ENCORD Position & Strategy Paper

Version 1.0
ENCORD Position & Strategy Paper

⇒ ENCORD and its role

ENCORD stands for European Network of Construction Companies for Research and Development. It is a network of active members from the construction industry, represented by decision-makers and executives in research & development (R&D) issues. ENCORD currently has 20 members with head offices in 9 European countries and operations worldwide. All members are major European contractors and suppliers of construction material, and are strongly devoted to R&D for increased competitiveness and growth.

ENCORD’s main objective is to be Europe’s forum for the promotion of industry-led research, development and innovation in the construction sector. ENCORD sees its role as twofold:

- As a network of members to exchange best practice experience, discuss strategies for the development of the construction sector and develop new ideas for research projects,
- As an instrument to communicate with the EU administration (directly and indirectly) and the European research community in order to focus on construction research, to initiate new R&D programmes and priorities and to gain support for members’ projects and proposals.

The ENCORD Council is responsible for setting out the ENCORD strategy and is a forum for discussion and debate on R&D priorities and the development of the construction sector. Within the Council common research issues, European R&D funding, project proposals, etc. are discussed. New members from the construction industry are welcome to join ENCORD. ENCORD is fully funded by its members.

ENCORD members regularly organise workshops on topics of high priority for construction companies. Participants represent the whole European research community, including construction companies, suppliers, end-users, research institutes, universities, etc.

ENCORD is an active member of the construction research community: several of the members have leading positions in the European Construction Technology Platform (ECTP) and the Joint Technology Initiative Energy Efficient Buildings (JTI E2B). ENCORD is a member of ECCREDI, the European Council for Construction Research, Development and Innovation and furthermore ENCORD members are represented in all major European research programmes, activities, and initiatives.

⇒ About this document

This document was prepared as an expression of ENCORD’s goals and the strategies chosen in order to reach these targets. It is intended to be used publicly on behalf of ENCORD as a source of information for the European Commission, the ECTP and other Technology Platforms as well as research and business partners.

⇒ The focus on long-term activities

The construction sector is facing numerous challenges in the coming years, from demographic change to climate change, from infrastructure to indoor climate. As the largest single sector in Europe, representing over 10% of the entire GDP, it has an enormous significance for all the major issues. This influence connotes an obligation, a challenge which the construction industry must tackle.

The members of ENCORD are willing to face these challenges and see them as an opportunity to help transform the industry in the long-term and continue on the path towards becoming a more performance orientated, customer focussed and environmentally aware sector than ever before: the built environment is THE area which effects us all and where the most significant impact can be made.

There are many long-term activities currently underway on national, European and global levels. ENCORD members are very active in many projects and initiatives, most notably the European Construction Technology Platform (ECTP) and the upcoming Joint Technology Initiative Energy Efficient Buildings (JTI E2B). You will find more information in the annex to this document.
The key issues facing the construction industry today

From an industrial point of view, ENCORD has identified the following priorities which are discussed at regular council meetings, during specific workshops and in the scope of platforms. In the following they are briefly described, a more in-depth analysis follows.

Eco-efficient Construction
- **Meaning**: To reduce the impact of the built environment and construction processes on the eco-system. Defining new construction materials, manufacturing technologies and production processes for new materials that have new properties, an optimised life-cycle and thus minimum impact.
- **ENCORD activity**: ENCORD has held workshops on Sustainable Construction and Energy & Buildings in the past and actively supports the JTI E2B. The workshop activity will be continued in 2009.

Mastering Greenhouse Gas Emissions
- **Meaning**: ENCORD members are active in reporting to the Carbon Disclosure Project (CDP), a non-profit-organisation which gathers information about corporate social responsibility of listed companies regarding their CO2 emission and reduction policies. The idea is to facilitate a dialogue, supported by sound facts, toward a rational reaction to climate change.
- **ENCORD activity**: ENCORD is actively involved in CDP reporting and a workshop is scheduled for 2009.

Knowledge Management (KM)
- **Meaning**: The basic objective of Knowledge Management is obtaining and creating the right knowledge, making it accessible to the right people at the right time
- **ENCORD activity**: Working sessions have been held and a workshop is in preparation for early 2009.

Lean Construction
- **Meaning**: To support the implementation of lean principles in the ENCORD member companies by discussing the objective and best approaches as well as sharing experience with Lean Construction.
- **ENCORD activity**: Two successful ENCORD workshops on the topic have been organised with more to follow in 2009. The formation of a Lean Platform within ENCORD is currently being explored.

Information and Communications Technology (ICT) for Virtual construction
- **Meaning**: Developing tools for design (3D/4D/nD), for construction support and control, and for lifecycle maintenance of buildings and infrastructure. To identify the specific user demands of a sustainable construction industry on ICT and to communicate these demands to the key players in the soft- and hardware industry.
- **ENCORD activity**: 10 ENCORD members are active on the ENCORD Virtual Construction platform, an internal ENCORD group that meets regularly to discuss all related issues.

