highlights 2013

Annual Report

CSTB
le futur en construction

^
HALLE PAJOL
Jourda Architectes
Innovation
SCHÜCO ATEx 1918: photovoltaic glass roofs

Cover page:
LA DUCHÈRE ECO-NEIGHBORHOOD, LYON
Labeled in 2013

Every year, CSTB works closely with many companies and particularly small and medium sized enterprises to assist them with the development of their innovations, from concept to market.
This initiative broadens the scope of their project.
Discover a few exemplary approaches.

iNNOVATiON
A COOPERATIVE APPROACH

Essentiel 2013 on line, click on this icon to view enriched contents.
www.cstb.fr

FIND OUT MORE

Contents

INTERVIEWS

Ecological and energy transition at the heart of CSTB missions

BERTRAND DELCAMBRE, *CSTB President*

2013 will prove to have been a pivotal year between a period of exceptional activity focused on the initial challenges set out in the French government's environmental policy *(Grenelle de l'Environnement)* and an increasingly clear ambition for the years ahead as building construction and renovation projects accelerate.

The new 4-year CSTB Objectives and Performance Contract signed recently by three government ministers puts the challenges of ecological and energy transition clearly at the heart of our missions. The key points of this contract focus on the quest for overall building performance bound by obligations to deliver results, support innovative stakeholders, and integrate performance in the urban environment.

How do these objectives align with the missions of CSTB?
The quest for tangible overall performance reflects our commitment to developing a multi-criteria assessment of building energy consumption that includes the grey energy required for construction, CO_2 emissions and water consumption, amongst other considerations. It applies to the full life of the building, from construction to demolition, and therefore involves a Life Cycle Assessment of materials, components and structures. 2013 saw significant advances made in developing the data and resources required by stakeholders. Every aspect of this new analytical capability will be usable from the building design stage onwards, thanks to the Building Information Model (BIM). The use of this digital model will deliver significant improvements in productivity and quality, and will soon be enthusiastically received by a large number of users.

Trusted innovation is central to your missions...
Once again, 2013 brought with it many innovations, with more than 1,000 assessments conducted!
A great deal of effort has been focused on making the assessment procedure run more smoothly, thereby encouraging the industrial innovation essential to achieving the performance challenges faced by construction stakeholders. The development of regional partnerships - the first of which was set up in Alsace at the end of 2013 - is a vital step towards the development of a national support network for innovators.

Working towards the sustainable city…
The new Objectives and Performance Contract stresses the need for CSTB to promote research across a very diverse range of subjects in the urban context. In 2013, we contributed to eco-neighborhood assessments and their first national accreditation scheme. CSTB was also involved in the startup of the Efficacity Institute for Urban Energy Transition as a center of excellence for low-carbon urban energy.

International news
Its many partnerships reflect the international reach of CSTB research, expertise and assessment services. 2013 was particularly notable for two flagship projects. Cerway, the Certivéa and Cerqual joint venture was launched in September with the aim of promoting the French vision of sustainable construction based on the HQE scheme. CSTB was appointed during the year by central government to organize the worldwide Solar Decathlon 2014 competition, which will culminate in late June at Versailles, when twenty teams from sixteen countries on three continents will complete head-to-head!

CAROLE LE GALL, *CSTB Chief Executive Officer*

CSTB: serving collaborative innovation for all construction stakeholders

How can the CSTB support all construction professionals - both private-sector and public-sector - in their innovation initiatives?
Ecological and energy transition is a structural goal for all construction stakeholders, and one that requires a completely new approach to design, construction and renovation. Making the transition successfully demands entrepreneurship, commitment, transparency and collaboration between the public and private sectors. Dialog and trust are absolutely key.

The pivotal position occupied by CSTB in all its areas of competencies gives it the unique ability to facilitate discussion and share expertise between project owners, project managers, construction companies and the industrial companies that manufacture construction systems and products.

CSTB is committed to making this mutually beneficial collaboration between professionals more effective and proactive by responding to the specific needs of each and anticipating the future challenges they will all have to face. The innovations implemented in 2013 illustrate the vitality of innovation in the construction businesses. It may be only one small part of the work accomplished with our partners and clients, but one that nevertheless illustrates the rich diversity of these joint adventures in innovation. CSTB is proud of the support it is able to give to so many companies, from start-ups to major corporate groups, non-profit organizations and public stakeholders with the development of their innovative products and services. We must work together to accelerate this impetus and disseminate these innovative responses on the widest-possible scale in our response to the quantitative and qualitative challenges posed by sustainable buildings and sustainable cities. That is our vocation as a member of the Carnot Institute network. That is also the focus of our new Objectives and Performance Contract 2014-2017, which was prepared in 2013 on the basis of participative consultation with all constuction stakeholders.

CSTB as innovator
The satisfaction of our clients and partners means that we must invest continually in improving the quality delivered by our range of services: reducing lead times, raising the profile of technical added value, and providing long-term guarantees of the scientific and technical excellence of our services. All of these are made possible by the expert skills of our people and our commitment to investing in top-class research and testing facilities. We place particular importance on developing the multidisciplinary expertise of our people, which is essential for expert cross-disciplinary understanding and achievement of the challenges posed by sustainable buildings, and on developing interoperable software packages that facilitate universal adoption of all the data generated by the digital Building Information Model (BIM).

CSTB as collaborative network stakeholder
The satisfaction of our clients and partners also depends on strong partnerships with our international counterparts and national and regional partners, which include Industrial Technical Centers, regional technical platforms, non-profit organizations, professional unions and industry bodies. Every year, many thousands of researchers and experts contribute to the collaborative initiatives initiated and coordinated by CSTB. These initiatives deal with scientific and practical projects, interact with each other, and have global and regional perspectives that advance knowledge and facilitate innovation.

Measuring, observing, simulating processes and comparing outcomes against field data: this is the scientific and technical history of a new cycle of innovation and improvement for overall building performance; an history we are now writing in cooperation with every stakeholder in the ecological and energy transition. CSTB is here to serve. Together, we are building the future of construction.

What we do

RESEARCH: CREATING NEW KNOWLEDGE

CSTB focuses its research work on a series of priority areas. Its systematic approach incorporates all the socio-economic challenges of safety, health, comfort, the environment and energy faced by buildings, neighborhoods and cities.

CSTB research forms part of the programs run by the French Ministry for Higher Education and Research. It also organizes and coordinates national programs and socio-economic stakeholders via EU-funded partnerships. The 2011 renewal of Carnot accreditation in 2011 confirms the role of contractual research as a central mission of CSTB.

INSTITUT CARNOT CSTB

EXPERTISE: PUTTING KNOWLEDGE TO WORK

CSTB applies its expertise in support of public policy (in health, safety, the economy, social affairs, energy, the environment and digital technology) and stakeholders in construction and the wider urban environment. Based on knowledge acquired through research and innovation assessment, its expert services are also underpinned by a practical understanding of construction professionals and a focus on systematic cross-disciplinary approaches. CSTB contributes to standardization and developments in construction technical regulations at national, European and international levels.

ASSESSMENT: SUPPORTING INNOVATION

CSTB assessment of innovations provides construction stakeholders with reliable data on component performance levels and durability (processes, materials, elements and equipment) within well-defined areas of application and conditions of use. CSTB supports construction stakeholders by enabling the emergence of innovations, bringing them to market and ensuring their security.

At European level, CSTB acts as a technical assessment organization. It is also an authorized CE marking assessor. CSTB and its subsidiary organizations lead the way in the certification of products and structures. CSTB certification activities and test laboratories are accredited by COFRAC, the French national accreditation body.

DISSEMINATION: SHARING KNOWLEDGE

CSTB makes scientific data and information on technical regulations accessible and directly usable through printed documents and information services, specialist industry software, and a range of in-house and external training opportunities for companies. In all these ways, it contributes to knowledge sharing for professionals; knowledge related to the challenges of building performance across multiple criteria, changes in regulations, and the progress with innovations.

CSTB holds ISO 9001 certification for all its activities.

afaq ISO 9001 Qualité AFNOR CERTIFICATION

Our values

SCIENTIFIC & TECHNICAL EXCELLENCE AND KNOWLEDGE SHARING

CSTB missions are based on scientific and technical issues, but take full account of the economic, environmental and social contexts posed by building-related challenges. As part of maintaining its demanding standards, CSTB periodically evaluates the skills of its people and provides them with the resources they need to develop their knowledge.

INTEGRITY AND TRANSPARENCY

CSTB practices are based on the identification of sources, transparency of knowledge, clarity of methods, and strictly objective reasoning. Cooperation, verification and validation further strengthen the work it does, based on its duty to protect and respect industrial, intellectual and private property rights, and to stand firm against inappropriate pressure of any kind.

CONFIDENTIALITY

CSTB staff are bound by non-negotiable rules of confidentiality essential for respecting its commitments to clients and maintaining the trust-based relationship it has with them.

SOCIAL RESPONSIBILITY AND CUSTOMER SATISFACTION

Delivering satisfaction to its customers and partners and maintaining mutually beneficial relationships with its suppliers are fundamental aspects of CSTB policy.

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ARIA,
the major research facility that studies the health issues surrounding the products and equipment used in construction and structures, CSTB

>
STRUCTURES TESTING LABORATORY, CSTB

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CSTB PUBLICATIONS

The Executive Committee

The Executive Committee brings the CSTB President and Chief Executive Officer together with all Management Committee members, the Chief Accounting Officer, all Department Managers, Head Office and Local Office Directors and invited guests to present and discuss projects. Whether in plenary session, in steering committee format or operations management board committee format, its purpose is to reach decisions and discuss current issues.

Left to right: JOSÉ FONTAN | CHARLES BALOCHE

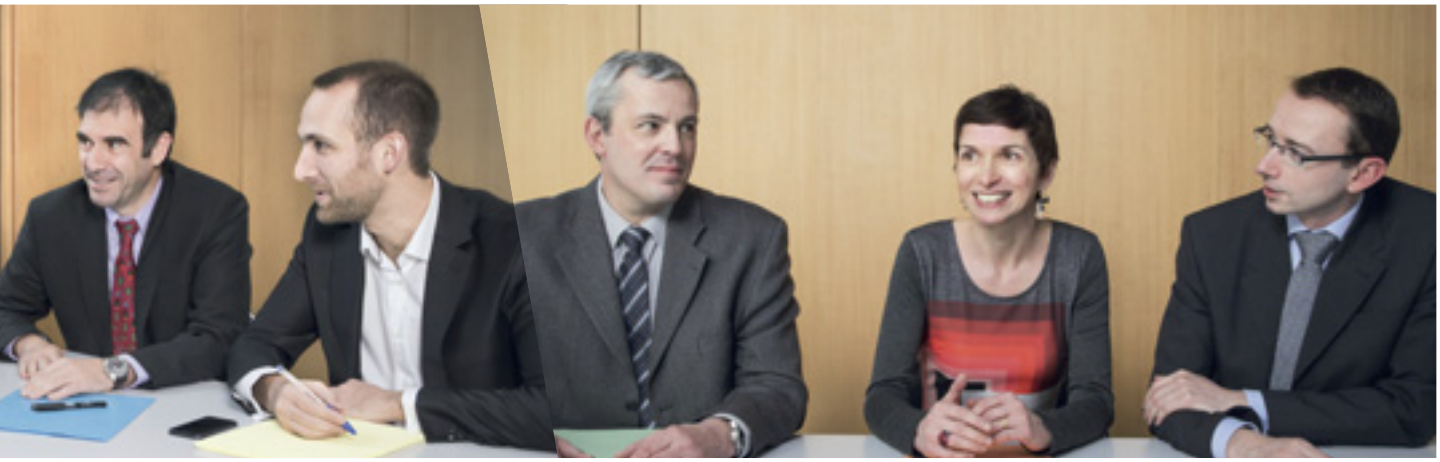
PHILIPPE THERASSE | CAROLE LE GALL

YANN MONTRELAY | FLORENCE FERRY | THIERRY WAGNER

JEAN-MICHEL AXES

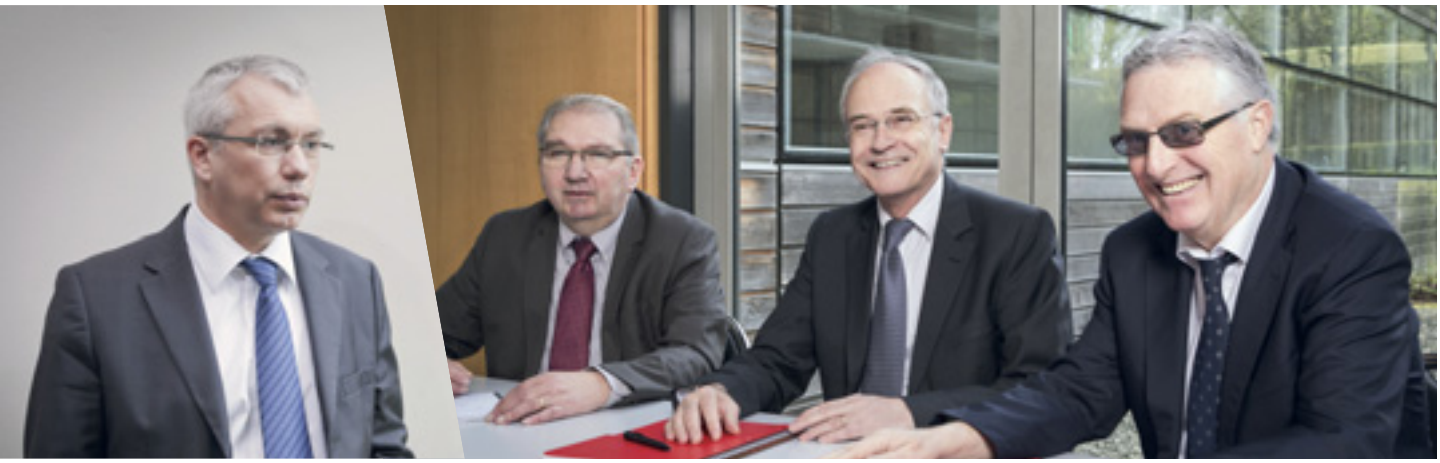
JEAN-CHRISTOPHE VISIER | ALBERT REIS | HERVÉ CHARRUE

CHRISTIAN COCHET | ANNE VOELTZEL



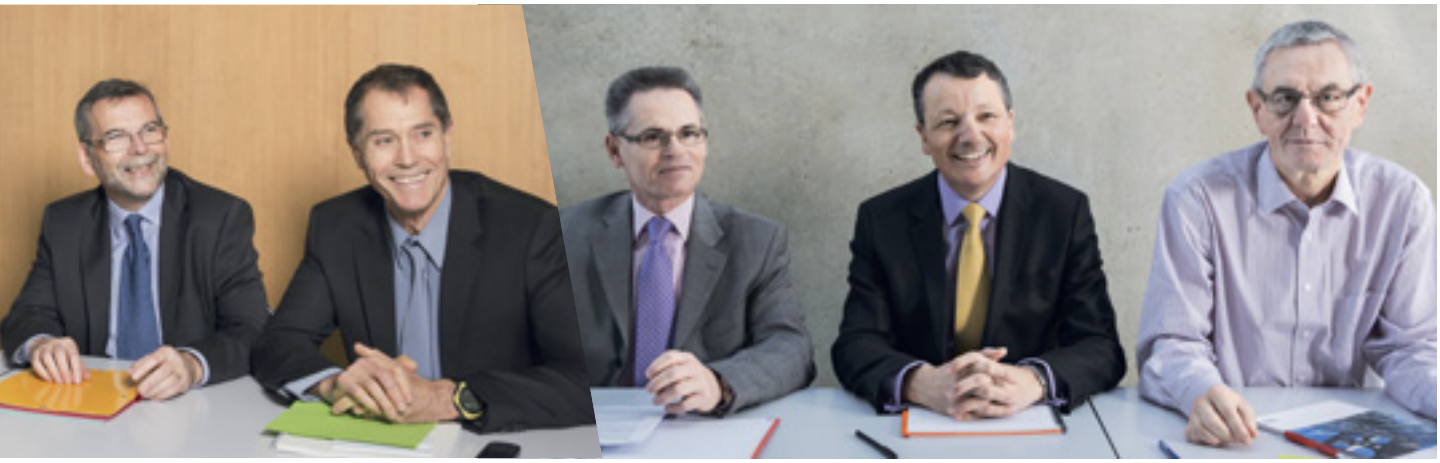
MICHEL COSSAVELLA | MAXIME ROGER

PHILIPPE PIED | BÉATRICE CROMIÈRES | CHRISTOPHE MOREL



PATRICK NOSSENT

DOMINIQUE POTIER | BERTRAND DELCAMBRE | DOMINIQUE NAERT



PATRICK MORAND | JACQUES MARTIN

EMMANUEL GIRARD | BRUNO MESUREUR | ROBERT BAROUX

highlights 2013

Left to right: Maud TALLET, Mayor of Champs-sur-Marne and General Councilor | Carole LE GALL, CSTB Chief Executive Officer | Bertrand DELCAMBRE, CSTB President | Isabelle THIS-SAINT-JEAN, Vice-Chair of the Île-de-France Regional Council with responsibility for Higher Education and Research | Jean-Marc MICHEL, Head of the Directorate-General of Planning, Housing and Natural Heritage | Vincent EBLÉ, Member of the French Senate and Chair of the General Council of Seine-et-Marne

MARCH

Official opening of the Vulcain facility

Vulcain is a major research facility investigating the fire resistance of innovative structures. The only one of its kind in Europe, it was officially opened by CSTB on March 26, 2013. With the capability to heat large-scale structures to a temperature of 1,300°C, Vulcain is now contributing to improving fire safety in today's rapidly changing construction sector. With its exceptional size and modular design, Vulcain makes it possible to replace the component-based approach with a technique that can assess the overall performance of a structure by combining full-scale testing with simulation. More than 230 construction professionals attended the opening ceremony, as well as representatives of the local and national press.

Research partnership with TNO

CSTB signed a research partnership agreement with TNO, the Netherlands Organisation for Applied Scientific Research, on March 6 in Delft. The agreement provides for collaboration between the two organizations on construction issues such as digital modeling in the urban environment, fire safety and engineering, and wind load engineering in order to respond jointly to European and international R&D projects and engage in a researcher exchange program.

MAY

CIB congress in Australia

**The triennial CIB World Building Congress was held between May 6 and 9 in Brisbane, Australia. This international congress for construction innovators showcases key advances in Research and Development.
CSTB Chief Executive Officer Carole Le Gall spoke on the impact of Research and Development on sustainable construction at a round table session attended by Australia's Chief Scientist Ian Chubb. CSTB experts Frédéric Bougrain, Julien Hans, Maeva Sabre and Jean-Luc Salagnac also contributed to this dynamic event by coordinating working groups and presenting scientific articles.**

Carole LE GALL, CSTB Chief Executive Officer | John McCARTHY, Chairman of CIB | Ian CHUBB, Australia's Chief Scientist | Professor Peter BARRETT, University of Salford, Manchester

JUNE

Air quality and thermal, acoustic and visual comfort in schools

To mark the launch of the national campaign involving 300 nursery and elementary schools throughout France, the Indoor Air Quality Observatory (OQAI) held a public workshop session on June 13, 2013 devoted to a particularly sensitive group population: children.

The session explained the latest developments in knowledge, progress and prospects for internal building environmental quality in schools by looking in detail at major research projects currently underway in France and the wider Europe: pollutant emissions from school supplies, the presence of phtalates, insecticides, flame retardants and other airborne semi-volatile organic compounds, dust, etc.

