

Kapla® frame

The built-in frame plays an important role in the traditional Dutch construction process. However, setting a frame is difficult from a health and safety point of view and can often exceed safe lifting limits. Moreover, the frame can be easily damaged because it only contains a primer and is generally unprotected against the weather and wind. The Kapla® frame was developed to remove such disadvantages.



The increasing realisation that the costs of defects have to be reduced, along with tighter health and safety regulations, have created a need for higher quality and an improved building process. TNO together with members of the Association of Building and Construction Entrepreneurs and the Union of Joiners in the Netherlands established an initiative in 1995 to develop a new construction process using a new method of setting frames. This new method is based on mounting frames without physical strain. In addition, a leap forward in quality was achieved by shifting a key portion of the work from the building site to the factory. The frames are now set just before delivery, already glazed and with fully painted timber. This principle is called Kapla®, a Dutch acronym for ready-made and set.

Frame tradition

A main principle in the development was the traditional construction process prerequisite that it is the frame that determines the brickwork; the bricklayer lays the bricks against the frame. The Dutch construction process and the products used differ in this respect from the approach taken in Belgium and Germany. In the Netherlands the joiner defines the dimensions of the wall and the frame is then set from the



outside with little need for carpentry on the inside. Together with various other suppliers of materials, lifting equipment was developed at the same time and new means of mounting and sealing produced.

Result

The advantages of the Kapla® frame are:

- A top quality product for builders and constructors.
- Final costs remain the same.
- Substantial reduction in non-compatibility risk and loss of quality risk.
- Same-day delivery and assembly.
- During the carcass phase the window keeps out wind and rain, and dimensions the brickwork.

The Kapla® principle was introduced into the building and construction industry a few years ago. TNO supervised ten housing development projects before Centrum Hout took over the introduction. In the meantime alternative systems have been developed that are similar to the Kapla® concept but which have different means of mounting or the window is made from a different material. These alternatives support the basic concept that underlies the Kapla® principle, which is expected to become the new standard in housing in the future.



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Construction Technology in Europe



Quarterly digest of news from the European Network of Building Research Institutes (ENBRI)

Issue 40 December 2008

The ENBRI Conference - Celebrating 20 years of networking

'Moving the construction sector forward through research, innovation and standardization' held at IMEC, Leuven, Belgium on 2nd October 2008

Over 100 delegates attended the conference *'Moving the construction sector forward through research, innovation and standardization'* organised by ENBRI to celebrate its 20th anniversary.

The conference was opened by the Executive Secretary of ENBRI **Carlo de Pauw**, one of the pioneers and a signatory of the original ENBRI Memorandum of Understanding. Mr. de Pauw welcomed delegates to the IMEC in Leuven, Belgium and noted his particular pleasure to see in the audience another founder signatory of the Memorandum of Understanding – **Mr. Roger Courtney**. Mr. de Pauw went on to describe the achievements of ENBRI over its 20 year history – particularly relating to its greater engagement with the European Commission and its activities to help steer EU R&D efforts to better reflect the European construction industry's needs. He recalled that in the beginning it was difficult to get construction research established on the research map because the construction sector was often perceived by senior Commission decision takers as being so traditional that there was no place for innovation nor a need for research. Construction is now on the map to stay and a lot of people recognize the importance of the sector in meeting the environmental and social challenges which we face.



The first presentation was given by **Lone Moller Sorensen**, the former President of ENBRI. Mrs Sorensen described in more detail ENBRI's achievements including information transfer activities achieved through the ENBRI newsletter *Construction Technology in Europe*, (a special issue of which had been produced for the event), the organisations growth reflecting the enlargement of Europe and greater awareness across borders of the large, sometimes unique, research and testing infrastructures that

ENBRI members operate. Mrs Sorensen then went on to expand on 'diversity' as a typical characteristic of Europe and that it can also be translated to ENBRI and even called 'Strength in Diversity'.

Europe spans at least four climate zones (Mediterranean, Maritime, Continental and Coastal Nordic); it unites different cultures and traditions and its citizens speak many languages. All this has its impact on the construction sector, particularly on:

- The need for frost-resistant materials.
- Methods used and necessity for pile foundations.
- Communications with on-site staff and building users, and the way training courses are produced.