Transport Infrastructure
- **Meaning**: Network systems (highways, railways, waterways, air traffic) and utilities (water, sewage, gas, electricity). Promoting a sustainable industrial approach to developing reliable, maintainable and sustainable infrastructure with a maximum life span and a minimum environmental impact. Furthermore to create space in congested cities by promoting underground infrastructure.
- **ENCORD activity**: Highway Maintenance & Management has been the topic for two workshops and is looking to continue this work. ENCORD activities focus on the transport of people and goods.

Health & Safety (H&S)
- **Meaning**: Ensure the health and safety of both workers (on and off site) and citizens against accidents, as well as against damage.
- **ENCORD activity**: A first workshop on Health & Safety is currently being planned for 2009.

Implementation of Research Results into Production Activities
- **Meaning**: Measuring the value of research results, their use in enterprise policy decision-making and maximising exploitation strategies, thus helping to increase the benefits of research in everyday business.
- **ENCORD activity**: An international Workshop on the Implementation of Research Results into Production Activities took place late 2008 and follow-up activities are planned for 2009.

These fundamental tasks cannot be tackled without impulses from the construction industry itself. This document intends to give you insight into what has to be done from an industrial standpoint and how ENCORD intends to go about doing it.

ENCORD, January 2009  www.encord.org
⇒ Approaching the key issues identified

ENCORD is active in a long-term approach to research and development but has a strong focus on identifying established systems and approaches on each topic and by adapting these approaches to our needs and adding the necessary tools. The following figure shows the framework in which ENCORD operates. This innovation driven approach means that the implementation of results into our everyday business is a key factor in bringing about the desired changes to the sector as a whole.

The key issues defined on the previous page are interlinked and share many common aspects. The following figure shows how ENCORD envisages these links, the foundation of which is implementing results. The list of topics is, of course, not exhaustive, but mirrors the current perspective of the construction industry today. The list is regularly updated and new topics can be added or older topics deferred if required.

⇒ Insight into the ENCORD position and strategy on the key issues

The following pages give a more in-depth insight into the position of ENCORD on each of the subjects identified and summarises the actions undertaken. Furthermore, ENCORD will be publishing a brief yearly report on its activities on each subject on www.encord.org.
The need for energy efficient buildings (abbr.: “E2B”) and therefore a sustainable construction sector is both an increasingly important priority and a major concern both in European and worldwide. The challenge needs to be faced urgently in order to avoid any irreversible impact on our way of life. Considering the fact that the demand in Europe for lighting, heating and cooling, as well as hot water for homes, workplaces and leisure facilities consume more energy than either transport or industry, the construction sector, and more precisely the E2B area, are the most appropriate fields in which to address these priorities. The key initiative on a European level is currently the Joint Technology Initiative Energy Efficient Buildings (JTI E2B), see http://www.e2b-jti.eu/ and the annex to this document. ENCORD fully supports this initiative and several members are deeply involved.

Materials are one of the key aspects when considering sustainable construction. The necessary reduction of the impact of new and existing materials on energy consumption and CO2 output will oblige us to review the current practice of the whole construction sector. Reconsidering the whole aspect of construction materials under sustainability perspectives is a huge task and requires coordinated efforts, and a concentrated, powerful industry.

We currently have a situation where ...

- Buildings make up for 40% of total energy consumption in the EU
- The built environment generates one third of all green-house gasses (GHG) in Europe today
- Not all new buildings are energy efficient (depending on the standard to which they are built)
- The replacement rate of the existing building stock is very small (at 1% to 2% per year)

Many new materials, technologies and processes have been developed to address these issues, but the tangible results are relatively limited. It can be summarised that the greatest challenge AND the greatest positive impact is to be achieved by renovation of the existing building stock.

The aspects most relevant for the construction industry are ...

Some of the most relevant challenges and aspects for the construction industry are:

- guidelines and methodologies for the design of energy efficient buildings, reliable simulation and prediction tools.
- clear prospects of generating new added value products and services worldwide as deliverables for buildings and district/cities
- the need to increase our efforts to generate and consolidate new knowledge in the field of energy efficiency on the subjects: materials, RES integration, nano-science, indoor environment, storage technologies, BeMS (Business & Environment Management Scheme)
- giving Europe a critical competitive advantage for increasing its growth potential and to fight the threat of delocalisation

Targets and goals for the industry ...

