# Annual Report 2015

**Belgian Building Research Institute**

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The BBRI met the challenges set by the working plans of the Technical Committees
In 2013 the BBRI published its first vision report ‘Cap sur 2015’ (‘Heading for 2015’). This approach, based on the working plans of the Technical Committees, became the driving force for the Institute actions and determined the priorities that the sector had imposed on it for the last three years. These challenges are focused on six main lines of action, which are divided into themes. Some of those themes will be briefly discussed below.

The priority line of action is undoubtedly the drawing up of recommendations for ‘zero-energy’ buildings that have the lowest possible environmental impact, while remaining economically feasible. Limiting our environmental impact is indeed a challenge that must be taken seriously by everybody and in which the construction sector has a key role to play. Much progress has been made in this area thanks to the numerous research projects carried out. So in 2015 the BBRI succeeded in publishing the very first Belgian reference document on the airtightness of buildings.

Another significant line of action is the working out of the technical details in order to meet the increasingly strict requirements imposed on buildings. Indeed the main difficulties are concentrated in these areas, more specifically at the interface between different building elements, where the intervention of various building trades is required. Several projects go deeper into the technical details, but it is essential to pay close attention to this issue at all levels.

The information of construction professionals was also high on the agenda this year. Having increased its information offer substantially, the BBRI undertook a large-scale campaign in 2015 in order to promote its central communication tool, namely its website. The campaign was well received, with the results being immediately visible.

The creation of quality frameworks is a way of highlighting the technical and organisational skills of the contractors, as well as promoting quality work. The quality frameworks help to increase customer satisfaction and to improve the image of the entire sector.

Innovation represents one of the BBRI’s core tasks, but the Institute distinguishes itself from other research institutes principally through its close contacts with the actors in the field. Thanks to the innovations, which have been developed in direct collaboration with construction companies, the Institute is able to meet the actual needs of the sector, while taking into account the implementation aspects. The BBRI may have its head in the clouds, but both its feet are firmly on the ground!

Even if these lines of actions will remain at the forefront over the coming years, substantial progress has been made. The number of challenges will certainly not decrease in the future, with notably the digital revolution that will affect the design, the creation and the exploitation of future buildings. The application of BIM (Building Information Model) will undoubtedly play a central role in this revolution. The BBRI intends to fully fulfill its mission by offering support and guidance to all actors of the construction sector with regard to this metamorphosis. A digital future is the only way forward!
A unique approach in Europe

With its 248 employees, the BBRI is one of the largest collective research institutes in Belgium. Its organisation based on a bottom-up approach that is unique in Europe builds on the annual working plans of its Technical Committees (TC). These working plans are a key thread running through the BBRI’s projects.

Every TC is chaired by a contractor and includes a core of representatives from the trade concerned, supplemented by experts (manufacturers, consultancy offices, etc.). These Committees ensure that the Institute focuses on subjects that are relevant to construction professionals. This includes guiding research towards areas of interest to the sector and also determining which publications are needed.

As in the last two years, the structure of this new Annual Report is modelled on the vision report ‘Cap sur 2015’, although for the last time. The Institute’s activities described in the following pages are classified into four themes:

- Energy and Environment
- Comfort, Health, Accessibility and Safety
- Building Materials and Systems
- Technical Installations.

1 Energy construction

Establishing recommendations for constructing (nearly) ‘zero-energy’ buildings.

2 Technical details

Putting at the sector’s disposal technical details that are optimised with regard to all requirements.

3 Energy renovation

Proposing a pragmatic approach for the energy renovation of existing buildings.
Each theme is divided into six main areas, which largely define the course to be taken by the BBRI over the coming years. These are presented below and illustrated by an icon that constitutes a benchmark for each of them.

For each project that is briefly described in this document, more detailed information can be found in the ‘project’ fiches which can be consulted in the database available at www.bbri.be. A list of the ongoing projects is annexed to this Report, including the subsidising bodies.

In 2015 the BBRI launched a national action plan to better promote its website. Indeed, there are still too many companies who make insufficient use of the tools offered to them. However, as soon as they become aware of the treasure trove held on our website, they start visiting it regularly to obtain information. The BBRI travelled all over Belgium to promote its website in a relaxed and friendly atmosphere.

In total, no less than 8,300 people took part to the event, spread over 28 evenings. The contents of bbri.be were presented to them through a ten-minute short film and a few live demonstrations. The vast majority of the participants had not heard of the website or knew very little about it. Indeed, 80% of them said that they never or very seldom use the website, despite the fact that it is specially aimed at them. Following the presentations, 85% of the participants stated that they find the website really helpful.

The initiative produced immediate results — in 2015 the website recorded 1,600,000 visits, an increase of 15% on the previous year. At the same time, the number of technical documents downloaded rose by more than 25%. This encouraging success rate proves that the construction sector is not as reluctant to embrace digital technology as one might think!

The BBRI meets the contractors

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The necessary energy

In 2015 particular attention was paid to various actions concerning the airtightness of buildings. Thanks to the continuation of the Luchtdicht bouwen van A tot Z project, around 20 contractors and architects were assisted with the integration of airtight structures within their construction processes.

Constructing energy-efficient buildings goes hand in hand with the reduction of the energy needs. Together with the airtightness, thermal insulation and ventilation form the cornerstones of the BBRI’s actions in this field. Various actions related to the ventilation of buildings are discussed in the ‘Technical Installation’ section of this Annual Report (see p. 22 & 23).

With respect to insulation activities, the review of TIN 215 was pursued. This Technical Information Note on flat roofs considers the most recent processing techniques. Various research projects were carried out into wall and roof insulation techniques that can be used for both new buildings and renovation works (see below).

Several actions were also taken in order to evolve and to improve the performances of outdoor joinery, thereby meeting the additional expectations with regard to these elements. For example, the iSOLA 2020 research project is aimed at guaranteeing the normally expected performances of joinery work (airtightness, watertightness, mechanical strength, etc.) as well as optimising the energy performance of these elements.

The requirements of the regional regulations on the energy performance of buildings (EPB) have evolved considerably over the last few years and will become even stricter for both new buildings and renovations in the future. Indeed, by 2021 Europe will be imposing nearly zero-energy consumption levels for all new buildings. The regulatory calculation methods and instruments result from the efforts of the regional authorities. The BBRI supports them via the EPB Consortium that consists of around ten teams. The consortium’s activities are aimed at evolving the regional EPB regulations in a coherent way. The Institute is also working on the EPBD CA4 project, a concerted European action for the implementation of the review of the European Directive on the energy performance of buildings. This Directive forms the basis of the EPB regulations.

The QUALICheck research project was also continued at European level. This project is aimed at highlighting the methods used to improve the quality of works, which should ultimately lead to properly declared performances in terms of the regulations. In this context, particular attention is paid to the study of issues such as the airtightness and the ventilation of buildings.
The construction sector is challenged daily with integrating the expected building performances with regard to technical details. Various actions aimed at developing, validating, optimising and distributing the integrated technical details were carried out in 2015.

One of the many constructional nodes that requires the intervention of different trades concerns the installation of joineries in the rough structure. The technical details corresponding to this node were elaborated by way of various actions. This included further work on the revision of TIN 188 on the installation of outdoor joineries, as well as on the prenormative study FENETRES ‘Evaluation des performances et de la durabilité de fenêtres à hautes performances et raccord au gros œuvre’.

Evaluating technical solutions and supporting actions that promote the energy renovation of the existing buildings constitutes one of the main tasks of the BBRI. The thermal insulation of external walls was therefore one of the major research areas this year. In this context, the Institute collaborated on the GEVISOL-ETICS and INNOV-ETICS projects, which study external thermal insulation systems with rendering, a very popular technique used in renovation works.

The RenoFase project is also aimed at removing all barriers – whether technical or not – to the renovation of existing buildings. The project includes research with regard to insulation techniques via the interior of existing walls and the application conditions are assessed by means of full-scale tests.

Through the RENOVATIE platform, the BBRI coordinates an extensive action consisting of various innovative renovation projects in the Flemish Region. In this context, renovation projects that are both reproducible and applicable on a large scale are being followed up. The affordability of the solutions developed during these projects is central to this action. The BBRI is also busy in the Brussels-Capital Region, acting as a coordinator for the Brussels Retrofit XL platform that brings together 13 research teams, each with their own area of expertise in the field of renovation. The platform is aimed at encouraging innovative renovation initiatives, along with analysing the possibilities within an urban environment.

AIM-ES is one of the projects that were realized within the scope of ‘Brussels Retrofit XL’. This project aims at the development of industrialised, multifunctional envelope systems for the energy renovation of urban areas. Based on three years of research, the technical report will contain guidelines and recommendations for designers, contractors and owners.

In the Walloon Region, the BBRI supports the proper implementation of PAE, the voluntary energy consultation procedure for existing dwellings. The Institute also encourages the application of an energy certification procedure for existing buildings and helps the three Regions in elaborating their energy certification procedures for non-residential buildings.

Last year the sector organised many information campaigns regarding energy, not only by way of presentations and seminars, but also through various BBRI publications.

The expertise in the field of the air-tightness of buildings lead to several publications in which some aspects that are specific for this issue were clarified.
Energy and Environment

Following several years of commitment, TIN 255 devoted to the airtightness of buildings was published. This long-anticipated publication is the first Belgian reference document explaining all the stages of constructing or renovating airtight buildings, from design to implementation.

The new rules for conducting pressurisation tests had already been discussed in the Dossier du CSTC ‘Nouvelles règles relatives aux essais de pressurisation des bâtiments’. The rules intended to ensure the wind resistance of the air barrier were also unravelled in two articles published in CSTC-Contact: ‘Exposition des parois au vent : influence sur l’étanchéité à l’air’, and ‘Parois constituées de panneaux à base de bois : influence sur l’étanchéité à l’air et sa durabilité’.

In collaboration with the Fédération des entrepreneurs généraux de la construction (FEGC, Federation of General Construction Contractors), a series of conferences on the airtightness of buildings and the ventilation was organised. These conferences brought together hundreds of participants in the various provinces throughout the country. Several other seminars, information sessions and conferences on the same issue were also organised. The dissemination of this information was supported through the thematic information platforms ‘Tightvent’ (www.tightvent.eu) and ‘AIVC’ (www.aivc.org), to which the BBRI lends its support.

Innovation can be stimulated through actions such as Technological Advisory Services. In the Brussels-Capital Region, the Advisory Service Construction durable provides significant support to the sector with regard to energy and environment in general. In the Walloon Region, the Technological Advisory Ser-

The initial realization of the Standards Antenna Smart Connect was the thematic CSTC-Contact of 2015, which is totally dedicated to technical details. The document specifically illustrates the influence of the various requirements (thermal insulation, airtightness, acoustics, fire safety, accessibility and watertightness) made on constructional nodes.

