above all, respectful of the living beings that populate it. This is one of the major challenges faced by urban planning and sustainable construction via the renovation of the existing building stock in order to meet the requirements of 2050 and 2100. //





Research at the CSTB

Buildings and neighbourhoods
that promote harmonious living

Three questions for Sophie Moreau / 10

Buildings and cities
facing climate change

Three questions for Alexandra Lebert / 11

Renovation, innovation and reliability
in the construction process

Three questions for Romain Mège / 12

The circular economy
and building resources

Three questions for Alexandra Lebert / 13



Buildings and neighbourhoods that promote harmonious living

SOPHIE MOREAU
DIRECTOR STRATEGIC AREA OF RESEARCH

Designing and developing pleasant and peaceful neighbourhoods that foster social ties is one of the priorities of your strategic action area. How were your research efforts structured around this topic in 2022?

We articulate our thinking around three structural areas that ask “why”, in the dual sense of causality and purpose, and “how”. So, we question the place of citizens through local initiatives that contribute to the development of a more collaborative and involved society. We observe their effects in improving the living environment and social ties, and we study the coordination of these actions with the institutions. Furthermore, we question traditional methods of urban analysis based on sustainable development standards and guidelines, by contextualising them, and objectifying the benefits of the various decisions of contracting authorities and local authorities. This approach gives rise to assessment methods that are better suited to the definition of strategies, decision-making and monitoring of actions undertaken over time. Finally, we explore the benefits of the digitisation of practices and the use of data in developing services for city stakeholders and users. This work, carried out using a systemic approach, highlights the multi-disciplinary aspect, and is based on thematic scientific foundations that we are continuing to explore in greater depth.

The quality of interior environments is also at the heart of your roadmap. Which types of indicator and which modelling tools or measurement methods has your work focused on and what needs do they meet?

Project management is concerned with the quality of the buildings that it sponsors and sometimes operates. Beyond the essential requirements associated with structural resistance or compliance with regulations (fire, environment, etc.), contracting authorities are attentive to the quality of interior environments, the impacts on comfort, health or cognitive abilities of which have now been proven. This attention is increased by the context of climate change, to which the strategic action area “Buildings and cities facing climate change” is devoted, and which leads to episodes of high temperatures that can lead to very real health risks. Therefore, construction engineering needs suitable instruments to be able to design buildings that meet these expectations. So, we are working on the development of tools for modelling the various factors involved in the quality of interior environments such as thermal quality, air quality, lighting, acoustics and vibrations. Many tools specific to each physical parameter already exist in a scattered way and with highly variable levels of precision and complexity. The reason why our approach is so original is that we are seeking to simplify complex modelling tools, initially dedicated to research, and to transfer them to a single interoperable platform. Based on this one model, we will thus be able to study the different parameters that constitute an atmosphere and calculate an occupant’s “overall” comfort. To this end, we are working on the development of aggregated indicators that take into account the multiple determinants of comfort, be they physical or physiological. And because we do not expect a home, a work space or a learning space to have the same characteristics as each other, these indicators are adapted to each of these functions.



Which main areas of the research project are devoted to the health and safety aspect of buildings, which includes exposure to pathogens, in the event of an epidemic or pandemic, and biological contamination?

Has the recent pandemic played a role in the development of the project?

We have been working for many years on the connections between buildings and health. In 2022, we continued the work undertaken on identifying health risks, including for example the assessment of exposure to ultrafine particles, the analysis of fungal development dynamics and the identification of sources of endocrine disruptors in nurseries. We have also carried out research into exposure to micro- and nano-plastics in indoor environments, as well as doctoral research into the health impact of recycled materials, in connection with the “Circular economy and building resources” strategic research action. Work on prevention and remediation will include research into particulate emissions from wood-fired heating, and original research into active substances and attractive surfaces to combat pests, including bedbugs.

The Covid-19 pandemic obviously guided our research, but this field is not new to the CSTB since this subject had already been explored during the influenza A (H1N1) epidemic, in 2009. The scale of this health crisis has nevertheless led to this research being prioritised again from 2020. We have structured a specific project, adapted from upstream to downstream. Its objective is to characterise the danger associated with in vitro biological agents by understanding the survival dynamics of viral aerosols, to assess, by combining simulation and in vivo experimentation, the risk of contamination in enclosed spaces, and to go on to develop solutions to protect building occupants. This project is leading to numerous collaborations with players in medical and health research (Institut Pasteur, the French Agency for Food, Environmental and Occupational Health Safety, etc.).



Buildings and cities facing climate change

ALEXANDRA LEBERT
DIRECTOR STRATEGIC AREA OF RESEARCH

Taking action to mitigate climate change by reducing our greenhouse gas emissions is a compelling obligation. What new measures were taken by the CSTB in 2022?

In May 2023, the CSTB and the administration of the Sustainable Building Plan submitted the low carbon roadmap for the construction sector to the French government on behalf of the sector. This brought together a large number of professional organisations in 2022 to formulate 25 levers for action and propose 120 measures to be implemented by actors or public authorities. It includes many subjects addressed by the CSTB, some of which are research subjects accompanied by the doctoral programme. This roadmap thus highlighted the need for shared data about the load of the whole sector and the quantification of greenhouse gas emissions at the level of the French building stock, in order to prioritise public action and that of the major players, in particular landlords or local authorities. It is also with this in mind that “Action Logement” is working with the CSTB on a detailed characterisation of emissions from its building stock. In order to build operational decarbonisation trajectories, considerable work needs to be done on the collection of data in order to qualify, using the French National Buildings Database (BDNB), the stock belonging to different branches, simulate action plans and monitor the evolution of emissions. These subjects involving the characterisation of the building stock and renovation projects to mitigate climate change are also at the heart of the strategic action area “Renovation, Innovation and Reliability in the Construction Process”.

In addition, the CSTB is continuing its engagement with Efficacy, through the provision of agents from Institutes for the Energy Transition, co-supervised theses and the development of two tools: UrbanPrint, a software tool which allows urban planners to assess the environmental impact of their projects, and PowerDIS, which draws on the CSTB’s Dimosim urban energy simulation calculation engine to analyse different energy scenarios for specific areas.

Lastly, at the level of the buildings themselves, we have a flagship project: “Colibri”. The aim is to prepare the development of this future reference tool for calculating the energy and environmental performance of new and existing buildings. We are currently gathering different stakeholders together to draw up unifying specifications to meet the needs of the players. The mission of the CSTB is to enable each of them to assess their decisions from a carbon point of view, i.e. by understanding the current impact of products, buildings or development projects, and also by translating the national carbon budget into targets that can be read by each player.

Regarding the objective of climate change adaptation, what were the major breakthroughs?

The CSTB is working on three areas to enable adaptation of the building stock. The first concerns the characterisation of future risks with the aim of providing stakeholders with a shared framework, enabling them to design and renovate while taking the climate of tomorrow into account. The second challenge is to share an assessment of the vulnerability to various risks of buildings and housing units. Finally, there is the question of evaluating the different solutions – technical or otherwise – so that the best ones can be deployed on a massive scale.

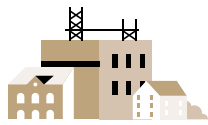


In 2022, we continued our research into the characterisation of the effect of the urban heat island with, in particular, exploitation of satellite data (Sat4BDNB project) and knowledge of summer comfort within buildings, by rolling out measurement campaigns in residential buildings (Renoptim CEE project) and consolidating our NHTM model to individualise the modelling of summer comfort and, ultimately, make the connection with the health risk.

We are also making progress in the construction of weather files, adapted to the building environment, so that actors can simulate the behaviour of their buildings according to future heat waves. The Go-Rénove project, stemming from the PROFEEL programme, provides initial indicators reporting on the vulnerability of buildings to these crises. We are also undertaking work to calculate the costs involved in adapting the building stock. At the same time, we are continuing our work on characterising the various solutions (greening, low-albedo materials, water cycles, etc.) to provide players with robust and specific information enabling them to carry out their building projects while taking climate change into account. This work, supported by this programme and the “Buildings and neighbourhoods that promote harmonious living” strategic research action, is carried out through partnerships with academics, associations and manufacturers.

The main guiding compass today is carbon, but analysing other components impacting the environment is also essential...

The CSTB systematically tries to approach the subjects in a cross-cutting manner. We have helped to make the life cycle analysis (LCA) more accessible to all. It is an accurate reflection of the various pressures exerted on the environment, from depletion of resources to water pollution, from biodiversity loss to waste generation. The “Circular economy and building resources” strategic research action focuses on resource management, whether in terms of extracting raw materials or of managing waste, and places the subject of water consumption at the heart of concerns. The “Buildings and neighbourhoods that promote harmonious living” strategic research action focuses on biodiversity, from its characterisation in urban environments to the qualification of its effect on micro-climates.



Renovation, innovation and reliability in the construction process

ROMAIN MÈGE
DIRECTOR STRATEGIC AREA OF RESEARCH

How has the French National Buildings Database (BDNB), developed by the CSTB and in operation since the start of 2022, enabled progress to be made in terms of knowledge of the existing building stock, essential to the widespread adoption of renovation?

Developed by geospatial cross-referencing of some twenty nationally available databases from public bodies, the French national buildings database (BDNB), structured at “building” level, makes it possible to better understand the existing building stock and to monitor its development, including renovations. Based on this information, which is regularly updated, we are currently working to produce expert knowledge, by associating each building with its typology. The renovation potential of the buildings is thus determined, in terms of both energy consumption and carbon gain.

In addition, the RénoStandard project, which became “Restore” during the second phase of the PROFEEL programme, makes it possible to study global renovation solutions for many types of private homes through replicable innovative solutions developed by professional groups.

This data, which is derived from knowledge of the existing situation thanks to the BDNB and from feedback from renovation projects, is useful for actors in the sector (developers, landlords, local authorities, project managers, contracting authorities) at several levels, to enable them to develop their renovation projects: pre-assessment of expected gains and costs, pre-filling of digital models, estimation of volumes of materials and labour or estimation of the potential associated with renovations per territorial area. With the help of the BDNB, we have initiated numerous studies with various partners, such as housing associations and local authorities, to analyse and study the carbon trajectory and the potential for renovating their building stock so that they can define the most appropriate renovation strategies. These studies fall within the scope of the new low carbon roadmap for the construction sector, which has been managed as part of the “Buildings and cities facing climate change” strategic action area.

Future climate, carbon footprint, circular economy: how can we renovate effectively while taking all these issues into account?

A renovation project passes through five stages: targeting the buildings to be renovated and carrying out a diagnosis, designing the renovation projects, determining the availability of resources adapted to the existing situation and the work to be carried out (labour, financing, materials), planning the implementation adapted to the constraints of the existing situation and, finally, ensuring the commissioning and efficient operation of the building over the long term.

Addressing these concerns requires a continuum between each of these steps along with a consideration of the systemic functioning of buildings and their users. Therefore, this involves the need to establish a multi-criteria survey of buildings by integrating an inventory of the needs of local actors right from the design phase. This approach was tested at seven schools based in the Var department that wished to meet the energy consumption reduction requirements related to the tertiary decree of the Élan law (Loi ELAN) while ensuring summer comfort. It was a real challenge, as educational institutions are occupied during the day – i.e. the hottest times of the day – and their activity is incompatible with outside noise if windows need to be opened. Acoustic comfort, ventilation, limited budgets and future climate changes were also parameters to be taken into account, thus justifying a multi-criteria diagnosis with the aim of proposing different renovation scenarios. This method is now operational and we intend use it and develop it in other use cases such as housing units.



How should the actual performance of buildings be monitored and maintained throughout their life cycle after renovation?

Before this stage, it is necessary to check that the renovation project has met its target. This is the role of the SEREINE system which is also supported by the PROFEEL programme. Focused on the energy consumption and thermal comfort of private homes, it objectively measures the effectiveness of the work by comparing the situation before and after renovation, independently of the behaviour of the user, and makes it possible to identify and correct any defects in the design or construction.

Other work, backed by SEREINE, is under way to cover all the buildings and improve efficiency: extension of the project to include apartment buildings, and reduction of the duration of measurements and their procedures so that they are as non-invasive as possible for users, in particular through the use of connected equipment. We are also working to measure criteria other than thermal ones in order to make quick and multi-criteria diagnoses by merging the knowledge acquired from many CSTB research projects (structure, indoor air quality, acoustics, building digitisation, etc.). Finally, the performance of a building is not limited to its condition at the end of the work. It must be ensured that this condition is maintained over time. In this respect, we are conducting research to qualify heating systems or photovoltaic devices over time by including their maintenance and monitoring. Users also have a role to play. It is important to make them aware of future climate changes, and also of the fact that their habits can have a positive or negative impact on their consumption (water, electricity, gas), the carbon footprint, air quality or the sustainability of their building. Training and informing the general public of these parameters and also of eco-gestures, is essential. Much of our work now includes these components, enabling those concerned to take ownership of the results. //



The circular economy and building resources

ALEXANDRA LEBERT
DIRECTOR STRATEGIC AREA OF RESEARCH

In order to guarantee the construction sector a degree of sustainability in the use of materials, it is essential to massively expand practices around the circular economy, and in particular, to ensure better end-of-life management of products and systems...

Absolutely. Like other sectors, the building industry is going to have to face increasingly difficult access to natural resources. The circular economy, thought-out in all its dimensions, allows us to design and deploy solutions to meet this challenge. It scrutinises our need for resources (quantity, type) by striving for material frugality, replacing secondary raw materials with virgin materials, designing projects with objectives in terms of performance sustainability, ease of maintenance, ability to change use or to be reused or recycled.

The circular economy means considering the existing building stock as also being a bank of materials for future needs. In order to move from concept to established practice, several projects need to be carried out: understand how to measure the performance of products and systems, recognise the performance of products that have passed through a reconditioning centre, deconstruct products with the objective of reuse or recycling, put together players looking for these products or making them available, gather feedback from economic models. Where these subjects are concerned, the CSTB is involved with operational players in research projects, demonstrators and working groups with the aim of making methods, guides, tools and data available to all. It should also be reiterated that the circular economy is a lever for decarbonising the building sector – a mission carried out by the “Buildings and cities facing climate change” strategic research action – and for meeting our national objective of climate neutrality.

What are the main actions to be taken?