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These issues demonstrate that there is a real need to have distributed centres of competence in construction technology which can work close to industry and also in collaboration with local small and medium-sized enterprises.

Mrs Sorensen also highlighted the five elements of the ENBRI strategy:

- Fulfilling user and stakeholder needs.
- Updating and improving the built environment.
- Exploiting new materials and technologies.
- Changing construction processes and relationships.
- Raising environmental standards.

Finally she expanded on interactions with users and stakeholders on the issue of the relative slow take-up of IT solutions to many of the challenges facing both the demand and supply side in the European construction sector.

Next, **Scott Steedman**, the current President of ECCREDI, gave a presentation regarding the pathway which has led to the formulation of an R&D research agenda in the construction sector. Initially Mr Steedman paused to note the crucial role that ENBRI has had in marshalling lobbying forces within the sector. This activity had been central in establishing the EFCT-TRA (Environmentally Friendly Construction Technologies Targeted Research Action), E-CORE (European Construction Research Network) and the current ECTP (European Construction Technology Platform). Mr Steedman argued that drivers for European construction R&D are themselves dynamic.

This is clearly demonstrated by the current 'credit crunch' which is now heavily influencing the construction sector. Mr Steedman explained that he believed carbon, not cost, will become a primary design (and hence R&D) determinant.

More generally, future drivers in society would also be different to existing ones and would include responses to the current 'credit crunch', food and energy security, and human migration. More specifically in construction the effective retrofitting of buildings would assume a far greater significance than at present. Overall, Mr Steedman argued, there would be a greater need for public engagement regarding the type of buildings that the industry provided.

A session then took place on construction products in the single market. This was led by a presentation by **Tapani Mikkeli**, from the Construction Unit in DG Enterprise and Industry. Mr Mikkeli set the scene by describing the proposed changes to the Commission's Construction Products Regulations which were intended to deliver clearer, simplified and more credible regulations reflecting an increasing focus on sustainability issues. Mr Mikkeli then described changes in terminology within the Regulations where, alongside the former six 'essential requirements' of the CPD (Construction Product Directive), a seventh 'Building Works Requirement' (BWR) is to be introduced; this is the requirement dealing with Sustainability. Mr Mikkeli clearly explained the situation where 'product requirement' issues are dealt with at European level while 'building requirement' issues are dealt with at Member State level.

John Moore, the GEN Construction Sector Rapporteur, then went on to describe how an effective standards structure could and should protect and support innovation and how, at a European level, there was much activity to better understand how to assess the environmental performance of buildings

This was followed by a talk from **Sean Balfe** on the role of the UEAtc and its activities in the construction sector. Mr Balfe compared the roles of standards to that of agrément approvals and the future expanding opportunities for agreements in an increasingly innovative environment.

Finally, **Rainer Mikulitis**, the Managing Director of OIB, the Austrian approval body, considered the increasing need for new construction products to respond to new challenges, particularly relating to energy and sustainability issues. Mr Mikulitis described how European Technical Approvals (ETAs) were an excellent response to these needs and the approval of innovative products which responded to these needs. According to Mr. Mikulitis the CPR is not strong enough to exclude all remaining technical barriers for CE marked products. In this respect he pointed out that

"...the proposal for a new construction products regulation is a step in the right direction, in that it takes into account sustainability as a Basic Works Requirement, but it does not yet take sufficient account of innovative products especially with regard to an equal treatment of standardised and innovative (ETA) products".

A lively debate was subsequently initiated on these aspects of regulation, innovation and standardisation.

The afternoon session began with an overview from **Luc Bourdeau**, the ECTP Secretary General, on the work of the ECTP focusing on its Strategic Research Agenda and how this would hopefully underpin and direct construction R&D at a European level.

Mr Bourdeau then introduced three speakers from the European Commission who outlined the present status and future plans for their respective research programmes. **Adele Lydon**, **Christophe Lesniak** and **Merce Griera I Fisa** spoke on these issues. Mrs Lydon was one of the pioneers at the European Commission

and was responsible for promoting projects in the field of the construction sector. Her first contact with ENBRI dates back to 1991 (with her colleague David Miles). She was also at the origin of the first construction sector topic 'City of Tomorrow'. Mr Lesniak was key in setting up the ECTP, European Construction Technology Platform and is responsible for the NMP action.