JUNE

Commercial buildings in operation

In June 2013, Certivéa launched the new version of the NF HQE™ Bâtiments tertiaires en exploitation (commercial buildings in operation) certification, enabling all those involved in the operation of non-residential buildings to achieve certification that substantiates and highlights their performance levels. The first development in France to be awarded this type of certification is the "Hervé Thermique Paris IDF" office building in Ennery.

Private home certification

Having led the way with NF certification of private homes in 2000 and the NF HQE scheme in 2006, Céquami launched its new NF HQE™ certification for new private homes on June 7, 2013. Its benchmarking scheme has been developed out of the user expectations and requirements highlighted by a survey conducted amongst 420 families.
The survey results revealed that criteria should be centered around 3 anticipated benefits: lower cost, health and user comfort.

JULY

Intrinsic Energy Performance Guarantee Charter

The Intrinsic Energy Performance Guarantee Charter (GPEI) was signed at the Sustainable Building Plan general meeting on July 11 by 16 signatories, including the CSTB group.

Given the extremely ambitious targets set by government for building energy efficiency, it is essential that project owners wishing to invest in energy efficiency upgrades and/or services have the ability to measure and confirm actual reductions in energy consumption.

The contractual Energy Performance Guarantee (GPE) will respond directly to this need.

SEPTEMBER

Reef online

In 2013, Reef online introduced a series of new functions and constantly refreshed content. This service aims to make it easier for all construction stakeholders to access, adopt and apply regulations and standards. Continual updating of the database behind the "News and New Online" pages delivers relevant content in response to searches by alerting users to the latest technical and regulatory changes.

Reef online delivers the full range of regulatory and standards related content, with a catalog of more than 3,950 items that includes 3,120 full-text documents of which 1,390 are standards.

The Claude Bernard urban development eco-neighborhood zone in Paris, labeled in 2013

SEPTEMBER

ÉcoQuartier labeling

On September 9, Cécile Duflot, the Minister for Regional and Housing Equality, presented the results of the first national ÉcoQuartier eco-neighborhood labeling campaign. Of the 45 developments awarded the national ÉcoQuartier label, 13 are completed or on the verge of completion. 32 other projects still under construction were awarded the description of *"Engagé dans la labellisation"* (Labeling in Progress). CSTB has been working with the French Urban Planning Institute and the Ecole des Mines on the issue of indicators, and is supporting the relevant public authorities in setting up an Eco-neighborhood Observatory and evaluating the results obtained. At the end of 2013, the French government appointed CSTB to provide national management of the 2014-2015 assessment campaign for 45 Eco-neighborhoods.

France GBC Green Building Week 2013

French sustainable construction expertise was the focus for the France GBC Green Building Week 2013 held throughout France between September 16 and 22. Site visits, official openings, conferences, training sessions and around 30 events for construction professionals were held in the form of an enormous national and regional initiative to disseminate good practices, share experience, acquire new knowledge, and identify ways forward for future progress. A broad diversity of issues central to the priorities of tomorrow's buildings and communities was addressed throughout the week, with particular emphasis on affordable sustainable construction. In other words, how can we offer healthy, comfortable, high-performance buildings that are financially accessible to everyone?

Left to right: Anne-Sophie PERRISSIN-FABERT, Director of the HQE Association and Chief Eecutive of France GBC | Florence FERRY, CSTB Director of Communication and External Relations | Michel HAVARD, President of the HQE Association | Méka BRUNEL, Executive Vice President Europe of Ivanhoé Cambridge and President of France GBC | Bertrand DELCAMBRE, CSTB President

Launch of Cerway

As part of the September 26 presentation of Vivapolis, the French sustainable cities brand for export markets, at the Ecocity World Summit on Sustainable Cities in Nantes, Nicole Bricq, the Minister for Foreign Trade, announced the launch of Cerway, the body created specifically to establish and develop the international reputation of the HQE™ scheme.

The prime mission of this joint subsidiary of France's two leading non-residential building, community and housing certification organizations - Certivéa and Cerqual - will therefore be to deliver the entire HQE™ scheme structure internationally.

Left to right: Michèle PAPPALARDO, Coordinator of the Mieux Vivre en Ville intiative set up by the Minister for Foreign Trade | Michel HAVARD, President of the HQE Association | Carole LE GALL, CSTB Chief Executive Officer | Nicole BRICQ, Minister of Foreign Trade | Patrick NOSSENT, President of Cerway and Certivéa | Antoine DESBARRIÈRES, President of Cerqual

Left to right: Prof. Dr.-Ing. Frank DEHN, Director of MFPA (Germany) | Kevin A. MUELLER, Postgraduate Researcher at the University of Notre-Dame (USA) | Dr. Eduard A.B. KOENDERS, Associate Professor at the Technical University of Delft (Netherlands) | Pierre PIMIENTA, Deputy Manager of the CSTB Mechanical Studies and Fire Resistance Division

Fire safety

Fire Spalling 2013, the Third International Workshop on Concrete Spalling due to Fire Exposure, looked at the current state-of-the-art, advances and research in this area of fire safety. Hosted by CSTB and INSA Rennes, this scientific symposium held at the FNTP in Paris between September 25 and 27 welcomed around a hundred delegates of twenty different nationalities. A scientific publication entitled *Concrete Spalling due to Fire Exposure* featuring 38 articles was published to mark the event.

Batiactu Construction and Innovation Awards 2013

On September 23 2013, Bertrand Delcambre presented DVVD SARL with a Commercial Building Construction Award in the New Construction category for its Villetaneuse (Seine-Saint-Denis) multimodal transportation hub footbridge project. This wooden footbridge designed as part of a university urban project by architect Daniel Vaniche links neighborhoods previously separated by main roads, and provides access to the station for passengers with reduced mobility.

OCTOBER

Technical assessment support

Left to right: Pierre-Étienne BINDSCHEDLER, President of the Alsace Énergivie Competitiveness Cluster | Philippe RICHERT, President of the Regional Council for Alsace | Bertrand DELCAMBRE, CSTB President

October 24 in Strasbourg saw the launch by the Alsace Énergivie Competitiveness Cluster and the CSTB of a technical assessment support scheme for innovative contractors in Eastern France as part of facilitating the dissemination of construction-related information. Around a hundred construction stakeholders attended the launch event to find out more about the operation and aims of the new scheme, which is based on providing hands-on support at a very early stage in order to respond effectively to the assessment expectations and specific needs of small-scale and midsize contractors.

Signature of the CSTB-ICC Evaluation Service agreement

The 2007 agreement between CSTB and the ICC-Evaluation Service (USA) was renewed in October 2013. This agreement covers joint working on the process to converge French (Atec) assessment procedures with their European (ETE) and American (ESR) counterparts. It provides for mutual recognition of testing, test reports and assessments in order to reduce the associated costs for construction manufacturers in Europe and the USA.

GreenCity

The second international GreenCity sustainable cities event sponsored by the Grand Paris project was held on October 17 and 18, 2013 at the Cité Descartes in Marne-la-Vallée. The two days of conferences and discussions between economists, institutions and academics focused on the new frontiers of energy efficiency. Officially opened by Minister for Foreign Trade Nicole Bricq, GreenCity included the signature of five international innovation partnership agreements between the Université Paris-Est and Tokyo University, developers, operators and economic development organizations. Bertrand Delcambre chaired the GreenCity 2013 conference cycle.

The RGE scheme extended to include more professionals

During her visit to the Batimat 2013 trade fair, Cécile Duflot, the Minister for Regional and Housing Equality, signed three charters with ADEME, CSTB and construction bodies effectively extending the RGE *(Reconnu Garant de l'Environnement)* quality labeling scheme. As a result, the scheme is now open to project owner professionals during their studies and to manufacturers of construction and renovation materials. Some 9,000 contractors are now RGE-accredited, and that number is expected to double by mid-2014.

NOVEMBER

Fire safety

Fire Safety of Facades, the first international scientific symposium on facade fire safety, was hosted by CSTB at the FCBA Institute in Paris on November 14, 2013. More than 180 experts in this area of fire safety came together in Paris from 32 different countries for two days of discussion on the current state of specialist knowledge, to discuss current research and identify new needs. A scientific publication containing all the symposium papers accompanied the event.

Solar Decathlon

Cécile Duflot, the Minister for Regional and Housing Equality, attended the November 6 presentation of the projects developed by 20 teams selected for the Solar Decathlon Europe 2014 event to be held in the Château de Versailles Gardens between June 28 and 14 July. The Solar Decathlon will give France the opportunity to stimulate innovation in energy efficiency and sustainable construction. Energy self-sufficient as a result of their efficient use of solar energy, all 20 of these "homes for tomorrow" will be constructed full-size on site, giving professionals and the public the opportunity to experience these future technologies for themselves.

NOVEMBER

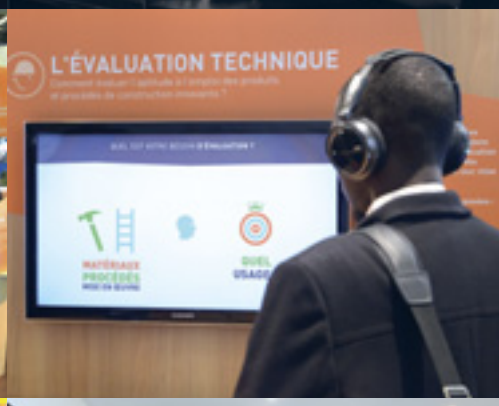
Batimat 2013

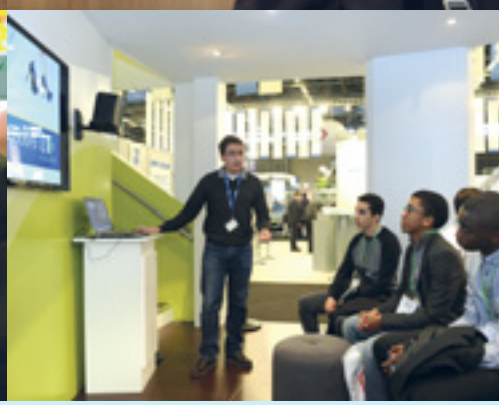
For CSTB, the 2013 Batimat trade show was marked by the rich diversity of issues promoted and events hosted. As part of her official visit to the event, Cécile Duflot, the Minister for Regional and Housing Equality, met with a number of small and midsize timber and biosourcing companies engaged in innovation processes alongside CSTB teams.

The Minister took advantage of the occasion to sign the 2014-2017 CSTB Objectives and Performance Contract with CSTB President Bertrand Delcambre.

The CSTB Publications team presented the new range of CSTB software with a series of conferences and demonstrations, as well as its latest publications and Reef online service developments. In 2013, nearly 25,000 users visited Reef to receive an effective response to their need to access and use regulations.

Meetings focusing on stakeholder innovation and expectations, and discussions between professionals and CSTB experts all contributed to the success of this major event for everyone involved. Some ten conferences on the issues of energy renovation, timber construction, installation materials, photovoltaic energy and European assessment were led and coordinated by CSTB partners and experts.





CAPEB partnership

Patrick Liébus, President of the Confederation of Craftsmen and Small Builders (*Confédération de l'Artisanat et des Petites Entreprises du Bâtiment* or CAPEB), and CSTB President Bertrand Delcambre renewed their partnership agreement on November 6, 2013. In today's complex standards and regulatory landscape, this new agreement facilitates access to reference documentation for CAPEB members. The associated licensing agreement also provides access to the Reef 4 document database via which CSTB delivers information online.

DECEMBER

> *"To draw, you need to understand the skeleton. It's the same with buildings. If you know how to build, you can create form."*
> Dietmar Feichtinger

Carte Blanche for Dietmar Feichtinger

Hosted annually by CSTB in partnership with Archinov and *Le Moniteur* magazine, the 2013 Cartes Blanches meeting welcomed Dietmar Feichtinger, the Austrian architect famous for his innovative structures and public buildings. What interests the recipient of the 2012 *Équerre d'Argent* award for the Lucie Aubrac School in Nanterre about architecture is: *"Creating spaces for living and interaction"*, with particular emphasis on structure.

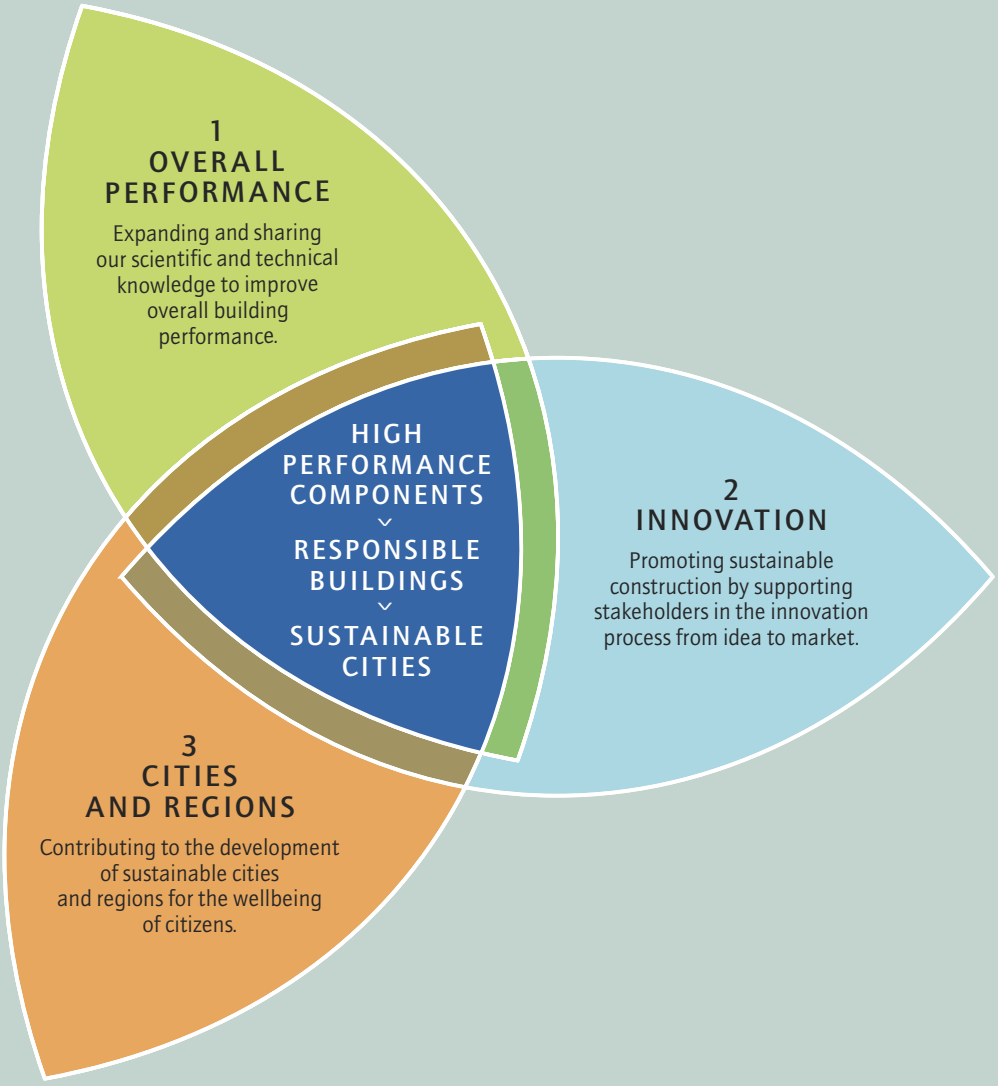
CSTB strategy

In order to respond effectively to the key challenges posed by the pace of change in construction and development, the structural initiatives of CSTB for the period 2014-2017 will focus on 3 strategic priorities:

1 | **OVERALL BUILDING PERFORMANCE:**
delivering ecological and energy transition, safeguarding health, preventing risks, controlling construction and renovation costs, and matching building use and adaptability to the changes in society...
they all require the development of **overall building performance**.

2 | **ENHANCED SUPPORT FOR STAKEHOLDERS IN THE INNOVATION PROCESS:**
improving access to new markets for contractors and creating new jobs demand higher level of support for the stakeholders who drive the **innovation** process.

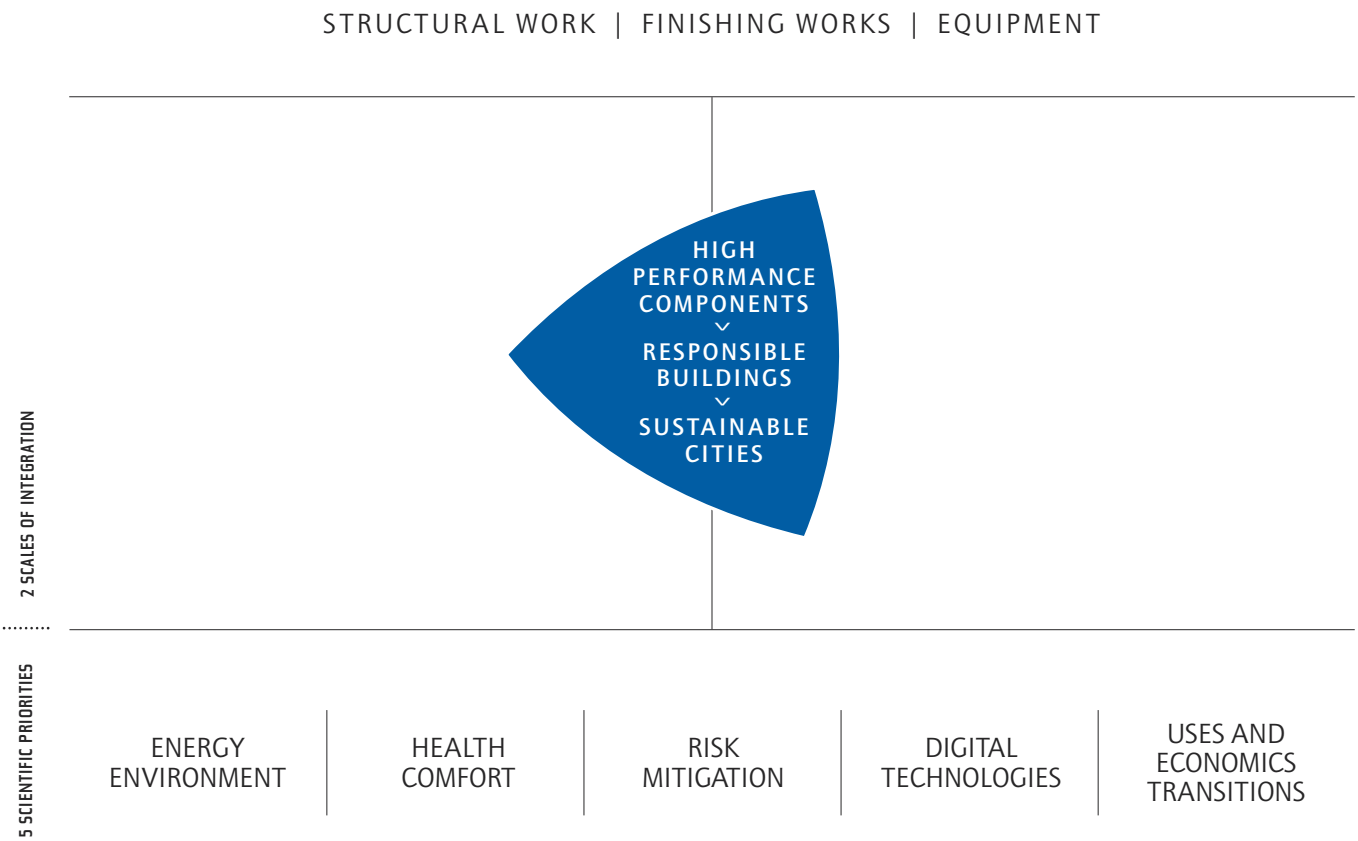
3 | **AN INTEGRATED APPROACH TO CITIES AND REGIONS:**
the emergence and development of sustainable cities as a result of building performance levels that improve quality of life for citizens demand an integrated approach to **cities and their surrounding regions**.