Implementing the circular economy requires the building of trust and confidence. Beyond shared ambitions and common terms, the definition of common metrics will enable players to engage in dialogue built around quantified objectives, monitor them and communicate their results. Thus, we are working with manufacturers, contracting authorities and project managers on indicators associated with components and structures to make the steps that we’ve taken as well as the actual pressure that their projects exert on natural resources, clearer.

The culture of the circular economy is still far too marginal. The CSTB is helping it to emerge and become better known so that it will become a standard component of building projects in the same way as energy performance, for example. It will become common place once the players are clear on the stakes and have got their heads round the solutions and working methods as well as the demonstrator projects to be analysed. As far as the CSTB is concerned, the aim is to improve and share a place-based knowledge of the flows of resources and waste, to encourage communities of actors to experiment and take part, to build consensus to standardise practices, particularly reuse, to spread the news about these practices widely and, finally, to understand their appeal but also their obstacles where the actors are concerned in order to enable the sector to overcome them.

In its quest to extend useful lives, the circular economy scrutinises the ageing of products, materials and components that are required to be used several times in succession in ever-changing climatic conditions. Better knowledge of their durability ascertained through natural or artificial ageing tests in laboratories, is essential.



Drastically reducing pressure on the environment, and in particular preserving water resources, is a major challenge for your strategic research action. What are the means envisaged to achieve this?

In March 2023, the government put forward an action plan for the resilient and concerted management of water, consisting of 53 measures, ten of which concern the building sector directly or indirectly. At the CSTB, the Water Department and the Water Management project look at the various issues related to the preservation of this resource. Knowledge of the components of our water consumption is being re-examined and updated, and the performance of cost-effective equipment is being characterised. In order to streamline our use, enable water to be used as a cooling solution to adapt to climate change (by means of natural solutions such as those studied in the “Buildings and neighbourhoods that promote harmonious living” strategic research action) and prepare for changes in the way we access this resource, our role is to make greater water circularity possible. The aim is to be able to implement systems for reusing treated wastewater, or more generally, to increase the use of non-conventional sources of water at the building scale. The success of these projects is based on the integration requirements of the proposed technical solutions, on their reliability and durability, on reconciling technical and health-related performance and on techniques that are often unproven, or even completely new. We are committed to observing and analysing demonstrators at different scales. //



CSTB's social commitment

Taking action for the planet
and future generation / 16

Nurturing human capital
and placing it centre stage / 26

Asserting ourselves
as an independent
ethical group / 36

Taking action for the planet and future generations

The perspective of Stéphane Hameury / 17

Decarbonisation roadmap for the construction industry / 18

Supporting concrete industry players in their environmental transition / 20

FDES configurator for valves and fittings: a win-win tool / 22

The CSTB adopts an ambitious waste management plan / 24

THESE ACTIVITIES MEET THE SUSTAINABLE DEVELOPMENT GOALS:



Innovation needs to be easy to implement

STÉPHANE HAMEURY
OPERATIONAL DIRECTOR, BUILDING ENVELOPE DEPARTMENT

We are collectively aware that our planet is a finite space, the fine balance of which can be threatened by every one of our actions. The effects of climate change and the ensuing environmental crises are here to remind us of this, and are exemplified by the water shortages that our country has been experiencing since the end of 2022.

In this context, rebelling against the rules in order to overhaul our frames of reference is an invitation to call into question the standards established to meet these challenges. By challenging preconceived ideas and daring to think differently, we are creating experimental ground dedicated to change and innovation. If we perceive this as a form of “constructive rebellion”, it can open up new perspectives. Innovators defy the limits, refuse to conform to expectations and therefore explore new territories. Innovation in the building sector needs to enable new technologies and approaches to be developed in order to mitigate climate change and adapt to its consequences. Innovative solutions such as renewable energy, bio-sourced and geo-sourced materials, sustainable buildings and environmentally-friendly transport are helping to reduce greenhouse gas emissions and preserve natural resources. Innovation also needs to promote education and awareness of climate issues, encouraging and accelerating the adoption of sustainable practices and the implementation of effective environmental policies such as the National Low-Carbon Strategy and the implementation of the decarbonisation roadmap for the building sector. All of this must involve the development of disruptive methods for assessing and measuring the environmental performance of buildings. Take, for example, Ecoscale, the CSTB’s service for carrying out environmental assessments of circular designs. Its objective is to characterise the circularity potential of construction products, equipment and materials in a robust and independent manner.



We also need to strengthen experiential learning approaches in order to assess the feasibility of innovations. This will involve stepping up experimentation, monitoring it and building on the experience gained so that innovation can be made accessible to all and thus expanded on a massive scale. This is the challenge of the reform of Technical Experimentation Assessments (ATEX), initiated by the CSTB. Finally, let’s keep in mind that innovation needs to be easy to implement so that it can be adopted on a wide scale. Non-quality in the construction sector is a major source of waste. Errors in design, materials or workmanship can give rise to defects and construction problems requiring costly corrections, and lead to irreversible environmental impacts. To reduce this waste, it is essential to invest in rigorous quality control processes, adequate training and effective communication between stakeholders.

Ultimately, thinking of innovation as rebellion on a large scale is a driving force for sustainable progress. Innovation encourages the calling into question of established standards, paves the way for new ideas and technologies, and promotes large-scale distribution and adoption. Rebellious (constructive) minds are agents of change and the creators of a better future. /

CREATING AND SHARING KNOWLEDGE

Reuse as a lever in the low carbon roadmap for the construction sector

The CSTB and the administration of the Sustainable Building Plan have been mandated by the French government to co-chair, with the support of the General Directorate for Planning, Housing and Nature (DGALN), the development of the road map for decarbonising the building life cycle value chain. The fruit of a long-term project, the road map was submitted to the public authorities on 24 May 2023.

Drawn up by all players in the sector as part of a dialogue and consultation exercise required by Article 301 of the Climate and Resilience Act, the roadmap for decarbonising the building life cycle value chain lists 25 levers for action and proposes just over 120 measures with the aim of contributing to developing the future French strategy for energy and climate (SFEC).

Decarbonisation objective

In accordance with Article 301 of the Climate and Resilience Act of 22 August 2021 on combating climate change and strengthening resilience to its effects, several roadmaps have been drawn up jointly by representatives of economic sectors, the government and representatives of local authorities for each sector that emits large amounts of greenhouse gases (GHGs).

The increase in GHG emissions plays an undeniable role in accelerating climate change. With 153 Mteq CO₂ in 2019, the building life cycle value chain alone accounts for 25% of France's annual carbon footprint. Therefore, the building sector is a contributor to climate change, but is also responsible for finding solutions to achieve carbon neutrality by 2050.

Collaborative work

To this end, dialogue has been established with all stakeholders in the sector (manufacturers, public and private contracting authorities, project managers, companies, operators, etc.) to share their vision of decarbonisation and identify the common actions to be taken. Led by a steering committee of 23 representative professional organisations, some fifty working meetings, involving over a hundred organisations and more than 200 participants, were held throughout 2022.

The CSTB took part in the work with the aim of drawing up an inventory, identifying and prioritising the levers to be mobilised with regard to the estimated potential savings of GHG emissions, characterising the levers used and, finally, quantifying the carbon impact of some of them. Some thirty CSTB employees from five different departments ("Research and Development", "Building Envelope", "Energy and Environment", "Economy and Resources", "Safety, Structures and Fire Performance") have been mobilised to provide cross-cutting and comprehensive expertise.

Four thematic working groups

The development work was organised according to four thematic working groups, supervised by actors in the sector, designated by the co-chairs:

- **WG 1: Components of structures**, overseen by the Strategic Committee for the "Construction Industries" Sector (CSF IPC) and the Social Union for Housing (USH);
- **WG 2: New constructions**, supervised by the French Building Federation (FFB) and the Fédération Syntec¹;
- **WG 3: Renovation of existing buildings**, supervised by the Confederation of Crafts and Small Building Enterprises (CAPEB) and the National Council of the Order of Architects (CNOA);
- **WG 4: Operation and use of buildings in their environment**, supervised by the Federation of Real Estate Promoters (FPI).

Low carbon roadmap for the construction sector: the 25 levers

The low carbon roadmap for the construction sector proposes 25 levers for action, i.e. more than 120 measures, with the aim of contributing to the French strategy for energy and climate (SFEC). For each lever, the stakeholders in the sector have endeavoured to contextualise their proposal, identify any existing obstacles, and determine the R&D needs, but also needs for new skills and additional jobs. They have also proposed concrete measures for implementing each of the levers, distinguishing between actions related directly to their respective missions and proposals for changing public policies (regulations, taxation, financing, etc.). The low carbon roadmap for the construction sector was submitted to the French government by the CSTB and the administration of the Sustainable Building Plan on Wednesday 24 May, in the presence of Christophe Béchu, Minister for the Ecological Transition and Territorial Cohesion, Agnès Pannier-Runacher, Minister for the Energy Transition, Clément Beaune, Deputy Minister for Transport, and Olivier Klein, Minister Delegate of Cities and Housing. //



1. The Fédération Syntec represents companies specialising in digital, engineering, consulting, event management and vocational training professions.

IN BRIEF

A DRAFT DIAGNOSIS AND EVALUATION METHODOLOGICAL GUIDE FOR REUSING CARPET TILES

As part of the research funded by the CSTB, the "Economy and Resources" and "Floors and Coverings" departments have been working on an initial methodological guide for reusing carpet tiles.

In this context, discussions have taken place with contracting authorities, and visits to several reconditioning platforms have been organised to better understand how this approach is articulated out in the field and what the CSTB could provide.

In addition, the CSTB's Health and Comfort department has been able to conduct tests to characterise emissions of volatile organic compounds and formaldehyde on reused carpet tiles. These were the first investigations of their kind, with the CSTB fully committed to the subject of the circular economy.



A WORD FROM AN EMPLOYEE

VIRGINIE CORDIER

Evaluation Engineer

Floors and Coatings Department

SUPPORT IN THE DEVELOPMENT OF REUSE

// I wanted to get involved in the field of reuse by participating, in particular, in the drafting of guides, because this is a subject dear to my heart, both professionally and personally. The planet's resources are not infinite and waste management is a very real challenge. It is particularly sad that we are wasting materials and equipment that could potentially still be used after being overhauled. In the construction sector, reuse is still in its infancy, but it is of interest to many stakeholders, which makes it a real subject of interest for the CSTB. Actively participating in this dynamic is very motivating. I have been working for fifteen years in the evaluation of soil processes at the CSTB, and linking this with the research being carried out has given me a much more macro vision of the construction sector.

This collaborative and cross-cutting mode of operation, which involves different working methods, puts everyone's skills to work to advance the scope of reuse. //

IN BRIEF

PowerDIS
UrbanPrint

CSTB AND EFFICACITY SUPPORT DEVELOPERS WITH POWERDIS AND URBANPRINT SOFTWARE

In a context where it is essential to reduce the carbon footprint and save energy, the entire chain of actors in the construction sector has a contribution to make, and this starts with developers, who design the city of tomorrow. To support them, the CSTB and Efficacy have made PowerDIS and UrbanPrint software available to them. UrbanPrint is a decision-making tool used for carrying out assessments, based on the life cycle analysis (LCA), of the energy/carbon and environmental impacts of new builds, refurbishments or mixed urban development projects. It supports local authorities and developers in defining their quantified objectives and backs up their recommendations to promoters and builders. PowerDIS, which draws on CSTB's Dimosim urban energy simulation calculation engine, is used to assess the energy needs of a neighbourhood and to estimate the impact of thermal renovation actions. It makes it possible to calculate the energy consumption of a neighbourhood and reliably forecast the energy dynamics of a project at different stages of the construction process.

Presentation of the software
UrbanPrint

Presentation of the software
PowerDIS

SUPPORTING INNOVATION

Supporting concrete industry players in their environmental transition

Through its support of low-carbon concrete manufacturers, the CSTB is the gateway to recognition for new materials or processes with a reduced carbon footprint before they are put on the market. Around ten Technical Experimentation Assessments (ATEX) have been issued to date and others are currently being evaluated.

This support came into being in 2018 to meet the demands of low-carbon concrete players. In order to successfully complete their environmental transition, many professionals in the sector are developing innovative binders or aggregates in the formulation of low-carbon concrete, or rethinking their products to achieve material or alloy savings (reinforced concrete, pre-stressed concrete, etc.) or to promote reuse. The CSTB's expertise is helping them to move from the level of the material to the scale of the entire building, and to test the mechanical performance. Obtaining a Preliminary Technical Evaluation of Material (ETPM) provides a solid basis for recognition of the material on the market. *"The aim is to ensure that innovative structures and semi-structures meet all chemical and environmental mechanical requirements, and that they comply with the conditions of use,"* explains François Boutin, Project Manager within the Mechanical Studies and Tests division of the CSTB's Safety, Structures and Fire Performance department.

