Fig. 4 Obtention de la traversée d’une conduite synthétique dans une cloison légère au moyen de manchons en applique.
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The BBRI, the sustainable reference for building tomorrow

After having celebrated its fifty years of existence and initiated new projects designed to fully integrate its activities within the social, economic and environmental challenges of our century, the BBRI is relentlessly pursuing its fundamental mission: to increase the quality and competitiveness of the sector through research, innovation, information and training of its participants.

While the world has never stopped evolving and reinventing itself throughout the course of history, one is compelled to note an acceleration of the process in the domains that directly concern us. Whether we consider the reduction of our environmental impact and, in so doing, that of infrastructures, the ageing of the population, the tightening of requirements relating to quality, safety and comfort as well as the emergence of new construction systems and products: all of these are of such a nature as to profoundly revolutionise the day-to-day life of the building professional. It is therefore vitally important that he not allow himself to fall behind, but instead keep in touch with the ever more technical developments of his profession.

Thanks to the close relationship that it maintains with the sector via the Technical Committees, the BBRI strives to remain capable of fulfilling the expectations of its members. The latter have long proven eager to specify the needs in the field and to define, together with the Institute’s engineers, the research studies and the information tools making it possible to respond to them. Besides the energy renovation of existing buildings, a major interest at the centre of a series of training courses that were highly appreciated by the sector, subjects such as the increased use of natural materials, ‘compact’ insulation systems for flat roofs as well as the difficulty of achieving the required levels of airtightness thus form the object of many studies, research programmes and publications.

In this sense 2010 was an absolutely record-breaking year, with twice as many pages being published as in the preceding years. So the information is out there, available just a click away on the BBRI’s Internet site: it is the professional’s duty to consult it more extensively in order to find answers to his questions. Because, in an increasingly competitive world, where the proliferation of information and telecommunications technologies sometimes does more to destabilise than to reassure, the contractor – however much he may regard himself as a craftsman – no longer has a choice.

Besides its obvious contribution in terms of information, training and documentation, the Internet and its derivative applications make it possible to optimise the collaboration and the exchange of information between the various actors in charge of building or renovating a structure. An unexpected godsend for a sector where the building process is as fragmented as ours. At a time when, for companies, competitiveness is synonymous with survival, no one can afford to ignore this technological revolution. And this is certainly true for the BBRI which, by multiplying its channels of dissemination, is seeking to accomplish the mission that the contractors have entrusted to it: to put at their disposal the desired information, in good time and in the most useful form.

Jan Vensternans, ir. General Director

Jacques Gheysens, ir. Chairman

Do not allow yourself to fall behind: a question of survival for the construction professional.
There’s no shortage of reasons for reducing the energy consumption of buildings and their environmental footprint: increasing scarcity of resources, global warming, ever more stringent regulatory requirements, and so on. Properly insulating buildings, whether new or already-existing, has therefore become a priority. During 2010, the BBRI thus gave its full support to the professionals of the sector in order to involve them in this energy revolution.

**Events**

**February 2010 : Tolerances under the magnifying glass ...**

According to the intervention statistics of the ‘Technical Advice and Consultancy’ department, 1 opinion in 6 concerns the appearance and the dimensional tolerances of structures. Based on this finding, the Belgian Building Research Institute devoted the first issue of CSTC-Contact for the year 2010 to this topic, about which the recommendations are sometimes not sufficiently clear.

**... AND ‘LOW-ENERGY’ STRUCTURES**

‘Low-energy’ structures have been flourishing ever since people became aware of the impact human beings are having on climate changes, the necessity of reducing CO₂ emissions and saving energy.

Nevertheless, there are many who remain convinced that ‘low-energy’ dwellings and passive structures can only be achieved by means of wooden structures. In reality, more traditional building methods do offer very interesting solutions.

During the course of two thematic days organised in collaboration with the ‘Rough Structure’ and ‘Hygrothermy’ Technical Committees of the Belgian Building Research Institute, a large audience discovered with interest the various building techniques for ‘low-energy’ structures, their advantages and drawbacks as well as the elements that allow them to attain the desired energy performances.

**September-November 2010 : Thermal insulation of existing walls**

Although the insulation of solid walls from the outside is by far the most favourable technology – one thinks in particular of plaster-on-insulation systems (ETICS), the incorporation of an insulation layer in a weatherboard, the blowing or injection of insulation into the interspace –, the method of insulating walls from indoors nevertheless constitutes an interesting possibility of improving the level of thermal insulation of existing buildings. However, this technique requires taking specific measures at the stages of the design, creation and even operation of the building.

A series of seminars were held to review these different insulation techniques. One of them gave the participants an occasion to discover a guide for insulation via the interior of solid walls made of terracotta bricks and to learn about several renovation projects that were successfully implemented using this technique.

**October-November 2010 : BBRI-FEGC Roadshow**

Buoyed by the success of the two seminars on the impact of ‘low-energy’ constructions on the rough structure, the BBRI and the Federation of General Building Contractors toured no fewer than nine Walloon and Flemish provinces in order to draw attention to the essential role that general contractors must play in coordinating the works on ‘low-energy’ buildings. A similar event was also organised in the Brussels-Capital Region. Apart from a meticulous installation of the thermal insulation, the attention of the participants was drawn to the necessity of achieving high levels of airtightness. There is no doubt that this new constraint constitutes a real challenge for the general contractors in charge of coordinating the different specialised trades responsible for the secondary works and finishings.

**September-December 2010 : Digital technologies within the company**

80 % of the errors committed on the worksite are not due to inadequate technical skills, but to a lack of organisation and information. Improving the management and communications within companies is therefore becoming a priority. 2010 saw a multiplication of the initiatives and events designed to help them enter into a new dynamic and encourage them to make more intensive use of today’s digital tools.
When considering the challenges our society is facing, the construction sector appears altogether providential. An integral part of many economic, cultural and social activities, buildings must reduce their environmental footprint and increase their quality. To achieve this, the BBRI bases itself on three pillars: scientific and technical research, innovation and development, as well as information, assistance and advice.

The present Report highlights the main trends of the year 2010 and the role that the BBRI played in them. However, the many projects it carried out are only briefly summarised here, so that readers who are particularly interested in one or another of them are invited to consult the ‘Projects’ database that has been put online on the Internet site (www.cstc.be). To facilitate efficient searching for the desired information, an overview of this database is presented in the annex (p. 37).

STANDARDISATION, CERTIFICATION AND APPROVAL

Via the activities of its Standards Antennas (subsidised by the FPS Economy), the BBRI strives to guide Belgian companies (and especially SMEs) through the complex thicket of standards and regulations.

Seeking to guarantee the transparency of the activities and to open up the process of standardisation to all interested parties, the new philosophy introduced in recent years in the Belgian normative landscape is based on a decentralisation of standardisation activities. The management of the standardisation committees responsible for elaborating standards has thus devolved onto the ‘sectorial operators’, independent bodies approved by the NBN and possessing the necessary competence in the sector involved.

As a technical reference centre for construction, the BBRI is recognised as the sectorial operator for more than thirty committees (some in collaboration with other organisations) responsible for developing draft standards and ensuring their follow-up.

COLLECTIVE RESEARCH, INNOVATION AND DEVELOPMENT

While everyone recognises the vital necessity of innovative techniques for construction companies, it is also accepted that the multiplicity of actors and the fragmentation of the construction process render this task especially difficult. This very complexity constitutes one of the reasons for the Belgian Building Research Institute’s existence.

The research carried out by the Institute is oriented by its Technical Committees, which make sure that the themes discussed are closely attuned to the needs of all its members and, more broadly, of society in general.

To successful fulfil this mission, the BBRI can rely on an extensive infrastructure and qualified laboratories. Among the tests conducted by the latter, more than 140 have been accredited by the BELAC office of the FPS Economy.

Parallel to the assistance provided to sector professionals by the staff of the ‘Technical Advice and Consultancy’ department (see p. 28) and the ‘Communication and Management’ department (see p. 26), the Technological Advisory Services and the Thematic Innovation Stimulation (TIS) projects contribute to encouraging the development of innovative processes on the worksite.

INFORMATION, TRAINING AND SUPPORT TO COMPANIES

In a constantly-evolving world, companies must become ever more efficient; and to do so, they have at their disposal ever more sophisticated management and communication tools.

The act of building or renovating, which offers responses to most of the challenges of our century, requires increased technicity on the part of professionals, who need to continuously improve their methods and skills.

Hosting since 2009 the 1,200 standards that are most useful for the sector, along with all of the Institute’s publications, the BBRI Internet site constitutes an information platform which is consulted more frequently every day: nearly 1,400,000 sessions in 2010 and more than 2,000,000 queries of the online technico-commercial database at bbri.be. The direct training of professionals logically supplements the information communicated via publications and the Internet site, and so the staff of the BBRI gave some 650 courses and lectures during 2010: more than 300 of them dealt with company management and information technologies (calculation of cost prices, planning methods, document management, project portals, etc.), while nearly one hundred dealt with the energy aspects of buildings and sustainable construction.
The stability and resistance of structures are areas in which considerable efforts are being made in order to enable faster processing, render systems more reliable, increase their resistance, endow them with related properties which makes them ‘intelligent’, but also to improve their energy performances within a context of sustainable development.

Moreover, the networked activities within various Belgian and European associations – the GBMS (Groupement belge de mécanique des sols et de géotechnique), ABTUS (Association belge des techniques et de l’urbanisme souterrains), FABI (Fédération des associations francophones d’ingénieurs), AIV (Association de l’ingénierie du vent), ELGIP (European Large Geotechnical Institutes Platform) – ensure that the BBRI enjoys a privileged forum for exchanging information and experiences.

Geotechnics

The results of the studies which have been conducted for several years now by the ‘Geotechnics’ and ‘Structures’ divisions constitute a genuine goldmine of information for the drafting of the national annexes of the Eurocodes 2 (Concrete Structures), 5 (Wood Structures) and 7 (Geotechnical Design), which are coordinated by the BBRI.

The programme of the ‘Geotechnics’ division includes the following themes:

• the technique of soil mixing; in 2010 this innovative research project, subsidised by the IWT, was the object of many tests aimed at characterising the material (notably on full-scale elements), whose results will make it possible to develop a calculation method appropriate to the ‘soil mix’ used in permanent structures
• sheet piling and micropiles technology. These prenormative studies, carried out thanks to the financial support of the NBN and the FPS Economy, led to the drafting of six Data Sheets on the subject of sheet piling techniques (Berlin walls, pile curtains and walls in treated soil). Moreover, practical execution sheets (diaphragm walls, sheet piling curtains, etc.) have been prepared within a support group, as well as a draft text concerning the application of Eurocode 7 to the dimensioning of sheet piling in Belgium. With respect to the research on micropiles undertaken at the end of 2010, an experimental programme was proposed in order to refine our knowledge about the effects of the combined actions and cyclical stresses
• research focusing on the vibratory driving of sheet piling curtains and other steel sections is virtually completed. In 2010 a digital model was developed to analyse the interactions between the vibratory hammer, the section and the soil. This ‘First DO.CA’ project subsidised by the DG 06 will result in the publication of a doctoral thesis at the beginning of 2011. The companies who apply these techniques may in the future base themselves on the expertise and the calculation models developed in this context.

Finally, the staff of the two divisions also focused on the energy problematics (revision of the European EPB Directive striving for virtually zero-energy consumption buildings by 2021). A consortium of eight partners, put together during the second half

Technological Advisory Service

‘NIEUWE GENERATIE GELIJMDE BETONWAPENING’

NEW GENERATIONS OF GLUED CONCRETE REINFORCEMENTS

This Technological Advisory Service subsidised by the Flemish Region (IWT) was created by the BBRI, Infobeton.be and the FEREB (Fédération belge des spécialistes de la réparation) to pursue the following objectives:

• translate recent scientific developments into possibilities for a concrete technological application on the Belgian market and, more specifically, the Flemish market
• publicise and make available a new generation of techniques intended for glued concrete reinforcements
• contribute to the proper application of the new systems encourage the launch of new products and developments in Flanders.
BBRI, the researchers have concentrated on the thermoeconomic capacity of medium to large-scale buildings integrating an intelligent concept of geothermal heating and climate control. Subsidised by the IWt, this new generation of projects entitled ‘VIS-Trajecten’ is destined to replace traditional orientable building offering the possibility of measuring the pressures and calibrating the developed digital models.

These two projects are presented at www.infoham.be (project concluded) and at www.project-simba.eu.

The Technological Advisory Service ‘OSSAMIX’, initiated in 2007, made it possible to achieve various industrial developments in the field of mixed structures. The renovation prize awarded by Infosteel for a worksite where light mixed steel-concrete floors were processed with the support of the advisory service confirmed the quality of the accompaniment provided.

With regard to self-compacting concrete, a prenormative study in progress has highlighted the adjustments that are necessary in Eurocode 2 in order to take account of the mechanical properties of the material (modulus of elasticity, relationship between cube and cylinder strength, tensile strength, etc.). This research will be expanded in 2011 and 2012 in order to study other aspects, such as those relating to prestressing and industrial applications.