Common themes in these presentations were the changing focus of research to meet new challenges, the increasing centrality of construction R&D in EU research strategy and the key role of organisations such as ENBRI, ECCREDI and the ECTP in directing this strategy. In their respective presentation the Commission representatives also fully described the different topics which would be addressed in future FP7 calls.

The final session of the conference looked at the 'stepping stones' that may be required to achieve the R&D goals for construction. Initially, **Claude Lenglet**, of Bouygues and co-leader of the JTI E2B, described the centrality of the E2B (Energy Efficient Buildings Joint Technology Initiative) to the CO₂ reduction goals which the construction industry needs to meet. Mr Lenglet described E2B as "thinking big" as the proposal for the JTI is similar to starting a new company and explained that society need to start making changes on the same scale as the problems it faces. Mr Lenglet explained that buildings are responsible for 40% of the total EU energy consumption and about 30% of greenhouse gas emissions during their construction and operation. The overall objective of the E2B JTI is to deliver, implement and optimise building and district concepts that have the technical, economic and societal potential to drastically cut energy consumption and reduce the CO₂ emissions due to existing and new buildings across the European Union.

The E2B JTI will speed up research on key technologies and develop a competitive industry in the fields of energy efficient processes, products and services. The main purpose is to reach the climate change reduction goals set for 2020 and 2050 and contribute to improving EU energy security thereby transforming these challenges into a business opportunity. Plans for the JTI are well advanced as are discussions with the Commission regarding its funding. Links are also being established with other European construction and energy



Achieving industry transformation in the construction sector

related technology platforms such as ESTEP (European Steel Technology Platform), HFCEP (Hydrogen and Fuel Cell Platform), PVTP (Photovoltaic Technology Platform), ESTTP (European Solar Thermal Technology Platform) and SUSCHEM (Sustainable Chemistry).

A presentation was then given by the host organisation, **Robert Mertens**, a Senior Vice President at IMEC, described some of the work, of particular relevance to the construction sector, currently underway at IMEC. In particular Mr Mertens focused on innovations in developing photovoltaic (PV) cells and advanced wireless technologies for buildings; including wireless energy distribution and energy harvesting in buildings. With respect to PV cells, Mr. Mertens judged that c-Si cells are the best option for roof integration while lower efficiency Si thin film, and in the long run OPV, technologies integrated on glass may be best applied for façade and window integration. Visual intrusion may require novel cell and module designs, especially in the case of crystalline Si cells. Mr Mertens predicted that emerging technologies to generate and distribute electrical energy in buildings have a great future. Wireless solutions might save cost by getting rid of cables and their installation. Linked to that energy harvesting techniques applied in buildings and functioning on light, temperature differences, vibration or a combination of these technologies were expected to become of importance for sensor nodes in buildings allowing the realisation of the smart homes of the future. Electronics in future homes may well be powered by wireless

transmission sheets embedded in the floor. All these applications will be made possible by semiconductor technologies such as solar cells, MEMS (Micro-Electro-Mechanical Systems) and organic large area electronics.

Finally, **Roger Courtney**, a former President of ENBRI, concluded the formal part of the conference with a consideration of the need for new models for transforming construction. Mr Courtney questioned whether construction was producing the right outputs and did it produce its outputs through an optimum process. If our models weren't correct Mr Courtney suggested that this might be a reason as to why research outcomes were not having the anticipated impact on the industry. A significant proportion of improvements in the industry were related to people and the processes in the industry. In the future it is quite probable that key research issues will not be technological or material-based but will be based on how people in the supply chain interact.

The conference was closed by **Andraz Legat**, newly-elected President of ENBRI, who emphasised the importance of a focus on market issues when discussing innovation and standardisation. Similarly there is a need for a focus on people when developing materials and technologies. Mr. Legat finally thanked all the speakers for their stimulating and thought-provoking presentations and also the delegates for participating in some interesting debates during the day.

The individual presentations are available on www.bbri.be/go/enbri/ under the Programme section.