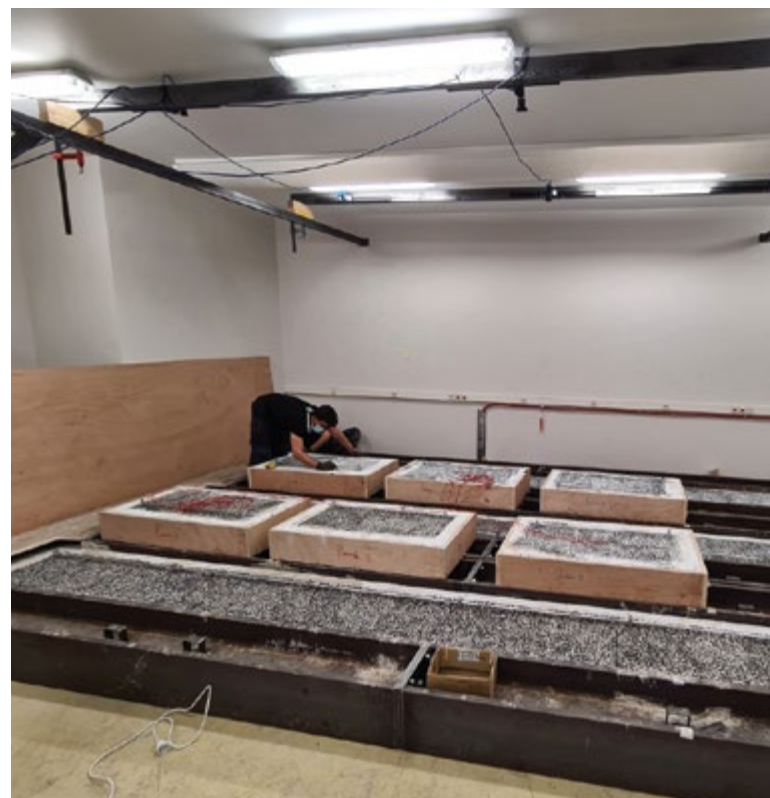
Ensuring the sustainability of the works

The carbon weight of concrete is highly impacted by the choice of cement. Portland cement is one of the more carbon-intensive binders, in particular due to the clinker production process (heated to 1,450°C and decarbonisation of limestone during this heating process). Innovations include new dairy-type binders for blast furnaces, fly ash, clay (burned, raw, flashed, etc.). Beyond the impact on environmental performance, these changes in composition mainly have an impact on the structure: shrinkage, creep, adhesion of reinforcements, grip kinetics, resistance, reaction to fire, etc. These different behaviours sometimes require practices to be shaken up, both on site and during the design process. *"Our mission is to reiterate the fundamental assumptions set out in concrete calculations and the Eurocodes, adapt the calculation code and, if necessary, support the players in defining the construction measures to be taken in order to ensure the sustainability and safety of the structure,"* continues François Boutin. *"For example, if low-carbon concrete setting kinetics are slower, longer formwork times will need to be considered, and the site, and training of workers will need to be reorganised. Similarly, less anchoring of the rebars can have repercussions on the dimensioning of the concrete or on the reinforcements. In terms of carbon weight, the question then arises as to what is the carbon gain if the concrete requires an increase in the density of the reinforcement?"*

Issuing Technical Experimentation Assessments (ATEX)

We propose two technical assessments: one for the material (ETPM) and the other at the scale of the entire building (ATEX) for each part of the structure (floor, wall, slab, etc.). *"We offer as many assessments as there are processes in which the material may be used. With ATEX, we rely on an identity card for the material and its properties, established during the ETPM, while specifying the control plan to ensure quality during its production,"* says Étienne Prat, Evaluation Engineer in the CSTB's Safety, Structures and Fire Performance department. We are currently focusing on ATEX case A (refers to a product or process applied at different work sites for a given limited period) or ATEX case B (concerns an identified implementation project, i.e. the application of a constructive technique to be carried out at a specific work site). To date, around ten ATEX certificates have been issued for cast-in-place structures such as stairs, slabs, superficial foundations, façade panels and load-bearing panels. At least five more ATEX certificates are expected to be issued this year. After this first stage which involves checking the structure's compliance with safety standards, come questions about the compatibility of coatings, adhesives, durability, acoustics and thermal characteristics. *"For these subjects, we are the main point of contact for other CSTB laboratories or outsourced external service providers. We are the gateway,"* comments François Boutin.

In 2018, Hoffmann Green Cement Technologies was the first player to benefit from this support. Other major players in the cement industry have been using this service over the past two years. *"We are growing rapidly in terms of applications, and this is also forcing us to restructure ourselves."*



A WORD FROM THE EMPLOYEES

FRANÇOIS BOUTIN,
Engineer, Project Manager
Safety, Structures and Fire
Performance department

ÉTIENNE PRAT,
Evaluation Engineer, Rapporteur
Safety, Structures and Fire
Performance department

SUPPORT FOR LOW-CARBON PLAYERS IN THE CONTEXT OF THEIR EXPERIMENTAL APPROACH REQUIREMENTS AND EVALUATION OF THEIR MATERIALS

Over the past two years or so, the objective of attaining carbon neutrality by 2050 has led many construction and cement industry players to ask the CSTB to support them in the process of evaluating their construction materials and processes with a reduced carbon footprint. As the first point of entry for these players, the Safety, Structures and Fire Performance department has been able to adapt itself in order to offer them the support and skills of our various business lines (assessment, expertise and experimentation) and to position the CSTB as an essential link in the development of these new materials which meet the challenges facing our society.



A WORD WITH AN EMPLOYEE

KARINE HECQUET,
Sales and marketing director

COMMERCIAL SUPPORT FOR LOW-CARBON PLAYERS

Conscious of the need to reduce the carbon footprint of their material, and wishing to do so, concrete and cement manufacturers are offering highly innovative solutions such as clinker-free or non-standardised cement. I am very aware of environmental issues and share a sense of the need to act quickly. So I'm delighted to take part in their projects as a dedicated point of contact for sales, promoting coordination. The CSTB's support of these players requires quick and nimble work which I particularly enjoy. It's also quite complex because it calls for a wide range of skills and services from the teams. Good planning and the responsiveness of each individual are key factors in speeding up the time it takes to get these products on the market in complete safety, and, ultimately, in reducing the carbon impact of the construction industry. Therefore, the CSTB is fully committed to helping the sector transform for the benefit of us all.

IN BRIEF

BIO-SOURCED MATERIALS AT THE HEART OF INNOVATION

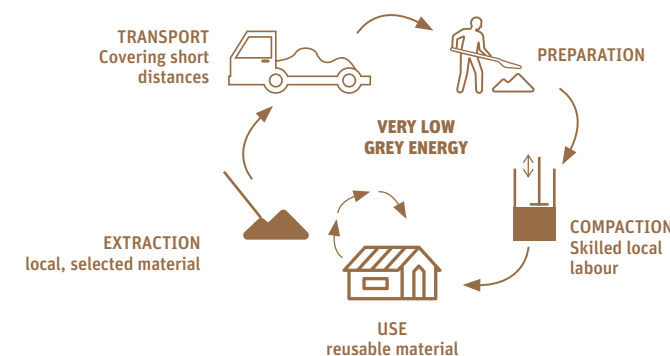
In terms of Technical Appraisals and Technical Experimentation Assessments, more and more evaluations (studies, tests, etc.) are focusing on the performance of bio-sourced materials. New bio-sourced materials such as straw or recycled materials, such as cellulose wadding, are regularly tested in thermal insulation systems. The assessment focuses on the durability of these materials – for example, on their settlement over time. For these materials that are sourced from living organisms, it is important to regularly check, in situ, the absence of fungal development and the possible absence of water inside them (or in their direct environment due to the effect of condensation) caused by hygrothermal transfer. hygrothermiques.

IN BRIEF



NATIONAL RAW EARTH PROJECT: REUSING THIS MATERIAL WITH MULTIPLE QUALITIES

Set up in 2021 by the Research and Innovation department of the French Ministry of Ecological Transition and following four years of preparatory work, the "National Project Terre Crue" (National Raw Earth Project) aims to enable the large-scale deployment of raw earth construction. In this context, and following calls for proposals launched by ADEME and the French National Research Agency (ANR), the CSTB is heavily involved in three research projects, the main objectives of which are to study techniques for implementing raw earth (cob, rammed earth, adobe, light earth, packed earth blocks, render, etc.), to better understand its behaviour under different types of constraints (mechanical, acoustic, water, fire, etc.), and to study the durability of the structures. Each project, the duration of which varies between two and four years, involves several partners, both academic and industrial. Characterised by its low environmental impact, raw earth boasts great hygrothermal and acoustic comfort. However, the material also presents obstacles to the widespread adoption of its use such as the re-appropriation of old construction techniques by current players or the guarantee of the performance of buildings over time due to the wide variability of raw materials. Considered as the main stream of inert waste by the construction sector, the earth produced when carrying out earthworks for buildings can also be reused to some extent.



SECURING AND ENHANCING PERFORMANCE

FDES configurator for valves and fittings: a win-win tool

To respond to the increasing demand for environmental and health declarations (FDES) and environmental product profiles (PEP), the CSTB is setting up an FDES configurator dedicated to sanitary valves and fittings and their associated accessories (drains, showers, etc.). It could also eventually apply to fittings in buildings, pipework and other construction-related products.

Contracting authorities and project managers are always asking for more details about the environmental performance of construction products and systems. Manufacturers too are increasingly requesting individual environmental and health declarations (FDES) and environmental product profiles (PEP). Faced with this influx of demands, the lead times are only getting longer. *"This enthusiasm is explained by the entry into force of RE2020, but also because manufacturers have clearly understood that, on the one hand, default values are destined to disappear and, on the other, collective FDES, although very useful, do not highlight the individual efforts of manufacturers,"* says Florence Wagner, Research and Expertise Engineer in CSTB's Energy and Environment department and Technical Project Manager for this tool. It is for all these reasons that the CSTB has designed this configurator which, for the time being, is reserved for sanitary valves and fittings only, and which allows manufacturers to more easily produce their own FDES themselves.

Simplifying procedures

This FDES configurator has been set up to include all materials, components and processes required to manufacture valves and fittings: brass valves, cartridges, bodies and spouts, energy, modes of transport, waste treatment. The end-of-life scenarios for each element were modelled using information from recognised environmental databases. Once connected, the manufacturer has access to a pre-populated library and to a form indicating the values corresponding to its own products. *"We have designed a real FDES blueprint that allows manufacturers to fill in the fields with ease,"* adds Florence Wagner.

Once the data has been integrated, the record is processed by expert life cycle analysis tools (LCA) in order to calculate all the impacts demanded by standards and regulations. The manufacturer then receives the calculation result and the FDES.

Saving time and money

For the manufacturer, submitting an FDES application does not require more than half a day. However, for the LCA expert, creating a record involves using a standard, regulatory database estimated to contain a thousand pages, studying the information provided by the manufacturer, converting this information into environmental data, and drafting a report to accompany the life cycle analysis which is required to draft the FDES. *"This involves a substantial amount of work and the process has to be started again each time for a new record,"* explains Florence Wagner. *"The configurator simplifies this step, increasing the efficiency of the LCA experts and considerably speeding up the process for manufacturers as it currently takes one year to obtain an FDES."*

The verification procedure is simplified compared to requests submitted in the traditional way. The processing time is therefore divided by six. In terms of cost, the savings are significant for manufacturers: €500 for the verification carried out with the configurator versus €3,500 via the traditional route.

The configurator makes it possible to keep up-to-date at all times and to remain independent of changing standards: *"For example, the changes to the methods introduced in November 2022 have been integrated,"* adds Florence Wagner. It is also and above all an aid for ensuring the environmental optimisation of industrial products as it is possible to simulate the impact of a change of supplier or of materials. *"If a manufacturer wants to reduce the quantity of brass and increase the quantity of plastic, it can create an FDES simulation and then work on its design again,"* explains Laurent Rousseau, Head of the Sanitary and Building Equipment division within the CSTB's Water Department.

A collaborative approach

This configurator is currently limited to valves and fittings. *"The Water department was a driver for this project because the market demand for FDES is high, manufacturers are numerous and the potential is real. The components used to make valves and fittings are similar, which makes it easier to fill in the fields using a standard form,"* comments Laurent Rousseau. *"Moreover, this project was launched at the request of the manufacturers, who expressed the need for support. The configurator was created with the participation of eleven manufacturers from small, medium and large companies. Although they came from competing companies, they all sat around the table together to list the product libraries, validate the blueprints, certify the calculations and produce their own FDES from the configurator."*

"The success of this tool, which is the result of one year's work, is linked to the joint participation of manufacturers, product specialists and CSTB's LCA specialists," adds Florence Wagner. The configurator will be presented to manufacturers in September 2023 and commissioned during the first quarter of 2024. It could then also be developed for other building sectors. Research into the development of other configurators, in particular for pipes and industrial valves, is already underway. //

IN BRIEF

RESISTANCE OF PIPES TO CHEMICALS

After over ten years' R&D work, the CSTB has set up several experimental tools to study the behaviour of tubes and other products that come into contact with water intended for human consumption, and that are subjected to chemical aggression from disinfection products.

For example, the accelerated ageing of pipes in a hospital environment leads to many accidents. To respond to feedback from the field, the CSTB has developed test protocols to assess the resistance of pipe materials to chemical attacks by disinfectant products, in particular polymer and elastomer materials used in drinking water supply networks.

The ultimate objective is to provide contracting authorities, design offices and operators with the necessary information about the compatibility of disinfection products with pipes. This will be made available via a support guide to help choose sustainable operating solutions suitable for all products, which it will be possible to use both in the design process by project management teams and when the systems are being operated by water treatment companies.

IN BRIEF

PIPES, PVC WINDOWS, COATINGS: RECYCLED MATERIALS ARE BECOMING MORE WIDELY INTRODUCED

With the aim of preserving the environment, limiting waste production and streamlining the use of resources, manufacturers are increasingly offering innovative products which contain recycled materials. Launched by the CSTB, in consultation with pipe and connector manufacturers, a research project is underway to measure the sustainability of pipelines, according to the percentage and quality of the recycled material used to manufacture them, in an aggressive environment representative of sanitation systems. In 2022, specific test benches were set up and calibrated, in order to carry out modelling tests on product resistance over time. The virgin and recycled materials that will be used for the study have been selected for their consistency of quality and their strong market presence (polyethylene, PVC, polypropylene). Objective: to reach fifty years – the reference lifetime of pipes made from virgin materials. If the results are conclusive for pipes, this study may be extended to other sanitation products which use these materials, and will allow manufacturers to increase the portion of recycled materials used in products while guaranteeing an optimum level of performance and securing the consistency of the supply quality.

Through its support for innovation and its assessment activities, the CSTB attests to the performance and sustainability of products containing recycled materials. This support covers all stages of development of new products (what portion and to what level of quality should recycled material be incorporated while maintaining good technical and sanitary performance?) up to the verification of product performance and the consistency of quality of the supplied recycled materials. QB34 certification, implemented with professionals for recycled PVC joinery, is a good example of the added value that CSTB can bring by providing the confidence required to recognise practices and facilitate their widespread adoption.

Find out about the certification
QB34 certification 



THE CSTB COMMITTED IN-HOUSE TO CSR

The CSTB has an ambitious waste management plan

As part of its CSR approach, which it reinforces each year, and in line with its involvement in, and daily support for, projects to preserve the environment, reduce the carbon footprint and develop circularity, the CSTB adopted a global action plan for managing its waste in 2022. Led by the Economy and Resources Department created in 2022, this project aims to redefine the CSTB's waste management policy by focusing, in particular, on reducing its volume of waste, developing recycling procedures and implementing centralised and standardised management within its four establishments at Marne-la-Vallée, Grenoble, Nantes and Sophia Antipolis. This project also provides the opportunity to encourage the sharing of feedback and best practices.