The ‘Structures’ laboratory is equipped with a large-scale test station enabling it to measure creep on ultra-high performance concretes and therefore to study the problems of long-term deformation of the material in structures. The laboratory also focused on developing a new testing station for creep in flexion. Let us recall that the laboratory is certified for a number of tests for the purpose of CE marking and accredited by BELAC to perform bending tests on fibre-reinforced concrete.

For several years now the ‘Geotechnics’ laboratory has held a BELAC accreditation to perform characterisation tests on soils and granulates. In 2010 it carried out various loading tests on new systems of piles and developed, in collaboration with third parties, new monitoring applications based notably on optical fibre technology.

Since the BBRI is concerned to keep its members well-informed about the evolution of standards, but also to further integrate their feedback into the Belgian normative documents, the Institute focused more than ever on coordinating the various standardisation committees for which it has been recognised as sectoral operator (SO):
• NBN E250 Eurocodes (in collaboration with SECO)
• NBN E288 Execution of special geotechnical works
• NBN I182 Geotechnical investigation & testing of geotechnical structures
• NBN E396 Earthworks (in collaboration with the CRR).

The Institute is also conducting intensive activities within other national or European committees: preparation of the national annexes of various Eurocodes and a document of national application for the new standard on the execution of concrete structures, followed by the standardisation of infrastructural and structural products in collaboration with PROBETON, participation in the works on drafting the Technical Approvals relating to buildings and civil engineering.

Finally, we would like to draw attention to the fact that the ‘Eurocodes’ Standards Antenna has put a number of free calculation modules on line, on its site www.normes.be/eurocodes, one of which makes it possible to determine wind pressures (Wint). ■
Most of the research projects conducted by the BBRI in the field of concrete are carried out with the collaboration of the CRIC and Belgian universities. We offer below a brief overview of the actions undertaken on the subject over the past year.

**Quality control**

**Detachment of the upper layer of concrete industrial floors**

In 2010 the ‘Technical Advice’ division received over forty requests for advice concerning detachment of the upper layer of concrete industrial floors. The frequency of this phenomenon appears to be increasing both in Belgium and in neighbouring countries.

The problems probably find their origin in a modification of the composition of the concrete, which can have repercussions on the three main factors responsible for detachment of the upper layer, namely occluded air, bleeding and hardening. The last two parameters have a strong impact on the finishing deadlines of industrial floors (floating and levelling, for example).

An article published in 2009 dealing with the specification of concrete for industrial floors according to the standards NBN EN 206-1 and NBN B 15-001 notably approaches the question of the composition of the granular mixture.

The research initiated in 2011 seeks to:
- formulate recommendations favouring the development of strong compositions for industrial floors
- develop tests making it possible to check and validate the quality of the concrete delivered on the worksite and to determine the optimal moment for performing finishing operations on surfaces.

**A posteriori dosage of the cement and water in a hardened concrete or mortar**

Does poured concrete or mortar contain enough cement? Is its water/cement ratio in conformity with the normative requirements? The answers to these questions require a chemical analysis in a laboratory. The Belgian standard NBN B 15-250 has served as the reference on this topic for many years. However, the test method that it recommends is only appropriate for certain types of cements and concretes. Moreover, it is only reliable if the cement used is available separately or its composition is known, which is rarely the case in practice.

Indeed, when the nature of the cement is unknown, it is presumed to belong to one of the three reference classes proposed by the aforementioned standard. And yet the standard NBN EN 197-1:2000 defines 27 categories of cement, of which 13 are commonly used in Belgium. In its present version, the Belgian standard does not distinguish certain constituents of the cement from mineral additives that can be present in concrete (calcareous fillers, slag, fly ash). The research being undertaken by the BBRI is designed to overcome these shortcomings.

**Standards Antenna**

‘Concretes, Mortars and Granulates’

As the ‘Google’ of concrete standardisation, the ‘Concretes, Mortars and Granulates’ Standards Antenna, subsidised by the FPS Economy, disseminates information to SMEs of the sector via publications, courses and an Internet site (www.normes.be), where each month more than 3,000 consultations are registered and some 3,500 articles downloaded. This year, the site was enriched by numerous standard summary sheets, notably on testing methods for green concrete. Nearly 70 of these sheets can currently be downloaded, as well as several articles, one of which is devoted to the specification of shotcretes.

**Fragments in concrete**

Since June 2010, the ‘Technical Advice’ division has also received numerous requests for advice concerning fragments observed in concretes that were cast in...
April and May of the same year. The size of the fragments (up to 17 cm in diameter) and their frequency vary widely. They generally have a conical form and one notes in their centre the presence of a nodule of lime that can be as large as 2 cm in diameter. Moreover, some inspection bodies have observed cracks extending from one chip to another.

These chips are due to a contamination of the granulates for concrete by quicklime (CaO) which occurred at a lime and granulates' producer. To attempt to respond to the questions of the sector, our staff published, in the 4th issue of the magazine CSTC-Contact in 2010, an article explaining the cause of the problem, its potential consequences and the repairs that can be envisaged. Moreover, several studies were undertaken in order to evaluate the impact of this contamination on the mechanical strength and durability of concrete elements.

**NEW STANDARD ON THE PROCESSING OF CONCRETE STRUCTURES**

The new European standard NBN EN 13670 on the processing of concrete structures was published in 2010 and will be supplemented by a Belgian annex at the beginning of 2011. These two documents will become a reference on the subject. Besides directions for inspecting reinforced and prestressed concrete structures, they formulate processing rules for concreting (curing, working during the winter, etc.) and specify the tolerances applicable to these kinds of structure.

The national annex, based on the state-of-the-art practices which are typical of our country, was drafted in a working group led by the BBRI.

**INNOVATIVE CONCRETE APPLICATIONS**

Along with studies devoted to the formulation of self-flowing refractory concretes and the structural behaviour of self-compacting concretes, the BBRI is continuing its research efforts in the field of ultra-high performance concrete (UHPC). Regarded as a major technological development, ultra-high performance concrete is characterised by a compression strength on the order of 150 N/mm², i.e. 4 to 5 times greater than that of an ordinary concrete. The material also boasts of excellent mechanical performances and an exceptional durability, thus opening up interesting prospects for a whole series of small or large-scale applications. UHPC also offers numerous architecture-related possibilities: columns with great load-bearing capacity, highly prestressed beams, thin veils without continuous reinforcements, etc.

In 2010, our staff studied the question of the extent to which the Eurocodes could apply to this innovative material. To do so, they sought to characterise several of its properties such as the shrinkage and creep behaviour, the modulus of elasticity, the tensile strength, the shearing stress, the risk of cracking at a young age, the adherence to the reinforcements, and so on. In addition, a study aimed at quantifying various durability parameters demonstrated that the ultra-high performance concrete presents a very low porosity, an extremely slow carbonation rate, a minimal sensitivity to sulphates (in the event of HSR cement) and a particularly high resistance to frost/thaw cycles.

**ENVIRONMENT**

Cement production accounts for around five to eight percent of the world’s total CO₂ emissions. These derive primarily from the firing of limestone, an necessary operation to obtain Portland clinker, its major constituent. One of the ways to reduce these emissions is to replace a part of the clinker by slag, flying ash or calcareous fillers. Another method consists in the use of these industrial by-products as additives in the concrete so as to reduce the quantity of cement. Because this technique does have an effect on the workability, the development of the strength and the durability of such concretes, the Belgian Building Research Institute had no option but to carefully study these aspects in order to establish the specific rules of their formulation and processing.

**LABORATORY EQUIPMENT**

Accredited by BELAC (ISO 17025) for a large number of tests, the Concrete Technology Laboratory owns equipment that makes it possible to create and preserve samples of mortar and concrete, as well as their characterisation in both green and hardened condition. It also has extensive experience with evaluating the durability of concretes: chemical resistance, resistance to carbonation and to the diffusion of chlorides, corrosion measures, etc. Recently, the laboratory acquired equipment enabling it to evaluate the rheological properties of mortars, the creep behaviour and the resistance of concretes to frost/thaw cycles according to the new European standard CEN/TS 12390-9.

**TECHNOLOGICAL ADVISORY SERVICE ‘USE OF SPECIAL TYPES OF CONCRETE’**

The mission of the Advisory Service ‘Use of special types of concrete’ is to disseminate information and to encourage and assist companies in their innovative approach. The technological fields covered are, more specifically:

* the valorisation of secondary materials in concrete in the form of filler, sand or granulate
* architectonic concretes
* heavy or light concretes
* concretes with additives or which have been reinforced by fibres
* self-compacting and high-performance concretes.

For more information, go to www.cstc.be/go/qt-betonsspeciaux.
With regard to masonry, the efforts have been concentrated on evaluating the resistance to frost/thaw cycles of masonry structures and terracotta bricks as well as on the phenomena of the appearance of efflorescences. In the specific area of facades, many research actions concerned the appearance and durability of plaster on insulation systems. Moreover, recent studies have been conducted in order to draft specifications and recommendations for the processing of bricks glued onto external insulation on-site.

Let us also note that the Belgian national annexes of the ‘design’ and ‘execution’ parts accompanying the European standards on masonry were approved and mentioned in the Belgian Official Gazette at the end of 2010. This success is notably the result of the consultation of the sector concerned, prenormative studies of the Belgian Building Research Institute and its very active participation within the ‘Eurocode 6 – Masonry’ committee of the NBN.

Finally, the BBRI organised information sessions on the effect of the EPB on rough structures.

All of these actions concern research, development, standardisation and quality certificates as well as direct services to companies via technical advice, the ultimate objective always being to disseminate objective and verified information among contractors.

**Facade Masonry**

The BBRI is pursuing its activities aimed at giving facing walls the desired effectiveness with regard to durability and appearance. These notably include development actions conducted at the request of the sector and bearing on the appearance of efflorescences and the formation of gypsum (late development of efflorescences in the form of gypsum). In addition, the durability of facade bricks vis-à-vis frost forms the object of a study initiated in 2006 in collaboration with the CRIBC (Centre de recherche de l’industrie belge de la céramique).

This project clearly demonstrates that the tried-and-tested Belgian methodology (which has been ratified by addendum 2 of the standard NBN B 27-009) is stricter than that currently being proposed on the European level (CEN TS 772-22). Moreover, it is impossible at present to establish a correlation between the classes adopted in the two methods.

For example, class F2 under the European standard would correspond at best to the class of normal resistance to frost of the Belgian method. However, this does not exclude the possibility that a type of brick classified F2 according to the European method might behave in accordance with the Belgian method and attain the ‘high resistance to frost’ class.

This conclusion gives the sector cause for concern, since the declaration of the European F2 class within the framework of the CE marking does not necessarily mean that the brick can be qualified as ‘highly resistant to frost’ according to the Belgian standard.

We therefore believe that one can still recommend that the national prescriptions should continue to be preferred and that one should use bricks which have been tested according to this method, i.e. accompanied by a technical data sheet clearly stating ‘high resistance to frost’ or ‘normal resistance to frost’ according to the standard NBN B 27-009/A2.

**Standards Antennas**

*Eurocodes*, *Concretes, Mortars and Granulates*, and *Finishing*

The transfer of information collected via the monitoring of European standardisation in the field of masonry and facades is handled by the ‘Eurocodes’, ‘Concretes, Mortars and Granulates’ and ‘Finishing’ Standards Antennas, all three subsidised by the Federal Public Service Economy. Thanks to the constant contact they maintain with the various standardisation committees and institutes, on the one hand, and the building contractors, on the other, these Standards Antennas are able to explore and define the needs of the Belgian SMEs from the sector and respond to them in the best possible manner.
This advisory service, supported by the Walloon Region via financing from the DGTRÉ, was set up to respond to the constantly growing demand for renovation works and to support small and medium-sized companies confronted with the evolution of products, techniques and laws. It addressed itself to all Walloon companies in the construction sector, i.e. both building contractors and upstream actors. The advisory service also makes it possible to accompany the optimisation of products and systems through laboratory tests or studies for which the companies can benefit from technological cheques issued by the AST. For example, in 2010 nearly a dozen files were in progress for around one hundred cheques. The direct support actions concerned nearly 60 interventions. In addition, the advisors help these SMEs to work out research programmes within the framework of different calls of the Walloon Region.

BRICKS GLUED ON-SITE ONTO EXTERNAL INSULATION

Constituted of terracotta bricks, ceramic tiles, natural stone or agglomerated stone glued onto the external insulation on-site, these composite systems derived from plasters on insulation are becoming increasingly common and raising questions from the entire construction sector. Research actions were rapidly launched at the request of several Technical Committees (Plastering and Jointing, Hard Wall and Floor Coverings, Stone and Marble), and are currently ongoing. This technique meets the great interest aroused by thermal insulation implemented on the outside of existing buildings and new structures, while preserving the aesthetic appearance of facade masonries. These solutions prove to be very interesting when the aesthetic choice of the owner or urban-planning constraints require it.