Sustainability GreenPrint

It can often be difficult to distinguish genuine sustainability from green claims made for marketing purposes. The recently developed 'GreenPrint' approach aims to help developers and designers to improve and credibly demonstrate the sustainability of their developments.

bre Improving development proposals

The GreenPrint methodology, developed by BRE, helps developers, design teams and other interested parties to optimise the performance of masterplans and site designs on development-scale issues. The first step is to gain an understanding of the site and its context, and to identify its strengths and weaknesses. This can be done through small workshops, but where public participation is required, large-scale exercises such as design charrettes can be carried out.

Objectives for each of eight GreenPrint categories (key areas that impact on sustainability – see box) are then established, through work with the design team and others with an interest in the site and planning process. The objectives recognise the issues that need to be addressed, whilst also playing to the strengths of the site. For example, one site that BRE worked on could use waste heat from a nearby power station, and another had the opportunity to reconnect habitats that had been severed by a previous development. Others have had to deal with constraints, such as airports, that limit landscaping and renewable energy options. Within each category, the sustainability objectives are weighted to reflect their relative importance to the site.

Once the objectives are set, benchmarks are identified to assess how successful the masterplan is in achieving them. The benchmarks recognise legislative standards and the use of generally accepted design tools and metrics, as well as incorporating standards achieved in exemplar existing developments. It would be unrealistic to expect an excellent benchmark to be reached for every objective, but using this system, trade-offs become clear and all the issues identified are considered in the design process.

The sustainability objectives and benchmarks for the masterplan are brought together in the GreenPrint framework for the site. Design options, draft and final masterplans can be assessed against the GreenPrint, and their sustainability performance assessed.

What is gained?

The GreenPrint produces an independent assessment of the sustainability of a design proposal, which can be used to accompany planning applications, speed the planning process and act as a means of public consultation. This independent assessment can also be used to give confidence in the sustainability credentials of the development to potential purchasers and occupiers.

The objectives and benchmarks in the GreenPrint are clear and are developed with regulators and other stakeholders, incorporating planning policies, local priorities and targets. Doing this at an early point in the design stage reduces the need for expensive reworking and delays later on. GreenPrint can be used as part of a Planning Performance Agreement for larger developments.

Many sustainability objectives can only be achieved through cross-disciplinary working. The GreenPrint helps this to happen through creating clear objectives and targets for the whole design team rather than having them considered by individual specialists.

The GreenPrint process enables developers to show how they have maximised the overall sustainability performance. Used as part of a public consultation process, it is also a useful tool for involving interested parties, ensuring that all can see how their concerns have been translated into sustainability objectives, and how these have been addressed in the final masterplan.

The GreenPrint framework covers eight key areas which impact on sustainability

Climate change

Ensures developments mitigate, and are appropriately adapted to, present and future climate change impacts.

Resources

Promotes the sustainable use of resources including water, materials and waste, both in construction and operation.

Transport

Ensures transport hierarchy issues are fully addressed and catered for within the development.

Ecology

Ensures the ecological value of the site is conserved and enhanced.

Business

Ensures that the development contributes to the sustainable economic vitality of the local area and region.

Community

Ensures the development supports a vibrant, diverse and inclusive community that integrates with surrounding communities.