A project extended to PEMW for testing and tertiary activities

In order to meet the regulatory requirements for prioritising treatment methods, which constitutes the legal basis for waste management with a view to reducing, reusing and recycling waste, the scope of the project has been designed to cover all Products, Equipment, Materials and Waste (PEMW) from testing and tertiary activities at the CSTB's four sites.

The issues related to this topic are:

- regulatory and contractual, with, in particular, the implementation of the new extended producer responsibility for building construction products and materials (REP PMCB);
 - environmental, linked to the desire to favour the most virtuous management methods (prevention, reuse);
 - economic, with the possibility of the free recovery of waste, introduced by the REP PMCB;
 - organisational, in particular in connection with the optimisation of PEMW management logistics at CSTB's different sites.
- To meet these various challenges, the project has set itself several objectives:

- redefine the action plan relating to the management of PEMW at CSTB's four sites;
- bring the CSTB into compliance with the current and future regulatory framework;
- manage the PEMWs resulting from the CSTB activities, taking into account the processing hierarchy pyramid and ensuring their follow-up;
- raise the awareness of, empower and communicate with, its employees.

Inventory and outlook: an action plan defined based on the hierarchy pyramid of processing methods

During the first phase of the work, the project team, which is made up of members representing the four establishments and the CSTB's operational and functional departments, met up monthly to draw up an inventory of the different themes relating to the management of PEMWs: a regulatory framework, PEMWs resulting from testing activities, management logistics at the four sites, in-house procedures, communication and accountability actions, etc. Based on this comprehensive inventory, the project team was thus able to draw up a plan of action, 29 of which were identified as priorities as part of the PEMW management strategy. To this end, significant human and financial resources were mobilised, with a budget of around €300,000. The actions that have been identified as priorities concern the CSTB's tertiary and testing activities, and are attached to the different levels of the hierarchy pyramid of PEMW treatment methods.

AVOIDING WASTE



PREVENTION

Measures to avoid the production of waste.

"NO WASTE" STATUS



RECOVER

"Any operation by which substances, materials or products that are not waste are used again for the same purpose as that for which they were designed."

WASTE STATUS



REUSE

"Any operation by which substances, materials or products that have become waste are used again."



RECYCLE

"Any recovery operation by which waste (...) is reprocessed into substances, materials or products for the purpose of their initial function or for other purposes (...)"



ENERGY RECOVERY

Recovery of energy produced during waste treatment by combustion or methanisation.



DISPOSAL

Landfill and burying of waste without recovery.

This project will include, in particular, the implementation of a "zero plastic" policy for so-called tertiary activities and, with regard to testing activities, a redefinition of the maximum quantities of products delivered for testing. These actions illustrate the "prevention" phase in the pyramid.

In order to develop and consolidate the company's recovery procedures, it is planned to define a standardised in-house procedure to supervise the sale of products and materials to the CSTB's employees and to associations.

Finally, for recovery through recycling, the project aims to standardise the management of "sorting at source" of tertiary waste as well as to organise the sorting of plastic waste at the CSTB's four sites.

Decided upon and developed in 2022, the action plan saw phase 2 of the "execution" project start in early 2023.

This is explained in detail on the intranet page dedicated to the project.

A project involving all employees

In addition to the project team that has been meeting since 2022 to define and implement this new action plan, the CSTB's PEMW management strategy must involve all its employees. Each employee has a role to play in correctly implementing more virtuous management of incoming and outgoing goods. Using a drinking flask rather than plastic bottles, following waste sorting guidelines and reusing items rather than throwing them away are all everyday actions that will ultimately facilitate the reduction of waste production and the effectiveness of their treatment.

In addition, the project team has set up an ideas box to collect questions or suggestions from each employee via an online questionnaire. One of the plan's priorities is to encourage CSTB's employees to take the initiative in managing PEMW and will therefore make it possible to act on the basis of proposals put forward. //

IN BRIEF

THE CSTB IS COMMITTED TO THE DEVELOPMENT OF SOFT MOBILITY

The CSTB is adapting its infrastructures and equipment to accommodate alternative mobilities.

At the Champs-sur-Marne site, a bicycle shelter comprising 27 bike stands and three recharging stations for electric bikes and scooters was installed during the renovation of the establishment's head office, in line with the work of the Recovery Plan. At the Sophia Antipolis site, in addition to implementing a workshop for overhauling employees' bikes, in connection with the Company Mobility Plan in favour of eco-responsibility, a bicycle shelter has also been installed. At the Grenoble site, the provision of a bicycle repair kit and "metro-bike", the removal of one of the service vehicles and the possibility of using a car as a car-share form part of the initiatives put in place by the establishment to encourage low-impact mobility. Given the increase in the number of users, the redevelopment and addition of a bicycle shelter, and potentially a repair/tyre pumping area, are being studied.

The CSTB is training its employees in the use of soft mobility

At Champs-sur-Marne, "CSTB Day" provided the opportunity to bring together over thirty employees on the occasion of a bicycle repair and maintenance workshop.

At Sophia, several communication actions aimed at raising awareness about maintenance and the quality of equipment, reducing risks for cycling in complete safety and the development of, and compliance with, the highway code have been put in place. This last point will be the subject of a training course in 2023. At the same time, the Nantes site will organise an annual programme including training, maintenance and equipment.

The CSTB participates in collective initiatives

In 2022, the CSTB's establishments in Grenoble, Sophia Antipolis and Nantes have committed themselves to the "Objectif employeur pro-vélo"(OEPV) or "Pro Bikes Employees Objective" label, which supports employers in promoting active mobility with their employees, and starts with a self-test in order to define the measures to be implemented. The Sophia establishment took part in the Sophia Antipolis Mobility Challenge from 19 to 23 September 2022 to promote alternative modes of transport.

A total of 1,427 kilometres were covered using alternative transport as part of this initiative.

For the fourth consecutive year, the CSTB establishment in Nantes took part in the Mobility Challenge. During this week-long collective challenge, employees from companies and pupils from schools in the region worked together to travel using alternative modes of transport. A 2022 award winner, the company climbed to third place on the podium in the category of 100-499 employees, with 29 participants and 67,290 kilometres completed. Finally, every year, the Grenoble establishment takes part in the Mobility Challenge designed to promote alternative modes of transport to individual cars.

Nurturing human capital and placing it centre stage

The perspective of Éric Coignoux / 27

Digitisation of rules and BIM:
a question of semantics? / 28

Walk-in showers for improving accessibility / 30

“Window installation service”
QB certification, the guarantee of quality / 32

CSTB’s HR policy: well-being
and corporate cohesion objectives / 34

THESE ACTIVITIES MEET THE SUSTAINABLE
DEVELOPMENT GOALS:



Construction trades are essential to the success of this global renovation initiative.

ÉRIC COIGNOUX
DIRECTOR OF PUBLISHING AND TRAINING

The challenges facing the construction and urban development sectors in the face of climate change are numerous, as its impacts, both health-related and economic, are significant for building users.

Consequently, these challenges are calling us to examine potential levers for decarbonising the building sector as part of a logic of mass renovation, preservation of resources, development of the circular economy and optimisation of the use of buildings. In all these areas, the CSTB is being called upon to assert its expertise and mobilise the multidisciplinary skills of its teams. At the heart of this ecosystem, the Publishing and Training department is responsible for spreading and sharing knowledge with stakeholders in the sector.

However, faced with these new challenges, skills and know-how are destined to transform themselves. Fully aware of this, the CSTB must keep pace with these developments. This is why it strives to bring together the various players involved to create synergies and offer content adapted to these changes. Raising awareness of project management thus remains its main objective through its training actions.

Continuous vocational training is also a major component of the appropriation of knowledge at the CSTB: theoretical and notional training on themes concerning innovation, but also on regulatory subjects (fire regulations, acoustics, environmental regulations, etc.).

The aim is to always stay ahead of the game where developments in the sector are concerned, as “CSTB Formations” training courses have done with the BIM and the digital model, or by supporting the E+C- label and the appropriation of the RE2020 through massive open online courses (MOOCs), which have made it possible to train several thousands of people. To support the rise of the circular economy, “CSTB Formations” also contributed to the development of the repository for the new profession of PEMW diagnostic specialist, for which certification training sessions have been developing across the country for over a year now.



A flagship project for decades to come, renovation requires a skilled workforce to integrate new, more resource-efficient construction techniques. The construction trades are essential to this global renovation initiative. However, the sector is in short supply of competent personnel in this area. Hands-on training, and, in particular, everything we put in place around windows and panes, is an essential lever for ensuring a building's quality and durability.

The building sector is now in the throes of change, and this raises many questions. The actions of the CSTB are intended to be a response to questions concerning the development of the skills of actors in the sector and, by extension, those of its own employees.

At the cutting edge of innovation, these employees need to master not only their own expertise, but also concepts that interface with them, in order to better understand the building and its environment. The development of skills is in the CSTB's DNA for everyone looking to open up new perspectives. The teams can access this initiative through the skills development plan, set up by the Human Resources Department, and drawn up in part with the INTER offer of CSTB Formations. The CSTB also welcomes and trains many work-study and doctoral students who play their part in enriching the company's human capital. //

CREATING AND SHARING KNOWLEDGE

Digitisation of rules and BIM: a question of semantics?

The feasibility of digitising rules (accessibility, fire safety) has been demonstrated by several initiatives. Thus, it is possible to check the conformity of a building's digital model with respect to a regulatory baseline, or to obtain lists of compliant products for a given model according to its environment. There are many avenues for development, particularly within the scope of the digital twin concept.

The digitisation of professional rules is not a recent development, indeed, the first expert systems date back as far as the 1960s. *"The principle has already been thought out, particularly by certifiers. However, the problem with these approaches is the cost of maintenance, which is exorbitant. This is all the more the case because rules and standards develop and change, and everything needs to be updated,"* asserts Bruno Fies, Research and Expertise Engineer in the CSTB's Information Technology department. Nevertheless, since the advent of so-called "semantic" technologies, the maintenance of such systems can finally be envisaged with more reasonable costs. The first efforts consisted precisely of ensuring the feasibility of the project and of developing a method and architecture that could allow certain parameters to be modified without calling the entire genesis into question. *"We didn't hard-code in the same place. It's possible to make changes without changing the rules via data management mechanisms,"* continues Fadi Lahlou, Development Project Manager in CSTB's Technical Department.

A design aid tool

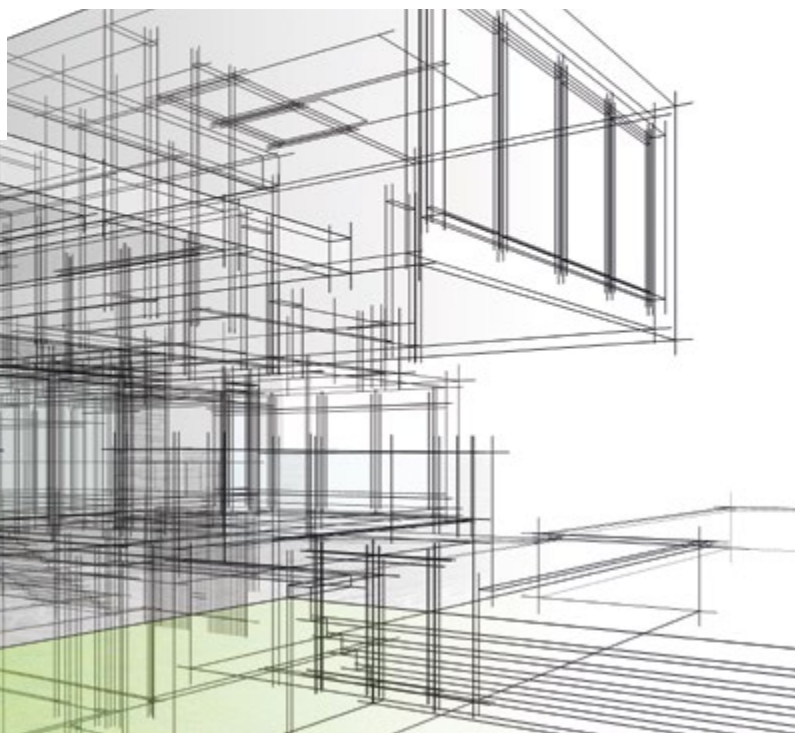
According to the CSTB's Information Technology department, the most notable works in this area date from the Digital Transition Plan in the building (2016), and then from the 2022 BIM plan (2019). The aim was to transcribe regulatory constraints, initially expressed in natural language, into digital language so that they could be interpreted by machines, and then to compare them with digital models for buildings. The idea was to offer users, right from the design phase, a service that could help control the compliance of their Building Information Modelling (BIM) models with regard to the regulations. The first digitisation processes were conducted in the areas of building accessibility and fire safety – identified due to the significant market opportunities that they represent. Proof of concept (POC), the tool was made available on Kroqi, a BIM collaborative work platform for construction professionals.

Beyond the control of digital mock-ups, this approach and these technologies apply almost identically to product prescription services. It is thus possible to digitise unified technical documents (DTUs) and offer prescription services for products adapted to a BIM model, presented as a system input. The designer can choose materials or solutions according to regulatory constraints, check the conformity of the project according to its environment right from the design phase, or even carry out monitoring while work is being carried out on site. A veritable design aid.

Finding a common language

Among the avenues for development, the engineers of the Information Technology department are seeking to link the digitisation of rules to the concept of a digital twin, which will make it possible to monitor the construction of a project during the building phase and even beyond the during operation, maintenance and renovation phases. This is especially interesting because the question of the reversibility of buildings and changes in its use are at the very heart of the issues. *"It would then be possible to consider reviewing the elements of the model and adapt the building to its new use, and to change the rules according to how the building is used,"* emphasises Fadi Lahlou. Today, the need to find an environment that can host and highlight these digitised rules still remains.

However, the issue is not just technological. The main obstacle to the digitisation of rules remains the development of a common language which can be understood by all. *"One concrete example is that of the pathway required to take accessibility into account. However, the concept of a pathway does not exist in the digital model and cannot be transposed in its current state. So it was necessary to establish links between all these vocabularies in order to develop a common lexicon,"* explains Bruno Fies. This involves the creation of a panel made up, in particular, of architects, engineers in charge of digital modelling, product manufacturers and certifiers. The aim of this panel will be to enrich and maintain this knowledge base which contains both digitised rules and a universal and cross-cutting lexicon, with the CSTB wishing to remain the leader of this project. //



A WORD FROM AN EMPLOYEE

SARAH MEDYNSKI
Engineer, Business Project Manager
Technical Department

MONITORING CHANGES IN THE CONSTRUCTION PRODUCTS REGULATION

// In March 2022, the European Commission presented its draft revision of the Construction Products Regulation, which includes ecological and digital transitions, in particular. This project will profoundly transform the working environment of the entire construction ecosystem, from manufacturers to entrepreneurs.