In order to arrive at a harmonised method that is recognised throughout Europe and which is tried and tested and sufficiently strict, the BBRI and the CRIBC are striving to optimise the European method during the second biennial of research. Specific problematics have also been studied: masonry mortars (including jointing mortars in renovation), masonry undergoing a change in stress due to an a posteriori

In the area of external plasters, and in particular of plasters on insulation (ETICS with plaster – External Thermal Insulation Composite Systems with Rendering), the BBRI continues to conduct actions under the aegis of the ‘Plastering and Jointing’ Technical Committee. These activities focus not only on collective research and support to information or training, but also on laboratory tests in favour of the European Technical Approvals (ETAs issued by the EOTA) and Belgian Technical Approvals (ATGs issued by the UBAtc). They are supplemented by direct services to contractors who ask the BBRI for technical advice as well as by information sessions and courses.

These actions are motivated by the fact that the solution of plasters on insulation, which is advantageous in hygrothermal terms, can be associated with the challenges of the energy performance of buildings (EPB) for both new constructions and existing buildings.

The research actions conducted last year focused on establishing a laboratory methodology that makes it possible to evaluate resistance to greening (growth of algae and mosses), on setting up a natural ageing site for comparing laboratory and field conditions, as well as on evaluating the influence of the growing thicknesses of insulation (35 cm, for example) on technical details and durability.

This advisory service, supported by the Walloon Region via financing from the DGTRÉ, was set up to respond to the constantly growing demand for renovation works and to support small and medium-sized companies confronted with the evolution of products, techniques and laws. It addressed itself to all Walloon companies in the construction sector, i.e. both building contractors and upstream actors. The advisory service also makes it possible to accompany the optimisation of products and systems through laboratory tests or studies for which the companies can benefit from technological cheques issued by the AST. For example, in 2010 nearly a dozen files were in progress for around one hundred cheques. The direct support actions concerned nearly 60 interventions. In addition, the advisors help these SMEs to work out research programmes within the framework of different calls of the Walloon Region.

RESEARCH ACTIVITIES AND INFORMATION SUPPORT

The Belgian Building Research Institute has great expertise with regard to evaluating the durability of construction materials, notably against climatic agents. This expertise, acquired for the benefit of contractors, was constituted thanks to stations for accelerated ageing (heat, rain, frost) that make it possible to assess the longevity of all types of construction materials.

These laboratory tests are performed within the framework of technical advice, research projects, Technical Approvals and the CE marking.
This advisory service, conducted jointly with the ‘Passive House’ Platform and with the support of the IWT (Flemish Region), is designed to support building companies in the introduction of innovative techniques via the dissemination of knowledge acquired by the BBRI regarding roofs and light structures. The central themes concern structures which are airtight and free of thermal bridges. Publications (solar technologies, impact on the environment, insulation of roofs a posteriori, etc.), organisation of lectures (on airtight buildings, for example), courses (intended for the professional federations, architects and CeDuBo) and technological advising ranked high among the priorities of 2010. The TAS also supported several companies that wanted to achieve innovative solutions.

The focus of enormous attention, ‘low-energy’ structures are entirely dependent on the degree of care given to the thermal insulation of the roof and facades as well as to the airtightness of the envelope. In this context, the integration of technical components such as photovoltaic panels or solar collectors is becoming a very widespread practice.

**LOW ENERGY-CONSUMING STRUCTURES**

At the behest of the European authorities, an EPB regulation was introduced in each of the Regions of our country. Since then, the requirements have been steadily tightened. In the Flemish Region, for example, the maximum E level was reduced from E100 to E80 on January the 1st, 2010.

This trend will most likely continue in the coming years. Indeed, within the framework of the revision of the European EPB Directive, the Commission set an objective of ‘zero energy’ (or almost) for all new buildings between now and 2021. Various actions are therefore being introduced by the Belgian Building Research Institute to support and accompany the Belgian building sector in this radical change.

**WOOD-FRAME STRUCTURES**

The market for wood-frame structures has undergone constant growth in recent decades. Perfectly adapted to energy-saving buildings, this type of construction proves interesting, in renovation as well, by reason of its lightness and its rapid execution which does not require the addition of water. The technical specifications on the subject were updated in 2010; this is notably the case of the STS 23, which were revised by the BBRI and the Centre technique de l’industrie du bois (Technical Centre of the Wood Industry).

In addition, the members of the ‘Joinery’ Technical Committee examined a number of problematic construction details. New research projects and information documents could be initiated thanks to a series of orientation tests and the interventions of many experts.

**MULTI-FLOOR WOOD-FRAME STRUCTURES**

The research programme devoted to the processing of multi-floor wood-frame structures was finalised in 2010. In this study, the most significant performance criteria for this type of building were examined: mechanical strength, dimensional stability, vibratory comfort, fire safety and acoustical insulation. The study’s objective was notably to better assess the influence of wood panels and assembly techniques on the resistance to horizontal stresses of the partitions.

**ACOUSTICAL OPTIMISATION OF WOOD-FRAME STRUCTURES**

In 2010, the Belgian Building Research Institute conducted research on the acoustical aspects of wood-frame structures. The works, which aim to establish clear processing instructions, take into account the direct and lateral transmission of noise through wood-frame partitions and floors and their junctions.

**ACTIVITIES CONDUCTED IN THE SEALING WORKS TC**

**MECHANICAL FIXATION OF SEALING SYSTEMS**

In 2010 the Belgian Building Research Institute published a Technical Information Note on the mechanical fixations of sealing systems. This TIN addresses the choice and installation of the vapour barrier, insulation and sealing system, as
well as the calculation of the wind resistance, on the basis of the former Belgian standard and the current European standard.

Self-adhesive sealing membranes

Self-adhesive membranes have recently been appearing on the market. Given the absence of directives concerning their storage and processing, the Sealing Works TC set up a working group that published an article on this subject in 2010.

Roof car parks

The high cost of land, the increasing number of cars and the multiplication of commercial spaces have turned the roof car park into an indispensable structure. Because there are few recent directives on the subject, a Technical Information Note is currently being drafted. Last year, the working group continued to develop the document on the basis of bibliographic searches, extensive discussions and visits to examine existing structures. Moreover, subgroups are dealing with specific chapters concerning the details and connections, pavement accessories, etc.

Connecting structures of flat roofs

In 2005, our staff began revising the Technical Information Note 191 on connecting structures, taking recent techniques into account. The compatibility between materials is examined in a separate chapter. The detail schemes, which will be published in electronic format (permitting rapid integration into tender documents), will be generated on the basis of the general principles in effect, then developed individually per type of sealing product. In the meantime, the thermal aspects of the connections were analysed in order to make sure that they are in conformity with the Energy Performance Building (EPB) regulation.

Resistance of flat roofs to wind action

Within the framework of the ‘Integreated evaluation of the effect of wind on flat roofs’ research project, the Belgian Building Research Institute explored the standardisation relating to mechanically fastened systems and glued systems. After having performed a parametric study on the basis of the available results, the researchers sought to establish correlations between the laboratory tests and the on-site tests.

Activities conducted in the roof coverings TC

Tile roofs

In 2010, the BBRI completed the revision of the Technical Information Note on tile roofs. This new three-part reference document, which partially replaces the TINs 175, 186 and 202, defines the good practice rules applicable to terracotta and concrete tile roofs. The connecting structures will be dealt with in a separate Note.

Metal roofs

Given the evolution in metal coverings and accessories, the Technical Committee began drafting a new TIN which will deal with the metal accessories that can be used on various types of coverings (gutters, rainwater downpipes, etc.). A later TIN will be devoted to the dimensioning of the water evacuation system. A draft Digest concerning the hygrothermal aspects of this type of roof was also prepared in 2010.

Insulation of sloped roofs

Faced with increasingly stringent thermal requirements and the essential role of the roof in terms of a building’s insulation, the BBRI worked on drafting a Technical Information Note relating to the insulation of sloped roofs. Because interest in the sound comfort of occupants has grown steadily in recent years, in 2010 our staff published an article on the subject of the acoustic insulation of sloped roofs.

Integration of solar equipment in roofs

The Roof Coverings Technical Committee, with the support of several other TCs, last year continued to draft a TIN on the installation of solar panels on roofs. After a discussion of the first draft text, the working group wrote various articles explaining specific aspects of the subject.

Standardisation, ATG and BENOR quality declarations

Within the framework of the activities of the UBAtc relating to the Belgian and European Technical Approvals, the BBRI drafts test reports, verifies the declared values and evaluates the suitability for use of products, whether these are natural slates, metal tiles and sheets, concrete tiles, insulations or sealings.

The staff also participates in the BENOR consulting boards for terracotta tiles, slates, fibre-cement panels, bituminous under-layers and concrete tiles. In addition, the BBRI sits in various working groups and European Technical Committees, as well as in the corresponding Belgian mirror committees; it chairs and provides the secretariat services for the CEN TC 128 and is sectorial operator of different national standardisation committees (follow-up of the CEN TC 88, 128 and 254).

Within the framework of the EOTA activities, the engineers are responsible for the production and revision of several European Approval Guidelines (e.g. inverted roofs) as well as the drafting and delivery of European Technical Approvals.

Finally, in 2010, the ‘Water evacuation and adduction in buildings’ Standards Antenna expanded its activities to include flat roofs. Under the name ‘H₂O and roofs’, it has already disseminated a great deal of information and standards relating to flat roofs.

Publications of the BBRI ‘Roofs & Light Structures’

Travaux d’aménagement des combles. Les Dossiers du CSTC, N° 2010/2.2.
Isolation acoustique des toitures à versants. Les Dossiers du CSTC, N° 2010/2.5.
Today more than ever, the sector requires assistance in order to assimilate all the new techniques and requirements, whether these relate to thermal and sound insulation, solar control, resistance to breaking and entering, protection, decoration, fire resistance or durability.

In 2010, the BBRI proved particularly active on all these subjects through its participation in various works, prescriptive studies, Technological Advisory Services and other Standards Antennas.

Research

Performances of wooden windows

As of February the 1st, 2010, the standard NBN EN 14351-1 became the reference for CE marking of doors and windows put on the market. To spare SMEs the necessity of investing heavily in the performance of tests, the BBRI finalised its study determining the primary performances of wooden windows.

Carried out in close collaboration with the sector and benefiting from the support of the FPS Economy, this study led to the development of two practical tools that are directly available on the BBRI Internet site. The first is the wooden windows database, whose purpose is to determine the minimum performances of joineries on the basis of the collective use of numerous test results. This solution frees joiners from having to systematically commission laboratory tests, often at great expense, in order to justify the performances of their products. The test results entered into the online application make it possible to obtain, in conformity with the standard NBN EN 14351-1, the wind resistance, the air- and watertightness as well as the manoeuvring stresses that the joinery can withstand.

The second tool is the module for calculating the U value of wooden windows, an invaluable aid for joiners, who often have to calculate the level of thermal insulation of the windows that are ordered from them.

Performances of wooden parquets

In 2010, the BBRI finalised its research aimed at evaluating the performances of wooden floor coverings. This work made it possible to provide the sector with many answers concerning the choice of materials with a view to creating high-performance, long-lasting systems. The results are being disseminated via lectures and various articles.

As a result of numerous cases of pathology related to the installation of wooden parquets on top of floor heating systems, in September 2010 the BBRI began a study on compatibility between such systems and wooden floor coverings. The researches, initiated and monitored by professionals from the sector via the ‘Joinery’ Technical Committee and its ‘Parquets’ working group, has as its primary objective to develop a standardised test method making it possible to determine the performances of wooden floor coverings installed on top of a floor heating system.
‘Roofing and Facade Elements’ Laboratory

This laboratory conducts tests to determine the performances of the elements of a building’s envelope: windows, doorsets, facade elements, flat or sloped roofs, private or industrial doors and gates, weatherboardings, skylights, verandas, etc.

The performances studied notably concern water- and airtightness, wind resistance, resistance to impacts, abuse, creep behaviour, resistance of the facade elements to attempts at breaking and entering, and so on.

The laboratory’s equipment makes it possible to simulate the actions of wind, rain, air, ageing, etc. in conformity with the European standards and other national or international guides.

The various possibilities for financial assistance given to SMEs in connection with innovation (technology cheques issued by the Agence de stimulation with innovation (technology cheque assistance given to SMEs in connection with innovation) were used within the framework of specific development tests conducted by the laboratory. The latter also seeks to support building professionals, and more particularly joiners, in the development of new products and the evaluation of their essential performances.

Standardisation evolves...

Over thirty ATGs were studied and issued in 2010 for different types of products: windows, coated glasses, joinery profiles, mastics and facade coverings. The studies conducted take account not only of the recent European specifications, but also of the specifications currently being drafted within the Technical Committees of the CEN and the working groups of the EOTA.

Published in 2010, the amendment to the standard NBN S 23-002:2007 ‘Glazing’ essentially concerns impact behaviour and protection against noise. Several publications and presentations were offered by the BBRI in order to inform professionals of the sector about the contents and practical implications of the new standard.

Besides the NBN B 03-004 ‘Guardrails of buildings’ published to replace STS 54, various technical specifications were revised or first published in 2010, notably including STS 23 (wooden structures), STS 92.2 (aluminium joineries) and STS 53.2 (industrial, commercial and residential doors).