The Standards Antenna Energie (Energy) keeps the sector updated on the normative evolution taking place in this area, in particular through conferences and the website www.normes.be.

In order to improve the quality in the construction sector, various actions were taken in 2015 concerning the definition and the expansion of a quality framework.

It includes for instance the conducting of pressurisation tests. These are indeed the subject of the new Technical Specifications STS-P 71-3, that were published at the end of 2014 by the FPS Economy. Information about the measuring devices with which the pressurisation tests can be conducted in compliance with these specifications was included in the TechCom construction products database that can be viewed via the BBRI’s website.

Moreover, the BBRI also started the development of a quality framework for the proper reporting of the performances of ventilation systems.

Thanks to wireless sensors, it is possible to monitor the indoor climate of buildings and to view the results remotely (‘MEASURE’ project).
vice COM-MAT encourages construction professionals to use innovative technologies that can increase the energy performance of buildings.

The ‘iD Innovation’ (www.iidi.be) evaluation system makes it possible to evaluate the technical aspects of innovative solutions with respect to materials, techniques and sustainable building concepts, which often have a positive effect on the energy performance or on the indoor climate of buildings.

Apart from this, a number of innovative research projects were carried out. This included an international campaign on the actual energy performance of buildings completed within the framework of the International Energy Agency (IEA EBC Annex 58). The MEASURE research project on the same subject was also continued. This project is aimed at investigating the actual performance of the high energy performance buildings, as well as the level of satisfaction of the occupants, through the remote monitoring of 25 dwellings.

The BBRI is also involved in the THERMOGRAPHIE project that focuses on the applications and limitations of infrared thermography in the construction sector.

**Environment**

The environmental impact of a building mainly depends on the choice of materials during the building’s life cycle and on the energy consumption during the use phase. The behaviour of the occupants in terms of transport and consumption also has an impact on the environment.

It is clear that the relative and absolute environmental impact of the materials increases as the energy performances of the building improve. For passive, nearly zero-energy or energy-plus buildings, the environmental impact of the energy consumption (spread over 30 years) is lower than that of material use.

A number of valuable insights were gained in the areas of technology and organisation for high energy performance buildings – at least for new buildings. Nevertheless, the environmental impact of materials – and their end of life – will constitute the next challenge for the construction sector. The applied research in the construction sector is thus devoted to nearly zero-energy buildings with a low environmental impact.

The European LEEMA project also focuses on innovative insulating materials and concepts of insulating masonry with a low environmental impact. Four years of research into the most suitable raw materials and production processes resulted in a number of prototypes aimed at reducing the grey energy use by 50%, with a cost price that is 15% lower for the insulation of hollow walls, facades and flat roofs as well as for insulating masonry blocks.

This focus on environment and health can also be found in LOWEMI, the Walloon Greenwin project, which is carrying out research into interior coverings with a very low emission during both the installation and the use phases.

Moreover, the environmental impact of construction processes or materials is systematically evaluated in new research projects. Indeed, knowing the environmental impact when developing innovative solutions makes it possible to take informed decisions with regard to life cycle (i.e. from cradle to grave or, in a construction context, from quarry extractions to recycling). Various research projects including DO-IT HOUTBOUW, ‘INNOV-ETICS’, ‘AIM-ES’ and RECYDESA therefore contain a section about environmental impact analysis.
The circular economy can be promoted by paying special attention to the use of raw materials and to short cycles. The availability of many natural resources is indeed limited; therefore we have to deal with them in an ecologically and economically sustainable manner. In this respect, Europe has taken a strategic decision with Communication COM(2015)614 ‘Closing the loop. An EU action plan for the circular economy’. Special attention is also being paid to this new concept at both federal and regional levels.

The construction sector has for many years been aware of this issue and has given more consideration to recycling, as well as to new challenges regarding the raw materials economy, such as flexible constructions, demountable constructions, short cycles, prefabrication and ‘urban mining’ (i.e. towns or buildings that serve as ‘mines’ of raw materials).

The aim of the FEDER BBSM project ‘Le bâti bruxellois : source de nouveaux matériaux’, launched in 2015, is to turn these objectives into practice by way of applied research. It investigates which waste or raw material flows will be available after the demolition and renovation works and which technologies are required to reintroduce them into the construction cycle.

Shortening the cycles is another specific subject for the ROADMAP RECYBET project. With the support of the Agentschap Ondernemen and the collaboration of several industrial partners, including recycling companies, prefabricated concrete producers and demolition companies, this project strives to develop a shortened value chain for concrete recycling.

The attention paid to raw materials used in construction works is also being converted into research projects, which evaluate the theoretical principles or the new recovery procedures according to their practical relevancy and feasibility. An example of this is the project DECHETS DE CONSTRUCTION BRUXELLES ‘Chantiers pilotes pour la Gestion des Déchets de construction à Bruxelles’.

The Belgian construction sector is a pioneer in the field of recycling and initiated a number of ambitious projects and collaborations. The NIB project FUTURE CONCRETE ‘Béton prêt à l’emploi du futur’ aims at introducing the general use of ‘green’ concrete, i.e. concrete containing recycled granulates, into building practices. The RECYBETON prenormative study increases the knowledge in this area and strives to determine to what extent and in which circumstances (environmental classes) natural granulates can be replaced with recycled granulates. Based on the results, modifications of the Belgian standard NBN B 15-001 can then be proposed. An important point that should be considered by contractors is the conservation of these granulates and the evolution of their workability, specifically when dealing with the more porous recycled granulates.

The Walloon project ‘RECYDESA’ is developing a recovery procedure for recycled sands that focuses on cleaning techniques. Within the same research network, the VALOCEL project endeavours to implement the recycling and the reutilisation of cellular concrete waste. The Flemish MIP GREENASH project focuses on the reutilisation of residues from domestic waste incineration and investigates their use in ready-mixed concrete. Finally, in the European Interreg project CEAMaS (www.ceamas.eu), the applications of marine sediments and dredging sludge are being identified thanks to the collaboration of a number of French, Irish, Dutch and Belgian partners from the public administration, the research sector and the industry.

The renovation of existing buildings constitutes a major challenge, particularly with respect to the efficient use of raw materials. In 2015 the collective research project RenOZym continued working on innovative cleaning techniques for facades, roofs and terraces. This also requires to consider the impact of the implementation of works on health and to the potential emissions of chemical substances or biocides. This Walloon project focuses on the development of environmentally friendly technologies based on new formulas using micro-organisms and enzymes. In particular, tangible results were obtained through the use of certain products containing enzymes and bacteria against biological pollution (greening, algae).
The evaluation of the environmental impact of material use should consider the entire life cycle: extraction of the raw materials, production and transport to the worksite, processing on site, required maintenance, replacements and ultimate demolition, disposal or recycling of waste materials.

A normative and regulatory framework is required for such complex processes in order to provide the actors from the construction sector (material producers, contractors, customers, owners, etc.) with clear and correct information. Within this context, the BBRI actively monitors the activities of the international (ISO TC 59 SC 17) and European standardisation committees (CEN TC 350 ‘Sustainability of construction works’) and besides plays the role of sectorial operator for the Belgian construction sector. The BBRI also closely supervises the legislative initiatives for the creation of a federal EPD database (Royal Decree of 22 May 2014) laying down the minimum requirements for applying environmental information on building products.

In order to further develop the standardisation, in 2015 the BBRI started a prenormative study aimed at improving the methodological framework for implementing LCA within the construction sector. The scope of this research covers additional environmental indicators and the way in which the environmental impact of recycling and reuse can be analysed (module D). Moreover, particular attention is given to site activities and renovations.

At the request of the industry, the BBRI also carries out studies in order to evaluate the environmental impact of building materials. This was done in compliance with the methods laid down in the European standards. The Institute contributes thus to setting up the Environmental Product Declarations (EPD) which, in the short term, will form the basis for calculating the environmental impact of buildings or even entire districts.

The sensitivity of construction materials to greening was examined in the laboratory via an accelerated procedure (RenOZym).

In the context of the Greenwin project LCIP ‘Life Cycle in Practice’, the BBRI also supports a number of companies in improving their understanding as well as the impact of their management and their products thanks to LCA. The collaboration between the BBRI, Greenwin and several Walloon knowledge centres on the application of life cycle analysis in Wallonia was extended in 2015.

The BBRI takes its role very seriously as a catalyst for stimulating and following up all innovation processes within the construction sector. In 2015 the Institute further developed the procedure for a simplified technical evaluation of sustainable, innovative products in the sector, within the framework of the ‘ID Innovation’ project.

The Technological Advisory Service ‘Eco-construction et développement durable’ in the Brussels-Capital Region and ‘COM-MAT’ in Wallonia also support innovation for sustainable materials and techniques. Moreover, the Advisory Service Valowall has the specific objective of assisting Walloon companies in their innovation projects on waste processing and recycling, with a focus on industrial by-products and contaminated soil and sites. Sustainability evaluation systems such as BREEAM, the Environmental Product Declarations (EPD) and environmental impact analyses at building level are just a few examples of how the new market demands and needs stimulate contractors and the construction industry in general to further innovate, with the support of Technological Advisory Services.

Energy and environment are important drivers of innovation; therefore the BBRI continued its activities concerning C-Watch ‘Inspiring Construction Technology’ in 2015. This web platform, which is part of the BBRI’s website, gathers all the latest innovative ideas and products from the sector. It not only concerns all the products already on the market, but also products and ideas that are still under development. This Technology Watch for the construction sector was also the subject of various articles devoted to innovation.

The environmental impact is one of the three pillars of sustainable construction and includes social, economic and ecological aspects. This is why in 2015 the BBRI continued to place its expertise at the service of sustainable construction and circular economy, in order to achieve the greatest consistency possible between the current initiatives. Sustainable construction and circular economy do not only have a significant impact on the market, but also possibly on the set up of quality frameworks and regulations. The BBRI therefore focuses on the techno-scientific principles and their relative feasibility (and affordability) in the current and future building practices.
A number of objectives were formulated in the Report ‘Cap sur 2015’ regarding comfort, health, accessibility and safety. Virtually all the aims were effectively achieved in 2015. However, our society continually strives to obtain higher levels of comfort, health, accessibility and safety. Therefore, these four keywords play an essential role in the realisation of construction works.

The RaDS II ‘Robust Acoustic Details Standard II’ study runs over two periods of two years and is aimed at helping the sector to apply construction concepts for optimising both thermal and acoustic insulation. In this context, new calculation models were developed to predict the insulation against airborne noises and impact noises of typically Belgian (and North European) constructive models, by using material properties and the acoustic performances of the building elements. The second two-year period delivered decisive results in 2015, thereby allowing the integration of those models into the recently modified series of standards NBN EN 12354 (6 parts). The importance of these calculation models is substantial, as they can also be used later on within the Building Information Modellers. Moreover, these models will make it possible to predict the acoustic performance of buildings once the digital model has been built.