The CSTB is closely monitoring this project in order to analyse the impact it will have on the construction and renovation of buildings, and the ability of stakeholders to respond to the essential challenges that the building stock will have to face in the coming years.

This involves studying the many proposals from the different European bodies which include the European Commission or the European Parliament, and all the stakeholders involved.

This collaborative work enjoys a wealth of exchanges with all the parties concerned (experts from the CSTB, manufacturers, professional federations, European counterparts, associated ministries, etc.) to fully understand their motivations and objectives. //

IN BRIEF




RENOPTIM: OPTIMISING THE SUMMER COMFORT OF APARTMENTS BY LIMITING THE USE OF AIR CONDITIONING

Preparing France for a four-degree rise in temperature means anticipating severe heat waves, which are becoming increasingly numerous and lasting longer, and resulting in discomfort in buildings, especially in apartment buildings. Indeed, the latter are particularly exposed to the urban heat island effect. They can rarely be cooled at night by natural ventilation – i.e. by opening windows – because the outside temperature usually drops very little and, what's more, outside noise pollution is often very great in cities.

Faced with this observation, the Renoptim project, which stems from the PROFEEL programme¹ and is supported by the CSTB's Energy & Environment department, in partnership with the Union for Social Housing, aims to improve the summer comfort of apartment buildings exposed to the heat risk, without the use of air conditioning, which consumes energy and therefore generates greenhouse gases.

The project aims to design and make available digital applications that will make it possible, within a real estate portfolio and a residential complex, to target the housing units to be treated as a priority according to the level of comfort felt and their ability to adapt to heat waves, and also to identify and select the existing technological devices most capable of achieving this.

A decision-making tool, an eco-gesture guide and practical information sheets will thus give building stock managers the opportunity to use these low-carbon solutions and provide the occupants of the housing unit with greater comfort while maintaining the use value, and therefore the asset value of the buildings. Renoptim will run for three years and the first deliverables are due in 2024.

Renoptim: a project stemming from the PROFEEL programme 
Discover the eight projects of the PROFEEL programme 

1. PROFEEL is a programme supported by professional building organisations and funded by the French state's Energy Savings Certificate (CEE) which aims to facilitate and improve the upgrading of energy efficiency in existing buildings in order to meet the challenges of the energy transition.

SUPPORTING INNOVATION

Walk-in showers to improve accessibility

In 2022, the CSTB published a guide on the implementation of accessible walk-in showers on concrete substrates in private shower rooms in new builds. It presents the technical solutions that exist and the products suitable for designing this type of structure.

Accessibility regulations now stipulate that showers have to be fully accessible. Previously authorised, the difference in level of maximum two centimetres between the shower room floor and the shower area is now prohibited in new apartment buildings and individual housing units. Instead, walk-in showers are now required, the aim of which is to allow access to the shower area for all persons with restricted mobility, both the elderly and people with disabilities. One of the reasons for this new provision is to encourage the elderly to live at home. To this end, the French Department for Housing, Urban Planning and Landscape (DHUP) asked the CSTB to revise the Guide to implementing walk-in showers in private shower rooms in new builds, originally written in 2012.

Technical constraints

The new guide designed by the CSTB, the title and content of which have been amended to comply with this regulation, specifies the general conditions for the construction of accessible walk-in showers on concrete substrates in private shower rooms in new builds, and presents the construction solutions technically evaluated and known to date.

As a walk-in shower is a technically complex structure to build, different constraints must be taken into account such as the flow of water to the evacuation device, the waterproofing of the substrate, the slipperiness of the shower area, the acoustics, and the electrical regulatory requirements. To ensure accessibility, minimum dimensions of 120 x 90 cm must also be observed for the shower area and the adjacent areas (space for using the shower and manoeuvring space).

A working group made up of different actors from the construction process met together over several months to produce the revised guide. The 80 highly committed participants included developers, companies, manufacturers, technical inspectors, insurers and experts. The challenge was to identify the technical solutions that exist and have been validated to date, and also to determine the technical difficulties to be resolved and the products to be developed to improve the solutions available.

Several technically evaluated solutions

For the two possible configurations, i.e. open shower spaces and partitioned shower spaces, three ways of creating a walk-in shower have thus been identified: shower spaces with masonry walls, shower bases ready for cladding and finished shower bases.

However, the guide does not absolve players from their responsibility to demonstrate the suitability of each type of shower to each different building in question, while respecting DTU, ATec or ATEx requirements, especially as not all product combinations have yet benefited from feedback in France. This guide, which is intended to alert designers to the measures to be taken according to the type of installation configuration chosen, is a provisional version which, in the short term, is waiting to be completed by other technical solutions (in particular for finished shower bases) once they have undergone technical assessments.

The CSTB is supporting all professional sectors in this development both by evaluating innovative solutions and by providing certification.

Walk-in showers also compatible with wooden floors

In line with this new regulation, and as part of the design of the Athletes' Village, the CSTB and the Olympic Works Delivery Company (SOLIDEO) have also drawn up a guide on the implementation of accessible walk-in showers on wooden floors in private shower rooms for new builds. Published in early 2023, this guide specifies the general conditions for constructing accessible walk-in showers with ceramic (or similar) or natural stone cladding on wooden floors. The guide is the result of a collective effort undertaken by players from the wood sector, including: ADIV Bois, France Bois 2024, the FCBA Technological Institute, the Committee for the Development of French Furniture and Timber Industries (CODIFAB) and France Bois Forêt, while drawing on the various actors involved in the construction process within a working group.

It has been designed to ensure accessibility for athletes with reduced mobility during the Olympic Games in Paris in 2024, but also with a view to converting the Village into a residential neighbourhood (housing units, hotel rooms, residences for the elderly and students) by 2025. //



Find our guides for implementing accessible walk-in showers in private shower rooms in new builds:

- on concrete substrates
- on wooden floors



A WORD FROM AN EMPLOYEE

WENJUAN WEI

Research and expertise engineer
Health and Comfort Department

**WINNER OF THE YAGLOU PRIZE
(INTERNATIONAL PRIZE AWARDED
EVERY TWO YEARS BY THE ACADEMY
OF FELLOWS OF THE INTERNATIONAL
SOCIETY OF INDOOR AIR QUALITY
AND CLIMATE - ISIAQ)**

// I was awarded the Yaglou prize at the Indoor Air 2022 conference for my “high quality and internationally recognised” research into the transport of endocrine disruptors in buildings and the quality of indoor environments. Awarded by ISIAQ, this prize rewards the scientific output of young researchers within the community of experts. This highly selective international prize is awarded every two years, and I am France's first ever prize-winner. Having received a Marie Curie grant which enabled me to carry out a post-doctorate in 2016, I then took part in several European and national research projects within the Health and Comfort department. Today, this international recognition of the work that I carry out for the CSTB is a source of pride for me. //

IN BRIEF



ITHACA: FOR SIMPLER ENERGY EFFICIENCY

In 2022, the start-up booster, CSTB'Lab, continued to support the technical developments of innovative start-ups from the construction sector. Objective: to help start-ups (whose activities are associated with one of the four strategic areas of action of the CSTB's research) reproduce their innovations at a scientific level, while taking regulatory building constraints into account.

Ithaque, the activity of which is linked to the “Buildings and neighbourhoods that promote harmonious living” strategic action area, supports owners in developing the energy efficiency of their properties, and thus helps to improve user comfort. The start-up, which was created in 2021, is directed at all property owners (landlords or owner-occupiers) and offers them support during the three stages of a renovation project: energy audits, the search for craftsmen, and financing.

The highly qualified team of experts carries out audits that are certified by the “RGE” (Recognised Guarantors of the Environment) label, and are adapted to the requirements thanks to a clear understanding of the project and thermal simulations that make it possible to generate the best energy efficiency scenarios. Ithaque has also teamed up with partner craftsmen, also RGE-certified, to offer direct and relevant contact with private individuals.

Lastly, the start-up has built up expertise in financing related to upgrading energy efficiency and advises its customers on obtaining MaPrimeRénov' renovation aid and energy saving certificates.

Upgrading energy efficiency, a major challenge in reducing the carbon footprint of housing, also makes it possible to reinforce the insulation of a building and therefore to improve the quality of life of its users.

As explained by Émilien Paron, Director of the Design High-Performance Buildings division of CSTB's Energy and Environment department and sponsor of this start-up: “Recognising the limitations of regulatory audit tools and current protocols, Ithaque's aim is to improve the reliability of the renovation and decision-making process. Its team has created an innovative field data collection application and is seeking to integrate the CSTB's most advanced simulation engines to provide advice to individuals on the work to be undertaken.”

Discover CSTB'Lab's start-ups

SECURING AND ENHANCING PERFORMANCE

“Window Installation Service” QB certification, a guarantee of quality

The recent “Window Installation Service” QB certification now includes 11 certified companies. Others are set to follow. This enthusiasm attests to the willingness of installers to ensure the quality of their services and stand out from the competition.

Over the past ten years, windows have taken a technological leap forward and manufacturers have not stopped innovating. However, regardless of how effective the window is meant to be, if it is badly installed, it loses all its benefits. This is why companies need to be trained in installing these new products and in the implementation rules. “Window Installation Service” QB certification addresses the concerns of window manufacturers, who see the installation of their products as a guarantee of quality, and who can attest to well-organised work sites and the quality of installation, and thus stand out from the competition.

The importance of the installation

It was in the middle of the health crisis that this certification came into being. Objective: to train companies in installing windows, and to certify the quality of the complete service. These are essential factors, as no compulsory training is required to become an installer. However, a badly installed window can damage the building envelope and lead to heat loss and the risk of a premature end-of-life of products. According to a study conducted by ADEME, over 40% of air leaks from buildings come from windows, the first cause being connection problems between the window and the structural work, or defects in the window sills.

What about certification?

“Window Installation Service” QB certification attests to the quality of service provided by the company. It is based on three areas: the quality and choice of the products installed, the competence of the installation staff and the company’s organisation of their work sites. Installers and metalworkers undergo regular installation training, with an evaluation of skills acquired at the end of the course. In addition, an audit of the company makes it possible to verify its ability to organise projects and take customer satisfaction into account. “We make sure that the installer has the products and accessories required for a proper installation as well as the appropriate instructions. The content of the technical installation file is verified in particular: implementation schematics, measurement sheets, self-checks during the installation, end of construction report and a window maintenance sheet. We also check the follow-up of the after-sales service. Organisation is an essential element. A well-organised project with trained and competent staff is the guarantee that the project will be carried out properly,” says Sophie Cuenot, Head of hands-on training and “Window Installation Service” QB certification within the CSTB’s Windows and Glazing department.

Strong enthusiasm

11 companies are currently certified and six more are in the process of being certified. The goal, by the end of the year, is to reach 25 to 30 certified companies. “Since the end of 2022, demand has increased sharply,” notes Hubert Lagier, Director of Windows and Glazing. “This enthusiasm is explained by the desire of companies to attest to the quality of their service and installation thanks to well-trained fitters.” And this is borne out in practice. According to a survey carried out among the certified companies, this certification is a significant mark of differentiation and offers a competitive advantage, the key being skilled staff and the assurance of a good installation. It also allows companies to lower their insurance premiums and to recruit and retain installers. “This certification is above all a voluntary act by companies wishing to set themselves apart by demonstrating their technical expertise. It requires a limited investment in time and money as its incremental direct costs are estimated at between 2 and 3 euros per window installed,” continues the Director.

Outlook

Four training platforms are currently spread across the country: Grenoble, Saint-Thibault-des-Vignes in the Paris region, La Rochelle and, since March 2023, Toulouse. Other sites in the region could emerge in the coming years in order to offer an even more fine-meshed network. Changes to this certification are being studied. It could thus include a worksite audit being carried out to check the actual installation. It could also take the environment into account with monitoring of site waste management. While it is still too early to comment on these prospects, the main objective will remain the same: to promote and support companies in improving quality without introducing administrative complexity or excessive constraints. //



“Window Installation Service”
QB48 Certifications - CSTB Evaluation
[Find out more](#)



SEREINE, a project stemming
from the PROFEEL programme
[Find out more](#)

IN BRIEF



SEREINE: FOCUSING ON THE ENERGY PERFORMANCE OF BUILDINGS AFTER RENOVATION

Stemming from the PROFEEL programme¹ and led by the Construction Quality Agency (AQC), the SEREINE project brings together around forty scientists with the aim of developing innovative solutions to effectively measure the actual energy performance of housing units and provide a snapshot of this after renovation. A pioneering, reliable, quick and simple method available for new builds and renovated private homes since the end of 2021, SEREINE makes it possible to establish a complete diagnosis of the envelope and the energy systems.

The device is easy to implement: the tested building is prepared in the same way as for an air leak test. After blocking all the air intakes, cutting off the controlled mechanical ventilation and closing the roller shutters to prevent the sun from disrupting the measurements, mobile heaters are installed in each room to inject a controlled thermal input into the interior environment. Sensors are installed in and outside the housing to observe the building’s behaviour. Once the measurements have been carried out, algorithms are used to deduce a standardised indicator which characterises the overall level of the actual insulation. This indicator is very close to the Ubat indicator, well known among heating engineers.

Once the measurements have been carried out, algorithms are used to deduce a standardised indicator which characterises the overall level of the actual insulation. This indicator is very close to the Ubat indicator, well known among heating engineers.

Adapting the method to apartment buildings

SEREINE measurements are currently carried out throughout the country in order to capitalise and share feedback on the actual energy performance of new and renovated private homes. At the same time, the SEREINE project is continuing its development and is preparing, in 2024, for the provision of a suitable energy performance assessment system for apartment buildings.

Thanks to all its tools, SEREINE will promote the development of skills in the sector and secure the renovation (the widespread adoption of which is essential) and construction market by providing guarantees on actual performance.

1. PROFEEL is a programme supported by professional building organisations and funded by the French state’s Energy Savings Certificate (CEE) which aims to facilitate and improve the upgrading of energy efficiency in existing buildings in order to meet the challenges of the energy transition.