- To develop affordable mass-market energy efficient buildings
- To develop the repeatability of solutions often shown in demonstrator projects
- To integrate the customer and value chain requirements (performance, social, environmental and economical) and create new business models
- The industry should consider addressing alternative business models to facilitate renovation / refurbishment measures (especially for the housing sector)
- To discuss what effect regulations have on construction, i.e. if regulations distort the way we build and if they could even have a negative influence
- We should make sure that benefits of research on construction process are fairly distributed between society and clients / contractors / materials suppliers in the short, medium and long term.
Not only is the construction of the building itself vital, the behaviour of the inhabitants is also essential. Measures must be taken to influence the culture of energy saving through education of the public, for example not only through campaigns tapping the emotional aspect of saving energy for coming generations, but through explicit measures such as consumption meters. Looking into the future: buildings will have to become more and more flexible in the future; control systems will be mandatory.

How ENCORD is involved …

On the subject of new buildings: An effective way forward would be to extract the best and most effective ideas out of all the relevant standards in order to reach more energy efficient buildings. ENCORD is taking steps to investigate this.

On the subject of existing buildings: realistic benchmarks are needed for the stock. Labelling (for example the American rating system “Leadership in Energy and Environmental Design” (LEED) or a European equivalent could also be used as a powerful incentive for existing buildings. The greatest impact for conversion programmes can be reached on a district level.

As previously mentioned, ENCORD also fully supports the E2B JTI and its members contribute to its development, promotion, dissemination and engagement of new industrial, research and public stakeholders. The objectives of the E2B JTI are to develop large scale short, medium and long term industry driven and European-wide research programs focused on clear technological and economic objectives. Some of the achievements of the E2B JTI would be:

- 40% savings in energy consumption in existing buildings in the current usage levels.
- 50% reduction in total energy consumption in new buildings and premises settled in the area
- 50% reduction of CO2 emissions compared to similar city areas
- 50% reduction of noise, pollution and traffic volume

ENCORD members see the necessity that the E2B JTI results are sufficiently disseminated and have an effect on directives and regulations (for example the European Performance of Buildings Directive (EPBD)).

ENCORD and its members discuss this topic on a regular basis, both at Council meetings and through dedicated workshops. A further best-practice workshop focussing on available technologies is scheduled for late 2009.
Mastering Greenhouse Gas Emissions

The ENCORD “champions” for this topic are: BAM & NCC

The scope of this issue is …

The awareness that corporate social responsibility is not just a label without content has reached most sectors. The construction industry is increasingly conscious that its carbon emission can, and must be reduced. Assessment of the actual emissions themselves is however not easy. A system is needed to measure emissions and Key Performance Indicators (KPI) to compare emissions of caused by the activities of construction companies. Not only direct emissions by construction companies are relevant. It should also be noted that CO2 is only one (but the most relevant) of at least 6 different Green House Gases (GHG).

It is clear that much more CO2 is emitted in an earlier stage of the supply chain. Direct emissions by contractors are marginal when compared to the emissions by producers of concrete, brick and steel. Therefore a study of the emissions by all parties in the supply chain is needed. It is also important that emissions related to the use of buildings should be taken into account. During the life cycle of a building much more energy is used than in the production phase. In the design of buildings such emissions should be one of the major factors considered.

We currently have a situation where …

The awareness that corporate social responsibility is not just a label without content has reached most sectors. The construction industry is at the beginning of a long process in this respect and ENCORD has identified this subject as an important part of its strategy.

An initiative for disclosing emissions is already underway: the CDP is a non-profit-organisation, founded by the financial sector in order to inform share holders on the corporate social responsibility of companies listed on the stock exchange. The idea is to facilitate a dialogue, supported by sound facts, toward a rational reaction to climate change. The information requested by the CDP is gathered by a questionnaire which has been addressed to companies regarding their CO2 emission and reduction policy. General information on the subject is on www.cdproject.net.

The aspects most relevant for the construction industry are …

Clients and investment consultants frequently ask contractors how their attitude is towards Corporate Social Responsibility. A carbon emission policy has become an integral component of this social responsibility policy over the past decade. Several construction companies have some experience in defining their carbon footprint, but for most of the sector, this is uncharted territory. The CDP initiative should be seen as an opportunity to improve the situation.

There is no industry-wide agreement on how to assess carbon emission and how to compare emissions between companies. The Green House Gas protocol provides calculation tools for some very energy-intensive industries, like the cement industry, but it does not give guidelines for the construction industry as a whole. To set targets and define best practices a calculation standard, accepted by the industry at large is required.

Targets and goals for the industry …

- Create awareness among all parties involved, in particular professional clients, architects, contractors and suppliers
- Develop Key Performance Indicators (KPI) for the industry and a reporting infrastructure.
- Develop concepts for low energy construction and zero-energy buildings.