FIVE SCIENTIFIC AND TECHNICAL PRIORITIES

In order to action these three strategic priorities, CSTB is structuring its activities and resources around:

- five scientific and technical priorities Energy - Environment, Health - Comfort, Risk mitigation, Digital technologies, Uses and economics transitions – that will enable the development of multi-criteria scientific and technical analytics covering all the challenges posed by sustainable development. These criteria will also deliver the kind of cross-disciplinary benefits specific to a scientific and technical center such as CSTB
- two levels of integration: the integration of components into the building structure, and the integration of buildings into the city. By covering the entire building lifecycle, this approach will address the factor of time at both levels
- four activities: Research, Expertise, Assessment and Dissemination of knowledge, supported by an internal management structure with a clear commitment to applying the principles of transparency and business ethics integral to the organization.



Supporting innovation stakeholders

CSTB CARNOT INSTITUTE

The CSTB Carnot Institute supports and works alongside contractors of all sizes to improve building quality and safety in response to the major technological and economic challenges faced by the construction sector. Its multidisciplinary skills underpin a commitment to research that gives preference to cross-disciplinary working and encourages industrial, architectural and sociological innovation in individual buildings and in entire cities. The CSTB Carnot Institute comprises all the CSTB teams involved in R&D and the promotion of its achievements. It encourages and facilitates innovation for all construction stakeholders through the use of its laboratories and extensive research facilities, all of which are united in their focus on 5 scientific and technical priorities. Its range of services adapts to meet the needs of its clients: research and expertise contracts, technology transfer, academic chairs in industry research, etc.

HERVÉ CHARRUE, *Deputy Chief Executive Officer, Director of Research and Development, CSTB Carnot Institute*

Over and above an economic situation that is rather mixed, especially in the construction sector, the finalization in 2013 of the new Objectives and Performance Contract 2014-2017 marked something of a turning point in recognition of the major role in society played by the construction stakeholders.
The inclusion of urban challenges as one of the three strategic priorities of CSTB alongside overall building performance and support for innovation now points the way for a systemic and more broadly based approach to the building in its urban environment. The CSTB R&D department had anticipated and called for this as part of a scientific approach based on integration and scales, because that is what is required to produce a relevant description of the building and its role in terms of its impressive potential to contribute to achieving the challenges of sustainable development. That is why the five scientific priorities of safety, energy and the environment, health, the economy and society, and digital technology all contribute to the continuity required to support public policy at every scale, from building components to urban planning. All these considerations support and pave the way for the unstoppable evolution of the construction sector, which must make the maximum possible contribution to achieving the goals identified and restated by the National Debate on Energy Transition.
In the same way as major manufacturing and service industry sectors, construction in the wider sense is entering the age of digital technology that alone offers the capability needed to deliver total performance in an increasingly complex environment by incorporating the ever-growing body of sociological, technical and economic data.
Clearly, in such a context exacerbated by the need to tighten economic and budgetary controls, CSTB must - and this is even more important today - address these issues through scientific and technical partnerships that benefit research and innovation.
On the one hand, it will develop joint planning partnerships with the various organizations and partners involved in construction and urban development. And on the other hand, like the Carnot Institute, it will step up the process of transferring research outcomes to companies through more proactive coordination of the construction sector alongside construction companies, the full range of research organizations, the Carnot Institutes, the Industrial Technical Centers and the regional centers. After a long period during which the contexts and challenges of sustainable development have matured, now is the time for action. Long decried as excessively hegemonic, the energy driver nevertheless remains the only one capable of engaging in this step change.
Whether via the various energy transition institutes, which include Efficacity set up by CSTB, or ANCRE's contributions to energy transition scenarios, all the guidelines and recommendations of contributors point directly to the interoperability of scales and socio-economic and technological issues, such as those championed by CSTB for many years now. Despite maintaining an important role in these expressions, this form of peer recognition can only motivate its researchers to maintain the impetus.

CHARLES BALOCHE, *Deputy Chief Executive Officer and Technical Director*

TECHNOLOGY ASSESSMENT SUPPORT SERVICE FOR SMALL & MIDSIZE COMPANIES AND FIRST-TIME APPLICANTS

The completely new support service for technology assessment applicants introduced in 2013 will soon have handled its first hundred requests. This one-stop shop channels the expertise of experienced engineers and experts in technical issues and procedures to advise innovators.
Their completely free advice checks the substance of the application, identifies any analyses and/or tests required to complete it, directs the applicant towards the most appropriate procedure for the level of technological maturity achieved by the proposed innovation (ATec, ATEx A or B, Pass Innovation, etc.), and provides significant time and cost savings, on the understanding that if the application is to be successful, it must present all the relevant risk management responses for the operations concerned.

HELPING INNOVATION TO FIND ITS MARKET

The proliferation of regulations, their increasing complexity and the need to control construction costs make it crucial that the time-to-market for all innovations is as short as possible. That's why CSTB does everything it can to significantly reduce the time taken to consider assessment applications, and particularly those for Technical Assessment approval.
To achieve that outcome, every application should ideally be complete at the time of submission, but this is unfortunately rarely the case. It's also in the best interests of companies to anticipate the need for other approvals, such as European assessments and certifications. The need to support innovative companies is clear, especially for these two preliminary essentials, especially since many of them are not from the construction world. The demand for support from manufacturing companies is expressed as a need to gain a clearer understanding of construction industry and its requirements. Expanding the scope of application for their product is also a potential opportunity for growth, which can also benefit from support.

PERSONALIZED SUPPORT

CSTB has for many years worked alongside innovative companies to help them complete the essential process of technical recognition as smoothly as possible, and significant progress was made in that direction during 2013. Firstly in the provision of information, and secondly in the provision of more personalized support. The provision of information was improved, for example, by the 2013 development of the CSTB-Évaluation website for launch at the beginning of 2014. This website contains the minimum Technical Assessment application requirements for every building component. It also provides detailed procedures in five languages, because the number of foreign companies making applications is increasing all the time.
CSTB has also opened a support service to provide a one-stop shop that welcomes and guides technical assessment applicants. An online form available from the CSTB-Évaluation website will enable applicants to request this new service *(see inset)*. Small and midsize companies also benefit from reduced rates (a 30% reduction on their first technical assessment application).

QUANTIFIABLE RESULTS

The commitment to involve all national competencies and encourage feedback about local innovations has resulted in the creation of regional and technical partnerships. The first of these - regional partnerships - bring CSTB together with highly skilled Building Energy centers that work closely with research organizations and are very familiar with the potential of their area. The second - technical partnerships - ensure effective synergy with the specialist Industry Technical Centers, whose expertise and skills are well established.
The work done on facilitating the emergence of innovations has halved the length of time taken to complete the procedure - and that's just for Technical Assessment applications. It now takes only eight to nine months from reception to finalization. The reduction has been achieved without reducing the total number of assessments, which remains unchanged at around 1,000, 75% of which relate to the Technical Assessment procedure.
Significant efforts to improve transparency were also made in 2013, with the emphasis on the appointment of Specialist Group members and the requirements placed on their working methods. Also in 2013, we developed application submission software to encourage experts to apply as new or replacement SG members. The new system will be implemented during 2014 on completion of its test period.

3 QUESTIONS FOR...

CHRISTOPHE MOREL, *Deputy Director of Technical Partnerships*

The emergence of new industries and increasingly demanding standards of energy and environmental performance are driving profound changes in the innovation market. How is CSTB adapting to this trend?

The fact is that the upward trend in the number of innovations seen over several years is continuing. They're coming not only from biosourcing, but also from more traditional areas of the industry and are being developed by manufacturers of very different types. We can also see that these manufacturers are very often small and midsize companies from all over the country. Lastly, these manufacturers are not always familiar with the world of construction, and more specifically with the importance of submitting their innovation for the type of assessment best suited to their own plans. One of the key challenges involved in supporting these manufacturers is therefore to provide them with information about the assessment procedures they could use to support their innovation project from idea to market.

So in 2013, CSTB created a network of partners to provide this level of support. In practical terms, it aims to work alongside regional stakeholders with the ability to provide manufacturers with direct local support. The introduction of this network gives CSTB be the resources it needs to deliver effective support for innovative manufacturers, thereby facilitating the emergence of high-quality innovations into the market.

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Could you tell us about this network of partners in more detail?

The network of partners is tasked with guiding and supporting manufacturers through the technical assessment process for their innovation. Explaining procedures, organizing the approach adopted by manufacturers, and helping them to put together their technical documentation are all part of the missions entrusted to our partners. This support enables manufacturers to schedule all the processes and components required for the assessment of their product, and to do so at the earliest-possible stage.

In creating this network, CSTB focused as a priority on working with the Building Energy centers and construction Industry Technical Centers. In October 2013, it signed the first regional technical assessment support mission agreement with the Alsace Énergivie Competitiveness Cluster. This partnership was a major step forward in creating this network.

The initiative will now press ahead with the aim of having a nation-wide network of partners by 2015. Our ultimate ambition for this project is that every manufacturer with a new innovation will be able to receive high-quality support regardless of the region they operate in. This is one of the major aims of the CSTB 2014-2017 Objectives and Performance Contract, and one that I am focusing all my efforts on.

How is CSTB building a shared impetus and commitment within this network of partners?

The role of CSTB is to share its knowledge with its local partners and provide them with technical support. A great deal of that support takes the form of training. Through training initiatives, our experts can pass on their knowledge about the assessment process, and prepare our partners for their mission by sharing their experience of supporting manufacturers.

It also involves providing our partners with access to a CSTB internal team whose job is to provide them on a daily basis with a level of support that suits their profile and experience.

Lastly, CSTB will hold regular meetings with this National Support Network containing all its partners with the aim of encouraging the swapping of good practices and feedback. The first meeting of this network in 2013 proved an enormous success. We're definitely up and running!

*Commitment charter signed in 2012 between the Building Energy center network coordinated by the Sustainable Building Plan, ADEME, Oséo and CSTB.

New European regulation for construction products: what impact on the assessment activity?

**European regulation (EU) No. 305/2011 repealed the European directive for the marketing of construction products on July 1, 2013.
This major change is aimed at making approaches more uniform and at simplifying procedures for assessment of standard and non-standard products.
It also affects operation of the EOTA*, a European organization to which technical assessment organizations in Europe such as CSTB belong.**

For products that are not entirely covered by a harmonized standard (non-standard or innovative products), the new European regulation sets up the European Technical Assessment (ETA) to replace the European Technical Approval (ETA). This new procedure is voluntary. Furthermore, the new regulation makes the declaration of performance and CE marking compulsory. These approaches apply to construction products covered by a harmonized standard, or complying with their European technical assessment.

The declaration of performance is the successor of the CE declaration of conformity. CE marking on a product now means that the product complies with the declared performances. Setting up the new European regulation (CPR) is changing how EOTA functions. Specifically, EOTA changed its statutes in June 2013. On October 16, 2013, its members adopted the internal regulations and elected their executive board during the first general assembly of the new version of EOTA.

Yannick LEMOIGNE, Head of CSTB's Certification Unit and Chairman of EOTA since April 2012, led all of these transformations.

The entire organization of the association has been operational since autumn 2013, to perform its missions.

EOTA also opened its new site at www.eota.eu in 2013.

*EOTA: European Organisation for Technical Assessment

CSTB PROGRESS FOR THE FRENCH ENVIRONMENTAL POLICY STANDARD PRACTICE PROGRAM

The RAGE (French Environmental Policy Standard Practice) program brings together major construction stakeholders with CSTB's scientific and technical support, for the 2011-2014 period.

One of the five actions of this program consists of writing professional recommendations. The objective is to provide professionals with technical reference systems for the construction of more energy efficient buildings.

CSTB's role in this context is to check that all documents produced are scientifically and technically coherent. Several tens of experts thus actively participate in proofreading documents produced for passive and active systems in the building.

CSTB also drives the concept of 16 professional recommendations on building passive systems (external and internal insulation, installation of door and window frames, sandwich panels, etc.). Almost all these technical contents were complete by the end of 2013. Final editing will be completed in 2014.

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BESANÇON
CITÉ DES ARTS
ET DE LA CULTURE
Leading architect
KENGO KUMA
Partner architect
ARCHIDEV

Innovation
SOPREMA ATEx 1875:
metal roof with
standing seam,
1.6% pitch with
outer roof

Giving meaning to our research... The major challenge to CSTB research workers in the next few years will be to successfully transform scientific and theoretical responses to new requirements for sustainable construction into efficient tools. These tools and solutions must be developed with and for contributors for design, construction and renovation in order to make their acceptance and use as easy as possible.

This challenge is applicable particularly to the energy and the environment fields for which the analysis is becoming more complex and the amount of data to be taken into account is increasing.

JULIEN HANS, *Energy-Environment R&D Program Manager, Energy-Environment – Research Deputy Director*

Energy, Environment

New methods of assessing structures have been designed to satisfy the obligation to achieve performances and results. Today's challenge is to transfer them into practice to better satisfy environmental and economic challenges.

Experience has shown that this performance-driven approach must be global, since this is the only way of achieving a relevant analysis and efficient results. This is why CSTB's scientific and technical Energy-Environment priority is organized around this quest to achieve global performance in buildings and developments, obviously at the time of their construction, but also throughout their life cycle.

Our decisions must always be guided firstly by energy and the environment, closely tied to comfort, health and economy.

There has been a similar development for the scales considered - the work is now broader than a Life Cycle Analysis of materials and buildings, and covers districts and cities, combining a broader vision and more extensive and more complex models. Analyses must be both holistic and much more detailed because, as in many sectors, the sum of the best individual solutions is not necessarily the best solution for the whole being considered.

These rules are always applicable when energy and the environment are concerned: in sustainable urban development, for new construction methods respecting the environment, in the assessment of innovations (products and systems), in the development of renewable energies, management of existing building stocks or even in control over the management of material and energy flows.

There are many challenges: the energy challenges for new construction and for the refurbishment industry are not the same. The objective for new construction is to guarantee long-term performances and to provide everyone concerned with high-performance tools capable of handling the considerable amount of data to be considered, and for refurbishment it is to provide a reliable and specialized diagnostic to define optimum strategies to achieve the purpose(s).

In this context, the Energy-Environment priority applies to the development of tools that can be used by professionals, the search for new, realistic and reproducible solutions, support with innovations, etc.

More fundamental research on understanding of phenomena is an essential prerequisite to reliable modeling. We will make every effort to assure that these theoretical models derived from our research are transferred to practical models used in business tools. Similarly, we offer support for developments from specific ideas to final solutions.

Our work is presented in scientific publications and professional training courses, thus contributing to the dissemination of information to the different stakeholders in the field. We have also built many partnerships with socio-economic stakeholders in construction, to better anchor our position as a "research application catalyst".

From building to city, from a specialized approach to a global design

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HÉLIANTHE, EIFFAGE CONSTRUCTION, building modeled for HQE Performance

HQE PERFORMANCE: LABELING GLOBAL PERFORMANCE

CSTB is working on an HQE performance label based on result with reference to a wide panel of environmental and comfort criteria. Reference values for environmental assessment of buildings were defined in 2013.

The purpose of the HQE Performance label is to assess performances of constructions rather than their ability to satisfy requirements of means, thus allowing more freedom in choosing design methods. The criteria are the results of an environmental assessment. Design and use are fully taken into account, thus broadening the field considered to include the complete life cycle of the structure.

A large amount of work is carried out in preparation for the label, particularly for environmental criteria determined over several years. CSTB created reference scales in 2013, using models produced by contributors working on HQE Performance. Working groups including particularly DHUP, the HQE association, ADEME and CSTB and also representatives of clients, project managers, professional associations, manufacturers and resource centers, defined the general framework in which the set of documents necessary for this assessment would be produced. A first series of experiments was made in 2010 on 74 buildings with the objective of facilitating the development of life cycle analysis (LCA) tools as a function of progress of the project. A second series of experiments led to models of 140 new highly diverse and highly energy efficient buildings. CSTB collected and consolidated information after these various steps, to create reference scales based on environmental criteria.

The approach consists of identifying events that have the greatest influence such as construction and some functional and even usage aspects of the building, such as displacements of occupants. The next step is logically to search for levers to improve the most influential points. Additional work has drastically reduced the time necessary for LCA modeling to a few hours by coupling Élodie, the building environmental performance assessment software, with the BIM and descriptions of structures as macro-components.

2020-2050 RESPONSIBLE BUILDING STUDY

CSTB is participating in the Working Group *"Réflexion Bâtiment Responsable 2020-2050"* implemented in the framework of the National *"Plan Bâtiment Durable"* (Sustainable Building Plan) about sustainable buildings, that submitted a report in 2013 suggesting major topics for research and encouraging local experiment.

The *"Réflexion Bâtiment Responsable 2020-2050"* working group was initiated within the Sustainable Building Plan with the mission of planning construction changes by the year 2050, with a milestone in 2020. CSTB's management is participating alongside representatives of clients, design, contractors and social housing, among others. Its conclusions confirm three main concepts: put the human being at the centre of research, reason at the scale of cities and facilitate experimentation.

The first proposal highlights the comfort and health of inhabitants, emphasizing that usage of the building is at least as important as its construction and renovation. Obviously, this view is accompanied by an encouragement to adopt more responsible "life styles", more respectful of environmental data and constraints. The change in scale is aimed at globalizing engineering requirements at least for an entire housing block, neighborhood or city, to enable sharing of needs and solutions. Finally, the *"Réflexion Bâtiment Responsable"* working group encourages experimentation, for example considering that regions should become fields for experiments, particularly to find local solutions.

The group suggests setting up a label for new, renovated and existing buildings by 2018, based on global indicators capable of federating research already initiated by the different stakeholders, to help materialize these objectives and to set up a milestone.

HEAT RECOVERY FROM GREYWATER

Between 25 and 65% of the energy necessary for showers can be recovered using systems assessed by CSTB and included in the 2012 Thermal Regulations as innovative systems.

From component to system, global performance is often achieved by innovative work to limit energy losses. The example of instantaneous energy recovery from greywater illustrates one energy efficient approach and the effectiveness of work done by CSTB over several years, for which important steps were completed in 2013.

A group of three companies wished to validate the principle of energy recovery on greywater from showers to preheat cold water entering the domestic hot water system (DHW) through exchangers. It aimed at characterizing performances obtained and possibly improving performances, but also to take performances into account in RT 2012 regulatory calculations. Therefore, CSTB started by creating a test protocol to qualify exchangers under conditions representative of real usage conditions.

Different tests demonstrated the efficiency of the system that saved 15 to 30% of DHW on average, with showers accounting for about 50% of the total consumption of DHW. This efficiency increases as the number of showers within a short period increases. This system is particularly suitable for communities, hotels, gymnasiums, etc.

The regulatory step consisted of validating the process through 2012 thermal regulation Title V that allows for proposed innovations to be taken into account after the initial regulatory text has been released. CSTB experts supported manufacturers in developing the calculation method.