In 2015 the VIS project Groen Licht Vlaanderen 2020 focused on lighting, the use of colours and contrast. On the one hand, these aspects were analysed on a test set-up for staircases created in collaboration with the ArcK research group from the University of Hasselt (UHasselt). The set-up can be described as follows:

- five staircases finishings: bleached gloss, bleached matt, light brown, dark brown gloss, dark brown matt
- various ‘light settings’: nose at the top/bottom of the treads, one spot per tread, one spot per second tread, lighting from the bannister, etc.

The renderings (digital images) were then created for all these settings and the staircase was effectively built. By asking students, it was possible to find out whether additional tests were necessary and which lighting and contrast options are ideal for staircases.

On the other hand, the VIS project also lead to the creation of a calculation tool for contrasts, which can currently be downloaded from the website www.toegankelijk.be. This tool helps with the selection of colours for specific build-
In collaboration with CoRI, the prenormative study PREDIVOC was launched in 2015, being a follow-up to the LOWEMI project completed the same year. The new study focuses on the emissions of volatile organic compounds (VOCs). Indeed, all building products on the Belgian market must comply with the new legislation concerning the emissions of VOCs. Emission limits for floor coverings came into force on 1 January 2015.

Therefore, manufacturers are obliged to control the emission from their products by using appropriate methods. However, the reference method drawn up in that regard is very time-consuming and expensive and requires experienced and qualified personnel. Moreover, in Belgium there is limited capacity for testing with the reference method (CEN/TS 16516). The sector of wall, ceiling and floor coverings is thus looking for alternative, user-friendly and cheaper methods for profiling the VOCs emissions from their products. This is also the main goal of the ‘PREDIVOC’ study: as an addition to the reference method, developing a new method whereby the VOCs emissions from paints and varnishes can be examined in a quick and simple manner. This will not only be useful to the manufacturers during the product development phase, but also for the authorised inspection bodies responsible for the control of the many paints and varnishes on the market. In order to implement these screening methods, the VOC BOX was developed within the scope of the prenormative study. This is a mobile device that is easy to use and makes it possible to determine the total VOCs emissions of paints and varnishes without further laboratory analysis.

The second objective of the study is the profiling of the VOCs emissions from the selected paints and varnishes by way of the existing techniques. Therefore, the reference method (chamber method) and two alternative methods are used. Not only can the results of the VOC BOX method be validated, but the advantages and disadvantages of each method can also be determined through a comparative study. In this way, guidelines can be drawn up allowing users to choose the appropriate test method for VOCs emissions (i.e. the simplest method that provides sufficient information).

It is not just the emissions from construction materials that determine the indoor air quality. The presence of moulds in the environment can also have detrimental effects on the health of the occupants or users of buildings or dwellings. Moulds are micro-organisms that release large quantities of fungal fragments and spores as well as microbial volatile organic compounds (MVOCs) into the indoor air. On the one hand, preventive measures can be taken to prevent mould formation, for example through proper ventilation and avoiding condensation and humidity. On the other hand, it is sometimes necessary to decontaminate the house, preferably as soon as possible after the initial signs of mould are observed. By disposing of affected materials and thoroughly cleaning materials that cannot be moved, it is possible to reduce the mould in the indoor environment to an acceptable level. Guidelines concerning this subject can be found in the article ‘Assainissement des logements contaminés par les moisissures’, that appeared in the CSTC-Contact no. 46.

As already stated, the ventilation of dwellings remains essential for a healthy indoor climate. Because of the constant flow of stricter requirements regarding energy efficiency, ventilation systems must be more effective in terms of air quality, energy and acoustic performances. Until recently, ventilation installers did not have the right tools at their disposal for the design, the installation and the delivery of optimally performing ventilation systems. Thanks to the results of the OPTIVENT collective research that was conducted from 2010 to 2013 with the support of IWT, calculation tools and practical guidelines were made available to ventilation installers. Thanks to an active support, these tools and guidelines were gradually introduced during and after the project.

The results of ‘OPTIVENT’ also made it possible to carry out a prenormative study on domestic ventilation within the

The presence of mould can reduce the indoor air quality and have a detrimental effect on our health.
The results achieved under the ‘RaDS II’ project (see p. 12) were integrated to the BAcPro software and applied in order to develop a very large number of robust acoustic constructional nodes (a sort of ‘rough structure recipes’). These nodes are presented using virtual 3D photos, a short explanatory text and several tables containing the most important parameters and properties of the materials used. Moreover, reference is made to a series of structural details and a list of common processing errors. The advantage of this new approach is that the construction sector can build structures with good acoustic properties and that no specific knowledge or expertise in this field is required. Of course, it is not just the design instructions that should be properly applied; the accurate implementation of the structural details on site is also essential.

In view of this, a Renovation Pact was formulated in Flanders in mid-2015. Together with 31 other construction sector stakeholders, the BBRI participated in the consultations leading to the pact. The aim of the Renovation Pact is to draw up a coherent action plan that should not only lead to a sharply increased level of renovation of Flemish dwellings over the short, medium and long term, but also improve the energy performance up to a nearly zero-energy level. This initiative was motivated by a substantial fall in the energy consumption of households, but also by the fact that this has a positive effect on various aspects: the environment experiences positive consequences, the purchasing power of families is protected, the housing quality improves, the energy supply security is ensured and the energy poverty is stamped out.

The other regions of the country also pay a lot of attention to renovation. Examples include the success of the energy audit of dwellings within the framework of the procédure d’avis énergétique (energy consultation procedure) in the Walloon Region and the research efforts delivered by the Brussels-Capital Region through the Brussels Retrofit XL strategic platform. Eleven large-scale research projects were conducted under the general coordination of the BBRI.

In 2015 the S.T.A.R. project ‘Sustainable Thermal Acoustic Retrofit’ was completed. The project aims at developing a large number of robust, multidisciplinary renovation details. In the final phase, the focus laid mainly on the acoustic efficiency of (thermo-acoustic) backing tiers (interior insulation) and light structures replacing facades. The work on robust details is partly being continued under the VIS project RenoFase.
The initial results of this project and the Flemish Building Renovation Platform were presented during a study afternoon held in Ghent in mid-2015.

The ‘RenoFase’ project puts the focus on the phased renovation of dwellings and thermal insulation techniques, and specifically on insulation techniques via the interior. In some buildings, interior insulation was the only possible post-insulation technique. However, this solution is not without risks (internal condensation, frost damage, thermal bridges, mould formation, deterioration of wooden beams, etc.). Among other things, capillary-active systems for interior insulation were further researched in 2015, and their performances were compared with the traditional vapor-tight systems.

Within the framework of the ‘RENOVATIE’ Platform, the Flemish government selected ten test beds that should lead to widely applicable renovation techniques. These full-sized test beds are aimed at upgrading buildings to an energy-efficient level by applying innovative products, concepts and processes. This includes paying attention to the levels of comfort as well as looking for the possibility for the occupants to live in their dwellings throughout their entire life.

Over the last decade, there has been much more attention paid to the accessibility of built-up areas, which is not entirely unexpected. The fact that the population is ageing undoubtedly constitutes one of the major social challenges, something that the BBRI has not missed. In the special thematic issue of CSTC-Contact about structural details published at the beginning of 2015, extra emphasis was given to the issue of accessibility, which forms a significant requirement, in addition to the performances regarding watertightness, fire safety, thermal insulation, airtightness and insulation against inside and outside noises. This aspect was taken into account when determining the areas of application of structural details in relation to the proposed minimum star classification and the performance type.

Apart from the threshold at the door, there are other elements that affect the accessibility of buildings, such as the properties of joineries (e.g. width, height and door clearance) and sanitary installations. An article devoted to automated pedestrian doors was also published in 2015. Such automatic systems are often used to improve accessibility, but their safety of use has to be guaranteed. The risks related to jamming, power failure, fire and unexpected contact with the door leaf must be limited as much as possible.

The indivisible link between accessibility and safety of use is not yet discerned by everybody. For example, this link is very strong when dimensioning glass partitions, since safety of use and suitability for use are both essential requirements. Indeed, glass partitions must ensure the safety of the users in the event of accidental impact that could lead to injury caused by contact or by a fall through the glass frame. However, the safety of use of glass partitions is not only determined by the traditional parameters (choice of glass, differential pressure and resistance to soft and hard impacts), but also by their visibility for the visually impaired or by a proper placement in order to prevent accidents caused by distraction. These aspects were discussed in the Dossier du CSTC ‘Dimensionnement des cloisons en verre’.

2015 was a very productive year for the fire safety of buildings. The Technical Information Note 254 ‘Obturation résistant au feu des traversées de parois résistant au feu. Prescriptions et mise en œuvre’ was issued in March 2015. In order to guarantee the fire resistance of a building element, it is necessary to properly stop up all the unavoidable feedthroughs. Thanks to this TIN, the contractor now has clear, practical guidelines for the correct processing of fire-resistant feedthroughs and installation instructions for various types of stopping means for conduits, air ducts, linear joints and other weak spots, including sockets and switches.
Comfort, Health, Accessibility and Safety

The Standards Antenna Prévention incendie (Fire Prevention) once again drew a lot of interest this year. This is not surprising since its website attracts 188 visitors every day. Moreover, there were more than 64,000 downloads from the same website. The consultants involved gave about forty presentations and so came into contact with around 2,300 participants in 2015. The legal framework regarding fire prevention undoubtedly stimulates the sector to work along with the BBRI on establishing clearer execution guidelines and ensuring an accurate dissemination of information.

The Standards Antenna Façades (Facades) focuses on safety and more specifically on anti-burglary protection. Break-in resistance is indeed an important property of facade elements such as doors, windows, gates and shutters. With respect to break-in resistance, the definition of ‘accessibility of facade elements’ has greatly changed since the publication in 2013 of the Dutch standard NEN 5087 ‘Inbraakveiligheid van woningen. Bereikbaarheid van dak- en gevelelementen: deuren, ramen en kozijnen’. This new definition was integrated in 2015 to the reference system for break-in resistance, available on the page devoted to the SA on the BBRI’s website. Among other things, this reference system allows to evaluate the break-in resistance of ‘accessible’ facade elements by way of checklists designed for different types of building.

Finally, safety during the works was also discussed in 2015, including an article about the proper choices and fastening of safety hooks, for example. The presence of safety equipment on roofs is essential when working at heights. The safety of roofers must be ensured at all times, and this is only possible if, when designing the building or when planning the works, all the necessary measures are taken so that it is possible to safely access and maintain the roof. Proper fastening of the ladder and safety hooks plays an important role in this.