For its part, the ‘Manual and Motorised Facade Elements’ Standards Antenna continued its activities of awareness-raising and normative and technical support to the sector during the past year. The Internet site, greatly expanded, now constitutes a reference platform bringing together a large amount of normative information necessary for joiners. Besides the multiple individual technical supports provided in this complex area, the SA organised several information evenings for the sector.

The new ‘Finishing’ Standards Antenna, initiated in 2010, focuses especially on light partitions, suspended ceilings and raised floors, all important subjects for joiners.

A close collaboration with the sector... Technical Committees and TINs

Feedthroughs in fire-resistant construction elements

To guarantee the fire resistance of construction elements, it is essential that all of the functional feedthroughs be correctly stopped up, because there would be otherwise little point in implementing such elements. In 2010 the BBRI continued drafting various Data Sheets on the subject within a working group issuing from the Joinery Technical Committee. The twelve Data Sheets already published (see boxed text on this page) seek to give installers practical recommendations and to encourage principals to devote particular attention to the feedthroughs of fire-resistant walls already in the design stage. Ultimately, all of these Data Sheets will form the object of a TIN that will constitute a reference document on the subject in Belgium. In 2010, several training courses were given to joiners, but also to heating engineers, sanitary specialists, electricians, fire brigades, etc.

Wood weatherboards

The engineers of the BBRI worked on finalising the TIN ‘Revêtements de façade en bois et en panneaux à base de bois’ in close collaboration with the sector (via the ‘Joinery’ Technical Committee). A large part of this publication, which is scheduled to appear during the course of 2011, is devoted to the processing and design details intended to ensure the durability of structures. Training courses or information evenings were already given on the subject in 2010, on the basis of this future reference which is eagerly awaited by the sector.

Particular glass structures

Since the lack of a good practice code for design and implementing special structures in glass (stairways, floors, etc.) was sorely felt, the ‘Glazing’ Technical Committee started drafting a TIN on the subject. This document will emphasise the aspects of dimensioning and the constructive details to which attention must be paid during the design and implementation of such structures.

The first volume, devoted to structural applications, was finalised in 2010 and will be published in 2011. It essentially deals with glass floor slabs and stairs, aquariums and glazed basin walls. The second volume will focus on structures such as shop windows, walls in profiled glass, doors and ensembles in hardened glass, glass guardrails and separations.

Publications of the BBRI Joinery & Glazing

Les Dossiers du CSTC

Infoches
The finishing sector is represented by four Technical Committees: ‘Plastering and Jointing’, ‘Hard Wall and Floor Coverings’, ‘Paintwork, Flexible Wall and Floor Coverings’ and ‘Stone and Marble’. The ‘Joinery’ Technical Committee also makes its contribution with regard to light partitions and suspended ceilings.

The ‘Structural and Finishing Materials’ laboratory also continues to perform large numbers tests for the account of different producers with a view to the classification and CE marking of their products. This laboratory is accredited by BELAC for performing adhesion tests on adhesives and adhesive mortars for tiling.

With regard to standardisation, the engineers of the BBRI serve as the relay between the CEN TC 67, on the one hand, and FECAMO and the importers, on the other. They also act as sectorial operator for standardisation for the important problem of the slipperiness of floor coverings (CEN TC 339), as well as with regard to screeds (committee NBN E 303).

Moreover, the diversity of the articles published attests to the dynamism of the Technical Committees: no fewer than three articles devoted to screeds, another dedicated to measuring the slipperiness of natural stones, and a final one on watertightness under adhesively-bonded tiling.

The ‘Mineralogy and Microstructure’ laboratory typically performs large numbers of petrographic analyses for the account of various quarriers and contractors, with a view to identification for the CE marking, verification of conformity within the framework of the ATG-BENOR Technical Approvals, but also in order to better understand the pathologies encountered. For example, one of these studies made it possible to discover the cracking and splitting mechanisms of certain types of stone and formed the object of a publication that has been highly appreciated within the sector (Les Dossiers du CSTC, N° 2010/4, Cahier 17). Moreover, this laboratory is the only one of its kind which is accredited in Europe to perform (microscopic) petrographic analyses on thin sections.

With regard to standardisation, the BBRI remains active within the CEN TC 246, notably by elaborating a Technical Report (TR) concerning the specifications of natural stones on the basis of the TIN 228. On the Belgian level it acted as sectorial operator for this same committee.

Concerning certification, the collaboration with BCCA and COPRO was confirmed with a view to the approval of quarries and certification of the finished products.

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CERAMIC TILES AND TILING ADHESIVES

For a number of years now the field of ceramic tiles and tiling adhesives has been undergoing rapid development. Tiles of ever-larger dimensions, tiling adhesives with constantly renewed properties, increasingly complex sealing systems, … These are just a few examples of the evolutions that the contractor-tiler has to master in order to keep up his professional skills. Since July 2010, the BBRI has been working together with the UGent and the HoGent on the Tetra study, which seeks to identify the optimal time scheme for installing coverings on cement-based supports. The three partners notably hope to be able to determine scientifically, after the two years of research, whether tiling soon after the execution of a cement-based screed can reduce the curving effect due to shrinkage.

Moreover, the diversity of the articles published attests to the dynamism of the Technical Committees: no fewer than three articles devoted to screeds, another dedicated to measuring the slipperiness of natural stones, and a final one on watertightness under adhesively-bonded tiling.

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FLEXIBLE FLOOR COVERINGS AND PAINTS

Ever-tighter construction calendars often lead to a narrowing of the installation...
sight of processing realities, a large part of the project, conducted in collaboration with Sirris, is devoted to identifying the best mixing and projection techniques. This strand concerns both the plaster mixtures and the filling walls used in wood-frame structures or the double walls that make it possible to improve the insulation of existing buildings.

Moreover, as in most other finishing areas, the BBRI continued in 2010 its activities as sectorial operator for standardisation with the committee NBN E 241 and participated in the revision, begun this year, of the ATG Technical Approvals for plaster coatings.

An ‘Interior Coatings’ working group was created in order to study the problematic of the detachment of interior coatings (essentially of plaster) on masonry blocks and to examine the criteria relating to the characteristics of the support.

The ‘Microbiology’ laboratory regularly performs for the account of third parties – generally manufacturers – accelerated tests of the sensitivity of finishing materials to being attacked by moulds and algae, in order to help optimise the products. The materials thus studied are ‘sown’ with spores of moulds or algae before being placed in conditions that encourage their development. In 2010, an inter-TC working group began drafting a Technical Information Note devoted to the development of moulds, notably in coatings.

**Light partitions, suspended ceilings and raised floors**

In the wake of the publication of TINs 230, 232 and 233, a working group was set up to establish a number of technical data sheets aimed at ensuring the proper implementation of feedthroughs for walls where fire resistance performances are required. Twelve Data Sheets were published, six of them in 2010, and several training courses for construction professionals were organised within this framework by the ‘Fire Prevention’ Standards Antenna of the BBRI.

**Publications of the BBRI Wall and Floor Finishing**

NIT 238 L’application de systèmes de peinture intumescente sur structures en acier (août 2010).


Le séchage des enduits intérieurs. Les Dossiers du CSTC, N° 2010/4, Cahier 11.


Deux pathologies spécifiques à la pierre naturelle. Les Dossiers du CSTC, N° 2010/4, Cahier 17.


Compatibilité des peintures. Les Dossiers du CSTC, N° 2010/2, Cahier 12.


Tolérances dans la construction. Peinture, revêtements souples pour murs et sol : le support est primordial. Les Dossiers du CSTC, N° 2010/1, Cahier 12.
Sustainable Construction

Sustainable construction creates 20,000 ‘green’ jobs; the sector has to take the various aspects of this phenomenon into account. That was the conclusion of the Construction Forum organised by the Confédération Construction. Today this challenge is supported by several pillars and proactively initiated research actions.

The range of research actions is extremely diverse. Sustainable construction requires an integrated approach, because it is a particularly broad concept touching on energy savings and the reduction of CO₂ emissions as well as ecological materials, rational use of water, comfort, accessibility and the cost of projects.

The BBRI is moreover closely involved in works which tend to give an interpretation of the term ‘sustainable construction’, in terms of both its content and its technique. By collaborating with the international (ISO TC 59 SC 17) or European (CEN TC 350) standardisation committees and by participating in the activities of the mirror committees, the BBRI ensures the transfer of knowledge and adapts the future international and European normative framework which will structure the area.

TECHNOLOGICAL ADVISORY SERVICES

Since 2006, the BBRI, supported by InnovIRIS (Institut bruxellois de recherche et d’innovation) has been putting a technological advisory service at the disposal of the partners who intervene within the context of sustainable construction and development works.

Although all of the facets of sustainable construction are being envisaged, the 2010-2012 biennial is focusing more specifically on the energy problematic, renovation and the maintenance of walls and facades, on acoustical comfort, accessibility, sustainable mobility (in collaboration with the CRR) and the use of durable materials.

Other important actions concern the technology watch and the innovative canvassing. The latter should make it possible to identify market and social trends well in advance and to analyse them so as to offer investment opportunities to the sector, both on the technological and managerial levels.

Life Cycle: A Question of Environment and Cost

Within a sustainable construction context, it is essential to consider a building’s entire life cycle. That is why, once again this year, the studies focused on life cycle
analysis (LCA), life cycle costs (LCC) and environmental impact.

The LCC project, financed by the Standardisation Office and the FPS Economy, is designed to elaborate a methodological framework and a calculation tool enabling the contractor to easily evaluate the costs related to the building or to the parts of building that he is working on, or even to determine the expenditures to be incurred later for their maintenance and replacement. This approach requires close attention to the quality of the information furnished by the literature with regard to life duration and maintenance services. Specific case studies conducted for this purpose have made it possible to compare the theoretical framework with practical projects.

Subsidised by BELSPO, the SUFFIQUAD project also contributes to developing the concept of the life cycle of buildings by exploring the complex interactions between quality of life, the cost of individual and multi-family housing and its environmental impact.

The methodological knowledge thus acquired is then transposed into more practical research projects where the life cycle principles applied to the environment and to the costs are integrated into different case studies, whether involving integrated sustainable renovation, as with RENO 2020 (conducted with the support of the DG06 in the Walloon Region), or very effective renovation targeting a virtually zero energy consumption, as in the Eracobuild One-Stop-Shop project (financed by the IWT in the Flemish Region). The latter project envisages not only the ‘very low-energy’ technological renovation solutions, but also the necessary forms of collaboration that permit the partners in a renovation project to obtain a high performance level for their works.

ACCESSIBLE CONSTRUCTION

The study of the complete life cycle of a building and the underlying challenge of demographic ageing have driven a whole series of studies concerning the accessibility and adaptability of structures. The ‘Accessible Construction’ network, conducted with the support of the European Regional Development Fund (ERDF), deserves special mention in this regard, since this network intends to integrate as much as possible accessibility and the concept of Universal Design into the day-to-day practice of building work sites for accessible buildings. Great attention is being devoted to themes such as light, colour, signs and markings, evacuation and safety as well as the installation of sanitary equipment. The implications of the new Flemish regulation with regard to accessibility are also receiving high priority.

GLOBAL MANAGEMENT AND RECYCLING

Construction and demolition wastes, like the recycling problematic, remain a matter of urgent actuality for the sector. The galloping complexity of the construction process, its impact on the environment, and therefore the concept strictest of the environmental regulations are all prompting the sector to adopt new practices and search for innovative solutions.

Here again, an approach targeting an integrated management of the chain offers the key to sustainable solutions. From the pre-demolition study and the actual demolition to the recycling and reuse in new materials, the chain is wholly designed to optimise the process and guarantee the quality of the final recycled products.

A first project to be highlighted – conducted with the financial support of the Study Committee of the Fonds Gravier – was intended to apply the theoretical aspects of the integrated management of the chain to a number of practical cases. At the other end of the chain, at the stage of recycling and the use of granulates of recycled debris, the BBRI is putting a lot of effort into VALRECON, a TETRA project supported by the IWT focusing on the high-quality production of recycled concrete containing a large share of debris granulates as a substitute for large granulates.

SUSTAINABLE RENOVATION TECHNIQUES

Renovation of the built-up environment is ideally integrated into a context of sustainable development, not only by reason of works that consume fewer resources, but also in order to preserve the social fabric and the identity of the built-up space.

The energy renovation of the built-up patrimony is a major issue. The TAS ‘New techniques for the renovation of walls and their finishings – RENOMUR’, financed by the Walloon Region and the Brussels region, is focusing on this area by emphasising the importance of prior diagnosis and an approach that integrates thermal insulation, ventilation and the building’s envelope.

Within the framework of sustainable development, we find on the market a growing number of products that do not contain organic solvents (surface water repellents, anti-graffiti products, treatment of rising damp, etc.). These products are offered to replace the customary formulations, and to limit the odours and risks related to the release of VOCs. Rapid progress is being made, but the level of effectiveness is not always satisfactory. Aware of the necessity of assisting users in the choice of effective products presenting a minimum of secondary effects, the ‘Renovation’ laboratory has developed a series of standardised test procedures which make it possible to test and characterise most of the products marketed in Belgium and which currently serve as a basis for the delivery of the Technical Approvals of the UBAtc.