THE CSTB COMMITTED IN-HOUSE TO CSR

Objectives of the CSTB's HR policy: to develop well-being and corporate cohesion

Ensuring the well-being and safety of employees, while maintaining their commitment and strengthening the corporate culture, was one of the CSTB's priorities for 2021, a year still marked by the health crisis. In 2022, the sharp decline of Covid-19 enabled the return and the initiation of many opportunities for sharing and social cohesion, thus consolidating these objectives. The CSTB also emphasised quality of life in the workplace and a willingness to engage more with young talent.

In 2022, the CSTB reached the symbolic threshold of 1,000 employees spread across all its establishments in Champs-sur-Marne, Nantes, Grenoble and Sophia Antipolis. This recruitment dynamic, which accelerated in 2021, is explained in particular by the strengthening of the newly created Energy and Environment, and Economy and Resources departments. *"The activity of these two entities focuses on two fundamental principles that underpin the various developments underway in the construction sector: the availability of resources to feed it and the existence of sustainable economic models,"* explains Rémi Leteinturier, Director of Human Resources at CSTB. *"Their essential expertise must meet the major challenges related to limiting environmental impacts and developing the circular economy."*

Quality of life in the workplace

This increase in the workforce was accompanied, at the same time, by an improvement in the working environment of employees through the Recovery Plan, a major programme for upgrading energy efficiency, initiated in 2020. With the initial objective of reducing energy consumption and carbon emissions, this work also contributes to modernising three out of the four CSTB sites. In Sophia Antipolis, the replacement of all windows, French doors and lighting in the three buildings has improved the working conditions of employees by providing them with better thermal and visual comfort.

In Grenoble, the main building has been renovated, like the Champs-sur-Marne administrative building, which was completely restructured in order to be transformed into the establishment's head office. In its approach to improving and modernising its working environments, in order to make progress, the CSTB is relying on and calibrating itself with the OsmoZ label, developed by its subsidiary, CERTIVEA. These two renovations will thus meet the requirements and expectations of this label, which promotes the transformation of workspaces and working methods to meet the needs of companies.

To help the teams take ownership of these new workspaces, delivered in the course of 2023, many hands-on workshops were held with the support of the Kardham group, which specialises in change management, the layout of professional spaces and the choice of suitable furniture. A large proportion of the future occupants were thus able to participate in the layout of their respective work areas according to their needs, the naming of spaces and the definition of the rules of conduct. These exchanges also provided the opportunity to prepare them for the "flex office", set up for the first time at the CSTB. *"The establishment of the 'flex office' in this new building in Champs-sur-Marne logically follows the signing, in 2021, of a company agreement allowing up to three days of remote working per week as well as the digitisation of our working practices,"* explains Rémi Leteinturier. *"These two organisational methods are at once complementary and beneficial: the first makes it possible to provide employees with diverse, user-friendly workspaces that are better*

suitable to each person's needs and uses, the second allows a good balance of personal and professional life, while maintaining real proximity to the teams, a strong collective dynamic and a shared corporate culture."

Health and well-being

Once a year, a day for raising awareness of a health issue is organised for employees from all establishments. On this occasion, three workshops focusing on sleep were organised: sleep and nutrition, understanding your sleep and introduction to "micro-napping" in your chair. On the agenda for 2023: the principles and benefits of nutrition.

A health application, Humanoo, has also been deployed for employees. This digital health coach offers over 3,000 sessions grouped into three themes: physical activity, diet and mindfulness, and over 500 recipe ideas. Thanks to these various sporting and connected challenges, Humanoo also makes it possible to create social ties between colleagues. "Over 25% of the CSTB's employees have started using this fun tool," says Karin Desmazières, Head of Occupational Health and Safety. *"The statistics relating to connections to the application and content viewed showed a strong interest on the part of employees in sports sessions in the morning or at lunchtime, and relaxation sessions in the evening."*

Corporate cohesion

Many moments of discussion and sharing to strengthen social cohesion also marked the year. Under the banner of "living well together", the annual CSTB Day took place simultaneously at the four sites on 24 June 2022. Various events were organised on this occasion: a parasport tournament, artistic workshops, cooking classes, a chess tournament, a concert and an introduction to the Fresque du Climat programme. In 2023, the circular economy will be showcased at this special company day.

In an effort to strengthen onboarding practices, the first day of collective onboarding for newcomers was inaugurated on 26 July 2022. Employees who have just joined the CSTB were given a presentation of the company in the presence of the CEO, Étienne Crépon.



A WORD FROM AN EMPLOYEE

GERMAIN WALESCH
CSU Cluster Manager
Information Systems Department

FRESHENER

// The Fresque du Climat (or the Climate Mural) is a fun workshop that raises awareness of the causes and effects of climate change. It provides an opportunity to reflect on actions that can be implemented, individually or collectively, to mitigate the impacts. I don't see myself as an "eco-freak", but rather as a responsible citizen, conscious of the fact that our planet is unique. When the CSTB launched an appeal to train volunteers to run this workshop, I saw it as an opportunity to learn more about climate issues. I also discovered a wonderful experience of sharing, exchanging and discussing with the participants. Hosting this climate awareness programme encourages me to reduce my own carbon footprint and change my consumption habits. That may well be tricky at first, but by looking at it from the perspective of a project entitled "Reducing my environmental impact" and by breaking it down into small steps, we manage to implement behavioural changes with rapid visible effects. It's encouraging and rewarding! At the moment, I only run "Fresque" meetings at CSTB level. However, I plan to extend this activity to schools, colleges, associations and even communities. We can all move things forward together! //

Fun activities, team workshops, a visit to the Floors and Coatings laboratory, a yoga break and a jovial lunch completed their introduction to the CSTB environment.

"Labo chrono" workshops were also organised throughout the year. Designed for all employees, these workshops are intended to promote and help employees better understand the trades and activities of their co-workers. In addition, mini-business conferences are also regularly organised. Spontaneous "Cafés de la rentrée" meetings allowing direct exchange between employees, the leadership and the members of the Executive Committee around breakfast, took place for one week in September 2022.

Initiatives in favour of young talent and older workers

As a committed employer, the CSTB is demonstrating its desire to get involved at a local and regional level. In particular, this has meant joining the network of committed companies of the Val-de-Marne. Proactive in recruiting young talent and integrating work placement and work-study students, the CSTB participates in numerous job fairs and forums. Experts regularly visit schools to present the activities of the CSTB and, in parallel, the company frequently opens its doors to allow many students to visit its laboratories.

All these initiatives, whether they concern the well-being of its employees or its commitment to young talent, have allowed the CSTB to be recognised by several labels. For the eighth consecutive year, the company won the title of "Best Employer 2023". It ranks third in the list of results drawn up by the magazine, Capital, in the "public research" category. The CSTB has also been certified "Happy Index® at Work", a label that rewards companies where employees are happy and motivated. For the first time, it also obtained the "Happy Index® at Work Seniors" label, which distinguishes companies working on the employment, and development of, older workers, highlighting the implementation of specific measures for end-of-career development within the context of a company agreement. //



Asserting itself as an independent, ethical group

The perspective of Christine Gilliot / 37

Making the right renovation choice with the aid of the BDNB / 38

Eco-design of construction products and systems / 40

Good prospects for QB Modular certification / 42

The CSTB ethics charter gets a makeover / 44

THESE ACTIVITIES MEET THE SUSTAINABLE DEVELOPMENT GOALS:



The CSTB adapts its offer by developing new services.

CHRISTINE GILLIOT
DIRECTOR FLOORS AND COATINGS

As a public industrial and commercial company, the CSTB strives to carry out its missions ethically and independently, both in-house and in its interactions with its key audiences. Impartiality, transparency and sharing, as well as confidentiality, are principles that underpin its actions and help reinforce its exemplary nature.

Revised and standardised in 2022, the CSTB's ethics charter is based on values dear to the company, namely excellence, scientific and technical rigour, impartiality and transparency, openness, social and environmental responsibility as well as attentiveness and customer service.

Mindful of its customers' expectations and the need to constantly improve the service provided in terms of quality of service and responsiveness, the CSTB set up a sales and marketing department in 2021. Among the priority areas identified in line with the business plan are customer relations and satisfaction. Aware that its multi-disciplinarity is a source of wealth but that it can sometimes also be an obstacle to providing a complete and rapid response to its contacts, the CSTB is continuously mobilizing and challenging its teams. The challenge: to be more available and responsive in order to propose targeted and coordinated solutions to the problems encountered. Also with the aim of improving customer satisfaction, the CSTB has recently modernised its methods by acquiring a new IT management tool for its certifications, the SIPP database. Ensuring the reliability of in-house information and facilitating access to external data are the watchwords of this website which has been designed for publishing certificates issued by the CSTB.

At the same time, the CSTB is adapting its offer by developing new services. With Ecoscale, the environmental assessment of the circularity of construction products and equipment, it is supporting manufacturers in recycling their products to meet the challenges of the circular economy.



As part of its activities, the CSTB also responds to citizens' concerns by producing tools for the various actors of the sector in order to foster scientific debate and dialogue, and to improve the living spaces and environments of users. Examples of this are the PROFEEL programme or the deployment of the French National Buildings Database (NDB) in 2022.

Strengthening the mastery of knowledge and providing expertise and a good understanding of regulations, standards and best practices is also part of its mission. Thus, the CSTB disseminates reliable tools, media and methods to ensure the quality of construction systems. In 2022, the creation of guides on installing accessible walk-in showers on concrete and wooden supports in private shower rooms, for example, made it possible to alert the designers to the measures to be taken according to the installation configuration chosen for this type of structure.

All these developments, actions and new services illustrate the desire to improve the service provided to customers and stakeholders involved in the construction process, while always respecting the CSTB's ethical principles which include rigour, impartiality, transparency and sharing as well as confidentiality. //

CREATING AND SHARING KNOWLEDGE

Making the right renovation choice with the aid of the BDNB

The French National Buildings Database (BDNB) is the first reference database for French property data open to the public. Diagnosing, simulating, targeting and assessing are the strengths of this tool, the aim of which is to become the basis for all French property data in the future.

The French National Buildings Database (BDNB) was created in 2019 as part of the Go-Rénove and PROFEEL projects¹. Up and running since the beginning of 2022, it now lists residential buildings (which tomorrow will no longer be residential), located in mainland France. It represents a true picture of the state of the French building stock at any given moment.

Simulating the effects of renovation on the building stock

The database currently contains 27 million buildings, each with an identity sheet containing 400 items of key data and information, such as the date of construction, the 3D geometric model, surface areas by orientation, the shape of the footprint, characteristics, uses or the structure of the building, glazing, technical equipment, meter consumption data, performance indicators, etc.

“Thanks to this database, it is possible to diagnose, simulate and target the performance of the buildings and assess the impact of the actions carried out,” announces Lionel Bertrand, Deputy Director of the Energy and Environment department, responsible for the development and positioning strategy at the CSTB. Two online services provided by the BDNB have been in operation for more than a year for housing association landlords (bailleur.gorenove.fr) and private individuals (particulier.gorenove.fr). The database is the same for both services, but the uses and features are different. Private individuals can become more aware of the renovation process: depending on the address of their building, they can find out about the energy label of their home, simulate an Energy Performance Diagnosis (EPD), if this has not already been entered in the database, and obtain an urban heat island risk indicator. They will also be able to simulate the label they could obtain in the event of renovation, find out about the benefits generated in terms of energy consumption, compare their building to those in the neighbourhood and calculate the revaluation of their property on the market following renovation work. For landlords, the principle is the same, except that access is regulated and not open to all. Once connected to the database, landlords have access to a dashboard for all their property. They can view the number of buildings, housing units, square metres, EPDs, and simulate the label that the building could obtain once fully renovated – its “green value”. This is another helpful tool for promoting renovation strategies.

A third intangible object, the Go-Rénove Lab, is used to support the public authorities in the development of public policies by simulating the impact of a regulatory measure or an aid scheme in real terms. *“We couldn’t keep working on the existing building stock with the tools of the past, having very little knowledge of them. We needed to map out the current situation and draw up a diagnosis, hence the creation of the BDNB,”* summarises Lionel Bertrand.

With 200,000 visits recorded by Go-Rénove for private individuals, 15,000 visits for housing association landlords and more than 2,200 open data downloads, the database is a real success.



Several players have taken advantage of this tool to manage their building stock strategies. For example, Action Logement relies on the BDNB/Go-Rénove platform to build an information system shared by all its subsidiaries and aimed at sharing data and standardising building performance estimations.

It also serves as a support for many public initiatives such as Mission Connaissance and France Chaleur Urbaine, etc. *“Widely accessible to all players and transparent in the calculation methods used, the BDNB is the reference base open to the public. Tomorrow, it will be the basis for all the data for the French building stock, i.e. 38 million housing units and nearly one billion square metres of tertiary premises,”* concludes Lionel Bertrand.

Outlook

Three BDNB services are currently in operation and two more are being planned: one for the local authorities, which will be made available in autumn 2023, and another for tertiary buildings, which will be accessible by the end of the year. The BDNB is the basis for capitalising on the knowledge of existing facilities. Beyond energy and carbon issues, the scope of the topics that it covers will gradually expand as the various areas of expertise of the CSTB and its partners are added. These include the topics of comfort and health, water consumption as well as the area of risk control, whether climatic, natural, technological or fire-related. Based on these new perimeters, the BDNB will offer the same services as today: drawing up an inventory of the building stock, helping with decision-making, targeting buildings, and measuring developments and trends. Together with the National Institute of Geographic and Forest Information and the French Agency for Ecological Transition, the CSTB is co-responsible for developing a single repository of buildings: BAT-ID. *“Cross-referencing between different databases – more than 30 of which from public bodies – is difficult. They are not structured in the same way and are not interoperable, which prevents creating a detailed description of the buildings, and therefore hinders monitoring of any renovations carried out. We are in a process of ensuring the reliability of this repository so that it reflects reality as far as possible,”* comments the Deputy Director. *“However, the data is getting very close to that now, and we are improving every day,”* he says, reassuringly.

In the coming years, the integration of artificial intelligence and machine learning will improve the reliability of this national database. **■**

¹.PROFEEL is a programme supported by professional building organisations and funded by the French state's Energy Savings Certificate (CEE) which aims to facilitate and improve the upgrading of energy efficiency in existing buildings in order to meet the challenges of the energy transition.

IN BRIEF

PROFESSIONAL TITLE OF PEMW DIAGNOSTIC SPECIALIST IN PARTNERSHIP WITH SEDDRE

“CSTB Formations” and the Economics and Resources department collaborated with the SEDDRe to set up the professional title of PEMW diagnostic specialist.