Over the last few years, the wood construction sector has seen growth in Belgium, which was nonetheless curbed by different factors. The increasingly stricter requirements in terms of building’s envelope, stability, acoustics, indoor climate, fire behaviour and durability that are imposed to the sector all played a significant role in this. The sector being unable to formulate specific answers to all the questions raised, several markets (e.g. apartment, utility and school buildings) are therefore difficult to get into for companies working in those areas. It is very difficult for an individual company to bring about changes. It is indeed not sufficient for a single company to make improvements with respect to just one of these aspects without considering the others. An integrated approach is needed here and, besides, the proposed solutions must be sufficiently supported so that they can make an effective breakthrough in practice.

The objective of DO-IT HOUTBOUW, which is a technical, multidisciplinary project from TCHN, the BBRI, UGent, KU Leuven and VITO, is to support the wood construction sector in developing innovative solutions that meet all the requirements and that can thus be brought to market as soon as possible. The project stimulates networking and collaboration within the sector and is aimed at creating a permanent culture of innovation, taking into account corporate social responsibility. In this way, the project also strives to contribute to the competitive position of the Flemish wood construction sector on an international scale.

Thanks to tests carried out on two thermal test houses and to long-term measurements (two to three years), the performances of specific combinations were analysed and improved. Issues related to acoustics were researched in the new acoustics laboratory as well as in a large mock-up installation of two (horizontal and vertical) adjacent apartments. This enabled the BBRI to develop an innovative construction.
Comfort, Health, Accessibility and Safety

concept for the installation of wooden separation walls and floors with excellent acoustic performance. Thanks to this solution, wood frames can now be used in apartment buildings. Measurements taken in the first apartments to be built showed that their acoustic insulation levels that are more than 5 dB above the highest comfort level.

At the request of an innovative company, TCHN and the BBRI came up with a solution for using wooden facades that meet the strictest requirements in terms of fire propagation. This company argued in favor of the developed solution to be collectively distributed in order to extend the dissemination and the scope of application.

Innovation not only arises from collective actions. Knowledge can also be acquired through developments achieved by individual companies. In general, companies are prepared to bear the associated costs, certainly if it concerns test activities in order to obtain certificates or technical approval. However, where it involves innovation or the optimisation of products, processes or services, companies can normally apply for subsidies that are granted by the competent regional authorities. For example, in Flanders there are the ‘kmo-portefeuilles’, in the Walloon Region the ‘Chèques technologiques’ (both systems are currently been improved) and in the Brussels-Capital Region the ‘Boost Innovation vouchers’. These initiatives make it possible to acquire financial support in a quick and simple way, but larger projects can of course count on a wider range of support channels. The BBRI advisers can give active support and guidance in these areas. Mainly small and large company projects related to the above-mentioned issues were thus realised in 2015, which will eventually contribute to innovation in many diverse areas.

With the ‘DO-IT HOUTBOUW’ project, the BBRI developed innovative separation walls and floors with excellent acoustic performance.
With around 16 million m³ used every year, concrete is and remains a very important building material. Within the framework of various studies conducted in 2015, the BBRI closely examined the many facets of this material without losing sight of the energy aspect. The Institute supported numerous projects concerning sustainable development, including CemCalc, which is aimed at developing new ternary cements with high lime content. For instance, it is possible to reduce the environmental impact of cement by replacing part of the main ingredient (clinker) with slag, fly ash and/or calcareous fillers. Indeed, the production of clinker emits large quantities of CO₂. Both two-year periods of this research gave very encouraging results for concretes made with ternary cements (low slag or fly ash content) with a limestone content up to 25%, as regards both the mechanical strength and the durability. Nevertheless, these results demonstrate that although these cements comply with the criteria of the ‘cement’ standard (NBN EN 197-1), a durability study should be carried out in order to determine in which applications they can be used as well as to establish additional requirements regarding the composition of concrete.

Over the last few years, wood construction systems have substantially evolved, especially because of their zero-energy and sustainable character, and are currently enjoying much success with both construction professionals and private individuals. The importance of this construction method could be proved thanks to various research projects and recommendations from the BBRI. The projects OPTIDUBO, DO-IT HOUTBOUW and CIMEDE 2 are aimed at optimising the composition as well as the implementation and use conditions for wood construction systems (also in view of industrial production) and thus guaranteeing the excellent performances of these systems and their biological durability. The durability and the performances of the buildings depend on the materials used (insulation type, nature of the air and vapour barrier, etc.) and on the care taken in the implementation. Since 2015, various wood structures (façades, roofs and floors) have been exposed to a series of tests in outdoor conditions in order to assess their hygrothermal behaviour. These life-size tests were supplemented with characterisation and accelerated ageing tests in the laboratory and digital simulations.

The energy performances of construction systems are often improved at the expense of other criteria which are also vital. Indeed, there is often insufficient attention paid to durability during the design phase of buildings, despite its great importance for contractors, designers and owners. The ‘OPTIDUBO’ research project assesses the resistance of innovative wood construction systems against biological attacks (fungi and insects).

Airtightness is an essential property of energy buildings. Although the airtightness of buildings can be evaluated during or after the works by means of tests, very little information...
Regarding the evolution of this performance is available at this time. Achieving high performance when the construction of a building is completed basically means little if the durability cannot be ensured. Thanks to the DREAM research project on the durability of air tightness, it was possible to define the most relevant installation techniques and building principles. The results were integrated to TIN 255 devoted to the air tightness of buildings and published in 2015.

Following on from green roofs, we now increasingly see green facades growing in the cities. They not only embellish the streets, but also offer plenty of other advantages: biodiversity, absorption of fine particle materials, reduction of the urban heat island effect, etc. This type of facade is increasingly used by companies to ‘green up’ their buildings. They also offer great opportunities for urban greening. The aim of the CONSTRUCTION VERTE project ‘Des façades vertes pour des bâtiments et des villes durables’ launched in 2015 is to promote and develop green facades within the limits of technical and economic feasibility. The project also strives to broaden the knowledge of installers, manufacturers and advisors and to better support them.

New standards and regulations have resulted in an increasing flow of performance requirements being imposed on buildings. Around 10% of all enquiries and issues submitted to the engineers of the Technical Advice and Consultancy department are related to constructive details, i.e. places where various elements are connected. It is therefore essential that all actors involved have clear design guidelines and practical processing and maintenance recommendations for the constructive details at their disposal. So that the construction professionals can be properly informed in this field, in 2015 the BBRI set up the Standards Antenna Smart Connect with the support of the FPS Economy. This SA is specifically aimed at providing information about the standards and regulations that apply to constructive details and at helping with the application of these standards at every stage of the construction process of the detail in question. This can be achieved by giving special consideration to the junctions between joined elements and the rough structure. The joinery sector is waiting impatiently for technical details that are worked out in function of the imposed requirements (air tightness, watertightness, acoustic insulation, etc.) for these junctions. This is precisely one of the main goals of the FENETRES study (subsidised by the FPS Economy). A testing method was developed under this project to assess the performances of the junctions between the frames and various types of rough structure (traditional masonry, wood-frame structures, ETICS). The results of the research were immediately valorized in a reworked version of TIN 188 on outdoor joineries.

Finally, there was also the WASH study oriented towards the efficiency of systems ensuring the impermeability of concrete structures. This study has the ambition to determine the phenomenon of damage recovery and to identify the most efficient impermeability systems for the junctions between different parts of a structure.

External insulation consists in protecting facades by using the appropriate insulation techniques. An example is ETICS, i.e. renderings or hard coverings applied on external insulation. It is mainly the application of external facade insulation systems with small bricks glued onto the insulation that is currently experiencing substantial growth. Such systems make it possible to reduce the thickness of the facade while retaining the same thermal insulation level and without changing the appearance of the facade. In addition to the technical and aesthetic considerations, the environmental impact also has a significant influence on the design choices and the evolution of building typologies. This emerges from the article of the BBRI that was published in 2015 under the INNOV-ETICS research project devoted to those innovative systems.

The thermal insulation of facades is fundamental for the energy renovation of existing buildings. However, high energy performance windows must also be used in this case. Apart from improving the thermal performances of joineries, the other essential performance levels must also be ensured and maintained over the long term if a durable renovation policy is in view. The DuraPerf research project highlighted various aspects which must be taken into account in order to guarantee the durability of high energy performance windows. These aspects were made known in an article published by the BBRI in 2015.
2015 saw the start of the activities related to a new Technical Information Note on wood-frame structures. In general, we can see a substantial growth in the building of wood-frame structures in Belgium. The ambition is also to adapt this construction method to high structures, as shown by some construction projects. A number of seminars were organised in 2015 in collaboration with UCL and FABI, including the conference ‘La construction multiétagée en bois : (r)Évolutions futures en Belgique ?’. Thanks to these seminars, recent developments in the fields of fire safety, acoustics and the stability of wood-frame structures (that were achieved under the ‘DO-IT HOUTBOUW’ and OPTIMBER-QUAKE projects) were valorised.

Regarding concrete, first of all we have the website of Betonic@ (www.betonica.be), which is aimed at spreading digital information about concrete. Another project that strives to make contractors more familiar with innovative concretes (self-compacting concrete, fibre concrete, ecological concrete) is the FUTURE CONCRETE project ‘Béton prêt à l’emploi du futur’. Several information sessions about this subject took place in 2015 and around 15 projects were continued. In the scope of the TETRA SCC project ‘Béton auto-plaçant prêt à l’emploi – Vers une intégration optimale dans le processus de construction’, self-compacting concrete was presented as a mature technology of ready-to-use concrete. This project was finalised in 2015 with the issue of a model for calculating the pressure on formwork for self-compacting concrete (see www.betonica.be).

With respect to hard floor coverings, topics such as XXL format tiling, installing flexible joints, etc. were addressed in the CARRELAGE project ‘Vers une implémentation plus rapide des innovations dans le secteur du carrelage de sol’ by way of workshops and the development of training tools. Decoupling mats were also examined in the UNCOUPLED FLOOR study. Within the context of the TIS IV project MAÇONNERIE, the BBRI also concentrated on implementing innovations concerning masonry.

Finally, the BBRI’s Standards Antennas (SAs) endeavour to inform SMEs from the construction sector as well as possible about the evolution of standards at Belgian and European levels. Based on their experience, the actions of the SAs sometimes also lead to the development of innovative products.

In order to expand the use of so called ‘ecological’ or ‘natural’ materials, it is necessary to provide the contractors with a quality framework guaranteeing that the materials in question have the necessary performance and that the structures built with them are of high quality. Insulation materials used at various places in a building not only have a filling function, but they are also exposed to all sorts of stresses (constant and variable loads on floors, solar panels and vehicles on roofs, wind and vibration in vertical walls, etc.). Thanks to the preliminary study DEFISOL that also falls within this context, stresses and admissible deformations could be identified and quantified depending on the application in the building. The TETRA project Planchers intérieurs isolés supplements these studies, particularly with respect to polyurethane applied under floating screeds.