Finally, since an ounce of prevention is worth a pound of cure, parallel to the renovation works, a significant share of the laboratory’s activities is also devoted to maintenance works, i.e. to lighter and preventive interventions which make it possible to maintain the performances of the structures and postpone the necessity of more major works. The European project CHIC (Cultural Heritage Identity Card) for example focuses on rationalising the management of properties forming part of the cultural real-estate heritage.

Study of the life cycle costs at the Saint Ursula School (photo Architectes DBV).

PUBLICATIONS OF THE BBRI ‘SUSTAINABLE CONSTRUCTION & RENOVATION’

Coûts financiers et impact environnemental. Les Dossiers du CSTC, N° 2010/2, Cahier 3.
Compatibilité des peintures. Les Dossiers du CSTC, N° 2010/2, Cahier 12.
ENERGY PERFORMANCES

The principal engine of change with regard to energy performance and indoor climate of buildings over the course of the last five years, regional regulations will remain in the future the reference instrument for objectively evaluating buildings and their installations. The regulations and the calculation tools are constantly being adapted, their requirements strengthened and their scope expanded to include other types of structures, opening the way to new applications and a better appreciation of phenomena such as summer comfort or thermal bridges (panel points). These adaptations must be undertaken in consultation with the three regional entities that hold authority in these areas; this is in the interest of the sector. The BBRI is contributing its support and its expertise within the EPB platform created in 2007 precisely in order to improve the coherence between the regional EPB regulations.

The BBRI also supports the professional federations that bring together the building companies concerned to prepare themselves for the new European regulations: as of 2021, the energy consumption of all new buildings is supposed to be virtually zero. In other words, this will involve reducing the energy needs to a minimum and covering the residual demand by calling on renewable energies produced at the local level.

Other actions supporting the regulations continued via the prenormative research EPINS, such as taking innovative systems into account according to the equivalence principle.

The BBRI also lends its assistance to the regional administrations in charge of energy. In the Flemish Region (VEA), this assistance bears on the practical aspects of applying the EPB regulation. The support given to the Walloon and Brussels Regions with a view to transposing the European Energy Performance of Buildings Directive was also continued.

In the Walloon Region, the BBRI last year helped set up training courses about the new regulations. 2010 also saw in Walloonia the implementation of the energy certification for existing dwellings, which is compulsory whenever they are sold or rented out. The BBRI, which has been working for several years now to get this system up and running, developed the certification methodology and furnished the scientific supervision of the software development as well as training the trainers for this procedure. In addition, we finalised the second version of the voluntary energy advice procedure (EAP) for existing housing, which will be implemented in a software program in 2011. Finally, acting as coordinator of the voluntary action ‘Building with energy ... naturally’ launched in 2004,
the BBRI gave its support to the Walloon Region to encourage the construction of exemplary housing units whose energy efficiency goes beyond the regulatory prescriptions.

Nor do existing buildings that are to be renovated escape from energy concerns. For example, in Flanders, all housing units must be equipped, between now and 2020 at the latest, with a well-insulated roof, as well as glazings and a high-performance heating installation. The BBRI organises the consultation between the actors concerned in order to prepare them for the energy renovation requirements of the Programme 2020.

The objective of the new ‘One Stop Shop’ action is to assemble the building companies around this perspective of large-scale renovation aimed at strengthening the energy performances of older buildings.

On the European level, the ASIEPI project was finalised. This action made it possible to highlight good practices for certain points of the EPB Directive, such as taking account of thermal bridges, innovative systems, summer comfort as well as the audit of the regulations in the member countries.

The envelope of a building

Several actions were conducted on the performance of the building’s envelope and renovation works.

Attention was devoted more specifically to the airtightness of structures. In 2010, a working group was created in order to draft a Technical Information Note on this theme under the aegis of the ‘Hygrot-thermy’ Technical Committee. Numerous actions of information dissemination by way of training or advice to companies were carried out on this topic. Moreover, a study aimed at developing practical solutions to attain high levels of airtightness will begin in 2011.

The strategic multidisciplinary research programme HAM, which bears on the transportation of heat, air and humidity within walls and roofs, was finalised in collaboration with engineering bureaus as well as the universities of Leuven, Ghent and Eindhoven. The goal of this project was to establish an integrated approach to the phenomena so as to create buildings that are energy efficient and offer a better indoor climate.

Within the framework of the RETERMAT project, the researchers studied the impact of phase change materials on the thermodynamic behaviour of buildings, and on summer comfort in particular. A study demonstrating the influence of the choice of insulating materials on the thermal mass of buildings and their impact on problems of overheating was also published in 2010.

As for the Technological Advisory Service ‘Duurzame bouwschil voor nieuwbouw in renovatie’ (Sustainable envelope for new structures and renovations, see boxed text on p. 12) subsidised by the IWT, it lends its support to companies wishing to develop innovative roof and facade systems with high energy performances.

The BBRI is also participating in the development of a system of prefabrication of scalable modular housing units and the monitoring of the construction process of an office building according to passive standards.

In addition, our staff took part in a demonstration project renovating housing units in the Walloon Region. They are also collaborating in a European programme aimed at structuring the energy renovation market by limiting the number of intervening parties and offering a global service of renovation to owners desiring to undertake this type of works.

Finally, the Standards Antenna ‘Energy and Indoor Climate’ (see boxed text on p. 20) transmits – via the Internet site www.normes.be – information about the standards and regulations on energy performances, heating, climate control, ventilation, insulation, shading devices, etc.
Lighting and Building

Lighting-related electrical consumption in tertiary building units represents around one-third of the total primary energy consumption of this type of building. Natural lighting is therefore an important element to take into account in order to guarantee the comfort of occupants.

The Belgian Building Research Institute has created a cutting-edge laboratory in which these aspects are being studied. The diversity of measurement infrastructures available at the experimental station in Limelette is unique in Europe. Several studies being conducted on the subject are commented on below.

The Thematic Innovation Stimulation (TIS) action ‘Groen Licht Vlaanderen’, supported by the IWT (see boxed text above) makes it possible to maintain close contacts with the lighting sector. Assistance was also provided to the Flemish administration in charge of energy (VEA) for the drafting of the technical content of the ‘lighting’ part of its Internet site.

Finally, the BBRI remains active within the IBE-BIV (Belgian Lighting Institute) and participates in the International Commission on Illumination (CIE).

Technical Installations

High-performance climate control and ventilation installations in terms of energy

To be able to guarantee a healthy and comfortable indoor climate, a low-energy building must be equipped with high-performance technical installations. For example, a ventilation system (either natural or mechanical) will be necessary in order to ensure a supply of fresh air and to evacuate the used air (which has become laden with humidity and various pollutants). Inasmuch as the functioning of such an installation is inevitably accompanied by a certain energy consumption, during the heating season it must be used in a sound and controlled manner, for example by combining it with a heat recovery system.

OPTIVENT, a new collective research project financed by the IWT, seeks to prepare directives and calculation tools intended to optimise ventilation, placing the emphasis on the following aspects: measures prior to acceptance (flow rate, airtightness of the ducts, pressure losses, etc.), dimensioning of the ducts, control of the flow rate, acoustical recommendations, clogging and maintenance (dusts, moulds, etc.), pressure losses of various types of ducts. The work programme includes a synthesis of current knowledge as well as the performance of both laboratory and on-site tests.

The resounding success of techniques for using renewable energies, such as solar water heaters, photovoltaic electricity production systems, heat pumps, pellet-burning stoves and boilers, etc., must not make us lose sight of the necessity of a proper quality control, even if the regulation is relatively silent on the subject. The BBRI is currently developing, via the project Q-DIRECT, quality proce-
The mission of this Technological Advisory Service, subsidised by the IWT, is to encourage, via direct assistance to companies, the application and integration of energy-efficient HVAC installations in energy-saving buildings: heat pumps, thermal and photovoltaic solar systems, sophisticated ventilation systems with heat recovery, condensation heaters associated with (very) low-temperature water heat emission systems, solar protection systems, passive cooling techniques and combined heat and electricity production.

The advisors also offer advice specifically relating to the EPB, highlighting the improvement of the E level of a building and making it possible to evaluate the real performances of innovative systems. The Advisory Service valorises the knowledge and experience acquired via numerous collective actions (publications, lectures, etc.). As an example, a series of Data Sheets made available to professionals (http://energie.cstc.be) formulates recommendations intended to improve the energy performances of ventilation installations.

In the Brussels-Capital Region, the assistance is offered via the Technological Advisory Service ‘Eco-Construction and Sustainable Development’, subsidised by InnovIRIS, whose objective is to encourage the transfer of innovative technologies capable of meeting the new prescriptions linked to eco-construction and sustainable development.

In addition, a study devoted to the peak flows in water distribution systems within buildings was undertaken at the request of the Sanitary Technical Committee. On-site measurements will be performed for this purpose in 2011.

The BBRI staff also examined, at the request of this same Committee, the possibilities of application within the Belgian context of a French typological study devoted to the collective networks for evacuating combustion gases inside apartment buildings. This work should make it possible to formulate recommendations for the replacement of older heat generators connected to collective chimneys.
In 2010, the Technological Advisory Service ‘Acoustics’ continued the work initiated in 2009 in the wood construction field. How to enable the sector to take on the multi-family structures market? A first project initiated in 2009 was finalised in 2010 in partnership with a Belgian company specialised in the production of wooden structures. This project made it possible to develop precise directions for building wood-frame apartment buildings. A second important project was undertaken with a manufacturer of individual wooden houses and buildings with a view to the development of acoustical hollow-core blocks. Once again, the objective was to open up the apartment buildings market to solid wood structures. Finally, a total of six remarkable projects were completed in 2010, such as the development of double opening and sliding frames with very high acoustical insulation. In addition, close to 150 interventions were conducted last year, covering activities as diverse as aid to the design of new products, the holding of lectures for construction professionals, the drafting of articles for the general public or support for resolving one-off problems in building acoustics.

In Flanders, the Advisory Service ‘Bouwakoestiek’ (Building Acoustics) subsidised by the IWT (Agency for Scientific and Technological Innovation) strives to disseminate knowledge and encourage innovations among SMEs in the sector. This mission is conducted via channels such as publications, seminars and training courses. More targeted advice is also issued (by mail, by telephone or during on-site visits) in response to concrete requests formulated at the worksite, in the workshop or during the design phase of the building. Some requests for advice give rise to a technology watch aimed at optimising products or construction processes. This type of project is subsidised by the Flemish Region’s Agency for Companies (KMO-Portefeuille) at the request of the SMEs concerned.

**Recasting of the Belgian acoustical standards, new requirements for non-residential buildings, success of the European multidisciplinary research for the benefit of textile architecture, new test stations: the Acoustics division is rapidly developing its activities, while assuring the dissemination of the knowledge it acquires.**

**Development of new laboratory measurement procedures**

Test benches devoted to the determination of the vibro-acoustic transfer properties of viscoelastic joints were commissioned (ISO standards 10846-1 to 5) with a view to characterising the elastic supports used to attenuate structurally-propagated noise. Distinct measurement procedures were developed depending on whether the insulation is intended to reduce the transmission of vibrations in the audible frequencies (between 20 and 20,000 Hz) or in the low frequencies (between 1 and 80 Hz).

Today the laboratory is also able to conduct tests of airflow resistance in accordance with the standard NBN EN 29053:1995. These tests make it possible to accurately determine the dynamic rigidity of the underlying layers and to develop analytical models for porous materials.

Let us also mention:
- the test station designed to evaluate the dynamic properties of resilient joints as a function of frequency (ASTM E 756-05)
- the Kundt tube for determining the normal incidence absorption coefficient $\alpha$ of porous (or fibrous) materials used as acoustical absorbers
- the test station making it possible to characterise the acoustical performances of materials subject to the impact of rain, according to the directions of the standard ISO 140-18:2008 (see further on p. 25, about the CONTEX-T research)
- the MIM station intended to measure the mechanical impedance of lamina-
measurement accuracy of the method and the estimation of the sources of vibration. The acoustical pressure levels were measured thereafter the installation in the structure of a building. The vibratory power emitted by different sources was measured and integrated into the European forecasting model EN 12354-5 in order to study the transfer of vibrations caused by an installation in the structure of a building.

Among the methods that can be used in the laboratory, the relatively new one called the 'reception slab' method makes it possible to determine the vibratory power emitted in a slab posed according to a standardised procedure. This technique formed the object of an in-depth study in 2010. The vibratory power emitted by different sources was measured and integrated into the European forecasting model EN 12354-5 in order to study the propagation of vibrations through a reference building. The acoustical pressure levels predicted for this building were then compared with the levels which were measured there after the installation of the sources of vibration. The measurement accuracy of the method was examined during an inter-laboratory international comparative test in order to be able to apply it to energy sources (relatively light sources arranged on heavy construction elements). Moreover, an extension of the method to the speed sources (relatively heavy sources placed on light elements) was elaborated within the CEN TC 126/WG 7/AHG 1.