What we could do and how ENCORD members are involved…

ENCORD members are collaborating in order to find a common understanding and a level of best practise and intend to be the industries’ discussion platform for CO2 emission management. In this framework ENCORD has organised a workshop to develop KPI's for emissions and will continue with this development in 2009.
⇒ Knowledge Management (KM)

The ENCORD “champions” for this topic are: CCC, Hochtief & Balfour Beatty

The scope of this issue is …

Knowledge Management (KM) is “… concerned with innovation and sharing behaviours, managing complexity and ambiguity through knowledge networks and connections, exploring smart processes, and deploying people-centric technologies.” (extracted from a definition by contax fz llc)

Relevant for any sector, this subject is particularly important for the construction sector, which is so reliant on individual knowledge and adapting to constantly changing boundary conditions of increasingly complex and knowledge intensive projects. Sustainable processes can only be identified and stabilised when this knowledge is available to the right people at the right time.

We currently have a situation where …

The approach to knowledge management differs greatly from company to company, yet all are in agreement that this issue is a key factor to improve processes and efficiency. Knowledge management itself is an ongoing challenge, and there is no one single solution. The issue tends to be IT-driven, but the tools themselves are not the only key: they are a means to an end. The drivers must be in the company management.

Transfer and dissemination of knowledge should not be “enforced”; the right environment and the willingness to pass on knowledge must be provided and then fostered. It is important to identify the knowledge carriers and motivate them to participate. Meetings and workshops are important to get people to know each other – networks are vital to prepare the right atmosphere. Communities of practice solidify there contacts. Currently there is no benchmarking system available for validating best-practice.

The aspects most relevant for the construction industry are …

The following issues should be addressed if efficient and effective Knowledge Management is to be implemented:

- Develop a common vision & strategy in the construction sector
- Develop a KM framework & maturity model
- KM Audit & Mapping, KM processes, KM metrics
- Initiating Communities of Practice (CoPs)
- Analysing social networks
- Identify IT tools & emerging technologies

Targets and goals for the industry …

The members of ENCORD have agreed on the following goals:

- Find a common definition for knowledge management
- Share experience, best practices and challenges
- Exchange ideas and data to convince peers on the knowledge management imperative
- Together with KM specialists ENCORD initiatives will support KM programs in member organisations
- Address new technologies to support knowledge acquisition and sharing

What we could do and how ENCORD members are involved …

A community of practice will be installed among the ENCORD members. This subject is dealt with regularly, both at Council meetings and dedicated workshops. A first workshop on KM was held in 2008 and a second event arranged for early 2009, focussing on real experience and addressing systems & behaviour.
Lean construction

The ENCORD “champions” for this topic are: Balfour Beatty, BAM, NCC and Hochtief

The scope of this issue is …

Lean construction is, in a nutshell, lean thinking applied to the construction sector. It is an approach to organise things differently for the whole project phase: tendering, design process, execution of construction work, quality control, time scheduling, builder-owner management, subcontracting management and logistic processes. The aim is to increase productivity, to reduce waste and bring about lasting change.

Because of the opportunities to apply lean thinking in the construction sector there has been much discussion about the subject and how it can be applied in the sector. There is often insufficient attention paid to where it came from and the philosophy behind the idea. While waste elimination is a vital element, in order to get it embedded lean construction needs to start with policy deployment. ENCORD can define the philosophy as it relates to the construction industry and to promote its acceptance. Two central themes can serve the construction sector well:

- Concentrating on excellent process management as a key strategy
- Obtaining excellent results from average people managing excellent processes

We currently have a situation where …

Processes on the construction site and the design process are unstable and vulnerable. The competition in the building industry is using predatory pricing strategy. Materials and structures are on a high technical level. The building industry and especially structural building industry has one-off production with differing boundary conditions and frequently the planning process occurs simultaneously to the construction process.

Lean construction is an approach which can tackle these problems. We currently have a situation however where part of the message in implementing Lean Construction is being lost because of the concentration on waste removal. The starting point needs to be policy deployment, building a system that is focused on processes and cascades responsibility

The second part of the above statement implies lean leadership. The reason that waste removal has got such prominence in the construction sector is easy to understand when the philosophy is more closely investigated. Start with four questions:

- What do your customers & stakeholders perceive as value? (this will vary widely)
- What are your value streams?
- Have you mapped the value streams?
- Do you understand the key issues & needs in being able to deliver greater customer & stakeholder perceived value?

Assuming an organisation can answer these questions there are only four options for value stream profit growth; % market growth; % of share growth; % increase selling price; % reduce costs.

The latter, to which waste removal is central, is attractive to the industry because it can be tackled immediately and is a more controllable internal matter. To be lean you need to create flow in the value stream as well as eliminating waste.