The BBRI recently investigated the reliability of temporary structures or equipment such as scaffolding and certain types of guardrails. The STEPWiSe study strives to develop a standardised approach for investigating the reliability of this type of structures through full-size measurements, digital CFD simulations (Computational Fluid Dynamics) and wind tunnel tests. Within the context of this study, tests were carried out on masonry elements in order to determine the performance of newly installed anchoring depending on the hardening conditions (temperature, humidity).

One of the factors that determines the quality of indoor air is the presence of volatile organic compounds (VOCs). Emissions from construction products are often an important source of VOCs in the indoor air. The objective of the PREDIVOC study is to develop a new standardised, predictive measuring tool, namely the VOC BOX. The VOC emissions from five different paints will be determined by using the micro chamber test method prior to testing the paints with the new VOC BOX. The PHOTOCATALYSE study also focuses on quality by assessing the durability of the air purifying and self-cleaning properties of photocatalytic, cement-based construction materials.
The price of building land and construction costs have been steadily increasing over the last few years. The need for new housing is clear, but the access to new buildings is becoming an enormous challenge for Belgian households. Manageable building costs are needed in order that quality low-cost dwellings remain a practicable option for potential builders. This is the objective of the OPTICOST project, which suggests a method and tools whereby the construction costs of new dwellings can be reduced for various construction systems, without affecting the quality.

With regard to concrete, we have seen over the last few years a significant evolution regarding not only steel fibres, but also alternative materials and more specifically synthetic fibres. The area of application of these materials has extended from use on bare ground, where strength is less important, to sectors where reliability requirements are very strict. Within the scope of the POLYFIB study, it was possible to quantify the consequences of creep in flexion by establishing a correlation with the creep of the material.

Within the framework of the RECYBETON project, the potential of recycled granulates in concrete is analysed in view of the latest technological advances. On the other hand, the conservation of old concrete in classified buildings often forms another challenge in itself. Indeed, in general the quality of old concrete (execution, composition, etc.) can absolutely not be compared with modern concretes. This often makes the fine repair works even more difficult and represents a real challenge for the conservators-restorers, architects and contractors who are involved in the restoration works. The REDMONEST project is specifically aimed at evaluating the possibilities of applying water-repellent treatments on surfaces that are being damaged by the corrosion of reinforcements through the carbonation of concrete.

In order to apply a new technology, companies, and SMEs in particular, often need skills that they do not have yet and they have to take risks that they actually cannot afford. One of the main goals of the BBRI is more than ever to help such companies in developing new materials and techniques and in having them integrated into their construction processes. The Institute plays an important role as a catalyst for innovation via the activities of Technological Advisory Services, for instance. Not only does the BBRI collaborate with the Advisory Services Construction durable, Valowall (concerning the recovery of industrial waste) and SUREMAT (focusing on new technologies for surface treatments), but it also acts as a coordinator for the Advisory Service COM-MAT. The latter brings together seven different research centres around three main areas of research, in order to support the SMEs from the construction sector in the development and the realisation of innovative ideas. The first area of research includes the most current construction materials used in buildings and roads (concrete, wood, steel, glass and road surfaces) as well as the associated execution techniques. The second area of research is aimed at renovating and repairing existing buildings, and more specifically improving their energy performances. The third area looks into the acoustic insulation and the integration of renewable energy sources in technical installations.

Moreover, we would like to draw attention to a number of projects including MORECAR, which made it possible to develop an approach for the formulation and the quick validation of refractory concretes, as well as CAPDESIGN, which is aimed at developing concretes with self-healing properties (i.e. that are able to ‘repair’ their own cracks without external intervention). This property is provided by adding microcapsules that contain a self-healing resin to the cement mixture. The project focused on the study of the industrial feasibility and the validation.

Within the context of the prenormative studies Soutènements and MICRORIEUX, the BBRI went on with the development of new measuring methods. Thanks to this last study, an approach could be defined for the dimensioning of micropiles used on the Belgian market and execution sheets could be drawn up for the various micropiles systems, as well as guidelines for sector members. These guidelines emerge from the work done for the revision of CSTC-Rapport no. 12.

Regarding ICT, we can also mention the projects RESTAURATION 3D (implementation of scanning and CAD techniques, in combination with CNC, milling and 3D printing techniques) and PILOTAGE 3D, which is principally aimed at introducing important innovations concerning the control of machinery on worksites (lasers, stations, [d]GPS, etc.) and the possibility of providing assistance via control signals in a 3D environment (e.g. sensors and adapted software).
Technical Installations

Because of the ongoing evolution of thermal insulation in buildings, technical installations (heating, cooling, ventilation, lighting and sanitary water system) must be continually adapted. These installations are thus becoming increasingly complex and efficient.

The GEOTHERM study (www.smartgeotherm.be) is investigating different ways of using geothermal energy for heating buildings. Within this context, the BBRI conducted studies on the buffering of heat and coolness in the building’s structure, the use of heat pumps and the advanced control of heat supply and demand.

Specific attention was given to ventilation installations in 2015. The PRE-VENT study focuses on ventilation flows and regulation as well as ventilation on demand. Hybrid systems that offer greater opportunities for improved air quality and/or reduced energy consumption are also examined.

The quality of the input air in ventilation systems is essential for ensuring proper ventilation. The In-Vent-Out study was set up in order to develop a method for determining the appropriate position of the air intake openings in relation to the position of the discharge outlets for used air and fumes.

The VIS project Instal2020 is aimed at designing energy efficient installations for the production of sanitary water (both hot and cold) and for (central) heating systems. The project also includes the development of a general method for designing and implementing such installations, both in new dwellings and renovations. The ideal design includes the choice of concept and the dimensioning, while taking into account factors such as energy, comfort, water hygiene and the overall cost.

Better understanding of water demand allows a more accurate dimensioning of the installation, without loss of comfort, and stimulates the rational consumption of drinking water.

The use of natural lighting and the implementation of advanced systems for the smart management of low-energy consumption lighting offer a wide variety of opportunities for development. With the emergence of LED technology (light emitting diodes), a rapidly evolving revolution has been taking place over the last few years, which in the meantime has reached the area of indoor lighting. The projects SMART LED and Groen Licht Vlaanderen 2020 (www.groenlichtvlaanderen.be) deal with various aspects of this type of lighting. The AIE 50 project ‘Advanced Lighting Solutions for Retrofitting Buildings’ (www.task50.iea-shc.org) focuses on the renovation of lighting installations. Including a demonstrative section on the buildings of the BBRI, it strives to identify potential synergies at international level.

The execution and the placement of technical installations are essential, because they influence not only the performances of the installation itself, but also those of the building’s envelope. An excessive number of bends in a ventilation system, for instance, can reduce the intrinsic performances. Similarly, poorly-designed conduit feedthroughs or incorrectly fastened solar panels...
or other systems can impede the finishing of the technical details and reduce the performances of the entire building (watertightness, airtightness, vapour impermeability and noise insulation). It is therefore important that these aspects are dealt with carefully, which is too often not the case.

The energy renovation programmes for existing buildings are no longer limited to the building’s envelope. The renovation of the heating, ventilation and lighting installations are often included as well.

The RenoFase project (www.renofase.be) strives to find solutions for the different renovation phases which, amongst other things, make it possible to integrate technical installations into the building’s envelope.

The information sessions devoted to technical installations, which were organised within the scope of the Technological Advisory Service Construction durable of the Brussels-Capital Region and of various Standards Antennas, proved to be a great success. In 2015 there was a total of 50 training courses dedicated to technical installations, including courses on heating, sanitary hot water, ventilation and lighting.

Furthermore, special attention was given to the development of calculation tools. In order to help with the dimensioning of heating installations, an online tool for calculating the basic heat losses of buildings was developed, for example. Another tool was created for calculating the energy consumption of lighting installations in compliance with the new European standard. Those tools were developed within the framework of the Standards Antenna Energie (Energy) and the new SA Éclairage (Lighting). The latter was set up in collaboration with Tecnolec and focuses specifically on electrical connection for light fittings (applications and products) and the management of natural lighting.

Several articles related to these research projects appeared in CSTC-Contact, covering the systems (heat recovery from waste water), the dimensioning (new standard for calculating heat losses, dimensioning of water distribution conduits) and the labelling (ecodesign and energy labelling for sanitary hot water production equipment). Other articles dealt with the importance of selecting the right type of fans, as well as with the issue of combustion air supply for local wood heating.

Technical installations in buildings must perform in accordance with the expectations of the users. A qualitative execution is therefore crucial. To this end, Construction Quality, BCCA and QUEST collaborate in the development of a quality framework for the different technologies: drawing up of several Technical Specifications (STS) for ventilation, setting up a quality framework for ventilation technicians (training courses, exams and inspection), issuing a label for recognised companies in the renewable energy sector (solar boilers, photovoltaic systems, heat pumps, ventilation with heat recovery, etc.), and introducing of a certification system for installers of renewable energy systems (following training courses and exams).

Sustainable technologies have already made their appearance in the world of patents. From now on, patents that help in combating climate change are included in the new Y02 class of the classification system. Inventions related to sustainable construction technologies (low-energy lighting systems, etc.) can be found in the sub-class Y02B. The website of the Patents Unit (www.ocbc.be) contains further information on the subject. The Patents Unit has also been operating as the i-DEPOT intermediary since 2015. In other words, contractors who would like to submit an i-DEPOT to BBIE may request a discount code from the Patents Unit (idepot@bbri.be).
Technical and Organisational Assistance

Technical assistance

In the 16th century, the British philosopher and scientist Francis Bacon was already of the opinion that science and technology were the driving forces behind progress. In his continual search for knowledge, he is reputed to have said: ‘Scientia Potentia Est’ (‘Knowledge is power’). Acquiring and sharing knowledge is indeed the key to a successful enterprise.

In our particularly rapidly evolving society, it is more than ever essential to be in possession of the appropriate knowledge. This certainly applies to the construction sector, where construction works must meet increasingly stricter requirements and expectations and where the use of innovative products and systems is therefore growing.

The transfer of information is thus vital for raising the level of knowledge and therefore also the productivity and competitiveness of construction companies. The BBRI already offers an extensive range of electronic communication tools in order to share its knowledge. Nevertheless, an additional, personalised service remains an absolute necessity for contractors. This is precisely the task of the BBRI’s ‘Technical Advice and Consultancy’ (TAC) department, which is available in order to help the actors from the building sector on a daily basis.

This department strives to act as the binding link between research engineers and the construction professionals. The aim is to provide them with information as quickly and specifically as possible. Contractors, and to a certain extent all construction professionals, can contact the ‘Technical Advice and Consultancy’ department when they are faced with a problem before, during or after the execution.