Besides this laboratory technique, a method that is applicable on site was studied with a view to determining the contact forces by mecano-acoustic reciprocity. The digital aspects linked to the matrix inversion inducing the contact forces formed the object of an in-depth study. The method was applied successfully in a reference building in which the source of vibration was constituted by a vibrating fitness platform, and the reciprocal speed source by a multidirectional source especially designed to emit low-frequency noises.

**Structural Noise of Installations**

It isn’t easy to evaluate the noise caused by technical installations in a building. Several techniques have thus been tested in order to study the transfer of vibrations caused by an installation in the structure of a building.

The research conducted in 2009 on wood-frame structures continued in 2010 and was expanded to include structures in engineered solid panels. The growing use of wood in construction has prompted a number of research projects to be undertaken in European laboratories. The BBRI also remains very active in this problematic and is studying, on a full-scale model, different solutions offering greater acoustical comfort on-site, while taking account of the aspects concerning the vibratory discomfort in wooden floors.

**Revision of the Belgian Acoustical Standards for Non-Residential Structures**

The revision of all of the Belgian acoustical standards continued in 2010, in partnership with the universities of Leuven and Liège. The final version of the standard prNBN S 01-400-2 which defines performance criteria for school buildings was proposed to the standardisation committee. The new criteria which were set forth there were tested during measurements performed in schools as well as during recent studies. A consultation with several educational networks made it possible to revise the guidelines of the draft in order to better align them with the needs. Finally, a study of the acoustical criteria to be imposed in office buildings and hospitals was launched over the past year.

**Context-T**

Context-T is a research programme dedicated to textile architecture, coordinated by CENTEXBEL in collaboration with 30 European partners. The objective of this multidisciplinary research is to expand the knowledge of the European textile industry about this type of construction and to ensure it a competitive international position. The Belgian Building Research Institute concentrates primarily on the acoustical aspects of the project and handles coordination tasks with regard to building physics and fire safety.

At the end of 2010, the absorption and acoustical insulation characteristics of multi-layer membrane systems were optimised with the aid of a calculation model developed earlier in the project. The use of porous intermediate layers and rigid and translucent intermediate layers was studied in detail. These systems were tested, simulated and optimised as to their insulation performances vis-à-vis noise produced by rain. Finally, practical guidelines were drafted in order to improve the overall acoustical comfort of buildings integrating textile fibres.

**Standards Antenna**

The activities of the Standards Antenna primarily concentrated on the application of the new standard NBN S 01-400-1:2008, a leading document with regard to building acoustics in Belgium. Besides the development of the Internet site, the Standards Antenna disseminated information on building acoustics in general (articles, conferences, individual contacts with companies) and the construction directives making it possible to fulfil the specifications of the NBN S 01-400-1:2008 in particular. This approach to the mission proved as fruitful for the Belgian companies as the development of innovative products conducted within the framework of the Technological Advisory Service.

**Development Activities in Laboratory and On-Site**

In 2010, nearly 220 acoustical characterisation tests on building materials or systems were performed in the laboratory within the context of development dossiers. The most frequently requested tests concerned measurement of the sound reduction index of glazings, frames, masonry walls and wooden structures.

Construction of the new laboratory infrastructure continued in 2010 and will probably be completed in the spring of 2011.

On site, over fifty buildings were studied within the context of development tests, primarily in order to verify the conformity of the insulation relative to the standards in effect.
In 2010, the staff of the ‘Management, Quality and Information Technologies’ division worked to raise awareness and accompany building companies in the use of IT tools for the purpose of improving their management and optimising the processes. These actions enabled numerous SMEs to identify high-performance solutions which were well-adapted to their company.

E-MANAGEMENT AT THE HEART OF THE COMPANY

The constant modernisation of the means of production, but also of management and communication tools, should push building professionals to become better informed and receive training. The very profitability and competitiveness of their company is at stake.

The partners in the projects ‘ConstrucTIC’ and ‘ABC DigiBouw’ therefore assigned themselves the task of advising and accompanying contractors in the effective use of information technologies in their management.

During an individual diagnosis of their company, the managers concerned received valuable advice on the optimisation of their IT environment and their organisation; they were able to discover various user-friendly and accessible IT applications. The individual advisory actions most often dealt with the computerised calculation of cost prices, digitisation of the planning of the company as well as the electronic management of data and documents.

As well as several awareness-raising actions, hundreds of training modules were dispensed in 2010, targeting all aspects of the organisation of companies (cost, planning, management, informatics, quality) with a view to encouraging the professionals to intensify the use they make of IT methods and tools.

MANAGEMENT TOOLS ADAPTED TO SMEs

For preparing estimates, the BBRI offers various supports that make it possible to pass easily from the theory of costs to actual practice. These learning modules are Excel applications that are compatible with MS Office (versions 2007 and 2010). The approach, developed on the basis of direct costs, allows small and medium-sized companies not only to calculate the cost price and the sale price of the various distinct items of a job, but also to work out the overall estimate.

The application C PRO can be downloaded from the BBRI internet site (www.cstc.be/go/cpro). It offers the following functionalities:

- introduction, verification and recovery of a bill of quantities
- calculation of the direct costs and the specific worksite expenses
- introduction of the profit margins
- calculation and transmission of the offer.

In addition, a whole series of Data Sheets relating to the calculation of the cost prices were finalised at the end of 2010. They ensure that companies do not neglect certain costs when calculating the cost price.

RISK MANAGEMENT IN CONSTRUCTION

This project, conducted with the collaboration of the K. U. Leuven and the financial support of the IWT (Flemish Agency for Scientific and Technological Innovation), was completed at the end of 2010. Its objective was to study the applicability of risk management to the planning of construction works in Belgium. The ‘Risk management in construction’ manual drafted for this occasion describes a number of effective risk management techniques and explains in detail how to use the developed tool (utility supplementary to MS Project).

In addition to various articles, our staff led a number of training courses and advised contractors who wished to apply the theoretical aspects of risk management to the practice of their worksites.

E-BBRI MADE TO MEASURE

Having served the construction sector for many years now, the BBRI – via its ‘Communication and Training’ division and its ICT department – draws extensively on the broad arsenal of digital tools available so as to ideally adapt itself to the specific needs of its members. Helping contractors optimise their search for information is another of our daily concerns.

In this context, the ‘Mobile ICT for construction’ working group deriving from the Technological Advisory Service ‘ConstrucTIC’ concentrated in 2010 on a technology watch concerning the contribution of mobile technologies for building companies. ■
Despite globalisation, the interaction between the owner and public authorities often remains a local event based on regional SMEs, traditions and smooth communication. Nevertheless, the construction sector remains just as sensitive to the consequences of European unification, notably with respect to the ‘critical’ trades and cross-border commerce in building materials.

In order to keep Belgian companies informed about the many developments in the European building sector and to defend the interests of Belgian SMEs, the BBRI sits in numerous bodies and actively participates in European and international initiatives.

**EUROPEAN REGULATION**

In 2007, the Commission took the first initiatives aimed at revising the European Construction Products Directive (89/106/EEC). The revised version of this text was published last year in the Official Journal of the European Union and the Commission mandated the European Committee for Standardization (CEN) to adapt the corresponding standards.

**EUROPEAN COMMITTEE FOR STANDARDIZATION (CEN)**

The activities of the CEN ([www.cen.eu](http://www.cen.eu)) are monitored in various mirror committees of the Standardisation Office (NBN, [www.nbn.be](http://www.nbn.be)). Within this framework, the BBRI chairs the committees E277 (Suspended Ceilings), E156 (Ventilation of Buildings), E128 (Roof Coverings) and E33 (Joinery). This led to the publication of about 400 harmonised standards.

**TECHNICAL APPROVALS**

In Belgium, for products which are not subject to specific standards, there is a system of Technical Approvals (ATG) issued by the Union belge pour l’agrément technique dans la construction (UBatc, [www.ubatc.be](http://www.ubatc.be)), a member of the European Union of Agrément (UEAtc, [www.ueatc.com](http://www.ueatc.com)) and of the European Organisation for Technical Approvals (EOTA, [www.eota.eu](http://www.eota.eu)). In 2010, the latter published some 2150 European Technical Approvals (ETA). As for the UEAtc, it explores new strategies to improve its service to the industry.

**ACTIVITIES IN NETWORKS**

Over the past year, the BBRI collaborated actively in various European networks, some of whose activities we will briefly review below.

**EUROPEAN CONSTRUCTION INDUSTRY FEDERATION (FIEC)**

The FIEC ([www.fiec.org](http://www.fiec.org)) is an important link in the dissemination to contractors of information regarding the above-mentioned activities. Our country is represented therein by the Confédération Construction, which relies on the BBRI for technical aspects. The latter chairs and handles the secretariat for Technical Committee ‘FIEC 1’.

**EUROPEAN NETWORK OF BUILDING RESEARCH INSTITUTES (ENBRI)**

The BBRI also provides the secretariat for the ENBRI ([www.enbri.org](http://www.enbri.org)), a network of 23 major research centres. During the course of 2010, the ENBRI actively participated in the Seventh Framework Programme of the European Union, and strove to intensify the collaborations among the members and their research teams.

**EUROPEAN COUNCIL FOR CONSTRUCTION RESEARCH, DEVELOPMENT AND INNOVATION (ECCREDI)**

This network ([www.eccredi.org](http://www.eccredi.org)) conducts a wide range of actions to secure European funding for research and development in the sector. ECCREDI thus collaborated on the drafting of several summary notes relating to the future Framework Programme of the European Union and played a major role in defining the themes of calls for projects of the FP7 (Seventh Framework Programme).

**EUROPEAN CONSTRUCTION TECHNOLOGY PLATFORM (ECTP)**

As a platform that coordinates European research on construction, the ECTP ([www.ectp.org](http://www.ectp.org)) can count on the assistance of the Belgian Building Research Association staff both within the operational group and in the various working groups. Taking the sector into account in the form of public/private partnerships in the European Union’s economic recovery plan gave a major boost to the E2B initiative ([www.e2b-jti.eu](http://www.e2b-jti.eu)).
More than ever, contractors and other building professionals need personalised accompaniment in a number of situations, such as:

- the search for relevant information amidst a constantly growing flood of data
- the interpretation of ever more numerous and complex regulations and directives
- the collection of various reference documents in order to select an adequate solution.

The statistics of the ‘Technical Advice and Consultancy’ (TAC) department demonstrate a steadily increasing interest in this type of service (see the graph below). This finding is explained not only by the growing renown of the Belgian Building Research Institute, but also by the infinite complexity of the building process. Increasingly advanced skills are being required of every professional.

To deal with this influx of technical questions, the TAC department can rely on the expertise of its staff, while making use of the most wide-ranging means of communication. Thus, frequently-asked questions can be dealt with effectively by telephone, fax or e-mail. More complex questions require a complete dossier accompanied by plans and photos, with the aid of which the engineer in charge will determine the most adequate approach. When written advice is not sufficient, or when the problem encountered cannot be resolved from a distance, it may be necessary to organise a field visit in order to be able to make findings and perform on-site measurements.

In 2010, our staff made more than 800 worksite visits, nearly half of which required the drafting of a written report. Moreover, some 7,300 questions submitted in writing received written answers, and more than 15,000 oral questions were handled by telephone.

In addition, the engineers of the Technical Advice and Consultancy department strive to correlate the individual questions that are submitted to them by the companies, in order to establish precise statistics. This approach makes it possible to rapidly detect recurrent problems and to remedy them as quickly as possible so as to prevent them from coming back again later.

When the questions posed reveal the necessity of refining the guidelines, our staff is able to formulate proposals that can result in practical publications, which might be commented on during seminars or information evenings. They can also bring together the common pathologies in order to process them in the form of Data Sheets, or even submit certain specific problems to the BBRI researchers.

This feedback to the research takes place via the Technical Committees, within which the Technical Advice and consultancy Engineers, through their action, contribute to the ‘bottom-up’ approach mentioned earlier.
The BBRI participates in the works of numerous associations linked to construction and even contributed to the founding of some of them. Dedicated to the most wide-ranging activities of the sector, the priority of these institutions is always to provide support for companies.

Recywall

Recywall’s mission ([www.recywall.be](http://www.recywall.be)) is to help companies to valorise and recycle their wastes. In 2010, a closer collaboration with the ‘Use of special types of concrete’ advisory service was undertaken via participation in various development projects.

Tradecowall

The objective of this company is to find solutions for the treatment of inert wastes and excavation soils coming from construction and demolition worksites ([www.tradecowall.be](http://www.tradecowall.be)). 2010 was marked by difficulties with the acceptance of recycled granulates, even when provided with the CE 2+ certification.

Belgian Construction Quality Society (BCQS)

BCQS ([www.bcqs.be](http://www.bcqs.be)) trains and accompanies companies with a view to obtaining certification of management with regard to quality (ISO 9001), the environment (ISO 14001) and safety (OHSAS 18001 or VCA). It organises also group training for a Construction Quality labellisation.