The aspects most relevant for the construction industry are …

What is most relevant for the construction sector is to fully understand these concepts of lean thinking and fully embrace the philosophy.
Targets and goals for the industry …

- Define the concepts of lean thinking in construction e.g. for complex one-off projects or long-term maintenance contracts.
- Disseminate the concepts of lean thinking widely among ENCORD members using the material already available from the two ENCORD workshops. Test take up by calls for a further teaching workshop and checking the spread of applications. Run a workshop within one year.
- Challenge ENCORD Member to ‘walk the talk’ and start to embed lean into their organisations, not just their projects. Request update at a workshop or ENCORD Council meeting once per year.
- Check diffusion of the concepts through a workshop call requesting illustrations of the application and successful delivery of lean thinking in aspects of member’s businesses. Run a workshop within 18 months.
- Working out conditions in the company, which are necessary to ensure the successful implementation of lean construction elements in the business (policy deployment).
- Using process mapping (tender phase, design process, execution of construction work, quality control, time scheduling, subcontracting management and logistic processes) will help the business to identify processes in general and especially processes which are rather unstable. The next step is to improve, simplify and standardise the identified processes. The final aim is to have all the standardised and tested processes noted down in the management book.
- The development of devices which are helpful regarding the day to day work with lean construction elements.

What we could do and how ENCORD members are involved …

The key issue is to get members to engage with the concepts through key personnel. ENCORD has held two workshops which have been strongly appreciated and participant’s report back significant learning from the events. The potential achievements will not be fulfilled until the application of lean principles becomes a key issue for decision makers within members. The suggested targets are designed to be able to feedback to members the degree of progress that is being made and to allow individual members to reflect on their adoption of this key issue.

Some of the potential achievements are as follows:

- Members report back examples of how they have adopted the whole philosophy of lean in parts of their business
- Members report examples of systematic application of lean principles to key or significant processes within their businesses
- Members are able to demonstrate increased profitability through the achievement of at least one aspect of value stream profit growth against their competitors

Encord has held several successful best-practice workshops on the subject in the past two years. A third workshop focussing on tangible results obtained in real projects is scheduled for mid-2009. ENCORD intends to continue this initiative and initiate a regular biannual lean construction forum meeting.
⇒ ICT for Virtual construction

The ENCORD “champions” for this topic are: BAM, Ballast Nedam, CCC, Hochtief and YIT

The scope of this issue …

ICT is one of the main enablers for technology development. There is a distinct need to support the primary processes of construction companies in order to design the technical solutions, the process and other issues. All our current tools and processes do not support collaboration, collecting knowledge or working in an object oriented fashion. Using ICT to its best advantage, processes can become more structured and the barriers between different project phases, disciplines and companies can be overcome.

These barriers are a major source of inefficiency on the construction process, and they must be identified and tackled. A major challenge is to make ICT available on the construction site itself – whereas most efforts so far have been for design and management issues. Bringing knowledge to site operatives and capturing site information to be organised in production management systems a key issue. Virtual Construction is the path the construction industry is following to address all these issues.

Our definition of Virtual Construction:
A three dimensional object-oriented representation of the building process with the goal to support the collaboration between organisations and the exchange of information in digital form.

Virtual Construction covers the geometry, spatial relations, geographic information, quantities and properties of building components. It can be used to demonstrate the entire building life cycle including the processes of construction, facility operation and building performance. Quantities and shared properties of materials can easily be extracted. The scope of work can be isolated and defined. Systems, assemblies, and sequences are able to be shown in a relative scale with the entire facility or group of facilities. Virtual Construction is able to achieve such improvements by modeling representations of the actual parts and pieces being used in constructing a building. It can be utilised to make buildings much more flexible for changing user demands: an issue that will face us increasingly in the future. This is a substantial shift from the traditional computer aided drafting method of drawing with vector file based lines that combine to represent objects.

We currently have a situation where …

The first and foremost problem is that the construction industry needs to invest significant time, budgets, long term commitment to invest in R&D and programs on ICT in general and specifically on Virtual Construction. It requires vision, belief and proof on real projects so that willingness to invest stage of adaptation is achieved. Long term issues like describing common requirements across the industry should be facilitated next to companies own roadmaps. This requires long term investment – trust – and fuel to achieve.

Our industry is well on its way to realising new optimised processes by utilising ICT. We are however forced to use tools that were designed for other industries (automobile, mechanical, aerospace) because we have still not, as an industry, defined common tools to implement new processes. We therefore have not been identified by the software industry as a potential market worth developing specific tools for. By voicing our common denominator on this issue using ENCORD, we can generate benefits for the whole industry.

The aspects most relevant for the construction industry are …

ICT should be focussed on our office applications, our site management, knowledge management, operation and maintenance. We should use ICT as an enabler to stabilise our processes. It will enable us to steer and prepare our processes and to anticipate the daily changes we need to handle much better.