For this purpose, CSTB, which developed the performance determination protocol, is currently obtaining COFRAC accreditation to perform these tests and is contributing to setting up certification of these products in the near future.

This work forms part of an approach towards global building performance. The production of domestic hot water consumes more energy than almost any other activity and every possible means of controlling and reducing this energy consumption should be studied. Digital models developed for this purpose provide input for global approaches applied using the Élodie tool.

Reuse of this water could be envisaged for some domestic uses not necessarily requiring drinking quality water, provided that a waiver can be obtained. Such recycling can save about 30% of water. CSTB has performed various actions to increase knowledge about greywater and associated treatment systems, so as to anticipate future regulations aimed at securing integration of recycling systems into buildings and protecting users. In particular, a PhD thesis was defended in 2013 characterizing dangers related to use of such water for the irrigation of urban green areas.

ELECTRICAL ENERGY: BEING FAMILIAR WITH THE COST

CSTB has developed electrical consumption load curves in a neighborhood, facilitating management of the global cost and illustrating the potential of renewable energies.

All recent studies lead to the conclusion that it makes more sense to manage energy at the scale of a neighborhood or a city, rather than at the scale of a building. Sharing of resources and needs can lead to more easily managed equilibriums requiring less investment in terms of production and therefore possible storage, particularly for electricity. CSTB has worked on defining an electrical load curves generator to better identify the consumption model, at the scale of a neighborhood. The tool has already enabled a much more detailed approach to needs. CSTB performed a study of occupant activities in their homes associated with domestic items (household appliances, multimedia, etc.), using INSEE statistical data and based on the behavior of 30,000 persons during a day (in steps of 10 minutes). Seven out of 200 identified activities were selected as being the most important and were used to define six typical days. The model projects data for a home over a year to generate representative load curves in time steps of one minute for the medium and long term, to determine possible solutions to reduce electrical costs.

These data are used to identify the impact of the energy cost on the thermal behavior of a home and any discomfort. They facilitate progress towards the scale of a neighborhood. Finally, good knowledge of user behavior will facilitate control of costs and therefore guarantee system performances.

An analysis of the phenomenon shows that globalization of needs leads to a lower demand than was imagined. This means that the current trend is to overestimate needs and therefore oversize networks, and even storage needs in the case of the use of renewable energy such as photovoltaic.

Renovation

DIAGNOSTIC AND ENERGY MANAGEMENT: WIDESPREAD AUTOMATION

An innovative home diagnostic and energy performance management system by an optimization specialist.

A company specializing in very large-scale machine-to-machine communication is working on optimization of energy consumption. It already markets industrial solutions but it would like to broaden its product range to include homes. Therefore, the objective is to develop simple measurement systems (a set of sensors arranged in the home) continuously providing information to easily accessed applications for use by home occupants and usable through Internet.

Energy optimization is particularly complex because it involves a large number of parameters such as consumption modes and identification of peak periods, changes in weather, orientation of premises and expected sunshine, etc. CSTB has been appointed to develop several applications.

This development has been based on data records kept over many years that have been used to analyze and interpret collected information by qualification of the thermal performance of homes and the identification of consumption patterns.

The next step is logically to identify the impacts of envisaged improvements. After the first operation, in 2013 the company asked CSTB to continue its work and study types of heating other than electrical heating alone, for a complete apartment building.

Completion of this work will eventually open up the way to outfitting eight million homes in France at an optimized cost. At the moment there is no equivalent fully automated system.

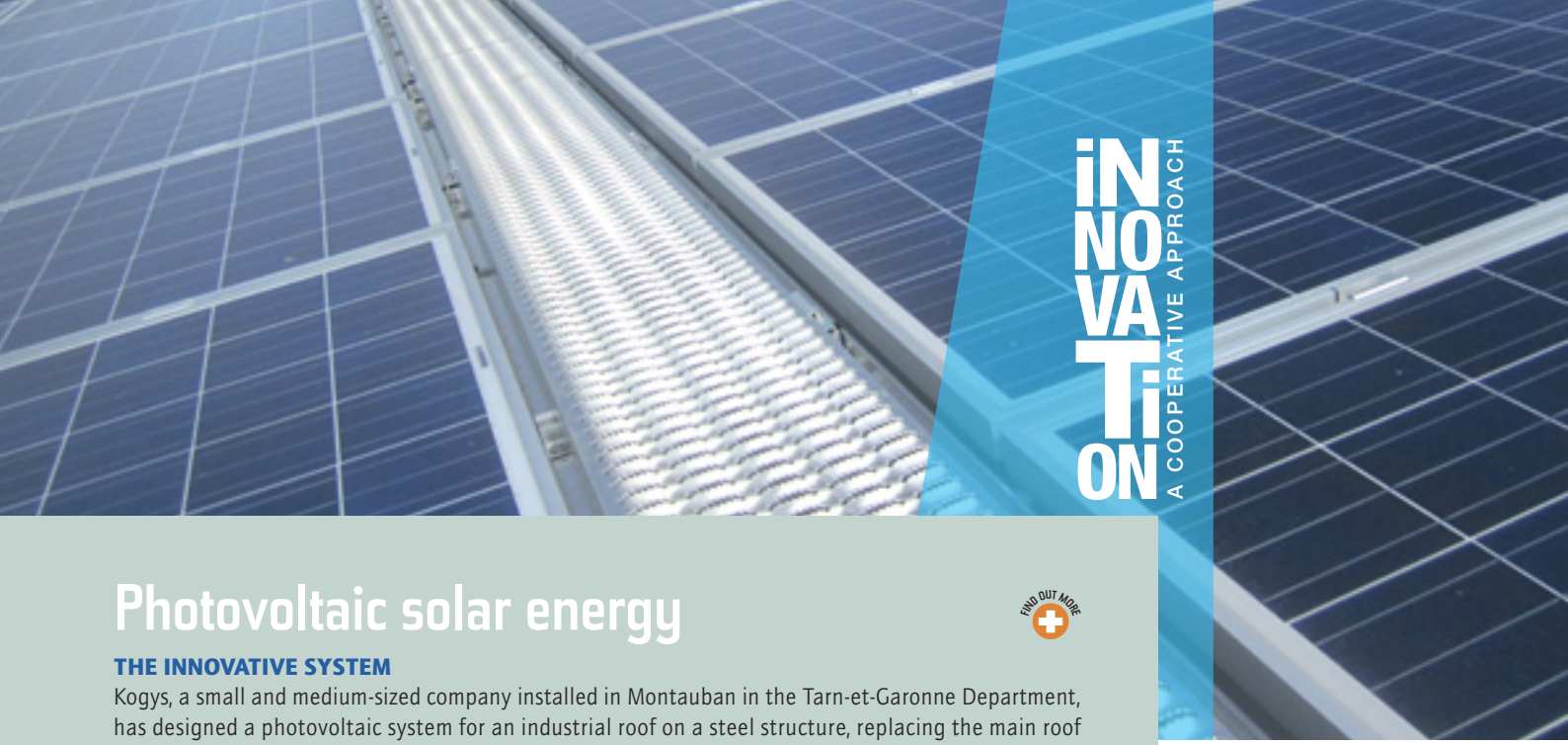
DIAGNOSTIC OF SOCIAL HOUSING AFTER RENOVATION

CSTB has assessed the real performance of energy renovation work done by a large social housing operator, so that savings can be passed onto rents.

The law allows social housing operators to transfer half the amount of energy savings to rents, after doing energy improvement work on their buildings. It is essential that the impact of this work should be estimated in advance, to make a financial estimate of the real savings achieved. This is an operation that must be done by a third party.

Habitat Toulouse asked CSTB to carry out this mission through an agreement, after the renovation of 1,300 homes. A vast long-term measurement campaign will be used to monitor indoor temperatures, consumptions recorded at the meter, the CO_2 content and also luminosity and relative humidity in a sample of slightly more than 10% of renovated homes. These measurement criteria include other variables such as changes in the weather and obviously how occupants use their homes.

The system was implemented in 2013 and monitoring will continue for three years starting in September 2014. The entire procedure can be repeated for the benefit of other social housing operators or building stock managers.



Photovoltaic solar energy

FIND OUT MORE

THE INNOVATIVE SYSTEM

Kogys, a small and medium-sized company installed in Montauban in the Tarn-et-Garonne Department, has designed a photovoltaic system for an industrial roof on a steel structure, replacing the main roof elements. It is designed for the construction of solar electricity generating installations, and includes several photovoltaic modules provided with a frame made of aluminum sections and an assembly system enabling installation of modules on the roof in portrait or landscape layout. The assessment applied particularly to the upstands (for which a patent has been deposited) for attachment of the assembly system while allowing for expansion.

THE ASSESSMENT APPROACH

1- Seven ATEx procedures have been completed on Kogys patented products since 2009, to adapt to different application fields and to develop the concept.
2- Wind tunnel tests were done at CSTB to determine the wind resistance of photovoltaic modules, and other complementary test series were done in a Toulouse laboratory.
3- Issuing Technical Assessments.

PROSPECTS

After a first Technical Assessment obtained in 10 months and that was quickly amortized, Kogys continued its assessment procedure with two other Technical Assessments to complete its range of photovoltaic systems and to cover a wide range of use at an optimized production cost. The partnership entered into with the German K2Systems company offers prospects for European development.

Recycled cotton insulation

THE INNOVATIVE SYSTEM

Métisse® is a thermal insulation range for buildings manufactured by Le Relais, the French leader in collection, sorting and reuse of cotton textiles collected by Le Relais. Once sorted by material, textiles that cannot be reused in their existing condition are defibred and then transformed to make insulation. A polyester fiber is then used as a binder to bind the fibers. Le Relais thus gives a second life to a high quality raw material (cotton) with recognized insulating properties. Métisse® is an innovative product because it is available in panels, rolls and flakes; it is suitable for use in buildings.

THE ASSESSMENT APPROACH

1- Three years of research, characterization and industrial development.
2- Issuing an ATEx supported by a financial subsidy from the Nord-Pas-de-Calais region. Textile made mostly of cotton is used for the first time in thermal insulation in the building sector.
3- Issuing a Technical Assessment. Acermi certification.

PROSPECTS

A new napping plant was constructed in 2012. Technical Assessments and the Acermi certification for the product manufactured on this line were obtained at the beginning of 2014.

FIND OUT MORE

> SOME SCIENTIFIC PUBLICATION REFERENCES

New approach to evaluate the seasonal performance of building integrated geothermal heat pump system
KANG E.C., RIEDERER P., YOO S.Y., LEE E.J.
Renewable Energy, 54, June 2013, p. 51-54
[doi:10.1016/j.renene.2012.08.067]

Laundry greywater treatment using a fluidized bed reactor: a proposed model based on greywater biodegradation and residence time distribution approach
DAVID P.L., BULTEAU G., HUMEAU P., GERENTE C., ANDRES Y.
Environmental technology, 34/23, 2013, p. 3087-3094
[doi:10.1080/09593330.2013.803133]

Adaptation of environmental data to national and sectorial context: application for reinforcing steel sold on the French market
GOMES F., BRIERE R., FERAILLE A., HABERT G., LASVAUX S., TESSIER C.
The International journal of life cycle assessment, 18/5, June 2013, p. 926-938
[doi:10.1007/s11367-013-0558-4]

> TRAINING

FIND OUT MORE

International environmental certifications: Comparison of HQE™ LEED, BREEAM, DGNB (ENV45)

Performance HQE™: Stakes, economic and environmental impacts (D3)

Hygrothermal transfers inside the building envelope (ENR18)

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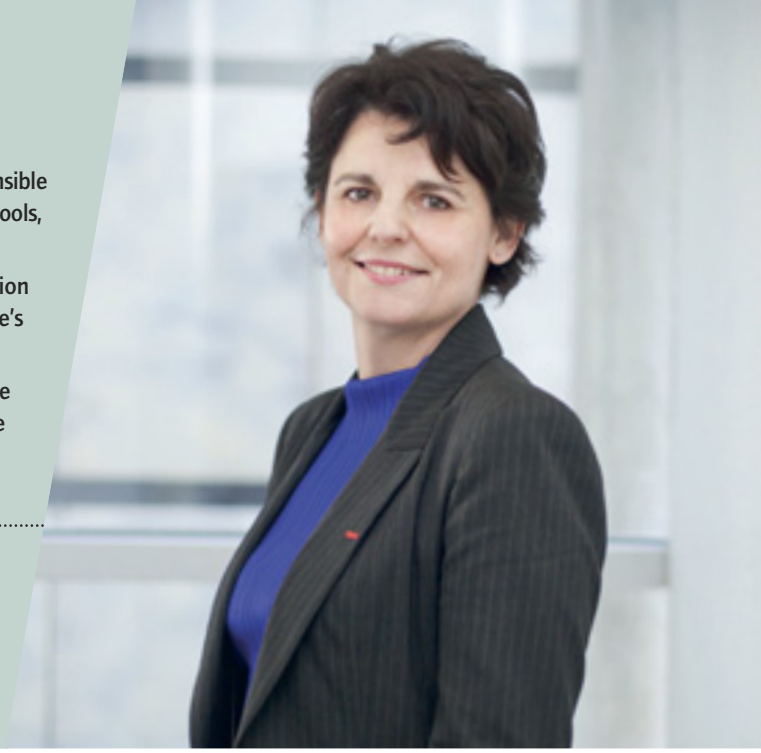
CENTRE SORBONNE CLIGNANCOURT
Architect GPAA

Innovation
MBS Waterproofing ATEx 1899:
built-up cladding with honeycombed polycarbonate boards

Well-being of populations is an essential objective for durable and responsible living spaces in which we spend our time at all ages, including homes, schools, offices, workplace, healthcare facilities and leisure facilities.

Therefore, special attention needs to be paid to the design and creation of these environments, to assure health safety and protect everyone's comfort, even for the most vulnerable populations.

Therefore monitoring, research and the development of solutions are complementary in protecting our citizens and maintaining a safe environment for them.



SÉVERINE KIRCHNER, *Health-Comfort R&D Program Manager, Health-Comfort – Research and public expertise Deputy Director, OQAI (Indoor Air Quality Observatory) Scientific Director*

Health-Comfort

Improvements to environmental performance in the construction sector and national development must take account of well-being of inhabitants, by creating conditions favorable to maintaining their health and comfort. Interaction between people and the environment in which they live is at the heart of sustainable development challenges.

CSTB's Health-Comfort priority is directly related to this mission. Its work relates to knowledge about living areas, identification of old or newly developing risk factors for health and comfort, and solutions for eliminating them or at least significantly reducing their impact.

These risks depend on interactions between human beings and their environment and are related to many physiological and environmental factors such as exposure to physical, chemical or microbiological pollutants, and also the perception of uncomfortable temperatures and noise, vibration or light nuisances. They are potentially more or less serious depending on the time spent in environments, the behavior of occupants and characteristics of the living areas: obviously at home but also in the office, at school, in leisure facilities, care facilities, at the scale of a building or city, when moving from place to place. Improving the quality of living areas limits health impacts, some of which have serious consequences and a high social-economic cost for society. The public authorities have initiated action plans such as the PNSE (National Health Environment Plan), the second of which terminated recently at the end of 2013 opening up the way for the next, with the ambition of reducing exposures responsible for pathologies with a strong impact on health, and resisting regional health inequalities due to the environment. The National Indoor Air Quality Plan was also presented in October 2013.

Progress was made in 2013 with research done by CSTB on the characterization of risk situations and the search for causes and means of managing risks. Each subject is studied with the specific end purpose of providing practical tools that decision-makers and managers can use to anticipate or correct risks, and expertise for some of these subjects has been acquired over many years.

At the scale of the component and the city, the investigation covers a wide range of risk factors such as nuisance due to noise and vibration generated by cities or inside buildings, air pollution, chemicals, particulate and biological compounds such as mould and bacteria, and more recently for example electromagnetic fields, endocrine disruptors and the use of nanoparticles in materials and products.

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MARIA
EXPERIMENTAL HOUSE,
CSTB

Indoor air quality

IMPACT OF HOUSEHOLD AND CLEANING PRODUCTS

CSTB carried out two measurement campaigns in real atmospheres in the Maria experimental house and performed experiments in emission test chambers during the ADOQ (Domestic Activities and Indoor Air Quality) research project, to get an understanding of the impact of using household and cleaning products on indoor air quality.

Consumer products in general and household products in particular can form a source of indoor air pollutants. Exposure to these pollutants is particularly important because it takes place in poorly ventilated environments in which we spend most of our time. This exposure is still relatively unknown even at the present day.

The ADOQ (Domestic activities and indoor air quality: releases, reactivity and reaction by-products) research project coordinated by CSTB in partnership with INERIS and IRCELYON with the support of ADEME as part of the PRIMEQUAL call for research projects, has provided some answers to all these questions through an experimental methodology for the study of household products and evaluation of exposures resulting from their use. The final report for this project was published in April 2013.
The methodology used is based on a combination of measurements in a real atmosphere in the CSTB's Maria experimental house during measurement campaigns made during the winter and summer periods, and in a simulated atmosphere using controlled emission chambers for the evaluation of compounds released into air by household products.

As a first step, release factors from 54 cleaning products were characterized, the products being selected after studying the results of an inquiry on the habits of French households made by CREDOC and representing several brand names, uses and packaging. These first tests demonstrated releases of a large number of volatile organic compounds (VOCs) and aldehydes. In particular, the release of formaldehyde was observed for more than 90% of the tested products and release of d-limonene was observed for more than 40% of them.

Secondly, about ten of these products were tested in the Maria house under realistic conditions based on previously identified scenarios. The objective was not only to understand product release mechanisms but also to study reaction by-products originating from interactions between released pollutants, firstly between themselves and secondly with other pollutants already present in the environment, the effects of which are sometimes more aggressive than the original pollutants. An increase in the contents of volatile organic compounds (VOCs and aldehydes) was observed for all the tested household products. The correlation observed between ozone and formaldehyde levels measured in studied rooms when the products are being used emphasizes the secondary nature of formation of this compound.

Furthermore, variations in limonene and ozone following the use of some household products showed good correlation with the formation of new particles smaller than 100 nm, thus revealing the formation of secondary organic aerosols (AOS) that could have genuine effects on health. In addition, the formation of other compounds that have suspected effects on health including methyl glyoxal and 4-oxopentanal, carboxylic diacids (levullinic acid and limonic acid), dialdehydes (limononaldehyde, etc.) has been demonstrated. Finally the study has demonstrated the formation

of secondary products such as nitrogen dioxide (NO_2), a compound for which effects on health have been proven and that can induce surface reactivity phenomena possibly with the production of nitrous acid (HONO).

Work done for this research project has resulted in a methodology for evaluating chemical releases from household products, inspired from ISO standards in force for construction products, and proposed specific tracers for health labeling of these products, based on their releases of volatile pollutants.

This work also provided the scientific community and public authorities with a large number of release data to be added to existing databases about consumer products, or databases more specific to household products such as the EPHECT database (releases, exposure models and effects of consumer products on health in the European Union).

Furthermore, release data obtained can be input into models that will be used to assess user exposure and estimate the associated health risk.

LUMAIR®: DISPLAY OF INDOOR AIR CONFINEMENT

The air confinement measurement and management instrument made by CSTB for locations in which children will be present is manufactured by two industrialists who presented their prototypes in 2013 under a commercial license.

Air renewal in closed spaces is essential, especially in locations attended by children (day nurseries, kindergartens and primary schools). Insufficient air renewal leads to a confinement and accumulation of pollutants.