Belgian Construction Certification Association (BCCA)

BCCA ([www.bcca.be](http://www.bcca.be)) is one of the Belgian leaders with regard to certification in construction and, thanks to this status, possesses accreditation from the BELAC office. For several years now this non-profit association has been supporting the collective label ‘Construction Quality’ and regularly performs production inspections in the context of the CE marking.

CoboMedia

CoboMedia ([www.cobomedia.be](http://www.cobomedia.be)) are determined to promote relationships with the sector, organises seminars and courses making use of multimedia tools, in collaboration with the ABEE, the NBN, the UBIC, the Cefora, the Confédération Construction, the GBB, the FPS Mobility and Transport, the FABI, the FPS Economy, etc.

Belgian Centre for Domotics and Immotics (BCDI)

In 2010, the BCDI ([www.bcdi.be](http://www.bcdi.be)) lent its support to several activities: the non-profit association In-HAM, the VIS/TIS projects (technological innovation in the non-commercial sector and preparation of a guide for designing integrated living space automation), congresses, forums and workshops. The information on this subject is disseminated via the BCDI’s Internet site.

Centre Durzaam Bouwen (CeDuBo)

A leading centre for sustainable construction, CeDuBo ([www.cedubo.be](http://www.cedubo.be)) last year organised several seminars, exhibitions and training courses. For the account of the Flemish Region it coordinated the ‘Transitiemanagement duurzaam wonen en bouwen’ and participated in the interregional project Sustainable Industrial Sites.

Organisatie voor Duurzame Energie (ODE Vlaanderen)

ODE ([www.ode.be](http://www.ode.be)) handles the consultation between companies active in the renewable energy field and the public authorities via thematic platforms: heat pumps, photovoltaic, biomass, wind energy, ‘green’ electricity.

Quality Centre for Sustainable Energy Technologies (QUEST)

QUEST ([www.q4q.be](http://www.q4q.be)) prepares, with the assistance of the building sector, quality procedures for the application of small renewable energy systems (heat pumps, solar, thermal and photovoltaic installations, pellet-burning stoves and boilers, ventilation with heat recovery).

Vlaanderen Bouwt (VLABO)

VLABO ([www.vlaanderenbouwt.be](http://www.vlaanderenbouwt.be)) accompanies local authorities (municipalities, CPAS) in creating housing units and service residences. The projects are evaluated according to their urbanistic, architectural and technical qualities, their durability and their costs.
The activities of the BBRI are oriented directly by fifteen Technical Committees. Eleven of them are the direct representation of a branch of the construction industry (painters, joiners, heating equipment installers, etc.) and are composed essentially of contractors. The other Committees focus on subjects of interest to several branches, such as hygrothermy or acoustics. These are also composed of professionals active in construction. This ‘bottom-up’ approach makes it possible to closely tailor the activities of the BBRI to the needs of the sector.
GLAZING

Chairman
H. Vigoureux

Members

Engineer-leader
V. Detremmerie

Engineers TAC
F. Caluwaerts, L. Lassoie

SEALING WORKS

Chairman
J. Coumans

Members

Engineers-leaders
E. Noirfalisse, E. Mahieu

Engineer TAC
E. Mahieu

ROOF COVERINGS

Chairman
G. Pierrard

Members

Engineers-leaders
D. Langendries, F. Dobbels

Engineer TAC
E. Mahieu, O. Vandooren

SANITARY AND INDUSTRIAL PLUMBING, GAS INSTALLATIONS

Chairman
A. Dooms

Members

Engineer-leader
K. De Cuyper

Engineers TAC
I. De Pot, V. Jadinon

JOINERY

Chairman
M. Collignon

Members

Engineers-leaders
Y. Martin, B. Michaux, S. Charron

Engineer TAC
F. Caluwaerts, L. Lassoie

STONE AND MARBLE

Chairman
H. Vanderlinden

Members

Engineers-leaders
F. de Barquin, D. Nicaise

Engineer TAC
L. Firket, J. Van den Bossche
**Plastering and Jointing**

**Chairman**
J. Van den Putte

**Vice-chairman**
J. Jacquemin

**Members**

**Engineers-leaders**
Y. Grégoire, A. Smits

**Engineers TAC**
S. Eeckhout, L. Firket

**Hygrothermy**

**Chairman**
E. De Kempeneer

**Members**

**Engineers-leaders**
X. Loncour, L. Vandaele

**Engineers TAC**
A. Acke, J.-M. Rostenne

**Acoustics**

**Chairman**
E. De Kempeneer

**Members**

**Engineer-leader**
B. Ingelaere

**Engineers TAC**
V. Jadinon, S. Vercauteren

**Company Management**

**Chairman**
R. De Backer

**Members**

**Engineer-leader**
D. Pirlot

**Architectes**

**Chairman**
A. De Herde (jusqu’en mars 2010), R. De Lathouwer (depuis mars 2010)

**Vice-chairman**
R. De Lathouwer (jusqu’en mars 2010), M. Procès (depuis mars 2010)

**Members**

**Engineers-leaders**
D. Langendries, P. Wouters

**Engineer TAC**
J. Van Mol

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**The work programme of the Technical Committees**

Since 2008, the different Technical Committees have focused on drafting a work programme giving an overview of the actions to which they wish to devote themselves during the following year.

These programmes bear not only on the dissemination of information (via Technical Information Notes, articles, courses, lectures, etc.), but also on the gathering of this information (studies, research, etc.).

At the end of October, all of the work programmes for the year 2011 were approved by the Standing Committee.
In order to successfully conduct its mission, the BBRI bases itself on the expertise of more than 200 staff members coming from a wide range of disciplines. This combination of professional skills, commitment and versatility helps to make the Institute the authorised body that it has become within its sector.

The Belgian Building Research Institute strives to improve the quality in construction and strengthen the skills of the sector’s professionals. This task is far from being an easy one, given the fragmentation of the building process and the diversity of the partners involved.

To accomplish its mission and anticipate technological developments, the BBRI can rely on a dynamic multidisciplinary team. Our staff thus ensures that the fruits of the scientific and technical research conducted by the Institute benefit the greatest number.

The experience and pragmatism of some staff members combined with the innovative vision of others make it possible to publish practical works, provide custom-tailored technical advice as well as to organise courses and training sessions that correspond to the real needs of the sector.

Given the growing complexity of those needs and the increased interest in such areas as sustainable construction and renovation, finishing techniques, energy and indoor climate, IT applications in construction or the accessibility of buildings, the BBRI staff expanded in 2010 to reach a total of 237 persons.

\[\text{Evolution of the work force during the period 2000-2010 (situation as at 31 December).}\]
The accounting seeks to give a accurate overview of the Institute’s financial situation and to motivate decisions with regard to management.

**Affiliated Members**

On 31 December 2010 the BBRI had 81,900 members, including 53,650 one-man businesses. The graph below shows that this number increased by 21.6 % over the course of the past ten years. If we take the index into account, the increase in fees collected for this period amounts to 15.7 %.

![Graph showing the evolution of the number of affiliated members from 2001 to 2010.](image)

**Revenues and Expenditures**

The bar graphs at the top of the following page illustrate the evolution of the various revenues and expenditures relative to the total budget over the last three financial years. One thus finds that the fees of the members represent some 53 % of the total revenues. Personnel costs – the most important item of all the expenditures – fluctuated between 62 and 67 % over the past three years.
**EVOLUTION OF THE REVENUES**

<table>
<thead>
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<th>% of the total</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
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</thead>
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<tr>
<td>Fees</td>
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<td>50</td>
<td>40</td>
</tr>
<tr>
<td>Development</td>
<td>50</td>
<td>40</td>
<td>30</td>
</tr>
<tr>
<td>Services</td>
<td>40</td>
<td>30</td>
<td>20</td>
</tr>
<tr>
<td>Others</td>
<td>30</td>
<td>20</td>
<td>10</td>
</tr>
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</table>

**EVOLUTION OF THE EXPENDITURES**

<table>
<thead>
<tr>
<th>% of the total</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goods</td>
<td>70</td>
<td>60</td>
<td>50</td>
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<tr>
<td>Supplies</td>
<td>60</td>
<td>50</td>
<td>40</td>
</tr>
<tr>
<td>Personnel</td>
<td>50</td>
<td>40</td>
<td>30</td>
</tr>
<tr>
<td>Others</td>
<td>40</td>
<td>30</td>
<td>20</td>
</tr>
</tbody>
</table>

**DESTINATION OF THE EXPENDITURES**

The diagram presented below shows the revenues and the expenditures which result from the activities of the BBRI, after distribution of the structural expenses. The latter represent not only the costs relating to the buildings and equipment, but also the administrative costs.

This demonstrates that the totality of the available resources benefits, directly or indirectly, the construction companies. Indeed, if 90.7% of the total budget is directly invested for the benefit of the sector, 9.3% of that is valorised in research activities under contract which, in the long run, also benefit construction. Consequently, all of our resources are devoted to improving the quality and the competitiveness of the sector, which is ultimately the founding mission of the Institute.

**PRODUITS**

**CHARGES : DESTINATION**

<table>
<thead>
<tr>
<th>FEES OF THE MEMBERS : 52.78%</th>
</tr>
</thead>
<tbody>
<tr>
<td>TECHNICAL ADVICE, COURSES, PUBLICATIONS, DATABASES 27.09%</td>
</tr>
<tr>
<td>THEMATIC INNOVATION STIMULATION PROJECTS, TECHNOLOGICAL ADVISORY SERVICES, STANDARDS 16.77%</td>
</tr>
<tr>
<td>ANTENNAS, STUDIES, AWARENESS-RAISING 13.26%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OTHER REVENUES : 47.22%</th>
</tr>
</thead>
<tbody>
<tr>
<td>INNOVATIVE COLLECTIVE RESEARCH 10.90%</td>
</tr>
<tr>
<td>PRENORMATIVE COLLECTIVE RESEARCH 7.92%</td>
</tr>
<tr>
<td>FUNCTIONING OF THE LABORATORIES 4.77%</td>
</tr>
<tr>
<td>STANDARDISATION, CERTIFICATION, TECHNICAL APPROVALS 9.99%</td>
</tr>
<tr>
<td>OTHERS 9.30%</td>
</tr>
<tr>
<td>RESEARCH UNDER CONTRACT 9.30%</td>
</tr>
</tbody>
</table>
During the meeting of the general Council of the BBRI on April 27th, 2010, the composition of the General Council and the Standing Committee was approved as follows:

### General Council

<table>
<thead>
<tr>
<th>Role</th>
<th>Members</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chairman</td>
<td>Mr Jacques Gheysens</td>
</tr>
<tr>
<td>Vice-chairmen</td>
<td>Messr Jan Coumans, Jacques De Meester, Vincent Favier</td>
</tr>
<tr>
<td>Honorary chairmen</td>
<td>Messr Edmond Goes, Rob Lenaers</td>
</tr>
<tr>
<td>Members appointed by the Confédération Construction</td>
<td>Mrs Veerle Hofman, Messr Robert Brams, Pierre Crabbe, Philippe Crohin, Daniël Daniëls, Roland Debruyne, Patrick De Kinder, Jacques De Meester, Robert de Müelenaere, Jean-Pierre Demuyck, Staf Drooghmans, Lionel Eckhout, Rudy Evens, Jean-Louis Henry, Maximilien Le Begge, Marc Lefebvre, Jef Lembrechts, Claude Macors, Jos Mauroïen, Jan Meuleman, Evans Meunier, Hendrik Mondelinaers, Léopold Ninnin, Gilbert Pierrard, Jean Polet, Leo Pype, Michel Schwanen, Michel Thérèse, Thierry Toussaint, Philippe Vandendorpe, Henri Vanderlinden</td>
</tr>
<tr>
<td>Co-opted members</td>
<td>Mrs Hilde Masschelein, Mrs Christel Peeters, Messrs Vincent Favier, Robert Hoedemakers, Yves Pianet, Bruno Zanardini</td>
</tr>
<tr>
<td>Member appointed by the FEB</td>
<td>Mr Jan Coumans</td>
</tr>
<tr>
<td>Member appointed by the Walloon Region</td>
<td>Mr Hugues Dumont</td>
</tr>
<tr>
<td>Member appointed by the Brussels-Capital Region</td>
<td>not designated as of April 27th, 2010</td>
</tr>
<tr>
<td>Members appointed by the Flemish Region</td>
<td>Mr Jean-Claude Moureau</td>
</tr>
<tr>
<td>Members appointed by the employees' organisations</td>
<td>Messr Dirk Otte, Leo Van De Loock</td>
</tr>
<tr>
<td>Account inspectors</td>
<td>Messr Dirk Otte, Leo Van De Loock</td>
</tr>
<tr>
<td>Statutory Auditor</td>
<td>Messr Staf Drooghmans, Léopold Ninnin</td>
</tr>
<tr>
<td></td>
<td>HLB Dodémont-Van Impe &amp; Co</td>
</tr>
</tbody>
</table>