Placemaking

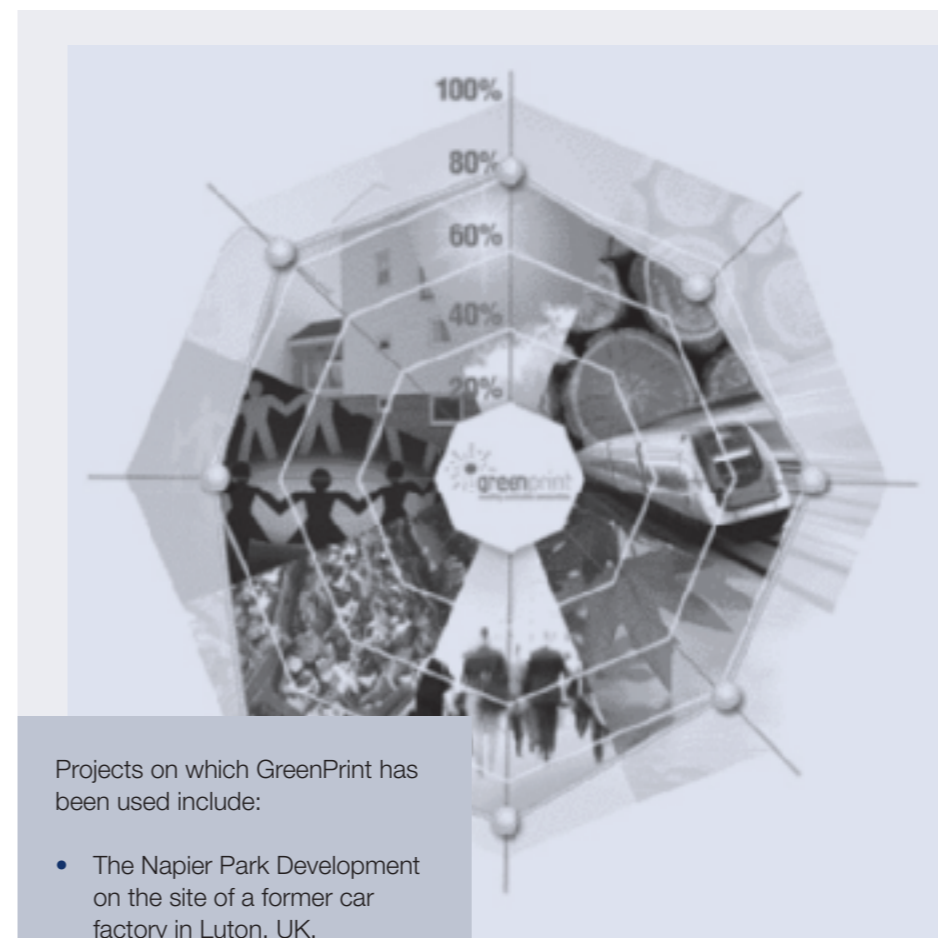
Ensures the design process, layout structure and form provide a development that is appropriate to the local context.

Buildings

Ensures that the design of individual buildings does not undermine the sustainability of the overall development.



The Proposed Napier Park development in Luton



Projects on which GreenPrint has been used include:

- The Napier Park Development on the site of a former car factory in Luton, UK.
- The re-development of the Shannon Free Zone in Limerick, Ireland
- A mixed-use development in Plymouth, UK.

Does it work?

Using GreenPrint iteratively through the design process produces demonstrable improvements. Interim assessment reports to the design team and client show weaknesses and enable improvements. Where required, BRE can provide specialist design support and recommend on the key areas to address to improve the overall sustainability performance.

GreenPrint also helps in the planning process. Its participative nature gives all parties confidence that sustainability has been properly addressed. In one case, a client used the GreenPrint to set incrementally increasing minimum scores that future detailed design phases of the development must reach. The planning authority recognised the advantage of this process, and included it in the agreement for the site's planning consent. Other planning authorities have welcomed the clarity and transparency that the GreenPrint process has brought.

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Sustainability and development of information technology drivers for building research at the VTT Technical Research Centre of Finland

Eva Häkkä-Rönholm, Matti Kokkala



The VTT Technical Research Centre of

Finland is a multi-technology contract research organisation operating under the auspices of the Finnish Ministry of Employment and the Economy. VTT's mission is to produce research services to enhance the international competitiveness of companies, society and other customers, and thereby create the prerequisites for growth, employment and well-being.

Building research benefit from special technology competences within VTT

Figure 1 illustrates VTT's current public research activities. VTT provides solutions to problems faced by practically all sectors of the real estate and construction sectors. The key cross-sectoral areas of competence are:

- Services and business processes.
- Information management and simulation.
- Eco- and energy efficiency.
- Health, safety and functionality of buildings.
- New and modified materials and buildings.