This need for training follows the implementation of new regulatory obligations for contracting authorities who now have to carry out a diagnosis relating to the management of Products, Equipment, Materials and Waste (PEMW) from buildings within the context of a demolition or major renovation work. It is also stated that this assessment must be carried out by a professional construction company, competent in building techniques, construction economics and the prevention and management of PEMW.

The professional title of “PEMW diagnostic specialist”, level V, issued by the SEDDRe, was registered in the national directory of professional certifications on 22 April 2022, for a duration of three years.

CSTB Formations is the training organisation authorised to issue this certificate. This training offer reinforces the positioning of the CSTB in the circular economy and supports players from the sector in this emerging profession.

Sign up for training
“Become a PEMW diagnostic specialist”



A WORD FROM AN EMPLOYEE

LIONEL BERTRAND
Deputy Director in charge of the positioning and development strategy
Energy and Environment department

BDNB EXPERT

“In order to be fully useful, the French National Buildings Database (NDB) needs to remain in place in the long term. This is why its construction takes on all the dimensions of a business start-up. It’s a long journey, sometimes challenging, for the whole team, but it’s always rewarding, especially as users are always encouraging us to keep going!”

Go-Rénove, a project stemming from the PROFEEL programme
Find out more

IN BRIEF

THE “BECOME AN OSMOZ LABEL EXPERT” TRAINING COURSE IS GAINING MOMENTUM

The post-Covid period highlighted the need to redefine the environment and the quality of life in the workplace. It provided the opportunity to rethink our operating modes, and the OsmoZ label takes this perspective into account from three angles: building, planning and HR events. Supported by CERTIVEA, a subsidiary of the CSTB, this label makes it possible to set up a structured approach around the quality of life in the workplace and to have this commitment recognised.

To support these labelling operations, CERTIVEA has developed a network of experts made up of professionals recognised for their knowledge of these certifications and/or labels. The process of recognising advisers involves, in particular, training courses which culminate in an exam.

CSTB Formations and CERTIVEA worked together to develop these “Become an OsmoZ Label expert” training courses, which brought together around fifty participants, forty of whom became recognised advisers.

The CSTB was also involved in this approach and now counts two OsmoZ label advisers among its workforce.

The CSTB thus places improving the quality of life in the workplace at the centre of its concerns, demonstrating its desire to boost the performance of its organisation and its actions at a social level.

Sign up for training
“Become an Osmoz label adviser”



SUPPORTING INNOVATION

Eco-design of construction products and systems

The choices made during the initial product design phase structure most of the impacts the products will face over their entire life cycle, from production to end-of-life management. Therefore, integrating the ecological transition requires an in-depth overhaul of design practices as well as of the role of the different actors and the economic models that connect them. In response to this major challenge, the CSTB is expanding its activities around eco-design, one of the pillars of the circular economy.

In order to facilitate the transition to a low-carbon economy and the widespread adoption of reuse and recycling practices, it is essential to take into account environmental and circularity aspects right from the design phase of buildings, construction products and materials. With this in mind, RE2020 introduces carbon thresholds not to be exceeded for new builds, and since 1 January 2023, the anti-waste law for a circular economy (AGEC) has put in place the Extended Producer Responsibility (EPR) scheme for construction materials or products in the building sector intended for private households or professional use. At the heart of this scheme, eco-design makes it possible to anticipate and promote the virtuous management of the end of life of a product and the waste it generates.


Traditionally positioned in certification and evaluation activities covering a very technical scope, and focused on the safety of goods and people, the CSTB must today meet the growing needs of contracting authorities in terms of new criteria such as low carbon solutions, economic performance and the social conditions under which goods are produced, health aspects, security of supplies, activation of local resources as well as the circularity of products, materials and equipment.

Supporting innovation

To encourage the rise of eco-design, the CSTB offers support at different stages of the product design and development processes.

Upstream, work to support planning in the building sector could be envisaged in order to clearly pinpoint the issues that will impact each type of player, and to identify the main developments needed to address them. During the conceptualisation or development stage of existing technical solutions, multi-criteria support can be provided to characterise the potential impacts (carbon, circular economy, technical or sanitary performance, etc.) associated with each product family (to identify the priorities for action) as well as with each proposed development. This makes it possible to guide choices in a better way.

During the development of technical solutions, the support involves, in particular, developing and carrying out test programmes to characterise innovations (e.g. defining the quantity of bio-sourced or recycled materials that can be integrated into a product while guaranteeing the product's suitability for use). In particular, the CSTB's Water Department is conducting a research project to measure the sustainability of pipes based on the percentage and quality of recycled material used to make them in an aggressive environment representative of sanitation systems. In addition, the Windows and Glazing and the Economy and Resources departments will be jointly starting research into the recycling of insulating glass.

Ecoscale, a link in the circular economy
Find out more 

Finally, the securing of performance and the justification of suitability for use involve evaluation or certification activities such as Technical Appraisals (ATec) and Technical Experimentation Assessments (ATEX), and the securing of the performance of products resulting from reuse. In 2022, shared and recognised practical guides on the evaluation of performance with a view to reuse were developed through the SPIROU (Securing Innovative Reuse Practices through a Unified Offer) research project. These guides will be presented to insurers in order to be able to guarantee the insurability of buildings resulting from reuse.


With the lengthening of the material cycle and the development of recycling, supply chains are becoming more complex, and the CSTB has put in place tools to secure the consistency of the quality of the recycled material throughout the value chain. For example, QB34 certification secures the performance of products containing recycled plastic materials in PVC window profiles. Through its CSTB'Lab, the CSTB is also supporting several start-ups that offer varied and innovative solutions to meet the challenges relating to preserving resources in the building sector.

Ecoscale, the CSTB's environmental assessment of circularity

To characterise and optimise eco-design, the CSTB carries out environmental assessments, such as individual environmental and health declarations (FDES), or develops FDES configurators, and can help manufacturers identify the main areas for improvement. Furthermore, in order to strengthen the consideration of the circularity of construction products and equipment, the CSTB is implementing an environmental assessment, based in part on the FDES, allowing a more complete analysis of the use of resources and circularity. The work was carried out within one of the CSTB's four scientific and technical research roadmaps: "Circular economy and building resources".

The evaluation is structured around four indicators reflecting the circularity of a product and highlighting the manufacturer's efforts for its eco-design:

- **content indicator for recycled and renewable materials:** evaluation of the quantity of recycled and/or renewable materials in the product;
- **dismantability indicator:** ability of the product to be dismantled without damage, in order to facilitate its reuse or recycling;
- **reusability indicator:** the ability of the product to be used again, at the end of its life cycle, for a new use identical to that for which it was designed;
- **recyclability indicator:** ability of the product to enter a recycling channel at the end of its life in order to be recycled.

Each of these indicators are designed based on several qualitative or quantitative criteria, which have been identified as levers. The criteria are then weighted according to their degree of importance, to make up the overall score for the indicator. Ultimately, each product is awarded one of five ratings (A, B, C, D or E), depending on the score it achieves for each of the four indicators. The results of the assessments are entered into a database which is accessible to the public, so that construction industry players can be assisted in identifying circular economy products and equipment. 

IN BRIEF

INAUGURATION OF THE CSTB'S FRESNEL LABORATORY, A TEST PLATFORM DEDICATED TO GLAZING

On Tuesday 5 July 2022, at its site in Saint-Martin-d'Hères, near Grenoble, the CSTB inaugurated its Fresnel laboratory in the presence of Étienne Crépon, CEO of the CSTB, Christophe Ferrari, CEO of Grenoble-Alpes Métropole, Samy Sisaid, the Sub-Prefect for recovery and transformation, and David Queiros, the Mayor of Saint-Martin-d'Hères.

The ceremony brought together over a hundred guests who were able to discover the Fresnel laboratory, a new testing platform for research and innovation in the field of glazing. This tool makes it possible to test, at a single site, the durability of performance and the suitability for use of glazing and associated products. The cutting-edge equipment included three new artificial ageing chambers, co-financed by the Auvergne-Rhône-Alpes region and the European Regional Development Fund (ERDF).

An item of unprecedented technological equipment made available to French and European players, the Fresnel laboratory aims to support the development and emergence of innovative solutions, in line with the challenges of energy and environmental performance. Indeed, in the face of the challenges of climate change and the conservation of resources, manufacturers of windows, the key elements of the energy and environmental efficiency of buildings, are taking action and adapting the design of their products to new requirements and emerging trends.

Decisive technological developments have enabled the emergence of a new generation of insulating glazing: gas-filled glazing, glazing with low-emission coating, warm edge, vacuum glazing, etc. Other developments are under way to incorporate ever more additional functions, complementary to those traditionally provided by the building envelope: electrochromic, thermochromic and clerestory glazing.

The teams in the CSTB's Windows and Glazing department, which brings together more than 50 engineers and technicians, spread across the laboratories of Marne-la-Vallée and Grenoble, are supporting manufacturers in this dynamic of innovation.

SECURING AND ENHANCING PERFORMANCE

Good prospects for QB Modular certification

QB Modular certification is a guarantee of quality and improvement for manufacturers and especially for the market. Currently proposed for 3D modules with a metal structure, it will be extended to wood and concrete structures by the end of the year. Further developments are scheduled for this growing market.

Off-site construction involves many changes in the way that a construction project is carried out, from the design of the building through to its implementation. This is all the more true for buildings built with 3D modules, the most elaborate version of industrialised prefabrication, since the fully equipped modules are made in the factory before being transported, lifted and assembled on site.

This type of construction, which has to meet the same regulatory requirements as constructions built with traditional techniques, requires a review of the whole process (contracting, project implementation, planning), and questions the principle of shared responsibility between stakeholders involved in the construction process. *“Such stakeholders are a little lost and find themselves in a vast sea of the unknown, without knowing precisely how to approach these construction methods: insurers don’t have enough data to assess the risks, inspection offices can no longer carry out their assignments in a traditional way, and specifiers and contracting authorities need prior and reliable information in order to embark on a more extensive prescription of this construction method... There are many questions,”* notes Valérie Gourvès, Head of the Safety, Structures and Fire Performance department at the CSTB.

These questions have led to a request for recognition of the quality of products and services from the Association of Industrialised and Modular Constructions (ACIM) and the creation, by the CSTB, of the Modular QB certification, launched at the Batimat trade fair in October 2022. The certification is a guarantee of trust, performance and maintenance, and aspires to technical quality. It is an important step in promoting this construction method. But it’s also more than that. For manufacturers, it’s also a tool for improving their products and their production, design and assembly processes. *“The devil is in the detail. Applying scientific expertise makes it possible to advance more quickly than waiting for feedback.”*

Certification adapted to products for all building trades

Is this construction method really innovative? The components of certain modules are covered by DTUs and could be considered traditional. However, the DTUs only apply to buildings built on site and do not take into account interfaces such as the transport, assembly and lifting of these elements which pass through the hands of several trades during the production stage. Other modules often use new components that are not covered by DTUs. *“Production is controlled in the factory, industrialised processes and controls are more advanced, and this ensures proper execution and reduces the margins of error. It is then possible to use materials that are more sensitive to use (such as bio-sourced materials that require protection on-site that is sometimes difficult to maintain), or to modify the construction methods (such as very low-sloped steel roofing). Industrialisation makes it possible to better control risks and improve execution tolerances, and this is also how we save materials,”* adds Anca Cronopol, Manager of the Structure, Masonry, Partition division of the CSTB’s Safety, Structures and Fire Performance department.

The Technical Appraisal applies instead to parts of the structure and to the construction processes. The certification covers every level, from materials to the entire building. It is thus an innovative certification for buildings which they themselves are also innovative.



Three-strand, soon to be four-strand, certification

QB Modular certification calls on a wide range of expertise. Around fifteen people from different departments of the CSTB (structure, façades, openings and roofing) have been mobilised to create the repository. The first version covers 3D modules with a metal structure. Three strands of certification are offered, with several levels of performance possible, as well as an annual inspection interval. The first strand concerns the design of the modules and the final building, the second strand covers production (assembly of the modules in the factory, area of use and performance) and the third strand covers the execution/implementation (transport conditions, assembly and management of individual points). A fourth strand will be operational in February 2024. This will involve the reconditioning and recovery of modules and their dismantability. *“These buildings, which are easy to dismantle, are sometimes built for a limited duration. They could be used as emergency, temporary housing... The building can be seen as a service, built for five to ten years, with the prospect of then being transformed or dismantled in order to reclaim the land – a “fixed-term building” in a way,”* continues Anca Cronopol.

Extending the certification

Several changes are being planned. The first is an extension of the certification to include wood and concrete modules. Publication of the standards is expected to take place by the end of the year. In the long term, the certification could be extended to other players involved in industrialised and modular constructions. At the moment, six manufacturers are being assessed and the outlook is pretty optimistic. In fact, the market is buoyant: *“Off-site facilities are not yet sufficiently developed in France. Overall, a good dozen manufacturers of 3D modules with steel structures exist, there are much more for 3D modules with wooden structures, and also a few manufacturers of 3D modules in concrete. And the number is increasing, driven by the actions of the public authorities aimed at supporting the development of the off-site construction method and the technological transformation of the construction sector, in order to meet national climate objectives and respond to environmental challenges. QB Modular certification is aimed at all players whose products meet the requirements of the reference framework,”* concludes the Manager. █

QB Modular certifications - CSTB Evaluations
[Find out more](#)

IN BRIEF

SIPP PROJECT: NEW WEBSITE FOR THE PUBLICATION OF CERTIFICATES ISSUED BY THE CSTB

The SIPP project – Information System for Steering Production Processes for certification – arose from the CSTB’s desire to develop and standardise its operational practices in order to improve the services provided to its customers, and enhance the value of certified products. This led to the creation, in 2022, of “The Database”, a new website for publishing certificates issued by the CSTB.

Easier to read and more intuitive, this new interface simplifies access to certificates issued by the CSTB. Certificates relating to sanitary valves and fittings, ceramic tiles and cladding are already available on this site, and other certification standards are to be added over time.

The SIPP project responds to the need to modernise, standardise and secure activities, and also to centralise information in order to provide customers with a rapid and reliable response to their certification requirements.