CSTB has been working on preventing this confinement for several years, and in particular has developed the ICONE marking system to qualify air confinement on a scale from 0 (no confinement) to 5 (extreme confinement). The ICONE index is calculated by measuring carbon dioxide contents while the premises are occupied. The Grenelle (French Environmental Policy) law that makes monitoring of air compulsory in premises occupied by children, includes calculation of the ICONE index.

Continuing on from this work, a measurement and management device called LUMAIR® was designed to calculate the ICONE index and display the degree of confinement by the use of three-colored lights. A marketing license was produced for it in 2013, with two manufacturers PYRES.COM and Environnement S.A. Prototypes of instruments based on the concept were presented at the 2013 Batimat trade show. A new instrument for measuring and displaying air confinement in homes was produced and tested in ten homes in 2013.

A NATIONAL SYSTEM FOR MONITORING AIR QUALITY AND COMFORT IN THERMALLY EFFICIENT BUILDINGS

This device installed for the Indoor Air Quality Observatory (OQAI) is aimed at getting better knowledge about indoor air quality and comfort in new and rehabilitated thermally efficient buildings.

It was necessary to produce reference protocols and to centralize data across the country, to be able to evaluate indoor air quality in new and rehabilitated buildings, particularly buildings that satisfy the most recent requirements of RT 2012. After a step to create these protocols and perform pilot campaigns, measurements were initiated in about a hundred buildings in 2013 in partnership with about fifteen operators throughout France.

Specifically CSTB, as the OQAI coordinator, has provided volunteer operators with measurement protocols for use in homes, office buildings and schools. Support documents like an action sheet for use if reference values for indoor air quality are exceeded, and a model result report form were produced and made available to local teams. The first results are expected for the end of 2014.

Tracking nuisance due to noise and vibration by urban transport

Noise nuisance, stress, lack of sleep, noise and vibrations generated by passing transport means have direct consequences on health.
The public demands that living areas inside buildings and outdoors should be protected. Two European projects in which CSTB is involved were completed in 2013 with the development of means and systems for reducing the effects of this nuisance and the vibrations due to railway transport at the source.

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HOSANNA PROJECT
In situ measurement of the acoustic efficiency of an urban noise-abatement wall with plant cover

INNOVATIVE MEANS FOR REDUCING URBAN NOISE

HOSANNA (HOlistic and Sustainable Abatement of Noise by optimized combinations of Natural and Artificial means), a European project resulting from the 7th Research and Development Outline Program, aimed at developing innovative systems for the abatement of noise due to land transport by a combination of natural means such as vegetation, earth, wood and stone, and artificial means such as metal and concrete. It was composed of 13 partners under the Swedish leadership of Chalmers University of Technology. The main objective was to work on low noise abatement protections (not more than 1 m high), for example using vegetation on substrate or modeling of ground as low humps.

CSTB was appointed to perform two missions: the first mission was evaluation of the performance of such noise abatement walls adapted to use in cities, and the second mission was an integrated approach to all propagative effects of urban noise abatement studied in the different technical Work Packages in the project.

Research began by producing an Inventory and choosing prediction methods capable of evaluating the acoustic efficiency of noise abatement protections with complex shapes. The study then went on to study small innovative screens and conventional noise abatement screens with plant cover, installed alongside road and railway noise sources. The results are very promising for improvement of the urban soundscape provided that these acoustic protections can be installed sufficiently close to noise sources, particularly if the addition of low screens between traffic lanes is considered for road traffic in the city and tramways. An experiment carried out on the Grenoble tramway has showed a reduction of about 12 decibels from an initial noise level of 80 decibels for pedestrians and cyclists.

CSTB's other work consisted of defining a simple hybrid method of integrating the different propagative effects of reducing urban noise for which there is no complete engineering method at the present time. This methodology for transforming digital results obtained for complex geometries could be integrated in the short term into acoustic engineering software such as Mithra-SIG developed by CSTB. In addition to this method, auralization of noise has been used to reproduce the soundscape before and after the use of acoustic protection systems for a perceptive comparison including 3D effects, using a dedicated sound installation. This realistic demonstration that can be enhanced by the use of a dynamic 3D visual support, is a valuable tool for communication and cooperation, and is already widely used by the General Council of the Nord Department for its new road projects. The system has been available for several years and has been enriched based on the results of a PhD thesis led by CSTB and completed in 2013.

The purpose of this PhD thesis was to improve the reproduction of road traffic noise based on a step-by-step approach for sound sequences and to develop appropriate software. This new tool can be used for example to obtain noise conforming with variations in engine speeds. It then becomes possible to simulate accelerations, decelerations and gear changes of vehicles, such simulations being essential for characterizing dense urban environment. The traffic model part of this auralization, also used in the HOSANNA context, was carried out in cooperation with LICIT (IFSTTAR-ENTPE joint laboratory).

RAILWAY NOISE AND VIBRATIONS

The same objective to reduce noise and vibrations, in this case applied to railway vibrations, was the subject of work done as part of the European RIVAS (Railway Induced Vibration Abatement Solutions) project. Five railway companies, rolling stock manufacturers and several European research centers including CSTB, cooperated in this project coordinated by the International Union of Railways. The objective was to attenuate noise emitted at the source and thus reduce vibrations inside neighboring buildings (that can be felt) and noise (structure-borne) induced by these vibrations.

CSTB's mission consisted of using calculations to evaluate the positive effects of protection measures developed by the different participants in buildings, including improved bogies, maintenance

of wheels and rails, mat under sleepers, screens in the ground, etc. CSTB main objective was to verify the extent to which inhabitants were sensitive to improvements made varying from a few dB to more than ten dB, depending on the systems used and the frequency bands.

This project that lasted for three years and was completed in 2013, began with an Inventory of models and indicators for exposure to nuisance. The second step consisted of sorting these models and indicators and choosing which appeared most appropriate for the evaluation. The study showed the variability of situations in different countries, showing a greater variety in countries north of France, particularly in terms of measurement standards. Empirical and statistical data in these countries were used to develop a simplified tool providing realistic results about the effects of studied solutions and including the calculation of exposure indicators, by making comparisons with a theoretical (finite element) model developed by CSTB. The abatement of noise and vibrational exposure of local inhabitants can be estimated and therefore the gain in comfort can be evaluated for each given treatment type.

This work should be used to provide a basis for national standardization on the subject. Furthermore, reconciliation of methods and indicators by CSTB offers solutions for international harmonization in the field.

Quantifying radon in the home

The development of a simplified but reliable method of evaluating the presence of this radioactive gas in homes is useful to evaluate the health risk faster, particularly for management of radon in existing homes.

We do not talk about exposure to radon as much as tobacco, and yet it is the second cause of lung cancer in France. It is also the most frequent risk of exposure to significant radioactive doses. This radioactive gas originating from the decay of uranium and radium is present in the ground and in water naturally in variable quantities and densities, depending on the regions. In some configurations, levels can become dangerous for people in buildings.

At the present time, the time required by investigation methods for measuring the radon content in a room can be an obstacle under some circumstances, particularly in the context of defining management methods for existing homes. CSTB carried out a four-year study that was completed in 2013 in an attempt to shorten this time, while assuring that the method used remains representative and realistic.

The results were compared with results derived from digital simulation, increasing confidence in the existing model. Therefore, these illustrative results were used as a basis for defining an evaluation method to characterize the radon risk in the building.

Different pressure and vacuum levels were generated using a blower door mostly used to perform tests on the efficiency of air tightness in homes. The result is that radon entries are exacerbated and entry into buildings can be measured. This operation can validate a "radon potential" that can then be compared with ventilation models. The operation requires a one-day campaign.

The next step is to test this protocol on a larger sample of homes to validate its relevance so that this method can eventually be used so as to facilitate management of the radon risk in the home.

> SOME SCIENTIFIC PUBLICATION REFERENCES

Acoustic performance of gabions noise barriers: numerical and experimental approaches
KOUSSA F., DEFRANCE J., JEAN P., BLANC-BENON P.
Applied Acoustics, 74/1, 2013, p. 189-197 [doi:10.1016/j.apacoust.2012.07.009]

Air stuffiness and air exchange rate in French schools and day-care centers,
RAMALHO O., MANDIN C., RIBERON J., WYART G.,
The international journal of ventilation, 12/2, September 2013, p.175-180 [doi: 10.5555/2044-4044-12.2.175]

Analytical quantification of airflows from soil through building substructures
DIALLO T.M.O., COLLIGNAN B., ALLARD F.
Building simulation, 6/1, March 2013, p. 81-94 [doi:10.1007/s12273-012-0095-2]

Emission characteristics of air pollutants from incense and candle burning in indoor atmospheres
MANOUKIAN A., QUIVET E., TEMIMEROUSSEL B., NICOLAS M., MAUPETIT F., WORTHAM H.
Environmental science and pollution research, 20/7, July 2013, p. 46-59-4670 [doi:10.1007/s11356-012-1394-y]

Positive associations between respiratory outcomes and fungal index in rural inhabitants of a representative sample of French dwellings
HULIN M., MOULARAT S., KIRCHNER S., ROBINE E., MANDIN C., ANNESI-MAESANO I.
International Journal of Hygiene and Environmental Health, 216/2, March 2013, p. 155-162 [doi:10.1016/j.ijheh.2012.02.011]

> TRAINING

FIND OUT MORE

"Indoor air quality: global approach" (ENV11)

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LES HALLES CANOPY ROOF
Architect Patrick Berger,
Jacques Anziutti

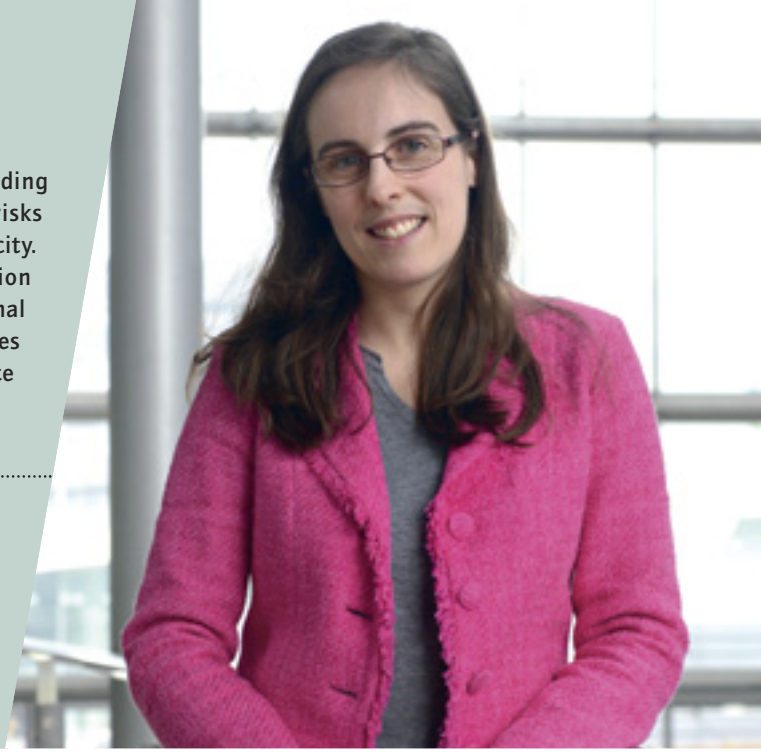
Innovation
VIRY-ATEx 1963:
construction of glass roofs with plane or convex laminated glazing retained on two opposite sides

SEELE-ATEx 2041:
construction of outer roofs and canopies with plane or convex laminated glazing retained on two opposite sides

LAUBEUF-ATEx 2047:
lightweight façades for which insulating glazing is retained by clamping the inner component with SSG bonding of the outer structural glazing, some of which is convex and insulating

Technological changes related to the search for global building performance have led to a re-examination of the question of risks (natural and accidental origin), in buildings and at the scale of a city. CSTB has done this through research, expertise and evaluation services. Maintaining and extending a network of regional, national and international partners is a key element of success. These changes also require major experimental facilities such as the Vulcain furnace and the Jules Verne climatic wind tunnel.

STÉPHANIE VALLERENT, *Risk mitigation R&D Program Manager, Responsible for the Research Partnerships Development mission*



Risk mitigation

Major ambitions to save energy and to limit emissions of greenhouse gases include commitments to intensify research and expertise efforts on the vulnerability of existing buildings to natural and accidental risks.

Adaptations are always necessary to make design choices and to improve performances made possible through technical progress (increasingly large civil engineering works, therefore more sensitive to the effect of storms and wind).

The form taken by fire risks, risks due to weather (wind, snow, flooding, storm, heat wave, etc.) and seismic risks can be different for the structures and persons who occupy them.

CSTB has benefited from its high level internationally recognized expertise in performing its mission for the Risk Mitigation priority. It has unique means in Europe, particularly with the latest acquired facilities such as Vulcain. It is continuing to extend its knowledge (for example about wind-related phenomena), while continuing its mission to validate emerging techniques. It is essential that new systems should be qualified taking account of all construction risks considered separately (for example fire resistance or mechanical strength alone) or combined.

This combined approach to risks and their effects at very different scales applies to the component itself and its suitability for its function, to the structure considered as a whole including its strength and reliability, and also to the neighborhood and urban environment.

TECHNICAL-ECONOMIC OPTIMIZATION AND FEASIBILITY

CSTB's work includes the development of economic solutions adapted to the variety of geographic and climatic contexts.

The objective is to provide players in the construction sector with the tools that they need to predict vulnerability of the structure to different risks and to choose the most appropriate solutions for their needs to combine safety of persons and property and building performance. This is the context in which CSTB performed different actions in 2013 for the development of performance-driven approaches. Fire remains a major risk, and fire risk studies are carried out on materials, structures and systems including smoke removal systems, taking account of new sustainable building data. But other risks, for example related to uncertain weather, must be considered in a global approach that must lead to the development of evaluation and then prediction tools.

Trinity tower in La Défense, Paris District Court: the multi-disciplinary approach

The CSTB Carnot Institute was called in during the year 2013 to perform specialized studies related to a number of symbolic construction projects. Designers called for multi-disciplinary expertise and major facilities for the Trinity tower in La Défense and for the Paris District Court.

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TRINITY TOWER,
La Défense.
Architect:
Crochon Brullmann
+ partners

The construction of tall buildings raises a number of questions. For wind, design includes calculations to assure that components resist wind in the long term. Usage needs to be studied by measuring the comfort of occupants in relation to building movements under wind pressure. Furthermore, the construction of a new building significantly changes the natural lighting of its environment and studies of introduced shadow effects (depending on the time and the season) are becoming increasingly necessary. Construction choices also need to take account of prevention of the fire risk. This three-fold service was provided by CSTB for construction of the Trinity tower in La Défense because it has the human skills, and it is also the only organization in France with the facility necessary to provide a complete and reliable approach.

WIND RESISTANCE AND AERO-ACOUSTICS

In particular, the facilities were used to determine the behavior of the building and all technical and architectural projections such as sunscreens, photovoltaic panels, antennas, etc., under wind. Simulations at different scales depending on needs (from 1:200 to full size) were made in the Jules Verne wind tunnel in Nantes that reproduces wind under maximum conditions.

Studies included the sizing of foundations and façades, dynamic and vibration behavior of the tower and behavior of cranes under wind for which the balance is seriously disturbed close to tall buildings, in addition to evaluations of comfort in wind conditions near the bottom of the building and inside it (due to the acceleration phenomenon). Finally, special studies were carried out on all projections to assure that they cannot be torn off.
CSTB also has test facilities capable of evaluating the consequences of direct aero-acoustic phenomena caused by the noise of wind on projections, and indirect aero-acoustic phenomena caused by vibrations specific to the object.

Tools and facilities contributed by the CSTB group for use by the design teams, including the Jules Verne and the Eiffel wind tunnels, helped to make all types of measurements, essentially of strength.

SUNSHINE STUDIES

CSTB experts carried out sunshine studies at the same time and also for the Trinity tower, on tools developed by specialists, particularly a 3D model of the La Défense district into which new projects can be inserted.

The PHANIE software, also developed by CSTB and its complementary HELIODON module, are then used to determine the position of shadows depending on the season. Precision depends on the need, and can vary from the equinox and solstice alone, or at steps of 6 minutes from when the sun rises to when it sets. Shadows on surrounding façades, public areas and sensitive nearby locations (squares, schools, etc.) can thus be evaluated. Fourteen areas surrounding Trinity were thus observed. Results are provided in the form of tables and maps.

GUARANTEE BEHAVIOR OF THE STRUCTURE IN CASE OF FIRE

Finally, Trinity is unusual in that it is built above roads that will thus pass under the tower. The client asked CSTB to study the risk of scaling of concrete on these roads. CSTB had already approached this complex phenomenon that depends on many parameters, in previous studies. There is no appropriate predictive calculation method, the only way to determine the risk is experimental verification of the phenomenon. Therefore CSTB has set up a test protocol necessary for these verifications, specifying concrete formulation parameters to obtain the most reliable characteristics (porosity, size grading, etc.).

WIND AND LIGHTING FOR PARIS DISTRICT COURT

The Project Manager asked CSTB to carry out a wind resistance study for Paris District Court, on façade panels that were tested using a 1:25 scale model in the Jules Verne wind tunnel. Another special study was carried out in parallel on natural lighting of the 27-meter high lobby for the project, illuminated particularly through ninety skylights, projecting from architectural roofs for which the project manager wanted to optimize performances without changing the dimensions. The study was also carried out with a 3D model using the PHANIE software.

Fire resistance of large concrete walls

A PhD study carried out in partnership with the National *Ponts et Chaussées* school has led to the definition of a design methodology for industrial building walls to resist fire, adapted to the case of large concrete panels.

The use of large concrete panels is widely accepted for industrial and storage buildings. These construction components may be made as single pieces or by the assembly of prefabricated panels, and must satisfy the requirements of fire regulations. Their fire resistance time varies depending on the nature and usage of the premises and it must be sufficient to guarantee integrity of the building for long enough for occupants to evacuate.

Combinations of bending and tension-compression forces are applied to large walls in a fire. These constraints depend firstly on the effect of heat on one of their sides, and secondly and consequently on their self-weight that becomes highly off-centered due to deformation of the panel.

AN ANALYTIC FORMULATION

These stresses significantly modify their mechanical characteristics, firstly through their influence on their geometry, and secondly by changing their degree of resistance. This combination can cause collapse of the structure before the time required by the regulations.

The PHD thesis done at CSTB on the fire resistance of large concrete compartmenting panels was aimed at compensating for the lack of data on this behavior and providing a design methodology that can be used by professionals.

It is based on the ultimate strength design method, applicable to different types of structures and was justified by validation tests carried out in CSTB's laboratories.

The model uses an analytical formulation to avoid difficulties related to digital calculations. It was compared with different behavioral studies of panels depending on their position, forces applied to them, and even the types of reinforcement in them. Cold tests and fire tests have confirmed that comparisons can be made with previous experiments. They were carried out firstly at small scale (on 1 m long and 45 cm wide models) and will be extended to large scale models in a few months using CSTB's Vulcain furnace (9 x 3 meters). This final step will clarify knowledge and complete the methodology, for example to identify any phenomena that have been neglected due to simplification requirements.

VULCAIN SCIENTIFIC COMMITTEE

The research program was defined in liaison with a group of international experts.