Internal Innovation Programme - Ecoefficient Intelligent Built Environment

In order to better respond at the same time to both the short term demand on developing energy efficient building solutions and the longer term vision of more broadly ecoefficient solutions, an internal innovation programme 'Ecoefficient Intelligent Built Environment' will be launched in spring 2009. The research in this

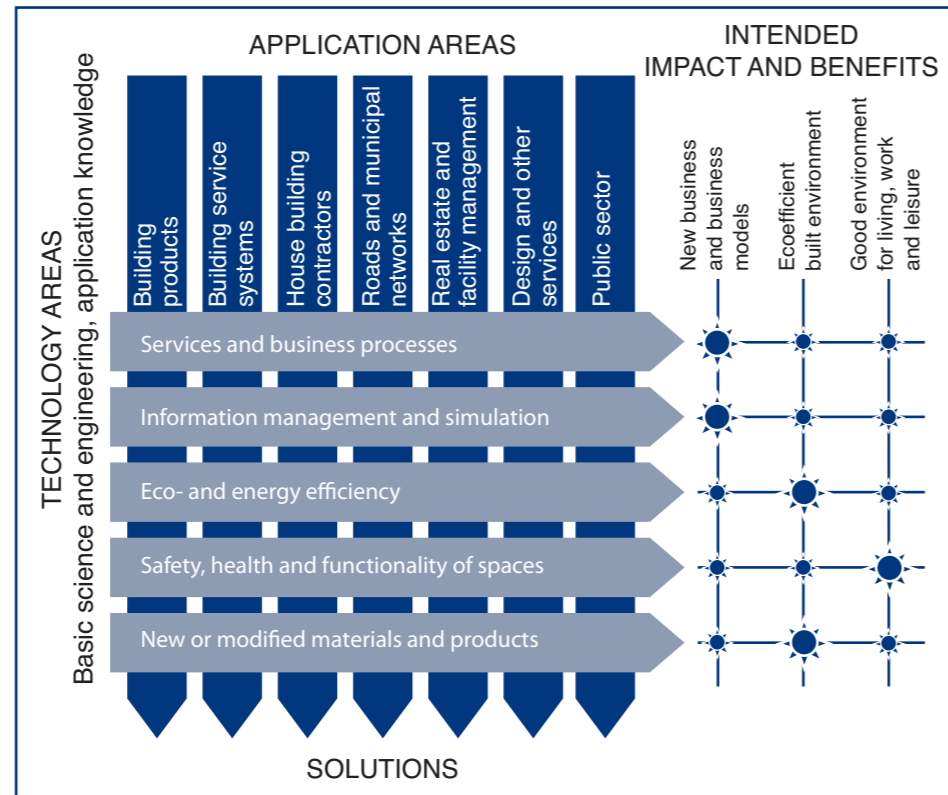


Figure 1 Structure of VTT's public research activities.

programme will comprise different types of projects from self-funded more fundamental projects to business-oriented proprietary contracts from the private sector.

A Novel Public Private Partnership to Change Research Funding Landscape in Finland

Finland is introducing Strategic Centres for Science, Technology and Innovation in fields that are important to the future of Finnish society and business and industry.

These centres will provide a new way of coordinating dispersed research resources to meet key targets to support Finnish business and society.

Companies, universities and research institutes will agree on a joint research plan in the various strategic centres. The plan will aim at meeting the practical application aims of the companies involved within a 5 to 10 year period. The research agenda for the Strategic Centre for Science, Technology and Innovation in the Built Environment has been developed during 2008 in close collaboration by the industry and VTT.

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Fresh-air Schools

Conventional ventilation solutions are expensive and demand drastic constructional alterations. TNO has come up with an innovative, affordable system that enables the indoor climate to be both healthy and comfortable with the minimum of constructional intervention.



In many schools and kindergartens the air is not fresh. Artificial odours, germs, particles and other forms of contamination are spread by children and their activities. In around eighty per cent of classrooms the CO₂ concentration is often three to four times higher than the health limit. With so many people occupying classrooms coupled with poor ventilation, the result is a poor indoor climate.

In addition, the indoor temperature in the summer is often excessive while in the winter the air quality is inadequate since doors and windows stay closed to prevent draughts. Such conditions can adversely affect pupil performance and cause a higher incidence of teacher illness.

How it works

The Fresh-air Schools solution has a different way of ventilating; instead of grilles and windows, fresh air is spread by openings in the ceiling. The result is a draught-free, fresh classroom with a pleasant temperature. The space above the ceiling is used as an air distribution system.

The combination of optimal and stimulating light with good sound insulation and acoustics enhances the indoor climate in the classroom. In turn, it enhances the well-being of the pupils and the working conditions of the teachers.

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