The SIPP certification project
[Find out more](#)

The six environmental objectives set by the European Commission



Climate change mitigation



Climate change adaptation



Transition to a circular economy



Pollution prevention and control



Sustainable use and protection of water and marine resources



Protection and restoration of biodiversity and healthy ecosystems

IN BRIEF

CERTIVEA

CERTIVEA, A SUBSIDIARY OF CSTB, ENGAGED IN THE EU’S “GREEN” TAXONOMY

As part of the Green Deal, the European Union is developing and implementing a sustainable finance strategy, the central element of which is the EU taxonomy. Objective: to promote financial flows and sustainable investments. This classification of around one hundred eligible economic activities is contributing to the achievement of environmental objectives.

The six environmental objectives listed are climate change mitigation, climate change adaptation, sustainable use and protection of water and marine resources, the transition to a circular economy, pollution prevention and control, protection and restoration of biodiversity and healthy ecosystems. In order for an activity to be aligned with the taxonomy criteria, it must substantially contribute to one of these six objectives without causing significant harm to the other five, while respecting a minimum set of social guarantees. Three eligible real estate activities have been identified among those listed: the construction of new builds, the renovation of existing buildings and the acquisition and ownership of buildings. The activity is deemed to be aligned if the building concerned meets a set of technical criteria. For these same three activities, successive versions of high environmental quality (HEQ) certifications, launched over twenty years ago, precisely define the sustainability requirements. In 2022, CERTIVEA, a subsidiary of the CSTB specialising in the certification of sustainable living environments, carried out work to reconcile the taxonomy criteria with the requirements of the HEQ standards, making them more or less complete forms of proof (the latest HEQ-Sustainable Building v4 version now being complete) and facilitating the reporting work of companies and their statutory auditors.

THE CSTB COMMITTED IN-HOUSE TO CSR

The CSTB's ethics charter gets a makeover

In 2015, the implementation of an ethics system led the CSTB to design and roll out its first dedicated charter. It sets out the principles governing the actions of the CSTB, and constitutes a reference framework for its employees. Initially revised in 2018, it underwent a complete overhaul in 2022.

In 2019, the launch of the business project presented the opportunity for the CSTB to redefine and present the values that drive it. As these principles are very close to the ethical principles, the charter needed to be reviewed and standardised in order to make the principles more visible. Changes in the legislative context, particularly with regard to the protection of whistleblowers, were also a trigger for deciding to review the charter.

In terms of content, the ethics charter means:

- **compliance with ethical rules**, such as respect for fundamental human rights, or respect for and protection of the environment;
- **respect for public order** including in particular compliance with laws and regulations, and the fight against fraud in all its forms, and against corruption;
- **respect for the CSTB's values**: namely attentiveness and customer service, excellence and scientific and technical rigour, impartiality and transparency, openness and corporate social and environmental responsibility.

The charter sets out the principles underpinning the CSTB's actions: rigour, impartiality, transparency and sharing, as well as secrecy, confidentiality and professional discretion. Respecting the charter contributes to the effectiveness of the CSTB's actions and those of its employees and to its credibility in its relationship with its external points of contact (customers, supervisory authorities, experts, partners, suppliers, users), known as "stakeholders". It guarantees the protection, integrity and reputation of its staff members in their professional undertakings by serving as a reference framework for them.

A very real collective and concerted effort has led to this new version which, after having been submitted to the External Ethics Committee, was approved by the CSTB's Board of Directors in June 2022. Appended to the in-house regulations, it is in force, and must be complied with by all company employees. //



This charter is available on the CSTB's website:

[Read the document](#) ➤



A WORD FROM AN EMPLOYEE

PETER RIEDERER
Engineer and Researcher
Energy and Environment department

OBTAINING ACCREDITATION TO SUPERVISE RESEARCH

// The CSTB offered me the opportunity to prepare for a diploma in accreditation to supervise research (HDR), and supported me in this process. I successfully obtained the diploma in May 2022 at the University of La Rochelle, after giving a presentation on the subject of "improving the design and operation of the energy systems of buildings and their neighbourhoods through digital simulation," before a jury made up of nine experts in this field in France. The diploma obtained allows me to officially transition from company tutor to thesis supervisor. Previously a thesis tutor at the CSTB, I am now authorised to supervise thesis work. Of course, this means greater responsibility for the conduct and success of theses, and allows the CSTB and myself to benefit from greater visibility in the scientific community. I am taking on this role for the first time at the Mines Paris Tech Doctoral School (ISMME) as part of an Efficacy/CSTB thesis which I started in 2023. //



A WORD FROM AN EMPLOYEE

TOAN DUC PHAM
Research and expertise engineer
Safety, Structures and Fire Performance department

OBTAINING ACCREDITATION TO SUPERVISE RESEARCH

// Obtaining accreditation to supervise research marks a real milestone in my career. It also represents a projection of the direction of the research strategy that I wish to take within the CSTB, in line, in particular, with the scientific and technical roadmaps for research, drawn up by the Research and Development department. Since obtaining my thesis which I worked on at the CSTB between 2011 and 2014, I have been conducting and managing research work that is distinguished by the complementary nature of the experimental and the theoretical. Some of this work included Vulcain, our facility for conducting large-scale tests in the field of fire resistance of structures. //

IN BRIEF

THE CSTB CONTINUES TO MAKE PROGRESS IN ACHIEVING GENDER EQUALITY

The CSTB's commitment to gender equality is reflected first and foremost in the score of the 2022 index, which has been maintained compared to 2021, and had increased from 91 to 92 points out of 100. As a reminder, the index had risen by six points between 2020 and 2021, thus rewarding all of the CSTB's actions over time.

The proportion of women in the company continues to increase at all levels of the organisation. The gender pay gap is narrowing annually and dropped below 3% in 2022. Beyond the figures, the CSTB is actively continuing its awareness-raising actions on gender equality among its teams.

In terms of disability, the rate of direct employment of people with disabilities rose from 3.29% to 3.86% in 2022, out of the 6% required by law. It therefore continues to grow, given the fact that at the same time, the CSTB significantly increased its workforce in the same year. In 2022, the CSTB also renewed its participation in DuoDay in partnership with Cap Emploi.

The concept: employees volunteer to welcome a job seeker with a disability and present their activity to them. This year, 12 employees came forward to offer to supervise a person with a disability for one day. The CSTB will renew the experience in 2023 and this will continue in the years to come. Other initiatives were implemented or continued in 2022. Parasport activities, identified and organised in connection with the French Parasport Federation, took place as part of "CSTB Day", which was held on 24 June 2022, on all sites. In Nantes and Sophia Antipolis, members of the Alpes-Maritimes and Loire-Atlantique parasport committees were present to lead archery, wheelchair boxing, blind football and wheelchair basketball workshops. A parasport tournament, with wheelchair basketball and a wheelchair biathlon, was also held at the Champs-sur-Marne site. In addition, for the sixth consecutive time, the CSTB from the Sophia Antipolis site took part in the "Joëlette" Orientation de Sophia" (JOS) event, a race organised on 17 November 2022 by the association, "Osons la différence" ("dare to be different") for companies in Sophia Antipolis, as part of the Week for Employment of People with Disabilities.



Snapshot

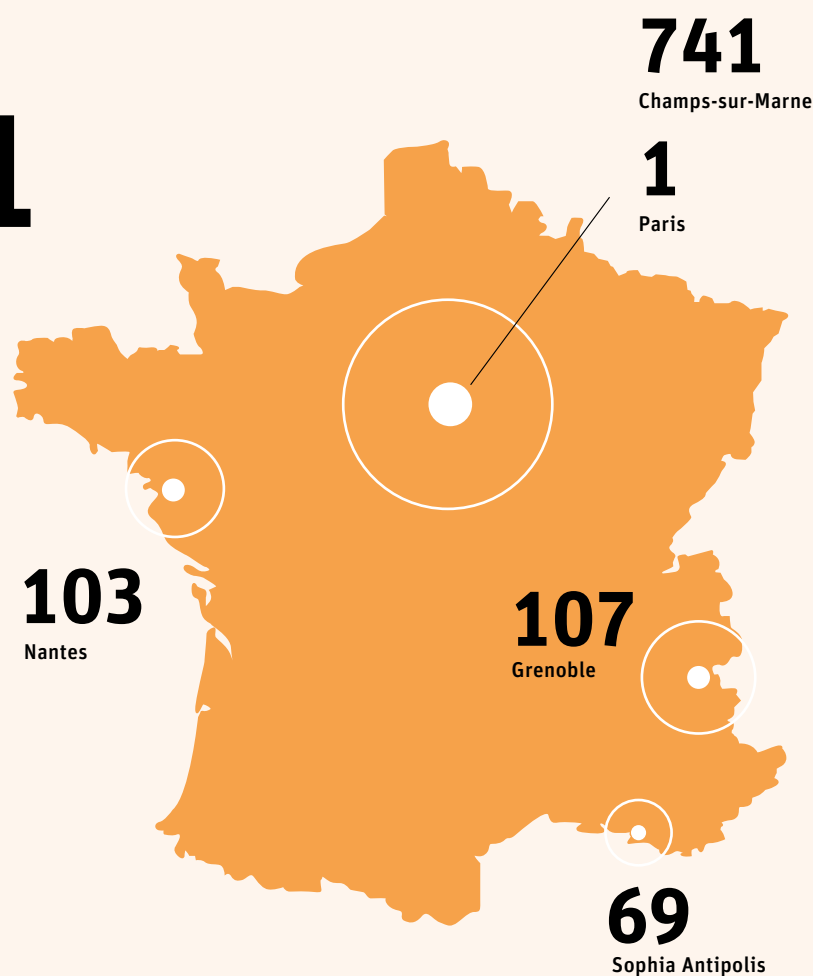
2022 key figures

HEADCOUNT & LOCATIONS

(excluding subsidiaries)

1,021

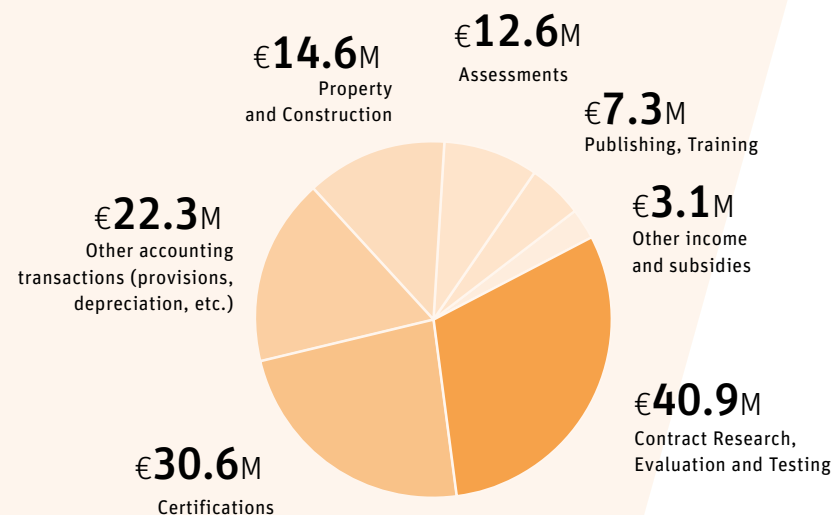
employees
at the 4 sites



2022 OPERATING INCOME

€131.4M

in operating income
(excluding subsidiaries)



RESEARCH AND EXPERTISE

Total research and expertise

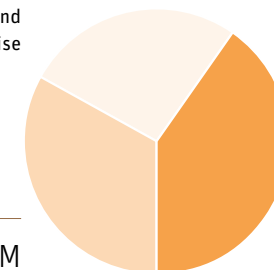
€43.92M

€3.20M external subcontracting incorporated into products
 €1M appropriations for investment in research equipment
 €6.14M contracts with partners
 €1.36M European contracts

€12.53M
Contract research and expertise

€16.82M
Contract research and expertise with public stakeholders

€14.57M
Capitalised production from appropriations



58
PhD students

217
researchers

5
patents

90
publications

TECHNOLOGY-RELATED ACTIVITIES

121
ATEX

32
ETAs
(European Technical Assessments)

823

ATec/DTAs published
 All types (excluding modifications to extend validity date), including 142 "New" types and 630 revisions initiated by committees.
 Average 2022 Technical Appraisal procedure time: 8.9 months

CE marking
583
certificates



Product certification
5,705
certificates

296
holders
17% from abroad



1,848
holders
52% from abroad

DISSEMINATION OF KNOWLEDGE

25,920

hours of training completed

154

training courses, including 6 new or updated

17

Cycles, training courses Premium and Become an Advisor

32

training courses, all or part digital

32,000

active user accounts on Batipedia

97%

Customer satisfaction rate





Scientific and technical roadmaps: Vision 2030



BUILDINGS AND NEIGHBOURHOODS THAT PROMOTE HARMONIOUS LIVING

Good community living means collectively “recognising and respecting all forms of diversity, fighting discrimination and facilitating harmonious coexistence¹”. Buildings, which shelter us, enable our activities, and neighbourhoods, which constitute our living environment and form the ties in our societies, contribute to this aspiration in an essential manner.

→ [Consult the roadmap \(p. 9\)](#)

1. Standing Committee on Living Together
of the International Association of French-speaking Mayors (2018)



RENOVATION, INNOVATION AND RELIABILITY IN THE CONSTRUCTION PROCESS

Making the construction process more reliable means ensuring, all along its life cycle, the performance and adaptation of a building to the various changes in its environment in the broadest sense, to its uses and to the expectations associated with it. While new builds potentially respond to this need, renovation of the building stock – the very core of the problem – must be reinvented to achieve this, by calling upon all possible innovations.

→ [View the roadmap \(p. 21\)](#)



BUILDINGS AND CITIES FACING CLIMATE CHANGE

Climate change is a major component of our current affairs and even more so, of our future. It already has a direct impact on our daily lives, whether at national level, urban level or in terms of individual buildings. Taking action to mitigate it is a vital imperative. This should lead the construction sector and the various players involved to adapt their practices, their uses and, more generally, the building stock.

→ [View the roadmap \(p. 14\)](#)



THE CIRCULAR ECONOMY AND RESOURCES FOR BUILDINGS

Optimising the use of our resources for construction is essential to ensure their longevity, and to preserve the environment. This means, in particular, extending their useful life, turning to reuse options, and massively developing secondary substitute raw materials resulting from recycling processes.

→ [View the roadmap \(p. 28\)](#)



VIEW THE SCIENTIFIC
AND TECHNICAL ROADMAPS

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