CSTB gathered together a group of international experts to form the scientific committee that validated three research topics in particular, before the official inauguration of the large Vulcain furnace for fire resistance tests. The first topic was work on second order effects, namely effects dependent on size. For example, increasing the size of the test piece from 3 x 3 meters to more than 9 x 3 meters showed that phenomena that might have been neglected in the first case have an influence on the result in the second case.

The development of a virtual furnace consists of developing a digital test simulation method and then simulating the phenomenon under changing conditions (for example temperature). Hybrid tests must be capable of evaluating the vulnerability of a complete structure to fire when only one element is tested in Vulcain. The work will concentrate on the development of interaction between Vulcain and the digital software, so that test conditions can be modified in real time.

Finally, research on performance-driven analysis of unprotected concrete structures will study the phenomenon of concrete spalling when exposed to fire and the behavior of three-dimensional structures and their connections in case of a fire.

Structures: reinforcement anchors tested under fire

**An experimental evaluation and calculation method was developed as part of a PhD thesis completed at CSTB in 2013, to guarantee the fire safety of structural assemblies in which chemical add-on reinforcement anchors are used.
Some of the research was carried out in partnership with the American NIST.**

Reinforcement can be installed in a concrete structure by chemical bonding using polymer adhesives. This technique can create connections between elements of a reinforced concrete structure. In particular, it makes it possible to build onto existing elements (such as the connection of a floor to an existing wall). It is fast and easy to install reinforcement by bonding, giving greater flexibility in control of work on site. At ambient temperature, the resistance of these chemical anchors is similar to the resistance of conventional steel/concrete connections.

However, some studies have shown that bond weakens quickly as the temperature increases. This is why the behavior of these anchors under fire has to be studied. The final objective is to predict the time during which structural stability of a building is maintained during a fire.

The two objectives of a PhD study carried out at CSTB up to 2013 in partnership with the Douai *École des Mines* were firstly to know and understand the phenomena and secondly to propose a design method taking them into account to assure that the assembly will resist for the time required by the regulations. A first part of the work was done in four phases, to understand the mechanisms.

The first task was to characterize the mechanical and physico-chemical properties of the polymer material alone. This work was done in the United States within a partnership between CSTB and NIST (National Institute of Standards and Technologies) during six months.

The second task was to combine the three materials (concrete, rebars and polymers) during high temperature tear-off tests. Operations were carried out in CSTB laboratories. These first two steps thus collected a set of data essential for understanding the phenomena, and then for creating the model.

The next step was a theoretical modeling phase to define the stress distribution along anchors to determine the resistance of the different configurations. A predictive thermo-mechanical model was created to determine the time to failure of the structure in the case of a real fire.

A test was carried out on 3-meter long brackets in the Vulcain furnace until collapse occurred after 3 hours' exposure to fire. The experimental results obtained showed good agreement between model and experiment.

A second work phase logically following on from the first is now under way. It is being done by European working groups of EOTA (European Organisation for Technical Assessment). The objective is to define assessment and design methods for anchors that will be published. The assessment methodology is being constructed in cooperation with other technical approval bodies and with chemical resin manufacturers.

This research activity will be continued in 2014, and extended to include timber. New partnerships like that with the NAVIER Institute will be created. A second PhD thesis will be conducted on this topic, and a "large fire" test will be made in the Vulcain furnace to validate the model.

FIRE SAFETY OF FAÇADES

The international conference organized by CSTB showed the need for better knowledge.

About 200 persons from 32 different countries attended the Fire Safety of Façades (FSF) conference organized by CSTB in November 2013. Engineers, research workers, manufacturers, persons responsible for regulations met for two days to debate Current Practice and the advantage of organizing an international network to get a better understanding of phenomena that have to be studied in more detail due to changing techniques. The medium-term objective was to set up harmonized European design rules.

The scientific committee for this conference was led by SP Technical Research Institute of Sweden, the Swedish equivalent of CSTB. The debates focused on engineering of fire safety, national regulations, assessment methods, etc. An analysis of currently available tools showed the need to change from an assessment in terms of fire reaction and resistance, to a global assessment of the system. The conference proceedings that include 38 publications are available freely on the Matec Web of Conferences Internet site.

A new conference on this program will be organized in Sweden in 2016 considering the interest of participants and the usefulness of working on a subject in which all countries are interested. In the meantime, a PhD study was initiated at CSTB in October 2013.

INNOVATION
A COOPERATIVE APPROACH

Composite wood / insulation panels

FIND OUT MORE

THE INNOVATIVE SYSTEM

Techniwood, a small and medium-sized enterprise located in Rhône-Alps region, developed the Panobloc® construction system composed of large structural panels with alternate solid wood and insulation layers intersecting at 90° and offset from each other. These panels are used to make curtain walls, load-bearing walls, floors, roof supports and waterproofing systems. The innovation lies in the offset wood lattice within which insulation is glued in position, rather than simply being put into place. This gives a very good waterproofing, very good fire resistance and very good real temperature performance (no thermal bridges) making the panel very long-lasting. The industrial system, in which the woodwork and the skins are integrated in the factory, can be used for new construction or for rehabilitation.

THE ASSESSMENT APPROACH

1- Assessment of the technical feasibility of the product as part of a preliminary study approach through Synerbois, an association between FCBA (French technology institute for forestry, cellulose, wood construction and furniture) and CSTB.
2- CSTB carried out several tests, particularly on fire safety and earthquake resistance, to determine product performances according to the initial concept.
3- Obtain a Type A ATEx.

PROSPECTS

CSTB will guide the manufacturer in capturing international markets, in a 100% CSTB "ID+Développement" service. Following the different ATEx approvals, Techniwood will make Technical Assessment requests to define the initiated procedures in more detail. New tests should be carried out in addition to the tests done to model the panel.

Wood and wheat straw façade

THE INNOVATIVE SYSTEM

Gaujard technologie Scop has developed prefabricated wood frame boxes inside which highly compressed straw is placed and used as thermal insulation. Straw is an insulation that can be used in passive constructions. This system combines ecological and economic advantages; for farmers, it is a new outlet for an excess product. The annual straw production is several hundred thousand tons. 10% of this production alone could satisfy needs for the insulation of 300,000 new homes built every year in France. This very abundant product is renewed every year, is available locally, it consumes little grey energy, stores carbon dioxide and its price is very affordable.

THE ASSESSMENT APPROACH

1- LEPIR II fire test on façade, normalized experimental test carried out by CSTB to verify fire propagation conditions between two levels through the inside and outside of the building: these data are essential for determining the behavior of the wood-straw assembly. This was the first test of this type done in France.
2- Authorization by the Committee for the Study and Classification of Materials and Components with regard to the Fire Risk (CECMI) to use this system to build public buildings with ground floor + 2 floors (three levels).
3- ATEx B to verify the durability of façades. The digital simulation for water vapor transfers was sufficient for this technical assessment that was investigated by CSTB.

PROSPECTS

The design office has carried out a number of projects since the tests done on the system, including school groups, dwellings and a theatre.
Gaujard technologie Scop has hired several persons since its activity started to grow sharply.

FIND OUT MORE

> SOME SCIENTIFIC PUBLICATION REFERENCES

Computational nonlinear thermomechanical model of large light partition walls based on experimental analyses and probabilistic models
DO T. T., SOIZE C., HECK J.V.
Computer-aided civil and infrastructure engineering, 28/2, February 2013, p. 81-97 [doi:10.1111/j.1467-8667.2012.00782.x]

Evolution of the Parisian urban climate under a global changing climate
LEMONSU A., KOUNKOU-ARNAUD R., DESPLAT J., SALAGNAC J.L., MASSON V.
Climatic change, 116/3-4, February 2013, p 679-692 [doi:10.1007/s10584-012-0521-6]

Ten years of increased hydrocarbon temperature curves in French tunnels
TAILLEFER N., CARLOTTI P., LEMERLE C., AVENEL R., LARIVE C., PIMIENTA P.
Fire technology, 49/2, April 2013, p. 531-549 [doi:10.1007/s10694-012-0259-8]

The use of Petri nets and a two-zone model for fire scene reconstruction.
MULLER A., DEMOUGE F., JEGUIRIM M., FROMY P., VANTELON J.P.
Fire safety journal, 55, January 2013, p. 139-151 [doi:10.1016/j.firesaf.2012.10.006]

> TRAINING

FIND OUT MORE

Main pathologies in contemporary buildings (TEC9)

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EXTRACT FROM A 3D DIGITAL MODEL OF A PARIS DISTRICT automatically reconstructed from aerial photos (Smart3DCapture technology)

Illustration of an application of this model to calculate and then represent the photovoltaic potential of roofs

The quantity of data now used in the design and implementation of a project is enormous. An overview is necessary at every step in the development to identify risks at all times and obviously means of improvement. A digital solution is essential so that every contributor can work efficiently to obtain an optimum technical-economic result, evaluated for construction and over the life of the building, district, and city. This necessitated a large amount of work that resulted in the development of the most appropriate tool, the building information model (BIM).

SOUHEIL SOUBRA, *Digital technologies R&D Program Manager, Information Technologies and Knowledge Dissemination Research Deputy Director*

Digital technologies

New design and operating approaches to create new methods and tools are necessary to satisfy a number of constraints related to sustainable construction requirements. All types of phenomena have to be anticipated to be able to manage the increasing complexity of projects associated with high-performance requirements in all fields, and the search for economic optimization. Therefore, an increasing number of data have to be taken into account and overviews have to be available as early as possible, at all scales from component to the city.

This satisfies the needs of project management striving to achieve efficiency. Investments also have to be controlled and managers attempting to optimize final global operations have to be satisfied. Finally, the expectations of professionals showing an increasing interest in a digital model approach have to be taken into account. The current build-up in the momentum of the digital model is mirrored by the increasing popularity of the generic term BIM (Building Information Model) to refer to the general problem of acquiring and sharing information at different scales.

This set of objectives structures the Digital technologies scientific and technical priority that can call upon extensive expertise in these fields.

Several actions carried out lie within the scope of the Carnot system. The current context in Europe is tending to encourage this approach and a new directive concerning public contracts is aimed at developing the use of digital models to facilitate information exchanges between everyone concerned.

Buoyed by its experience and knowledge, in 2013 CSTB completed new steps in the trend towards total integration of designs. It moved on from research to applications, without neglecting its mission to disseminate knowledge to everyone interested and particularly very small, small- and medium-sized enterprises. CSTB is taking steps to make means of sharing all data that might improve a project available to everyone concerned as early as possible, in addition to its work on scientific developments based on interoperability, training and disseminating information, and developing tools.

Progress for manufacturers includes digitization of catalogues to facilitate the use of innovations in specification tools. Some systems are so complex that the user needs help for quickly measuring the efficiency of innovative construction systems. In this context, it is important to mention significant progress made with the COSYBIM project. The scale then changes from a component to a structure, for which the digital model can give information at every level from fine details to a global view, facilitating various assessments (thermal, acoustic and environmental performances, etc.).

Once again CSTB's work dealt with data integration, organization of computerized exchanges and also the organization of feedback loops to identify where to implement potential improvements. Finally, at the scale of the city, the use of a digital model helps to collect a considerable amount of data useful to citizens and councillors or decision-makers, to make a better assessment of the impact of planned developments, allowing for factors such as traffic, noise, air quality.

MODELING OF THE STIC CAMPUS PROJECT
as part of the Sophia-Antipolis and Alpes-Maritimes Department global model

Architect:
Jean-Michel WILMOTTE

SIMBIO: facilitate digital dialogue

A digital model provides support data necessary to produce a summary of work done by all contributors and its purpose is to facilitate communications between persons doing the work and their tools. Significant progress was made in 2013 with the SIMBIO project that includes the development of common models and harmonization of data before tools can become interoperable.

The SIMBIO (Interoperable and Open SIMulation of Buildings) project is aimed at defining open methods for integration and interoperability of software tools, to design efficient, comfortable and healthy new or renovated buildings. These tools are designed to work together making use of the digital model (BIM), that acts as a common work platform for all trades and disciplines.

Progress made with SIMBIO in 2013 applied to all development levels including the design platform itself, interoperability and physical communication between tools, and interoperability between models.

SIMBIO, led by CSTB in partnership with publishers and manufacturers, is related to two ANR Maevia and Cosimphi projects and the European HOLISTEEC project. The MAEVIA (Interoperable and Adaptable Model Applied to Energy and Ventilation) project done with CNRS, the University of La Rochelle and EDF, applies to mathematical models and their reversibility and its purpose is to produce simplified simulators of aeraulic and ventilation phenomena applied to construction.

The COSIMPHI (Interactive Multi-PHysical CO-SImulation) project carried out in partnership with the Tribu BET (Thermal Studies Office), Toulouse School of Architecture, CEA and G2ELab and the University of La Rochelle, is aimed at designing and renovating installations by simultaneously dealing with environments (acoustic, visual, air and temperature quality) and energy and environmental efficiency. It deals with the core of interoperable calculations. Finally, HOLISTEEC (Holistic and Optimized Life-cycle Integrated SupporT for Energy-Efficient building design and Construction), is dedicated especially to 2-directional exchanges between BIM and business tools, including a part of multi-physical co-simulation.

REFINING MODELS AND ACHIEVING RETROACTIVITY

SIMBIO is aimed at three priority objectives, namely to promote a global building approach, to provide detailed calculation methods in which no double input is necessary (also eliminating the corresponding errors) and to support public policies in terms of regulations. Integration of RT 2012, anticipation of RT 2020 and the need in the near future to take account of human health criteria have already been taken into account or will be shortly.

Improvement of the design platform in 2013 applied particularly to the possibility of integrating and working on multi-scale pre-assembled components. The objective is to obtain a closer relation between specialized software and the BIM, so that action can be taken on one or several elements of a complex component (such as the combination of concrete, an insulation material and a skin) to optimize performance.

More generally, another achievement in 2013, namely inter-operability, which applies to all technical problems, makes it possible to integrate all assumptions and data from all disciplines so that none are neglected. For example, this step enables a thermal engineer to work only on the external walls while the acoustics engineer works on internal and external walls, at the time the core calculations are being done (while waiting for translation into software tools).

REDUCING UNCERTAINTIES

Finally apart from the data themselves, work has also been done on most models to limit uncertainties due to simplifications. Thus, a thermal model does not allow for the behavior of the occupant, or faults in installations at the time of their use, or even degradation due to aging of the structure. The objective is then to define possible ranges of results that can be used to predict scenarios for change. This work was done and is continuing with a team of sociologists. For example, the behavior of inhabitants has an influence on the efficiency of ventilation installations. Their consequences are taken into account particularly in work related to MAEVIA to make aeraulic and ventilation phenomena study models more realistic.

Moreover, a statistical base of construction defects was begun in 2013 and will be used to improve models that, once defined, will be adapted for use in software tools. Naturally, the work will be done taking account of all projects for which CSTB's digital technologies program is used.

Finally in 2013, the environment topic was used to justify the link between the digital model and business models. It is now possible to use the BIM model and create a relation with the INIES database coupled with the Élodie software, to obtain complete project assessments. The result obtained is an environmental "trade view" of projects that precedes the thermal view planned for 2014. This progress was materialized through CSTB's marketing of the eveBIM-Élodie software tool that is capable of using BIM digital models as input data for projects for which the performance can be evaluated by the Élodie software.

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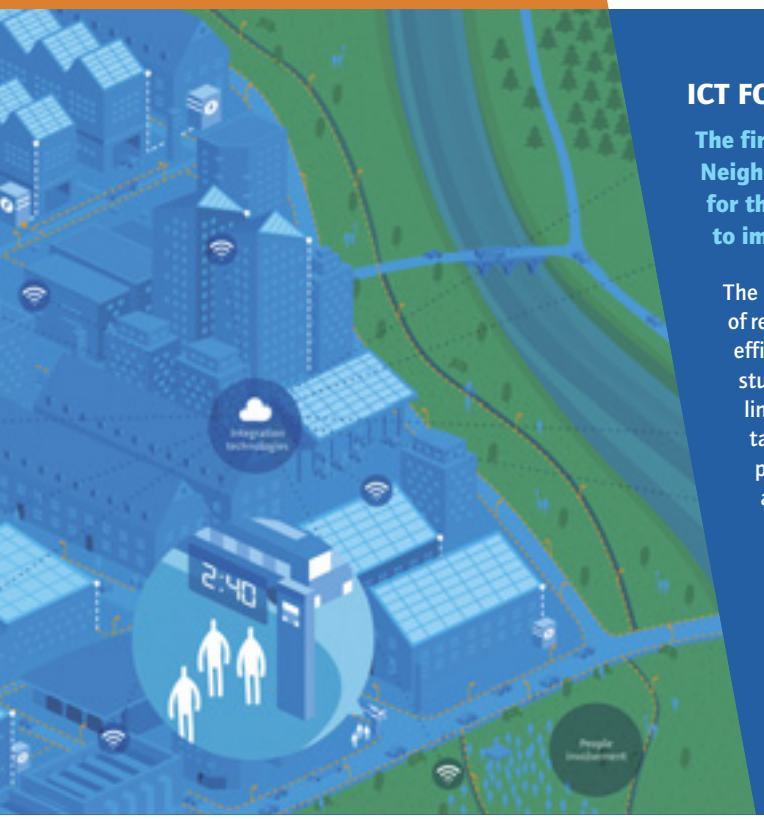
FOCUS ON GRAPHIC DISPLAY
OF THE IREEN PROJECT



ICT FOR MANAGEMENT OF ENERGY IN NEIGHBORHOODS

The final report of the IREEN (ICT Roadmap for Energy Efficient Neighborhoods) project completed in 2013, opens up prospects for the use of information and communication technologies to improve energy performance on the urban scale.

The objective of the European IREEN project was to fix priorities in the field of research on information and communication technologies to improve energy efficiency in neighborhoods. The objective was to perform an international study and then, based on an inventory of the situation, to suggest possible lines of development. Seven partners worked alongside CSTB to support this task, in which about 80 experts from all fields participated, resulting in the publication of a report in enriched graphic form in 2013. The other partners are Manchester City Council, VTT Technical Research Center of Finland, Atos Spain s.a.e, Acciona Infrastructuras, GreenIT Amsterdam, D'Appolonia s.p.a. and Austrian Institute of Technology.

This report explores several possibilities starting from examples of urban situations. Responses may relate to social aspects such as involvement of citizens through social networks, or technical aspects such as centralized management of all components of a neighborhood using computer tools.

The Decision 3D service for city planners

This service is based on the use of a precise 3D geographic database, built and updated automatically from aerial photographs. It is a common denominator for a very large number of developments and plans in all fields related to urban development, and includes a platform of tools particularly useful for decision-makers.

Decision 3D uses the 3D photogrammetry reconstruction technology to build precise and realistic 3D data based on aerial photos. The raw data are then processed and transformed to produce a wide variety of maps including land occupancy, acoustic impacts related to infrastructures, precise photovoltaic potential of an urban zone, light pollution, illumination of remarkable urban areas, dispersion of traffic-related pollutants, and exposure to electromagnetic waves. Decision 3D is based on the technology developed by the Acute 3D start-up originating from the partnership between CSTB and the National *Ponts et Chaussées* school, as part of the Imagine laboratory, to offer a diversified product range in the context of a consortium initiated with CSTB and Technicom – IGN (French National Geographic Institute) and other partners being invited to join the group at the beginning of 2014. Its added value consists of gradually changing from a purely geometric set of data to a semantic interpretation identifying and analyzing urban objects by cross referencing them with geographic information systems to define their characteristics. These enriched and cross-checked data can then be sent directly to physical models and simulations developed by CSTB and its partners, such as IFSTTAR (French Institute of Sciences and Technologies for Transport, Development and Networks) and CEREMA (Study and Expertise Center on Risks, the Environment, Mobility and Development).