In order to obtain rapid answer to simple questions, the most appropriate method is to make direct telephone contact (help line) with the engineers of our department. More than 11,000 enquiries for information were dealt with in this way in 2015. For more complex problems, or when a written answer is required, the request form on the BBRI’s website can be used for online advice. Photos and explanatory drawings can also be attached to this form. Around 6,000 cases were handled by e-mail or by letter in the previous year. Finally, about 900 cases, the most complex ones, required on-site visits and around 50% of them involved drawing up a technical report.

In return, the questions posed are an important source of information for our employees. They enable us to identify recurrent problems that affect the sector, but also the shortcomings that still characterize the available information and techniques. It goes without saying that the information received is used intensively in order to improve the quality of our interventions. This mission is entrusted to the ‘Interface and Consultancy’ (ICO) division.

This working method permits the BBRI to publish articles that match the users’ needs. Two new Standards Antennas, ‘Détails constructifs’ (Construction details) and ‘Tolérances et aspect’ (Tolerances and appearance) were thus set up in order to better inform construction professionals about the standards and regulations that apply to these fields. Moreover, the engineers of the ‘Technical Advice and Consultancy’ department are represented in various Technical Committees and working groups and participate in many research projects, including ‘RenoFase’, ‘OPTICOST’ and ‘Construction étanche à l’air de A à Z’. Furthermore, they also contribute to the ‘Erfgoedlocket’ (Heritage desk) and the cluster ‘Entretien’ (Maintenance).

In order to continually ensure qualitative support, the ‘Technical Advice and Consultancy’ department conducted a large-scale customer satisfaction survey in 2015 among construction professionals, within the framework of the ISO 9001 certification.

It emerges from the answers of the respondents (13 %) that the service is highly valued.

The personalised advice offered to construction professionals and companies by the ‘Technical Advice and Consultancy’ department as well as by the ‘Management, Quality and Information Technologies’ division constitutes one of the strengths of the BBRI. The Institute is therefore actively involved in the field, which enables it to give the best support to the sector through technical and organisational assistance.
Technical and Organisational Assistance

Organisational assistance

In 2015 the ‘Management, Quality and Information Technologies’ division worked to raise awareness among building companies, and to train and accompany them so that they can manage the construction processes efficiently. The aim of these actions is to provide the SMEs with effective solutions and customised information.

Contractors are obliged to permanently monitor their business’s organisation and profitability. They are assisted in this task by a multidisciplinary division consisting of engineers, architects and economists.

Just as in the previous years, more than 100 training days were organised this year, targeting all different aspects of the way how companies are organised: cost price calculation, planning techniques, financial management, etc. The courses consist of a mix of theoretical knowledge and practical examples. The division also contributes regularly to seminars and training sessions organised by the professional organisations from the sector.

Many of the division’s activities consist in providing assistance to companies, specifically with regard to cost price calculation, financial analysis, planning and resource management, organisation and quality.

In addition to this assistance, the division was also involved in the following projects:

- **URBANWISE**: the transportation of goods for the supply of worksites in urban locations has for many years been an economic and environmental issue, partly because of inefficient organisation. Information technologies provide a real means of solving such problems. The ‘URBANWISE’ project strives to develop an IT platform that connects all the actors involved in urban logistics.

- **OPTICOST**: over the last few years, construction costs and the prices of building land have been constantly increasing, while household incomes have been stagnating and the banks have been laying down strict stipulations for mortgages. There are various factors – both contextual and techno-economic – that influence construction costs. The main goal of the ‘OPTICOST’ research is to provide tools which can help making a decision in order to optimise production costs for new dwellings through the analysis of techno-economic factors.

- **TRIPLE T**: this project keeps construction companies up to date with the opportunities offered by Track and Trace and time recording systems. During the general information sessions, a global overview of the systems was given and many questions were answered.

- **BIM (Building Information Modelling)**: the objective of this project is to familiarise construction professionals with the BIM technology and encourage its use in practice. In order to achieve this, general information sessions and workshops are organised, in which the advantages for the different stakeholders are discussed and the costs and benefits are made transparent.

- **Construction étanche à l’air de A à Z**: the division also collaborated in this project giving companies detailed guidance over a three-year period, in order to gain practical experience in the construction of airtight buildings.

- **CRM-BBRI**: the division conducted the analysis and the programmation of a CRM system allowing to follow up questions and contacts efficiently within the construction sector.

- **cpro (on web)**: in 2015 intensive work was carried out to program a new version of the cpro calculation module. This involves a fully online version that will be suitable for all types of operating systems. The software package was presented to a contractor test panel and will be launched at the beginning of 2016.
Associations of the BBRI

The BBRI participates in the works of numerous associations linked to construction and it even contributed to the founding of some of them. Dedicated to several specific construction activities, these institutions always give the priority to providing support for companies.

**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)). In 2015, new possibilities for valorising construction wastes were studied: together with the BBRI, Tradecowall initiated a research project on the valorisation of cellular concrete debris.

**Belgian Construction Quality Society (BCQS)**
BCQS ([www.bcqs.be](http://www.bcqs.be)) trains and advises professionals involved in a labelling and/or certification process (management of quality (ISO 9001), safety (VCA) and the environment (ISO 14001), for example). Privileged partner of BCCA and Construction Quality, BCQS also assists companies that have signed up for the quality programmes set up by these two associations.

**Belgian Construction Certification Association (BCCA)**
BCCA ([www.bcca.be](http://www.bcca.be)) is one of the Belgian leaders of certification in the construction sector and holds, thanks to this status, an accreditation from the BELAC office. For several years now, this non-profit organisation has been supporting the collective ‘Construction Quality’ label and has regularly performed production inspections within the context of the CE marking.

**Belgian Centre for Domotics and Immotics (BCDI)**
The BCDI ([www.bdci.be](http://www.bdci.be)) defines itself as a study and information centre in the field of home and building automation. Themes such as personal assistance, smart cities and intelligent buildings are also part of the BCDI’s expertise. In recent years, this centre has collaborated on many national and European research projects as well as on various congresses, forums and workshops.

**CentrumDuurzaamBouwen (CeDuBo)**
Thanks to the renewal of its exhibition and the organisation of various seminars and training courses, CeDuBo ([www.cedubo.be](http://www.cedubo.be)) remains the reference centre for sustainable construction for both building professionals and the general public. In addition, it coordinates the Flemish transition network Duwobo ([www.duwobo.be](http://www.duwobo.be)) and is the originator of the Dubolimburg support platform ([www.dubolimburg.be](http://www.dubolimburg.be)) and of Duwolim ([www.duwolim.be](http://www.duwolim.be)), a local entity intervening in the eco-credits. New initiatives include the Centrum Duurzaam Gebouwbeheer ([www.gebouwbeheerder.be](http://www.gebouwbeheerder.be)), which is a platform for building managers, and the coordination of the Vlisog cluster, both of which are aimed at the systematic maintenance of buildings.

**Organisatie voor Duurzame Energie (ODE-Vlaanderen)**
As a coordinating body for sustainable energy in Flanders for 20 years, ODE ([www.ode.be](http://www.ode.be)) ensures the consultation between companies and organisations in the field of renewable energy and the public authorities through thematic platforms: heat pumps, photovoltaics, biomass, wind energy, heating networks, etc. Within this context, the BBRI is mainly concerned with the integration of renewable energy systems in buildings.

**Quality Centre for Sustainable Energy Technologies (QUEST)**
QUEST ([www.q4q.be](http://www.q4q.be)) drafts, together with the construction sector, Construction Quality and BCCA, quality procedures and technical reference documents for the application of small renewable energy systems (heat pumps, thermal and photovoltaic solar installations, ventilation systems with heat recovery, etc.). QUEST is also the official representative for the certification of renewable energy system installers.

**Vlaanderen Bouwt (VLABO)**
VLABO ([www.vlaanderenbouwt.be](http://www.vlaanderenbouwt.be)) sets up, with the technical support of the BBRI, construction projects to create durable, affordable, high-quality housing for local authorities while monitoring over the urbanistic, architectural and technical qualities of the design and its costs.
The activities of the BBRI are oriented by thirteen Technical Committees. Eleven of them directly represent a branch of the construction industry and are composed essentially of contractors. The other Committees focus on subjects of interest to several branches. In order to guarantee this bottom-up approach, each Committee defines the actions that will be taken the following year, via working plans submitted for approval to the Standing Committee of the BBRI.

### Rough Structure and General Contractors

**Chairman**
- X. Braet

**Members**

**Engineers-leaders**
- N. Huybrechts, B. Parmentier

**Engineers TAC**
- C. Arts, S. Vercauteren, J. Wijnants

### Heating and Climate Control

**Chairman**
- D. Peytier

**Honorary chairman**
- R. Debruyne, G. Ledoyen

**Members**

**Engineers-leaders**
- C. Delmotte, P. Van den Bossche

**Engineers TAC**
- I. De Pot, V. Jadinon

### Paintworks, Flexible Wall and Floor Coverings

**Chairmen**
- J. Meuleman, S. Magnée

**Members**

**Engineers-leaders**
- E. Cailleux, E. Nguyen

**Engineers TAC**
- W. Van de Sande, H. Vercoutere

### Hard Wall and Floor Coverings

**Chairman**
- P. Goegebeur

**Members**

**Engineer-leader**
- T. Vangheel

**Engineers TAC**
- L. Firket, J. Van den Bossche
Technical Committees

Glazing

Chairman
A. Sanchez

Vice-chairman
J. Jacobs

Members

Engineer-leader
V. Detremmerie

Engineers TAC
F. Caluwaerts, G. De Raed, L. Lassoie

Sealing Works

Chairman
J. Coumans

Members

Engineers-leaders
E. Mahieu, E. Noirfalisse

Roof Coverings

Chairman
G. Pierrard

Members

Engineers-leaders
F. Dobbels, D. Langendries, C. Mees

Engineers TAC
L. Geerts, O. Vandooren

Sanitary and Industrial Plumbing, Gas Installations

Chairman
A. Dooms

Members

Engineers-leaders
B. Bleys, K. De Cuyper

Engineers TAC
I. De Pot, V. Jadinon

Joinery

Chairman
M. Collignon

Members

Engineers-leaders
S. Charron, B. Michaux

Engineer TAC
G. De Raed
Technical Committees

Stone and Marble

**Chairman**  
H. Vanderlinden

**Members**  

**Engineers-leaders**  
V. Bams, D. Nicaise

**Engineers TAC**  
L. Firket, J. Van den Bossche

Plastering, Jointing and Facade Works

**Chairman**  
J. Van den Putte

**Members**  

**Engineers-leaders**  
I. Dirkx, Y. Grégoire

**Engineer TAC**  
S. Eeckhout

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**  
L. De Geetere

**Engineer TAC**  
S. Vercauteren

Architects

**Chairman**  
M. Proces

**Vice-chairman**  
R. De Lathouwer

**Members**  

**Engineers-leaders**  
D. Langendries, P. Wouters
The BBRI strives to improve the quality in construction and strengthen the skills of the professionals of the sector. This task is far from being an easy one, considering 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 and multidisciplinary team. Our staff thus ensures that the fruits of the scientific and technical research conducted by the Institute benefit building contractors, but also other professionals of the sector (architects, consultancy offices, surveyors, education, administrations, etc.).