### Standing Committee

<table>
<thead>
<tr>
<th>Role</th>
<th>Members</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chairman</td>
<td>Mr Jacques Gheysens</td>
</tr>
<tr>
<td>Vice-Chairmen</td>
<td>Messr Jan Coumans, Jacques De Meester, Vincent Favier</td>
</tr>
<tr>
<td>Members</td>
<td>Mrs Hilde Masschelein</td>
</tr>
<tr>
<td>Observer</td>
<td>Mr Dirk Otte</td>
</tr>
<tr>
<td></td>
<td>Messr Jean Biesmans, Daniël Daniëls, Robert de Muelenaere, Hugues Dumont, Philippe Gillion, Marc Lefebvre, Jan Meuleman, Jan Staal</td>
</tr>
</tbody>
</table>
## Geotechnics & Structures

| A1 | Règles de dimensionnement, d’exécution et de monitoring des systèmes de blindage traditionnels ou non |
| A2 | Micropieux : directives pour l’exécution, le dimensionnement et les essais |
| A3 | AN Prévention du feu |
| A4 | AN Eurocodes |
| A5 | TETRA – Conception de constructions résistant au feu |
| A6 | SOIL MIX dans des applications constructives et permanentes. Caractérisation du matériau et développement de nouvelles lois mécaniques |
| A7 | TIS Speciale funderingstechnieken (Techniques spéciales de fondation) (IWT) |
| A8 | ENER-VIB – Vibration de profilés et transfert d’énergie (First DO.C.A) |

## Concrete & Concrete Structures (sequel)

| B16 | BESLAG – Bétons à haute teneur en laitier |
| B17 | GT Constructions multifonctionnelles à ossature mixte – OSSAMIX (SPW) |
| B18 | GT Mise en œuvre de bétons spéciaux – BESPECX (SPW) |
| B19 | Betonic@ – Mise en relation du matériel et des logiciels pour l’industrie du béton |
| B20 | MORECAR – Modelling of Refractory Castable Rheology (Modélisation des propriétés rhéologiques du béton réfractaire) |
| B21 | Eclats dans le béton dus à une contamination des granulats secondaires |

## Masonry & Facades

| C1 | Examen critique et optimisation de la méthodologie européenne d'évaluation de la gelivité des briques et des mortiers de maçonnerie (2e biennale) |
| C2 | AN Prévention du feu |
| C3 | AN Eurocodes |
| C4 | AN Bétons, mortiers, granulats |
| C5 | Nouvelles techniques de remédiation des problèmes dans les maçonneries chargées de sel |
| C6 | TETRA – Conception de constructions résistant au feu |
| C7 | CEMCALC – Ciment ternaire à haute teneur en calcaire et à faible teneur en laitier |
| C8 | HUMIBATI – Traitement de l’humidité ascensionnelle : innovations, performances et environnement |

## Roofs & Light Structures

| D1 | Evaluation intégrale de l’effet du vent sur les toitures plates |
| D2 | AN Eurocodes |
| D3 | AN H₂O et toitures |
| D4 | TD Duurzame bouwschil voor nieuwbouw en renovatie (Enveloppe durable pour constructions neuves et rénovations) (IWT) |

## Joinery & Glazing

| E1 | AN Prévention du feu |
| E2 | AN Eléments de façade manuels et motorisés |
CSTC – Rapport d’activités 2010

**Sustainable Construction & Renovation (sequel)**

- **E3** TETRA – Conception de constructions résistant au feu
- **E4** GT Eco-construction et développement durable en Région de Bruxelles-Capitale (InnovIRIS)
- **E5** OPTIMBERQUAKE – Optimisation of Timber Multi-Storey Buildings against Earthquake Impact (Optimisation antisismique des bâtiments en bois multiétages)
- **E6** GT Le verre dans le bâtiment – BatiVer (SPW)
- **E7** GT Nouvelles techniques de rénovation des murs et de leurs parachèvements – RENOMUR (SPW)
- **G9** SUFIQUAD – Sustainability, Financial and Quality Evaluation of Dwelling Types (Évaluation de la durabilité, des coûts et de la qualité des différents types de logements)
- **G10** CLEAR-UP – Clean and Resource Efficient Buildings for Real Life (Bâtiments propres et économiques en énergie en conditions réelles)
- **G11** HEMICPD – Horizontal Evaluation Method for the Implementation of the Construction Products Directive (Méthode d’évaluation horizontale de l’application de la directive européenne sur les produits de construction)
- **G12** Gestion de la chaîne avec évaluation technique et écologique des éléments de démolition, de la démolition sélective et du recyclage axé sur la production de granulat recyclé comme substitut durable au gravier
- **G13** CIMEDE – Construction industrielle de maisons évolutives, durables et économiques
- **G14** RENO 2020 – Méthodologie d’insertion des nouvelles technologies dans la rénovation durable du logement wallon : développement, mise au point et diffusion
- **G15** BTP 100 – Recherche de solutions pour des bâtiments tertiaires passifs à 1.000 EUR/m²
- **G16** Maison didactique – Centre didactique de la performance énergétique et de la construction durable

**Energy, Indoor Climate & Installations**

- **H1** Evaluation de la compatibilité entre systèmes de chauffage par le sol et revêtements de sol en bois
- **H2** AN Energie et Climat intérieur
- **H3** AN H₂O et toitures
- **H4** OPTIVENT – Développement de directives et d’outils de calcul pour la conception optimale et l’installation de systèmes de ventilation dans les immeubles résidentiels
- **H5** TIS Groen Licht Vlaanderen : energiebesparing met beter licht (Groen Licht Vlaanderen : économies d’énergie et éclairage) (IWT)
- **H6** TD Duurzame bouwtechniek voor nieuwbouw in renovatie (Envelope durable pour constructions neuves et rénovations) (IWT)
- **H7** TD Innovklima – Innovatieve klimaatechnieken : integratie van energie-efficiënte HVAC-installaties in energiezuinige gebouwen (Techniques de climatisation innovantes : intégration des installations HVAC durables dans les bâtiments à faibles besoins énergétiques) (IWT)
- **H8** ERACOBUILD – One Stop Shop – From Demonstration Projects towards Volume Market : Innovations for Sustainable Renovation (One Stop Shop – Du projet de démonstration à la pérennité du marché : innovations pour la rénovation durable)
- **H9** SBO – Heat, Air and Moisture Performance Engineering : a Whole Building Approach – Info Ham (Approche intégrée des performances liées au conditionnement du climat intérieur)
- **H10** CLEAR-UP – Clean and Resource Efficient Buildings for Real Life (Bâtiments propres et économiques en énergie en conditions réelles)

**Joinery & Glazing (sequel)**

- **F1** ETICS II – Enduits extérieurs : critères pour une durabilité améliorée (2e biennale)
- **F2** Evaluation des performances des revêtements de sol en bois collés : essais et spécifications
- **F3** Evaluation de la compatibilité entre systèmes de chauffage par le sol et revêtements de sol en bois
- **F4** AN Parachèvement
- **F5** TD Hygiène -en gezondheidsaspecten van materialen voor woon- en werkruimten (Aspects sanitaires des matériaux dans les logements et les locaux de travail) (IWT)
- **F6** RETERMAT – Revêtements intérieurs à base de MCP pour une régulation thermique des bâtiments
- **F7** GT Revêtements organiques – REVORGAN (SPW)

**Wall and Floor Finishing**

- **G1** Elaboration d’un protocole d’essai visant à déterminer l’impact des matériaux de construction sur la santé
- **G2** Analyse des frais liés au cycle de vie (LCC) dans le cadre de l’évaluation des performances économiques des bâtiments durables
- **G3** ERACOBUILD – One Stop Shop – From Demonstration Projects towards Volume Market : Innovations for Sustainable Renovation (One Stop Shop – Du projet de démonstration à la pérennité du marché : innovations pour la rénovation durable)
- **G4** GT Eco-construction et développement durable en Région de Bruxelles-Capitale (InnovIRIS)
- **G5** GT Nouvelles techniques de rénovation des murs et de leurs parachèvements – RENOMUR (SPW)
- **G6** PERFECTION – Performance Indicators for Health, Comfort and Safety of the Indoor Environment (Indicateurs d’évaluation des performances de l’environnement intérieur en matière de santé, de confort et de sécurité)
- **G7** LEHR – Low Energy Housing Retrofit (Rénovation basse énergie des logements)
- **G8** EU-CHIC – Cultural Heritage Identity Card

Annexe
<table>
<thead>
<tr>
<th>ENERGY, INDOOR CLIMATE &amp; INSTALLATIONS (SEQUEL)</th>
<th>ACOUSTICAL COMFORT</th>
</tr>
</thead>
<tbody>
<tr>
<td>H11 RETERMAT – Revêtements intérieurs à base de MCP pour une régulation thermique des bâtiments</td>
<td>I1 BANC II – Norme acoustique belge : critères (2e phase)</td>
</tr>
<tr>
<td>H12 Construire avec l’énergie ... naturellement ! (3e phase)</td>
<td>I2 AN Acoustique</td>
</tr>
<tr>
<td>H13 ETANCHAIR – Construction étanche à l’air : de la conception à la réalisation pratique</td>
<td>I3 Optimisation acoustique des constructions à ossature en bois</td>
</tr>
<tr>
<td>H14 GT Eco-construction et développement durable en Région de Bruxelles-Capitale (InnovIRIS)</td>
<td>I4 TD Bouwakoestiek (Acoustique du bâtiment) (IWT)</td>
</tr>
<tr>
<td>H15 SAVE-ASIEPI – Assessment and Improvement of the EPBD Impact for New Buildings and Building Renovation (Évaluation et amélioration de l’impact de la directive PEB pour les bâtiments neufs ou en rénovation)</td>
<td>I5 GT Acoustique (SPW)</td>
</tr>
<tr>
<td></td>
<td>MANAGEMENT, QUALITY &amp; INFORMATION TECHNOLOGIES</td>
</tr>
<tr>
<td>H17 Q-DIRECT II – Development of Referentials for Belgian Quality in Distributed Renewable Energy Concepts (Développement de procédures de qualité belges pour les systèmes d’énergie renouvelable de petite échelle) (2e biennale)</td>
<td>J2 La gestion des risques dans la construction II – Mise au point d’un système de gestion des risques pour l’évaluation et le contrôle des facteurs de risque durant toutes les phases d’un projet de construction (2e biennale)</td>
</tr>
<tr>
<td>H18 LEHR – Low Energy Housing Retrofit (Rénovation basse énergie des logements)</td>
<td>J3 TIS Intelligent bouwen (Constructions intelligentes) (IWT)</td>
</tr>
<tr>
<td>H20 EPINS – Développement d’une méthodologie d’évaluation pour la caractérisation des performances des produits de construction et des systèmes innovants en matière d’énergie et de climat intérieur</td>
<td>J5 TD proKMO – Projectorganisatie voor KMO-bouwbedrijven (proKMO – Organisation de projets pour les PME de la construction) (IWT)</td>
</tr>
<tr>
<td>H21 CIMEDE – Construction industrielle de maisons évolutives, durables et économiques</td>
<td>J6 GT ConstructIC – Sensibilisation et accompagnement des professionnels de la construction dans l’implémentation des technologies innovantes de l’information et de la communication</td>
</tr>
<tr>
<td>H23 BPT 100 – Recherche de solutions pour des bâtiments terri- toriaux passifs à 1.000 EUR/m²</td>
<td>J8 ABC DigiBouw – Aannemers begeleiden en coachen bij het implementeren van computertoepassingen (ABC DigiBouw – Accompagnement et support des entrepreneurs dans l’implémentation des applications informatiques)</td>
</tr>
<tr>
<td>H24 Maison didactique – Centre didactique de la performance énergétique et de la construction durable</td>
<td>J9 Centre de compétence ‘Construction durable’</td>
</tr>
<tr>
<td>H25 Participation au développement de l’offre de formation relative à la PEB en Région wallonne</td>
<td>J10 Vlaams Netwerk Toegankelijk Bouwen (Réseau flamand pour la construction accessible)</td>
</tr>
<tr>
<td>H26 Accompagnement scientifique du développement du logiciel de certification énergétique des logements existants en Région wallonne</td>
<td>J11 SIMBA – Simulation multiphysique du bâtiment</td>
</tr>
<tr>
<td>H27 Soutien de la Région de Bruxelles-Capitale dans l’application de la nouvelle réglementation PEB</td>
<td>J12 Organisation d’un Roadshow en collaboration avec le SPF Economie sur le thème des moyens de développement économique dans le secteur de la construction</td>
</tr>
<tr>
<td>H28 Soutien de la Région wallonne dans l’application de la nouvelle réglementation PEB</td>
<td>J13 Etude-cadre intersectorielle des frais généraux d’entreprise</td>
</tr>
<tr>
<td>H29 Soutien de la Région flamande dans l’application de la nouvelle réglementation PEB</td>
<td>J14 Support aux activités de la plateforme belge ‘Construction et innovation’</td>
</tr>
<tr>
<td>H30 AIVC – Air Infiltration and Ventilation Centre</td>
<td>J15 QUEST – Développement et gestion de systèmes de qualité pour des applications d’énergies renouvelables à petite échelle</td>
</tr>
</tbody>
</table>