Targets and goals for the industry …

The coordinated efforts of the industry-driven initiatives and projects have many goals. The first requirement should be to support individual disciplines better. ICT will enable connections between disciplines & partners and enable cross discipline learning across the whole lifecycle: estimation, tendering purchase, preparations, logistics, execution, facility management & maintenance.
Virtual Construction can be used to achieve the interoperability requirements of construction documents, such as drawings, procurement details, environmental conditions, submittal processes and other specifications for building quality. It is anticipated by proponents that Virtual Construction can be utilized to bridge the information loss associated with handing a project from design team, to construction team and to building owner/operator, by allowing each group to add to and reference back to all information they acquire during their period of contribution the Virtual Construction model.

Virtual Construction will facilitate:

- Industrialised production
- Digital models
- Intelligent constructions
- Interoperability
- Collaboration support
- Knowledge sharing
- Value-driven business processes
- ICT enabled business models

**How ENCORD is involved …**

ENCORD is deeply involved in this issue through the long-standing ENCORD Virtual Construction Platform (VCP). This forum enables the exchange of best practice, it hosts contacts with hard- and software suppliers. Many of the VCP members are active in the major European projects (inpro, i3con, manubuild etc.). The VCP also caters for initiatives dedicated to individual topics, such as the 5D initiative ([www.5d-initiative.eu](http://www.5d-initiative.eu)).

The core of the ENCORD activities is:

- to continue and intensify the ENCORD VCP collaboration
- to intensify contact with hard- and software suppliers
- to keep the industrial issues in our focus

Another emphasis of ENCORD is to steer existing results of R&D: It would be a major step if we could get even a fraction of the last 10 years of European ICT R&D projects into our daily practice. If we keep aiming higher we may miss the target which could end up widening the gap between what we do research on and what we need in our day to day business.
⇒ Transport Infrastructure

The ENCORD “champions” for this topic are: Balfour Beatty, BAM, Ballast Nedam, Bouygues, Dragados & Züblin

The scope of this issue is …

The development of Transport Infrastructure is one of the most pertinent activities for ENCORD members, as it impacts a very large share of our core business. This topic encompasses such a large portion of the built environment that it must be tackled with a coordinated and concerted effort. The large scope of the topic has prompted ENCORD members to concentrate on the transport of people and goods, with utilities taking a secondary role.

It can be argued that transport supports and shapes society just as society shapes transport. In the past there was an assumption whether implicit or explicit that transport policy was something that served society. The interactions that are implied by transport systems in a world in which every action has a consequence and where causes and effects are interconnected in multiple ways is clearly complex. The challenge for ENCORD members is to be aware of how their efforts interact with society and to inform themselves about the consequences beyond the boundaries of the work they are often contracted to undertake.

We currently have a situation where …

We currently have a situation where transport infrastructure is planned in response to political needs and that has for the past half century, at least, been in response to an implicit assumption that economic growth should be high and sustained. It is only in recent decades that some parts of society have questioned that underlying assumptions and have recognised that transport infrastructure has a role in shaping society. With the growth in concern about sustainability, recently reinforced by general consensus that global warming is taking place, infrastructure proposals are under very close scrutiny across Europe.

On a more pragmatic level with the increased reliance on transport infrastructure in allowing society to function, there is need to provide systems capable of fulfilling their service levels with a high degree of reliability. The expansion of the European Union has increased the amount of travel undertaken for both business and leisure and, with rising prosperity; the flow of goods across the EU is ever increasing.

The aspects most relevant for the construction industry are …

The main issues directly in the focus of our industry can be seen as:

- development of international trade, calling for new harbour facilities, airports, etc.
- construction of the “European Community”, calling for more high-speed connections, more infrastructure links (highways, railways, waterways)
- sustainability of urban development: calling for more transport infrastructures (metro – tram) to densify transportation schemes and control urban sprawl

Some of the key drivers:

- development of trade, calling for new or enhanced harbours, new or enlarged airports, increased capacity in existing transport links
- the harmonisation of the EU, even in practical rather than political terms, calls for more high speed connections and infrastructure links
- sustainable urban development calls for more public transport infrastructures to control urban sprawl and preserve resources

Out of these drivers, the aspects that appear most relevant for the construction industry are to be able to provide new infrastructure efficiently and effectively in a sustainable manner, use new techniques and sustainable new materials in both new and refurbished systems, maintain and manage transport infrastructure in the best value whole life cost terms and be able to dispose of obsolescent systems with minimum impact on society and the environment.
Targets and potential achievements …

Within the ENCORD scope, two major items are in focus:

- **combating congestion**: congestion an underestimated waste of resources and energy
- **achieving sustainability**: the infrastructure itself needs to become more sustainable

Some of the potential achievements are as follows:

- Addressing the efficiency of developing underground spaces could provide decision makers with better options for reducing the impact of infrastructure developments on society and the environment
- Automation and mechanisation of construction processes including underground would enhance safety and economy to the benefit of society and economic well being
- Effective use of networks would benefit asset owners and wider society as a whole
- Adoption of sustainable guidelines would enhance the industry’s image and pay back on the so called “triple bottom line” (= People, Planet, Profit)
- Wider engagement by members on the broader political arena enhances the standing of all members and encourages the early involvement of constructors