FOR MEDIUM-SIZED CITIES

The Decision 3D service is aimed particularly at medium-sized cities because it can result in a significant reduction in the cost of operations (modeling, simulations), while increasing precision and reliability. Different uses can be imagined, particularly related to expertises developed by CSTB or its partners. Eventually, industrial partnerships could also be developed for Decision 3D. Decision 3D is correlated with CSTB's "Urban information" R&D program. In particular, partners will be required to sign the "Digital city" charter (release planned for September 2014) so as to respect commitments intended to guarantee quality of data, transparency of the results and interoperability between the different services and the digital model. The reliability and updating of input data are essential to precisely measure the many impacts of planned urban projects.

SIMULATION OF THE SOLAR POTENTIAL OF A NEIGHBORHOOD, produced using the eveCity software

BIM-Edition: widespread use of the digital model

The BIM-Edition software solution presented at Batimat in 2013 aims at providing a cooperative work platform for use in the construction sector in 2014, wide open to software using the IFC format and enriched with all CSTB's design developments (thermal, acoustic, environment, etc.).

Use of the digital model will only become widespread if the service is affordable for all professionals. Calls for bid for the construction sector will eventually include an obligation to use it. Therefore it is essential that all tools necessary for its operation should be available so that everyone can become familiar with these new practices. They thus will be able to satisfy the increasing number of requirements for digital deliverables.

This is the aim of the BIM-Edition solution that is now mature and was presented at Batimat 2013; it should be marketed in the first quarter of 2014.

BIM-Edition was developed by CSTB, in cooperation with the Lascom software publisher, specialist in cooperative work tools including PLM (Product Lifecycle Management) platforms. Its ambition is to propose an online range of software tools allowing common work on a platform hosted on a web server developed and managed by Lascom. Potential users working on the same project can work on it with their tools in return for a monthly subscription, including the use of an eveBim viewer developed by CSTB. The platform is based on the IFC standard and is intended to be open to all business software using the same protocol. It is the first time that such a tool has been created, and specifically that it has been possible to share a BIM digital model between different organizations based on a business logic (by batch, by phase, etc.).

MANAGE RIGHTS AND ORGANISE EXCHANGES

Several steps necessary to optimize efficiency were necessary before the model could be implemented. Firstly, it was necessary to define the responsibility of everyone concerned, in other words to determine everyone read and write rights on the model, and the scope of his work. In the same way, an annotation principle enables everyone to comment on, validate, issue reserves and in general make all sorts of exchanges, for which traces are kept. Technical and regulatory comments written here will be duly considered.

Eventually, coupling will be set up with all the tools developed by CSTB in the thermal, acoustic and even surveying fields (scanning plan or laser telemetry, etc.).

BIM-Edition's organization is consistent with the BIM 2015 cooperative project that combines CSTB and the Mediaconstruct association under the control of the Ministry of Industrial Renewal. It is aimed at setting up a national procedure for assessment and certification of IFC interfaces of software publishers.

A first application planned for 2014 is the design of Ajaccio hospital that is the first call for bids in France imposing a response using the digital model for all phases of the project, as far as the As-Built Works file.

> SOME SCIENTIFIC PUBLICATION REFERENCES

ECOBIM, Value driven life cycle based sustainable business models
HUOVILA P., ANTUNA-ROZADO C., SOUBRA S., TRINIUS W.
Sustainable Building 2013, Implementing sustainability: barriers and chance, April 24-26, 2013, Munich, Germany, 7 p.

Boîte à outils R&D CSTB pour l'évaluation intégrée des opérations d'aménagement urbain durable
(CSTB's R&D toolbox for integrated evaluation of sustainable urban development operations)
BELZITI D. et al.
CSTB/TIDS Report, January 2013, 69 p.

Quels apports des maquettes numériques urbaines dans les projets urbains durables ?
(What are the benefits of urban digital models in sustainable urban projects?)
BAILLY E., DURET H., TUAL M.
Rapport CSTB/DESH, mai 2013, 54 p.

Maquette numérique urbaine au CSTB : état des lieux et perspectives face au marché
(CSTB's urban digital model: inventory and prospects facing the market)
SOULA J.
Rapport CSTB/TIDS, mai 2013, 54 p. [MOD-EVE-12-187-RE]

Estimating and reducing uncertainties in ray-tracing techniques for electromagnetic field exposure in urban areas
NOE N., GAUDAIRE F., DIARRA BOUSSO LO M.
IEEE APWC 2013, 3rd IEEE-APS topical conference on Antennas and propagation in wireless communications, September 9-13, 2013, Torina, Italy, IEEE, 2013, p. 652-655 [doi:10.1109/APWC.2013.6624897]

Natural ventilation design for low-rise buildings: comparison between a nodal model and wind tunnel tests
DEMOUGE F., FAURE X.
Building Simulation 2013, 13th International conference of the International building performance simulation association, August 25-28, 2013, Chambéry, France, p. 3315-3321

ICT Roadmap for energy efficient neighborhoods: IREEN reference guide
TOMMIS M., DECORME R. (EDS)
CSTB Sophia Antipolis, 2013, 100 p.

> TRAINING

FIND OUT MORE

"Assessment of the environmental performance of a building using a Life Cycle Analysis (LCA): using Élodie" (ENV36)

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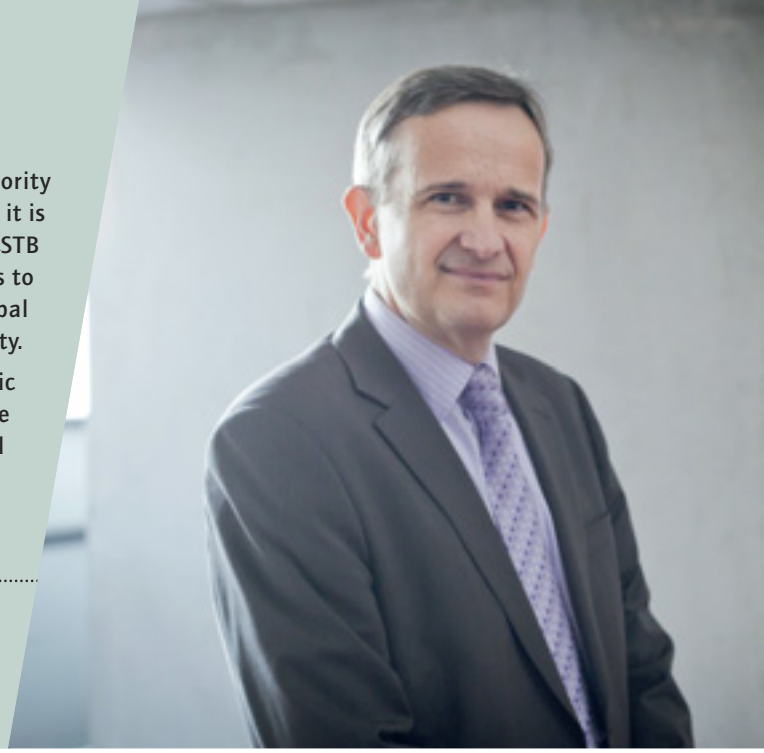
SEYDOUX
PATHÉ FOUNDATION
Architect: Renzo Piano

Innovation
FRENER and REIFER
ATEx N° 1898:
use of double curvature convex glazing held in place by isolated glass pressure plates

The Uses and economics transitions scientific and technical priority mobilizes essentially socio-economic themes and disciplines and it is closely related to the other four scientific and technical priorities. CSTB thus aims to deploy its research, expertise and assessment skills to enable integration of responsible buildings, combining global performance and usage at the scale of the neighborhood and the city.

Development of the cities and regions is at the heart of economic development and society changes. CSTB's ambitions are to provide a federating role in the Sustainable City scientific and technical policy in France and to provide major operational support for the Sustainable City policy.



YANN MONTRELAY, *Uses and economics transitions R&D Program Manager, Economics and Social Sciences Director*

Uses and economics transitions

The requirement for changes in the construction sector applies to both volume and quality. The defined objective for upgrading energy efficiency in all buildings by 2050 requires that the construction sector quadruples its annual production of square meters of BBC (low consumption buildings).

While there has been a sudden qualitative change in requirements for the thermal resistance of buildings, requirements for other building functions such as health, comfort, usage and risk are also increasing. Society changes make it necessary to adapt and rethink the building and living spaces in response to changes in usage, expectations and environmental constraints - adaptation to aging, handicaps and home care, health risks and social vulnerabilities.

Working on usage makes it necessary for questions about habits, life styles and the relationship to the environment to be treated jointly, in a generalized and changing urban context.

The economic analysis and evaluations of impacts help to accompany and guide public policies in the construction, housing, real estate and development sectors. These sectors are now strongly guided by studies dealing with conditions for success of an ecological transition. Special attention is paid to the residential-tertiary sector because almost 45% of final energy consumption is concentrated in this sector. The Sustainable Building Plan with the assistance of CSTB thus published an ambitious trend chart in 2013 showing the main indicators for implementation of the building energy efficiency program.

The first Eco-Neighborhood labels were awarded in 2013. The Eco-Neighborhood labeling approach is the preferred operational tool in French policy for sustainable cities in France. At the end of 2013, the State appointed CSTB to be responsible for national control of the 2014-2015 assessment campaign for 45 Eco-Neighborhood operations.

It is essential that actions on buildings, transport and networks, should be more coherent, to contribute to creating sustainable cities with everyone agreeing on the policy. This integrated approach is based on quantitative and qualitative performances of buildings and development, to improve the quality of life of citizens.

Faced with these challenges, the development, design and management processes for construction will have to change significantly. To achieve this, the various socio-economic contributors need design, management, assessment and decision-making assistance tools to assure economic and social efficiency of the building stock. Building on past experience is also a necessary condition to successfully select high-performance technical and economic solutions.

CSTB worked alongside regional communities in 2013 to perform research and take actions, like the approach adopted in Reims, to study and contextualize sustainable urban development challenges.

^
THE BANANA HANGAR
along the Buren rings,
Nantes

Towards a sustainable city

PUTTING PEOPLE AT THE HEART OF SUSTAINABLE CITIES

Participants in the September 2013 workshop organized by CSTB in the context of Ecocity in Nantes, pointed out the need to give priority to associative and citizen initiatives, so that a sustainable city can form part of an ecological transition approach.

Regardless of whether the approach is technical (energy, bioclimatic architecture), based on environmental objectives (reduction of CO_2 emissions by management of transport and waste) or related to regional planning (search for central areas, adapted governance), construction of a sustainable city often puts people in the background, as beneficiaries of progress made in these fields and rarely as participants in taking specific initiatives. However, it must be observed that when a person is given the opportunity, he develops initiatives and his initiatives are frequently successful.

The objective of the session organized by CSTB as part of Ecocity in Nantes on the theme "Putting people at the centre of the sustainable city" was to draw the consequences from this observation. A study of several initiatives, frequently conceived in associations such as *Terre de Lien*, and *GERES CO_2 solidaires* (Renewable Energies, Environment and Solidarities Group) carbon compensation program, or neighborhood and public citizen associations such as the "Transition City movement" shows that citizen and association experiments, and experiments originating from the social and joint economy, can make a contribution to sustainable cities. However, if this contribution is to form part of an ecological transition approach, it seems important that public authorities should recognize the increasing capabilities of these regional contributors and support synergy between them that can have lever effects between social and ecological innovations. This leads sociologists to believe that this "society" involvement in the ecological transition is not sufficiently used. This is the reason why public authorities should pay more attention to these initiatives and these regional contributors and make better use of them.

At the end of this event, the General Commissariat for Sustainable Development appointed CSTB's "Economics and Social Sciences" management to perform a study on the "Resilient society and social cohesion" theme.

FOR SUSTAINABLE URBAN DEVELOPMENT OF THE REIMS NORTH EAST ARC

The North-East Arc is a strategic development region in greater Reims. It is composed of modest homes and industrial and railway wasteland, and offers a social, economic and urban opportunity to tie together different neighborhoods of Reims and Béthény.

The *Foncière Développement Reimois* (Reims Land Development) GIE (Economic Interest Group) worked jointly with CSTB and JDL to initiate a previously unheard Research and Development approach in order to define an unusual sustainable urban concept for city planning in the North-East Arc, and to envisage sustainable urban development of this part of the region. About twenty experts and research workers in city planning, the environment (thermal, acoustic, ventilation, solar, etc.), economy, social sciences from CSTB and university laboratories, and representatives of EDF, the Caisse des Dépôts, all worked together in a multi-disciplinary research approach to contribute to writing a white book on sustainable urban development. This white book was broken down into a strategic guidelines plan, particularly in the context of workshops with research workers and experts. It is now a genuine reference framework for development of the North East Arc.

Two books were published in 2013 following this work, a theoretical book, namely the White Book for sustainable development, and an operational book, namely the North-East Arc strategic guidelines plan.

Energy insecurity: improve regional systems

CSTB is closely involved in work done by the National Energy Insecurity Observatory, and was appointed to perform two missions in 2013, one by the Corsica Regional Community and the other by ADEME in Aquitaine to optimize assistance systems for the populations concerned.

As part of the scientific control over work done by the National Energy Insecurity Observatory, CSTB has been working particularly on development of the phenomenon over time and in different places, thus making use of surveys carried out since 1996 by INSEE. It involved a detailed study carried out in 2013 on characterization of categories of persons concerned and their degree of insecurity. A study for this purpose provided information about policies adopted in five countries and especially in the United Kingdom. Experts met in a workshop led by CSTB in Paris in October on the "Resisting Energy Insecurity in Europe – Changes and action" theme. The research work done in this context was used to publish support material for appropriate methodological approaches, indicators used, their advantages and their limits. As a result of this expertise acquired by CSTB, the Corsica Regional Community and the ADEME Aquitaine Regional Delegation appointed CSTB to support them in their policies to prevent energy insecurity.

For the Corsica region, the Regional Community appointed CSTB to perform an AMO (Client Aid) mission in cooperation with Burgeap and Gefosat. The objective was to propose different types of actions, for example to better centralize existing systems through local action services to improve control over energy and to grant national subsidies in favor of vulnerable populations in order to improve the energy performance of their home and extend this device to cover the entire region through a Regional General Interest program. At the same time, greater use of renewable energy must be encouraged in this region that simply distributes electrical energy. This massive plan to support renovation for the most vulnerable, combined with rental mediation systems and a property management unit concerns about 9 to 15% of the Corsican population, namely about 10,000 households that are in a potential energy insecurity situation.

The ADEME Aquitaine Regional Delegation has also adopted a policy to prevent the phenomenon by supporting a number of actions. It has asked a team composed of CSTB, Burgeap and Batitrend to perform an audit to draw up a panorama of possible, desirable and achievable actions.

This audit that is based on calling in all the partners, and particularly local communities, will terminate at the end of 2014 and will enable the ADEME regional delegation to better position itself in the struggle against energy insecurity.

AN INDICATORS TREND CHART TO EVALUATE THE ENERGY EFFICIENCY OF BUILDINGS

The building and real estate sector represents the largest component of the National and European energy transition policy. Ambitious objectives are assigned to it, therefore it is essential to have a global monitoring tool.

Based on existing indicators, CSTB created a trend chart for the Sustainable Building Plan that offers a perspective of public data and is complementary to the various existing publications. This work was made possible due to the cooperation of many institutional contributors and experts. The trend chart will be updated once every year, and it is intended that it should be updated in real time as the system becomes more mature. Nationally, this document will also mirror trends of Regional Economic Construction Cells (CERC).

The trend chart is built around 6 theme chapters and provides a snapshot of sustainable construction and renovation at the end of 2012. The new construction sector has the best results, and the new thermal regulation RT 2012 is generally well accepted. The first encouraging results in the field of energy efficiency improvement have been recorded in recent years. However, efforts have to be intensified to get on the right path to achieve medium-term (2020) and long-term (2030-2050) objectives. Jobs and economic activity of the building energy efficiency sector are sensitive to the economic situation, but the sector is relatively resilient.

> SOME SCIENTIFIC PUBLICATION REFERENCES

Recension des outils et modèles utilisés au CSTB pour prendre en compte l'usage dans le bâtiment
(List of tools and models used at CSTB to take account of usage in buildings)
HAAS B. TRICOIRE A.
Rapport CSTB/DESH-DEE, 2013, 52 p.
[RE-151-120USC-873-USA-2.1]

Energetic life cycle cost of energy efficient building: French case studies
LAURENCEAU S.
SB13 Oulu, Sustainable procurement in urban regeneration and renovation Northern Europe and North-West Russia, May 22–24, 2013, Oulu, Finland, 11 p.

Analyse de la valeur verte dans l'immobilier de bureaux
(Analysis of green value in office buildings)
LAURENCEAU S. – CSTB/DESH Report, April 2013, 20 p.

> TRAINING

FIND OUT MORE

"Taking account of usage in building performance" (USAG1)

Governance authorities

The missions and legal organization of the Scientific and Technical Centre for Building, an Industrial and Commercial Public institution, are defined by the Construction Code and particularly its articles L142-1, L142-2 and R142-1 to R142-14.
CSTB's organization is headed by the President of the Board and the Chief Executive Officer.
The President is appointed by decree and the Chief Executive Officer by Ministerial Order.

Consultative Committee

The Consultative Committee's mission is to support and guide CSTB's R&D policy. Its composition is defined by Ministerial Order and it has opened its membership widely to include multidisciplinary skills. Representatives of Research Bodies as well as representatives of socio-economic players working in the construction sector, are now working alongside representatives of the Government and Agencies. Michel RAY, EGIS Technical and Innovation Director, is president.

PARTICIPANTS IN CONSULTATIVE COMMITTEE MEETINGS

ADEME | ANAH | ANR | CGDD | CGEDD | CGI | DGALN | MINISTRY OF SOCIAL AFFAIRS AND HEALTH | MINISTRY OF THE ECOLOGY, SUSTAINABLE DEVELOPMENT AND ENERGY | MINISTRY OF EQUALITY OF REGIONS AND HOUSING | MINISTRY OF HIGHER EDUCATION AND RESEARCH |

BRGM | CEA | CERTU | CETE | ENPC | ENSMP MINES PARISTECH | IFSTTAR | IGN | INERIS | INSTITUT TELECOM | IRSTEA | MÉTÉO FRANCE | PRES. UNIVERSITÉ PARIS-EST |

ADVANCITY | AETIC | AIMCC | ASTEE | CAPEB | CERIB | CETIAT | CICF CONSTRUCTION | CINOV | CTICM | EFFINERGIE | EGIS | FCBA | FFB | FIB | FRANCE NATURE ENVIRONNEMENT | RENEWABLE ENERGIES ASSOCIATION | SYNTEC INGÉNIERIE | UCI-FFB | PARIS REGIONAL UNION FOR THE ENVIRONMENT | USH |

The Management Committee, the Executive Committee

The Management Committee (CODIR) produces and monitors the performance policy while remaining consistent with the Objectives and Performance Contract. It is in charge of coordinating responsibilities between process supervisors and for internal arbitration. It prepares Board meetings. CODIR members include the President of CSTB, the Chief Executive Officer, the Deputy Chief Executive Officer responsible for the Research and Development Department, the Research & Development Deputy Director, the Deputy Chief Executive Officer responsible for Technical Management, the Technical Partnerships Deputy Director, the Secretary-General, the Human Resources Manager, the Communication and External Relations Director, and the Marketing and European and International Development Director. The CODIR is assisted by the "Performance Management" mission.
The Executive Committee is presented on pages 6 and 7.