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

Given the growing complexity of those needs and the increased interest in areas such as sustainable construction and renovation, finishing techniques, energy and indoor climate, IT applications in construction as well as the accessibility of buildings, the BBRI expanded its staff numbers to a total of 248 employees in 2015.

Evolution of the workforce during the period 2005-2015 (situation as at 31 December).
One of the aims of the bookkeeping is to provide an insight into the financial state of the Institute, and also to show details of the policies implemented.

**Affiliated members**

On 31 December 2015, the BBRI had 84,941 members, including 58,138 one-man businesses. The graph below shows that this number increased by 24.36% 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 23.26% in constant value.

![Evolution of the number of affiliated members](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 over the last three financial years. One thus finds that the fees of the members represent some 52% of the total revenues. Personnel costs – the most important item of all expenditures – have fluctuated between 64 and 66% over the past three years.
**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 89% of the total budget is directly invested for the benefit of the sector, 11% 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.

### Revenues

- **Fees of the members:** 52.27%
- **Other revenues:** 47.73%

### Expenditures: destination

- **30.25%** Technical advice, courses, publications, databases
- **12.36%** Thematic Innovation Stimulation projects, Technological Advisory Services, Standards, Antennas, studies, awareness-raising
- **19.98%** Innovative collective research
- **8.45%** Prenormative collective studies
- **8.62%** Functioning of the laboratories
- **4.20%** Standardisation, Certification, Technical Approvals
- **4.86%** Others
- **11.28%** Research under contract
During the meetings of the General Council of the BBRI on 28 April 2015 and 24 November 2015, 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><strong>Chairman</strong></td>
<td>J. Willemen</td>
</tr>
<tr>
<td><strong>Vice-chairmen</strong></td>
<td>J. Coumans, E. Devos, C. Golinvaux</td>
</tr>
<tr>
<td><strong>Honorary Chairmen</strong></td>
<td>J. Gheysens, R. Lenaers</td>
</tr>
<tr>
<td><strong>Members coopted by the Confédération Construction</strong></td>
<td>A. De Bie, E. Devos, B. Gilliot, C. Peeters, Y. Pianet, B. Zanardini</td>
</tr>
<tr>
<td><strong>Members appointed by the Bouwunie</strong></td>
<td>G. Baert, J. Debuf, B. De Malsche, J.-P. De Vogel, D. Hellemans, H. Masschelein, P. Suys, L.-J. Vancauwenbergh, F. Verkest</td>
</tr>
<tr>
<td><strong>Member appointed by the FEB</strong></td>
<td>J. Coumans</td>
</tr>
<tr>
<td><strong>Members appointed by the Federal Public Service Economy</strong></td>
<td>F. Debuyst, H. Dumont</td>
</tr>
<tr>
<td><strong>Member appointed by the Walloon Region</strong></td>
<td>P. Villers</td>
</tr>
<tr>
<td><strong>Member appointed by the Brussels-Capital Region</strong></td>
<td>O. Eugene</td>
</tr>
<tr>
<td><strong>Members appointed by the Flemish Region</strong></td>
<td>D. Otte, L. Van De Loock</td>
</tr>
<tr>
<td><strong>Members appointed by the employees’ organisations</strong></td>
<td>P. Cuppens, N. Deprets, P. Franceus, J. Staal, J. Vandycke</td>
</tr>
<tr>
<td><strong>Account Inspectors</strong></td>
<td>J. Lembrechts, B. Tasiaux</td>
</tr>
<tr>
<td><strong>Statutory Auditor</strong></td>
<td>HLB Dodémont-Van Impe &amp; C°</td>
</tr>
</tbody>
</table>

### Standing Committee

<table>
<thead>
<tr>
<th>Role</th>
<th>Members</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Chairman</strong></td>
<td>J. Willemen</td>
</tr>
<tr>
<td><strong>Vice-chairmen</strong></td>
<td>J. Coumans, E. Devos, C. Golinvaux</td>
</tr>
<tr>
<td><strong>Observers</strong></td>
<td>D. Otte, P. Villers</td>
</tr>
</tbody>
</table>
Annex ‘Projects’ Database

3D-RESTAURATIE – Nieuwe vormgevingstechnieken voor metaal-, steen- en pleisterwerkrestauratie (New execution techniques for the restauration of metal, stone and plastering) (IWT - Flanders)

3D-STURING – Technologiën voor het meten, communiceren en sturen op de werf van de toekomst (Technologies for measuring, communicating and managing on the worksites of the future) (IWT - Flanders)

AIE 50 – Advanced Lighting Solution for Retrofitting Buildings (SPW DG04 - Wallonia)

AIM-ES – High-efficiency rehabilitation of (semi-)identical urban housing ensembles: Experience-based guidelines for Architectural Industrialized Multifunctional Envelope Systems (InnoviRIS - Brussels)

AN Acoustique (SA Acoustics) (FPS Economy and NBN)

AN Béton (SA Concrete) (FPS Economy and NBN)

AN Eclairage (SA Lighting) (FPS Economy and NBN)

AN Energie (SA Energy) (FPS Economy and NBN)

AN Eurocodes (SA Eurocodes) (FPS Economy and NBN)

AN Eye precision (SA Eye precision) (FPS Economy and NBN)

AN Façades (SA Facades) (FPS Economy and NBN)

AN H₂O & toitures (SA H₂O & roofs) (FPS Economy and NBN)

AN Parachèvement (SA Finishing) (FPS Economy and NBN)

AN Prévention incendie (SA Fire prevention) (FPS Economy and NBN)

AN Smart connect (SA Smart connect) (FPS Economy and NBN)

B-LCA – Cadre méthodologique pour l’exécution de l’ACV dans la construction: interprétation belge et affinemen du cadre européen (Methodology framework for the execution of LCA in the construction sector: Belgian interpretation and further development of the European framework) (FPS Economy and NBN)

BBSM – Le Bâti bruxellois : source de nouveaux matériaux (Brussels’ buildings: a source of new materials) (FEDER - Brussels)

BÉTON APPARENT – Exigences de mise en œuvre et procédures d’évaluation (EXPOSED CONCRETE – Execution requirements and evaluation procedures) (FPS Economy and NBN)

Betonic@ (FEDER - Brussels)

BIM – Building Information Model (IWT - Flanders)

BIO BASED – Fire safe use of bio-based building products (European Union)

BrunGeoTherMap – Valorisation du potentiel géothermique de la Région Bruxelles-Capitale (Valorisation of the geothermal potential of Brussels-Capital Region) (FEDER - Brussels)

Brussels Retrofit XL – Retrofiting of the Built Environment (InnoviRIS - Brussels)

CAPDESIGN – Encapsulation of polymeric healing agents in self-healing concrete (European Union)

CARMAT – Développement de nouveaux types de matériaux à usage du BTP obtenus par carbonatation, au moyen de fumées industrielles et de fractions de scories d’aciéries difficilement valorisables (Development of new types of materials for the BTP obtained by carbonation, by means of industrial fumes and non-recoverable fractions of steel-mill slag) (SPW POLE MECATECH - Wallonia)

CEAMaS – Civil engineering applications of Marine Sediments (European Union)

CemCalc – Ciments ternaires à haute teneur en calcaire et à faible teneur en cendres volantes (Ternary cement with high lime content and low fly ash content) (SPW DG06 - Wallonia)

CemComStruct – Textile reinforced cementitious composites for a high-performance, fire-resistant, sustainable building system (IWT - Flanders)

CIMEDE 2 – Constructions industrielles de maisons évolutives durables et économiques (Industrial construction of evolutive, durable and economical houses) (SPW Greenwin - Wallonia)

COMPONAT – Développement de composites à base d’huiles végétales naturelles (Development of composites based on natural vegetable oils) (SPW Greenwin - Wallonia)

Corrosie OB – Innovatieve Corrosiebescherming bij Ondergronds Bouwen (Innovative protection against corrosion in underground constructions) (IWT - Flanders)

DECHETS DE CONSTRUCTION BRUXELLES – Chantiers pilotes pour la Gestion des Déchets de construction à Bruxelles (Pilot projects for the management of construction waste in Brussels) (Bruxelles Environnement - Brussels)

DO-IT HOUTBOUW – Duurzame innovatie op het vlak van technologie en leefcomfort voor houttoepassingen in de bouw (Sustainable innovation in the area of technology and living comfort for wooden structures) (IWT - Flanders)

DuraPerf – Durabilité des performances des éléments menusisés énergétiquement améliorés (Durability of performances of more energy-efficient joined elements) (SPW DG06 - Wallonia)

EcoRen – Energetische renovatie van Vlaamse representatieve eengezinswoningen en appartementsgebouwen (Energy renovation of representative Flemish single-family dwellings and apartment buildings) (IWT - Flanders)
EMERISDA – Effectiveness of methods against rising damp in buildings: European practice and perspective (BELSPO)

EPBD CA4 – Concerted Action for the implementation of the Energy Performance of Buildings Directive (European Union)

FAReBOIS – Façades et menuiseries extérieures RÉsistant au feu en BOIS (Fire-resistant wooden facades and outdoor joineries) (SPW DG06 - Wallonia)

FENETRES – Evaluation des performances et de la durabilité de fenêtres à hautes performances et raccord au gros œuvre (Evaluation of the performances and the durability of high-performance windows and their junction with the rough structure) (FPS Economy and NBN)

FLOORCRETE II – Délamination de la couche superficielle des sols industriels en béton (Delamination of the surface layer of concrete industrial floors) (FPS Economy and NBN)

FUTURE CONCRETE – Stortklaar beton voor de toekomst (Ready-to-use concrete for the future) (AO NIB - Flanders)

GABI – European network for shallow Geothermal energy Applications in Buildings and Infrastructures (European Union)

GARDECORPS – Prescriptions normatives pour la conception des garde-corps de bâtiments (Normative prescriptions for the design of guardrails) (FPS Economy and NBN)

Geïsoleerde binnenvloeren – hedendaagse praktijken en toekomstige innovatieve trends (Insulated indoor floors – current practice and innovative future trends) (IWT - Flanders)

GEOCONSTRUCT – État limite de service de structures géotechniques : Méthodes de déduction des paramètres de déformation du sol, de calcul des déformations de structures géotechniques et directives relatives aux déformations admissibles (Service limit state of geotechnical structures: Method for the deduction of the ground deformation parameters, the calculation of the deformations of geotechnical structures and directives on the admissible deformations) (FPS Economy and NBN)