What we could do and how ENCORD members are involved

Some of the ENCORD suggestions for action are to:

- identify key practical topics, concerning effectiveness and efficiency of processes that justify occasional workshops or special interest groups, with the goal of running not less than two events per year.
- develop sustainable design and execution guidelines for the development and refurbishment of transport infrastructure. (This would draw on existing work such as RAE’s Sustainable Design Guidelines and Guidance on Integrated Systems Design). ENCORD members to consider adopting the guidelines within three years.
- encourage the industry to reflect the move away from transport infrastructure serving society to taking its place in the shaping of society and society shaping its solutions if it wishes to be fully consulted. It has the opportunity to caution others about the potential unintended consequences of proposed scenarios.

Through its members ENCORD should engage in political and technical debates about the development of infrastructure within the EU.

There are already examples of member’s engagement with each other and other parties on which actions can be built. A seminar was held on underground construction in 2005 and proposals have been put forward to the EU for funding of R&D in underground construction.

A proposal was made in 2006 that ENCORD members should come together to look at the management and maintenance of road networks. The challenge was to explore a number of topics to gauge whether there was sufficient interest and learning to be gained to justify trying to develop a special interest group with a number of grouped themes. A number of internal (e.g. benchmarking, asset management) and external (e.g. congestion, incident control) topics were examined.

A second workshop in May 2007 involved more specific examination of the issues in the Netherlands with participation from client organisations and contractors who were not members of ENCORD. The breakout sessions were considered to have provided added value.

A third workshop is currently under consideration for 2009 and are to focus on future research proposals both on nation and international level while taking the clients perspective better into account.
Health & Safety (H&S)
The ENCORD “champions” for this topic are: Taylor Woodrow & BAM

The scope of this issue is …

The construction sector across Europe has, historically and due to the nature of the activities, one of the poorest records of any sectors with regard to the safety and health of its workforce. This record covers both the number and severity of accidents that cause injury and sometimes death, together with occupational health issues that cause widespread health issues across a workforce that debilitating in later life, e.g. vibration white finger and asbestosis. The consequences of these issues at an individual and corporate level are significant and are being addressed with vigour across the EU. However, there is little evidence of learning and transfer of experience across organisations and between countries. ENCORD seeks to establish, through its members, whether current rates of improvement could be accelerated through such an approach.

We currently have a situation where …

The construction industry is regarded by many as suffering from the so-called three D’s: Dirty, Difficult and Dangerous. Whilst these three do generate some attractiveness for our current and future workforce, when they are converted into unsafe working conditions, life changing accidents and death, they become a deterrent to recruitment and retention. Anyone who has been involved with a project where a fatality has occurred will testify to the enormous impact it has on all of the people involved.

There have been many initiatives at a national level to improve this situation, notably the implementation of the European Directive, which in the UK resulted in the implementation of the ‘six pack’ of regulations and of corporate manslaughter legislation

Whilst these do seem to have contributed to an overall improvement in performance – reducing trend in fatalities and incident frequency for major accidents – at the current rate of improvement it will take at least 20 years to ensure that the construction industry is one of the safest rather than least safe industries. Relying on legislation is only one part of the picture, many organisations and individuals are keen to operate at better than legal compliance levels.

Set against increasing competition for recruiting and retaining talented people, it is clear that the industry must improve or it will fail to attract the best and brightest, damaging national and EU competitiveness and our ability to meet the many challenges that face us, such as climate change to name just one.

The aspects most relevant for the construction industry are …

Issues closest to home for the construction sector are:

- Occupational Health
- Accidental injury
- Fatality
- Prosecution – loss of liberty
- Loss of employment for others at failing firms

When considering the development of new materials and their impact on H&S, the impact of the REACH Directive (http://ec.europa.eu/enterprise/reach/) is not to be underestimated, as it leads to the obligation to declare the detailed labelling of construction components. The entire structure of the materials market will be affected by these changes.

Targets and goals for the industry

Two simple yet essential goals can be set for the near future:

- Zero Accidents
- Zero occupational health incidents
What we could do and how ENCORD members are involved

ENCORD is preparing a workshop on Health & Safety, focussing around the following issues:

- Showcase current practice and initiatives designed to improve performance and share learning
- Establish future policy direction from National H&S regulatory bodies - where are we likely to go next - are there lessons from other countries that could inform policy at a national level?
- Debate opportunities for further improvements.
- The output from this workshop would be the start of a library of case studies, together with a strategy and action plan for ENCORD members.