The Board

It is composed of 18 members appointed by a Ministerial Order in three colleges:
– six staff representatives;
– six state representatives;
– and six qualified experts.

Its skills defined by Decree apply to approving budgets and accounts, validation of the Objectives and Performance Contract and annual research programs, and all strategic questions. The Government Commissioner, the economic and financial Auditor General, members of the Executive Committee and the secretary of the Workers' Council attend Board meetings.

The following members of CSTB's board were appointed as state representatives:

Patrick Paul DUVAL*, *Representing the Minister of Scientific and Technical Research*
Hoang BUI*, *Representing the Minister of Industry*
Bertrand DELCAMBRE, *CSTB's President, Representing the Minister responsible for Construction and Housing*
Gérard GOUDAL, *Representing the Minister responsible for Architecture*
Jean-Christophe VILLEMAUD*, *Representing the Minister for the Environment*
Hervé TEPHANY, *Representing the Minister responsible for Civil Security*

** Decree to be published in March 2014*

Experts:

Henry BEAUGIRAUD, *Delegate to Technical Affairs at the French Building Federation (FFB)*
Alain BENTEJAC, *President of Syntec-Ingénierie and President of COTEBA*
François BERTIÈRE, *President of Bouygues Immobilier*
Emmanuelle COLBOC, *Architect*
Patrick LIEBUS, *President of the Confederation of Craftsmen and Small Builders (CAPEB)*
Jean-Marie VAISSAIRE, *General Manager of Placoplâtre – Saint-Gobain*

Elected staff representatives:

Catherine ANDRIEUX, *CSTB Marne-la-Vallée*
Martina BOLLMANN, *CSTB Marne-la-Vallée*
Florence RENIER, *CSTB Marne-la-Vallée*
Jean-Paul FLORI, *CSTB Nantes*
Marie-France LEROY, *CSTB Marne-la-Vallée*
Claude POMPÉO, *CSTB Grenoble*

Also participate in Board meetings:

Étienne CRÉPON, *Director of DHUP (Directorate of Homes, Urban and Country Planning) as Government Commissioner*
Albert-Patrice PEIRANO, *as General Economic and Financial Auditor*

Organization & teams

MARCH 2014

Human Resources

Albert REIS
Director

Christophe JEANNOT
Assistant

Communication and External Relations

Florence FERRY
Director

Marketing and European and International Development

Bruno MESUREUR
Director

Bertrand DELCAMBRE
President

CSTB Grenoble

Christian COCHET
Director

Pierre VERRI
Deputy Director

CSTB Marne-la-Vallée Paris

Dominique NAERT
Director

Franck SÉNÉCAL
Assistant

Hervé CHARRUE
Deputy Chief Executive Officer

Research and Development Department

CSTB Carnot Institute

Hervé CHARRUE, *Director*

Robert BAROUX, *Deputy Director*

Information Technologies and Knowledge Dissemination

Patrick MORAND
Director

Souheil SOUBRA
Research Deputy Director

Hélène ANDRAULT
Professional In-House Training

Franck ANDRIEUX
Information and Software Engineering

Éric COIGNOUX
Publishing

Alain ZARLI
Innovation and Services Engineering

Economics and Social Sciences

Yann MONTRELAY
Director

Thierry WAGNER
Delegate Director

Olivier TEISSIER
Economic Analysis Manager

Energy, Environment

Jean-Christophe VISIER
Director

Julien HANS
Research Deputy Director

Dominique CACCAVELLI
Renewable Energy

Jean-Robert MILLET
Public Expertise Deputy Director

Lionel BERTRAND
Innovation and Development

Jacques CHEVALIER
Environment and life cycle engineering

Patrick CORRALES
Computer development and digital methods

Mireille JANDON
Automation and Energy Control

Charles PELÉ
Building Energy Performance

Daniel QUENARD
Envelopes and innovative materials

Health, Comfort

Christian COCHET
Director

Jacques MARTIN
Delegate Director

Séverine KIRCHNER
Research and public expertise Deputy Director OQAI Scientific Director

Jean-Baptiste CHENE
Acoustic Tests

Jérôme DEFRANCE
Environmental and Urban Acoustics

Corinne MANDIN
Expology – Indoor Air Quality Observatory

Christophe MARTINSONS
Lighting and Electromagnetism

François MAUPETIT
Physico-chemical Pollutants sources and transfer

Enric ROBINE
Biological agents and air contaminants

Michel VILLOT
Noise and Vibrations in Buildings

Climatology, Aerodynamics, Pollution and Purification

Jean-Michel AXES
Director

Pierre PALIER
Deputy Director

Christian BARRÉ
Olivier FLAMAND
Wind – Structures

Jean-Paul BOUCHET
Extreme Climatic Loads

Marc DUFRESNE DE VIREL
Air – Comfort – Environment

Philippe HUMEAU
Water and Water Treatment

Performance Management

Béatrice CROMIÈRES
Officer

General Secretariat

Emmanuel GIRARD
Secretary-General

Accounting Office

Philippe THERASSE
Accounting Manager

Véronique PAPON
Assistant

Carole LE GALL
Chief Executive Officer

CSTB Nantes

Jean-Michel AXES
Director

Christian BARRÉ
Assistant

CSTB Sophia Antipolis

Patrick MORAND
Director

Christiane PUJOL
Delegate

Charles BALOCHE
Deputy Chief Executive Officer

Technical Department

Charles BALOCHE, *Director*

Christophe MOREL, *Deputy Director of Technical Partnerships*

Safety, Structures and Fire Performance

Anne VOELTZEL
Director

Ménad CHENAF
Deputy Director

Martial BONHOMME
Fire Reaction Studies and Tests

Stéphane HAMEURY
Expertise, Regulatory Assessments, Research

Philippe RIVILLON
Mechanical & Fire Resistance

Anca CRONOPOL
Promoting Innovative Technologies

Insulation and Cladding

José FONTAN
Director

Maxime ROGER
Delegate Director

Christine GILLIOT
Coverings – Waterproofing – Rendering and Mortars

Salem FARKH
Hygrothermal Engineering of Structures

Envelope and Roofing

José FONTAN
Director

Michel COSSAVELLA
Delegate Director

Stéphane GILLIOT
Lightweight Construction and Roof

Hubert LAGIER
Windows and Glazing

Coralie NGUYEN
EvalIE

Hydraulics and Sanitary Equipment

Dominique POTIER
Director

Philippe PIED
Delegate Director

Patrick BERNARD
Pipes for Fluids, Materials

Jean-Marie FRANCO
Tapware and Sanitaryware

Thibaud ROUSSELLE
Processes – Services – Systems

Premises

MARNE-LA-VALLEE

– Energy-Environment
– Economics and Social Sciences
– Health-Comfort
– Envelope and Roofing
– Insulation and Cladding
– Safety, Structures, and Fire performance
– Hydraulics and Sanitary Equipment
– Information Technologies and Knowledge Dissemination
– OQAI (Indoor Air Quality Observatory)

Scientific equipment and technological platforms
– ARIA – Scientific equipment for study of the sanitary quality of construction products and equipment and structures
– LABE – European laboratory for building acoustics
– Laboratory for testing the seismic reaction of structures
– Hydraulic and sanitary equipment laboratories
– Envelope and coating test platform
– VULCAIN – Scientific equipment for fire resistance of innovative structures
– Fire testing laboratories

Head Office
84, avenue Jean-Jaurès
Champs-sur-Marne
F-77447 Marne-la-Vallée Cedex 2
Tel.: +33 (0)1 64 68 82 82

Bâtiment "Bienvenüe"
14, boulevard Newton
F-77420 Champs-sur-Marne
Tel.: +33 (0)1 40 50 28 60

PARIS

– Professional training centre
– Certivéa, Céquami, Cerway, subsidiaries of CSTB group

4, avenue du recteur Poincaré
F-75782 Paris Cedex 16
Tel.: +33 (0)1 40 50 28 28

GRENOBLE

– Energy-Environment
– Health-Comfort (acoustics, lighting, electromagnetism)
– Insulation and Cladding
– Envelope and Roofing
– Information Technologies and Knowledge Dissemination
– Acoustb, subsidiary of the CSTB group

Scientific equipment and technological platforms
– PRE3CIE – Platform for evaluation of building envelope products

24, rue Joseph-Fourier
F-38400 Saint-Martin-d'Hères
Tel.: +33 (0)4 76 76 25 25

NANTES

– Climatology, Aerodynamics, Pollution and Purification
– Health-Comfort (lighting)

Scientific equipment and technological platforms
– AQUASIM, research and testing platform for sustainable management of water resources
– Jules Verne climatic wind tunnel, major facility for physical climate simulation

11, rue Henri-Picherit
BP 82341
F-44323 Nantes Cedex 3
Tel.: +33 (0)2 40 37 20 00

SOPHIA-ANTIPOLIS

– Information Technologies and Knowledge Dissemination
– Envelope and Roofing
– Energy-Environment

Scientific equipment and technological platforms
– Le Corbusier immersion room for a digital model of construction projects
– Gerhome, laboratory for providing solutions for keeping the elderly at home
– LEPS – Solar system testing laboratory

290, route des Lucioles – BP 209
F-06904 Sophia-Antipolis Cedex
Tel.: +33 (0)4 93 95 67 00

CSTB group: subsidiaries

ACOUSTB
ENVIRONNEMENT ACOUSTIQUE

Controlling noise pollution through exploration, proposition, measurement, calculation and protection
Acoustb is a French environmental, building and industrial acoustics consulting firm established by CSTB in partnership with Egis. Its services cover every link in the acoustic analysis chain, from a single facility or infrastructure right through to acceptance of completed noise pollution control projects.

24, rue Joseph-Fourier | F-38400 Saint-Martin-d'Hères
Tel.: +33 (0)4 76 03 72 20
www.egis-acoustb.fr

Céquami
Certification QUAlité Maison Individuelle

Energy and environmental quality and performance for private homes
Jointly owned by the CSTB group and the Qualitel Association, Céquami leads the market in quality certification, labeling and promotion for new-build and refurbished homes. It is accredited by COFRAC, and delivers, manages and develops structural certification schemes, including NF and HQE.

4, avenue du recteur Poincaré | F-75016 Paris
Tel.: +33 (0)1 44 96 52 50
www.cequami.fr

CertiVéA

The leading French environmental certification agency for non-residential buildings, sustainable communities and stakeholders
Its primary mission is to enable progress in sustainable development, support stakeholders in their environmental commitments, and measure, certify and promote their performance. Certivéa helps to reduce energy consumption and improve health, comfort and quality of life.

4, avenue du recteur Poincaré | F-75016 Paris
Tel.: +33 (0)1 40 50 29 09
www.certivea.fr | **www.certivea.com**

cerway

A joint subsidiary of Certivéa and Cerqual, the operation body for all HQE™ schemes out of France

4, avenue du recteur Poincaré | F-75016 Paris
Tel.: +33 (0)1 40 50 28 85
cerway@cerway.com

Aérodynamique d'Eiffel

Aerodynamic studies and testing
Aérodynamique Eiffel uses the wind tunnel built by Gustave Eiffel in 1912, and offers its expert services to the automotive and construction industries to examine ventilation flows in industrial buildings and aeraulic applications.

67, rue Boileau | F-75016 Paris
Tel.: + 33 (0)1 42 88 47 40
www.aerodynamiqueeiffel.fr

Eurovent Certita Certification

Climate engineering certification
Jointly owned by ATITA, CETIAT, CSTB, Eurovent Certification Company and LNE, Eurovent Certita Certification is a leading European certification organization for climate engineering. Its 35 certification programs cover the full range of applications, from domestic residential to industrial-scale installations.

48-50 rue de la Victoire | F-75009 Paris
Tel.: +33(0)1 75 44 71 71
www.eurovent-certification.com | **www.certita.fr**

certisolis

Test laboratory and certification body for solar photovoltaic modules
Certisolis performs qualification testing of solar photovoltaic modules and certifies their performance according to international standards by issuing an accreditation label. Jointly owned by CSTB and LNE (the French National Metrology and Testing Laboratory), it operates under a scientific partnership with CEA/INES on the Savoie Technolac site.

BP 364 | 39, allée du Lac de Côme | F-73372 Le Bourget-du-Lac Cedex
Tel.: + 33 (0)4 79 68 56 00
www.certisolis.com

CSTB SOLAR

Promoting the dissemination of renewable energy knowledge and research, with particular focus on solar energy
The mission of CSTB Solar is to organize the Europe Solar Decathlon Europe 2014.

10, cours Louis-Lumière | F-94300 Vincennes
Tel.: +33 (0)1 40 50 29 34
www.solardecathlon2014.fr

2013 Key figures

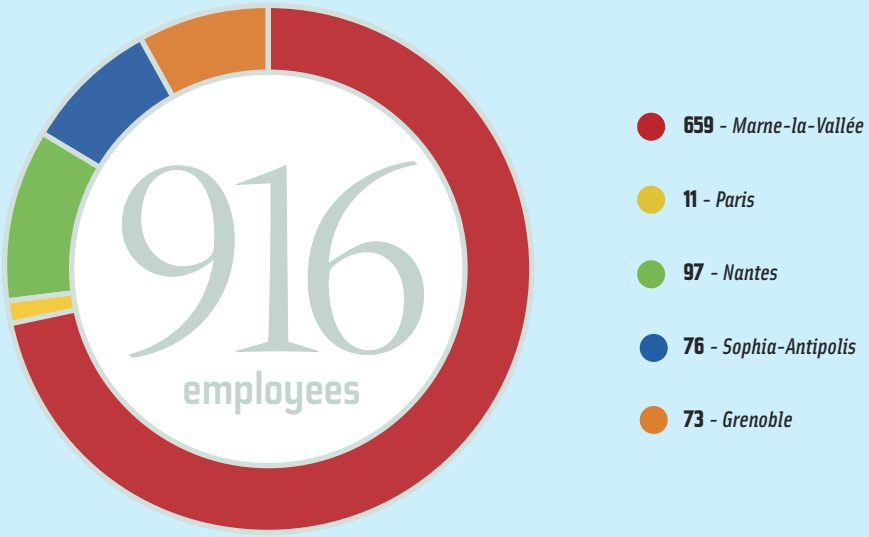
> CSTB leads **a scientific and technical community** of several thousand persons.

> CSTB works in network with about **700 experts** in specialized groups and **100 external authors and instructors**.

> **3,600 customers** for research, expertise and assessment activities.
> **7,900 customers** for dissemination of knowledge.

EMPLOYEES

on December 31st, 2013
(excluding subsidiaries)



RESEARCH & EXPERTISE

21 Directly operated research projects
82 Collaborative research projects with ADEME/ANR/EU
5.6 Research funding in partnership with CARNOT in millions of euros
85 Scientific publications
15 Scientific conferences co-organized by CSTB
188 Researchers (equivalent full time)
65 PhD/Post-doctoral students

TECHNOLOGICAL ACTIVITIES

746 Technical Assessments and Technical Application Documents published* (DTAs) including

229 New Technical Assessments

178 European Technical Approvals

79 ATEx

13 Pass Innovation

AVERAGE TIME FOR A TECHNICAL ASSESSMENT PROCEDURE **IN 2013: 8 MONTHS**

PRODUCT CERTIFICATION:

4,345 Active certificates, **1,625** Certification holders of which **49%** are foreign holders

CE MARKING CERTIFICATION:

610 Active certificates, **375** CE marking holders including **25%** foreign holders

** All types: New, Revisions, Addenda, Commercial Extensions and Amendments (excluding amendments extending expiration dates)*

DISSEMINATION OF KNOWLEDGE

122 Books available

25,000 Number of users subscribing to technical and regulatory information services

19,000 Number of training hours

70 Training modules distributed on six topics each with their scientific and technical priorities

2013 OPERATING INCOME

(excluding subsidiaries)
Forecast ex VAT 2013

€44.1m
Technological activities

€20.9m
Contractual research and expertise

€20.6m
Research subsidies

€6.8m
Dissemination of knowledge

€8.7m
Others

CSTB HEAD OFFICE, MARNE-LA-VALLÉE

Sustainable development essentials

SAFETY

The well-being of employees depends primarily on safety. This is the logic through which safety training for employees was enriched. From now on, a work accident and care analysis system will be capable of more precisely targeting the prevention policy. The accident frequency ratio in 2013 was 9.2* with a severity ratio of 0.10.
With this approach, all workshop machines were made conforming and the Sophia-Antipolis platform mountability bench was put into service in close cooperation with the CHSCT (Committee for health and safety and working conditions).

SIGNATURE OF THE "SUSTAINABLE DEVELOPMENT OF PUBLIC INSTITUTIONS AND PUBLIC ENTERPRISES" CHARTER

CSTB has been a member of the Sustainable Development Club for Public Institutions and Public Enterprises since 2011, and it officially signed the charter on March 18, 2013. This club is the leading structure for coordination of sustainable development in the public sector. Its ambition is to provide an incentive to "do" and accelerate formalities, by sharing good practice between organizations with many different sizes and missions. Its members belong to a wide variety of sectors including mobility and transport, buildings and city, management of regions, health and the environment, culture, finance, energy, research and the *Grandes Écoles*.

EASY MOBILITY

CSTB continued its commitments to promote sustainable transport in 2013. The Grenoble and Nantes plants thus participated in regional challenges on the "Mobility challenge" theme in Nantes and the "I go to work differently" theme in Grenoble. CSTB is a pioneer in clean mobility in the Marne-la-Vallée zone through car sharing. Three vehicles are accessible for CSTB employees using a car sharing platform for trips between the RER railway station and the Champs-sur-Marne premises. 85 employees on the different sites have made a commitment to use the bicycle for daily transport.

ENERGIE HANDICAP, LET'S SHARE OUR DIFFERENCES

It was decided to launch the "Energie Handicap, let's share our differences" Mission for the Handicapped at the end of August, to encourage long-term employment of the handicapped at CSTB. Two handicapped persons were recruited and three employees were recognized as being handicapped in 2013. Awareness actions were set up and adaptations to job positions were made as a function of needs. CSTB is continuing to cooperate with ESAT (Assistance through Work Institutions and Services) structures and appropriate enterprises, and the Nantes plant laundry was awarded a prize at the 9th insertion trophies organized by Medef 44 (French Employers' organization - Loire Department), during the week for Employment of the handicapped.

5S DAY: ARCHIVING AND CONVIVIALITY

The 5S day was held in all CSTB plants for the 3rd consecutive year. The tidying up day with convivial activities was marked this year by starting up the ARCATEG paper archiving method. Employees were able to sort and archive, and also to participate in various workshops focused on safety and well-being at work. Exhibition of photos for the "Sustainable Development Objective" competition helped to share everyone's vision about CSTB's eco-responsibility.

*Frequency ratio (TF) = (No. of lost time accidents/hours worked) x 1 000 000
The average national accident ratio is equal to 24 work accidents.

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Building the future

CSTB, Scientific and Technical Centre for Building, is a public organization for innovation in building, which performs four key activities, namely research, expertise, evaluation and dissemination of knowledge, organized to satisfy the challenges of the ecological and energy transition in the world of construction. Its field of expertise covers construction products, buildings and their integration into districts and cities.

With over 900 employees, and with its subsidiaries and networks of national, European and international partners, CSTB offers its services to all parties involved in construction to improve the quality and safety of buildings.

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le futur en construction