GEOTHERM – Mobiliseren van thermische energieopslag en thermische inertie in grondgekoppelde concepten voor de slimme verwarming en koeling van (middel)grote gebouwen (Mobilisation of thermal energy storage and thermal inertia in ground-related concepts for the smart heating and cooling of medium-sized and large buildings) (IWT - Flanders)

GEVISOL-ETICS – Buitengevelisolatie met ETICS (External insulation for facades with ETICS) (AO NIB - Flanders)

GREENASH – Groene technologie voor mineralen grondstoffen: valorisatie van materialen en energie uit bodemmassen (Green technology for mineral raw materials: recovery of the material and energy from slag) (IWT MIP - Flanders)

GREENBIZZ – Brussels Greenbizz (FEDER - Brussels)

GROEN BOUWEN – Groene gevels voor duurzame gebouwen en steden Integraal beoordeling van de windwerking op platte daken (GREEN CONSTRUCTION – Green facades for sustainable buildings and cities Global evaluation of the wind effects on flat roofs) (IWT - Flanders)

GROEN LICHT – Innovatieve en duurzame lichtbronnen (Innovative and durable lighting) (IWT - Flanders)

GT COM-MAT – Matériaux et techniques de construction durables (Sustainable construction techniques and materials) (SPW DG06 - Wallonia)

GT Construction durable – Eco-construction et Développement Durable en Région de Bruxelles-Capitale (Eco-construction and sustainable development in the Brussels-Capital Region) (InnoviRIS - Brussels)

GT SUREMAT – Traitements de surface et revêtements actifs multi-matériaux (Multi-material active treatments for surfaces and coverings) (SPW DG06 - Wallonia)

GT Valowall – Valorisation des déchets industriels et sols contaminés en Wallonie (Valorisation of industrial waste and contaminated soils and sites in Wallonia) (SPW DG06 - Wallonia)

In-Vent-Out – Positionnement relatif des ouvertures d’amenée d’air par rapport aux évacuations d’air et de fumée des bâtiments (Relative positioning of air intake openings in relation to the discharge outlets for used air and fumes) (FPS Economy and NBN)

INNOV-ETICS – Insulation composite systems with render or tiles (InnoviRIS - Brussels)

Instal2020 – Integraal ontwerp van installaties voor sanitair en verwarming (Integral design of heating installations and installations for sanitary hot water) (IWT - Flanders)

ISOLA 2020 – Développement d’un kit modulable pour le marché basse énergie associant un pré-cadre et une nouvelle gamme complète de menuiserie en bois (Development of a modulable kit for the low-energy market associating a pre-frame and a new complete range of wood joinery) (SPW DG06 - Wallonia)

LBAZ – Luchtdicht bouwen van A tot Z (Airtight building from A to Z) (AO NIB - Flanders)


LLAB RETROFIT – Living Labs Retrofit (FEDER - Brussels)

LOWEMI – Revêtements intérieurs à très faible taux d’émission de composés volatils (Interior coverings with very low emissions of volatile compounds) (SPW Greenwin - Wallonia)
Annex
‘Projects’ Database

**MEASURE** – Mesure de performances réelles et de satisfaction des occupants dans les bâtiments résidentiels à hautes performances énergétiques (Measurement of the real performances and the satisfaction of the occupants in high-performance residential buildings) (SPW DG04 - Wallonia)

**METSELWERK** – Innovaties in de metselwerksector: implementering door innovatievolgers (MASONRY – Innovations in the masonry sector: implementation through innovation monitoring) (IWT - Flanders)

**MICROPIEUX** – Développement d’une méthode de dimensionnement belge intégrée (MICROPILES – Development of an integrated Belgian dimensioning method) (FPS Economy and NBN)

**MORECAR** – Outils d’aide à la formulation de bétons réfractaires (Support tool for the formulation of refractory concretes) (FEDER - Wallonia)

**Mutatie+** – Mutatiewoningen harmonieus geüpgraded met modulaire technieken in functie van levensloop, leefcomfort en energiebesparing (Mutation homes harmoniously upgraded with modular techniques in function of the life cycle, living comfort and energy savings) (IWT - Flanders)

**OPTICOST** – Optimisation technico-économique des coûts de la construction (Technical and economical optimisation of construction costs) (SPW DG06 - Wallonia)

**OPTIDUBO** – Développement et optimisation de toitures et parois à base de bois innovantes et durables dans le temps (Development and optimisation of innovative and long-lasting wood-based roofs and walls) (SPW DG06 - Wallonia)

**OPTIMBER-QUAKE** – Optimization of Timber Multi-storey Buildings against Earthquake Impact (European Union)

**OPTIVENT** – Ontwikkeling van richtlijnen en rekentools voor optimaal ontwerp en installatie van ventilatiesystemen in woningen (Development of guidelines and calculation tools for optimal design and installation of ventilation systems in dwellings) (IWT - Flanders)

**PAE 2** – Procédure d’avis énergétique 2 (Energy auditing procedure 2) (SPW DG04 - Wallonia)

**PHOTOCATALYSE** – Durabilité des matériaux de construction photocatalytiques à base de ciment (Durability of photocatalytic cement-based construction materials) (FPS Economy and NBN)

**POLYFIB** – Evaluation de l’utilisation structurelle de macrofibres synthétiques (Evaluation of the structural use of synthetic macrofibres) (FPS Economy and NBN)

**PRE-VENT** – Ventilation des logements : critères de performance et règles de conception des systèmes (Ventilation of dwellings: performance criteria and rules for the design of ventilation systems) (FPS Economy and NBN)

**PREDIVOC** – Développement d’un outil prédictif, rapide et simple d’évaluation des émissions de composés organiques volatils (Development of a predictive, quick and simple tool for the evaluation of organic volatile compounds emissions) (FPS Economy and NBN)

**PRO3** – Prefab-Renovatie-Oplossingen voor de tertiaire gebouwsector (Prefab-Renovation-Solutions for the tertiary building sector) (IWT - Flanders)

**QUALICHecK** – Towards improved compliance and quality of the works for better performing buildings (European Union)

**RaDS II** – Robust Acoustic Details Standard II (FPS Economy and NBN)

**RECYBET** – Utilisation de granulats recyclés dans le béton prêt à l’emploi (Use of recycled granulats in ready-to-use concrete) (FPS Economy and NBN)

**RECYDESA** – Recyclage de déchets de construction inerts : développement, par lavage, de sables et micrograves à destination des chapes et bétons (Recycling of inert construction wastes: development by washing of sands and micogravel intended for screeds and concretes) (SPW DG06 - Wallonia)

**REDMONEST** – Monitoring dynamic network for existing structures of concrete Cultural Patrimony (BELSPO)

**RenoFase** – Stappenplan voor een kwaliteitsvolle energetische renovatie (Procedures for a high-quality energy renovation) (IWT - Flanders)

**RenOZym** – Techniques de nettoyage des façades, toitures et terrasses à l’aide de micro-organismes et d’enzymes (Cleaning techniques for facades, roofs and terraces using micro-organisms and enzymes) (SPW DG06 - Wallonia)

**ROADMAP RECYBET** – Roadmap voor een korte waardeketen voor beton-recycling (Roadmap for a short value chain for concrete recycling) (AO - Flanders)


**SMARTLED** – Caractérisation des performances réelles des installations d’éclairage LED (Characterisation of the real performances of LED lighting installations) (SPW DG04 - Wallonia)

**Soutenements** – Règles de dimensionnement, d’exécution et de monitoring pour les techniques de soutenement récentes et anciennes (Rules for dimensioning, implementing and monitoring for modern and old support techniques) (FPS Economy and NBN)

**STEPWiSe** – Safety of Temporary Works (FPS Economy and NBN)

**SUNROOF** – Fixation des panneaux solaires sur les toitures plates et inclinées (Fixation of solar panels on flat and inclined roofs) (FPS Economy and NBN)
TEGELWERK – Naar een snellere concreting of van innovaties bij vloerbetegeling (Towards a faster concretisation of innovations in floor tiling) (IWT - Flanders)

THERMOGRAFIE – Thermographie als graadmeter van de gebouwschil (Thermography as indicator of the building’s envelope) (IWT - Flanders)

TRIPLE T – Track en Trace en Tijdregistratiesystemen (Track and Trace and Time Registration systems) (IWT - Flanders)

UNCOPLED FLOOR – Cadre normatif et critères d’utilisation pour systèmes de désolidarisation des revêtements de sol (Normative framework and use criteria for uncoupling systems for floor coverings) (FPS Economy and NBN)

URBANWISE – Plateforme de communication et gestion pour une logistique urbaine intelligente (Communication and management platform for smart urban logistics) (SPW DG06 - Wallonia)

VALOCEL – Recyclage et valorisation de déchet de béton cellulaire (Recycling and valorisation of cellular concrete waste) (SPW DG06 - Wallonia)

VETURES II – Encollage de parachèvements durs sur isolation thermique : critères performanciers de sélection des matériaux, de durabilité du système et prescriptions d’utilisation II (Adhesive bonding of hard finishings on thermal insulation: performance criteria for the selection of materials, the durability of the system and use prescriptions II) (FPS Economy and NBN)

VKP RENOVATIE – Vlaams Kennisplatform Woningrenovatie (Flemish Housing Renovation Knowledge Platform) (IWT - Flanders)

WASH – Structures étanches : vers une classification performantielle (Impermeable structures: towards a performance classification) (FPS Economy and NBN)

WEARFLOOR – Résistance à l’usure et Durabilité de sols en béton : Établissement de directives relatives à la composition et à la mise en œuvre (Wear resistance and durability of concrete floors: establishing directives on the composition and the execution) (FPS Economy and NBN)
Belgian Building Research Institute

Research • Development • Information

Primarily financed by the membership fees of some 85,000 Belgian companies, representing virtually all of the construction trades, the BBRI has been considered for more than 50 years as one of the leading scientific and technical institutes, contributing directly to the improvement of quality and productivity.

Research and innovation
The introduction of innovative techniques is vital for the survival of an industry. Oriented by the construction professionals, contractors and experts sitting in the Technical Committees, the Institute’s research activities are closely aligned to the day-to-day needs of the sector.

With the aid of various official bodies, the BBRI encourages companies to continue innovating, offering advice that is tailored to the current social challenges and applicable to various domains.

Development, standardisation, certification and approval
At the request of public or private players, the BBRI also works on various development projects (contract research). Actively collaborating in the activities of the standardisation institutes – on the national (NBN), European (CEN) and international (ISO) levels – as well as in those of bodies such as the Belgian Union for Technical Approval in Construction (UBAtc), the Institute is ideally placed to gain insight into the construction sector, so that we can respond more quickly to the future needs of the various building trades.

Dissemination of knowledge and support to companies
The BBRI makes extensive use of information technology in order to efficiently share the results of its work with all companies of the sector. Our website, adapted to the diverse needs of construction professionals, contains the publications of the Institute as well as more than 1,000 construction standards.

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