This workshop will be hosted by Taylor Woodrow, in London, with input from the UK Health & safety Executive. Case studies on various initiatives will be a part of the workshop scope:

- Analysis of accident data to identify changes in policy
- The use of behavioural safety training, education and management to drive improvements in performance
- Analysis of business performance and safety performance to drive behaviour
  (Taylor Woodrow and supply chain partners)

ENCORD members are involved through:

- Learning from others and contributing to the debate via their own experience.
- Showcasing their own experiences in managing improved health and safety performance
- Engaging with their National Regulator to ensure either attendance and/or a contribution to the presentations on future policy and/or the debate session.

ENCORD is planning a first workshop in 2009 to bring these main aspects to fruition.
⇒ Implementation of Research Results into Production Activities

The ENCORD “champions” for this topic are: Dragados & BAM

The scope of this issue is ...

The construction sector is facing great challenges to increase the quality of life of both today’s and tomorrow’s society. The sector will shape how citizens live and the way relationships among them are developed. A great effort of research & development is needed to meet these demands that must finalise at implementation of breakthroughs at global scale. The transition from R&D to implementation is not smooth and many attempts to bring R&D to marketable results end unsuccessfully: the construction sector has a poor “track record” in this field. One of ENCORD’S missions is to improve the knowledge and expertise to make this transition possible. The implementation of research activities should be carried out from a scientific / engineering point of view as a method to ensure foreseen results are met.

We currently have a situation where ...

We currently have a situation where construction is a global driver of economic activity but also a great consumer of resources and energy. We are at the turning point where the core needs and values of society exact accounting (optimizing) for the lifecycle of our construction creations. We are at the moment where a definite change in direction, an evolution, towards new technologies, business models and environmental respect must be achieved. However, traditional construction industry alone cannot cope with the pressure of all these demands, values and objectives being requested. Solutions can be found in conjunction with other areas of knowledge, science and engineering what makes taking the R&D to reality even harder than before. There is a need of standard ways and mechanisms of performing the implementation of R&D results very much in the same way a simple project is planned and executed. There is a need to overcome the technical, legal, societal barriers that impede the transfer of R&D results to marketable solutions.

The aspects most relevant for the construction industry are ...

In order to improve the construction industry’s “track record” on effectively implementing R&D results into everyday on site business, several issues should be addressed. We need:

- guidelines for the implementation of research results
- to solve the legal aspects of the introduction of new R&D solutions (regulations, insurance etc.)
- new contracting models and client views of experiencing a new solution as result of R&D
- to measure risk of failure
- to measure success as validation of the R&D activity

Targets and goals for the industry ...

By obtaining a structured method of implementing research and development activities we can:

- based on existing economic models for implementation,
  develop a model that is better suited to the needs of our industry
- achieve a clear measurable link between research and results achieved
- achieve a higher rate of success from research activities, thus achieve economic growth
- ensure we have the right shareholders involved
- obtain feedback from failures
- enable a sustainable industry

What we could do and how ENCORD members are involved...

ENCORD’s objective is to provide a forum of discussion for all the stakeholders involved and to exchange and compile best practices on implementation of research in the form of guidelines. An international workshop on the implementation of R&D results was organised in 2008 with representatives from clients, authorities and the insurance sector, addressing all the key issues of this topic. In 2009 we will be preparing guidelines for best practice when implementing research results based on our findings.
Concluding remarks

There is a great need for research, development and innovation in all sectors, but the construction industry has special significance, as the built environment defines how we shall live and how our society will develop in the future. The construction industry has, as a major stakeholder, both the obligation and the chance to ensure our efforts are heading in the right direction and that we are really addressing the problems correctly.

The following diagram gives an overview of ENCORD activities:

ENCORD has identified the topics described in this document as being most relevant to our industry at the moment. These subjects will continue to be in our focus in the future. We will advance by identifying established systems and approaches on each topic and by adapting these approaches to our needs and adding the necessary tools. These approaches will then be implemented in our processes. To this end ENCORD will:

- continue activities (such as workshops, platforms, initiatives etc.) on all subjects relating to our industry
- continue supporting of research projects in which ENCORD members participate
- continue and increase supporting the E2B JTI
- continue active support of and involvement in the ECTP
- regularly update the developments on the topics described in this document
Appendix to the ENCORD focus on long-term activities

ENCORD members are active at all levels of the European Construction Technology Platform (ECTP) since its foundation and continue to actively engage in all ECTP activities.

**ENCORD supports the ECTP research priorities**

The European Construction Technology Platform (ECTP) was co-founded by ENCORD and its members are actively involved in all its activities. The ECTP has published three key documents: the “Vision 2030”, the “Strategic Research Agenda (SRA)” and the “SRA - Implementation Action Plan”. The documents can be found under [http://www.ectp.org/documentation.asp](http://www.ectp.org/documentation.asp).

They describe the vision for key research priorities for the construction sector and suggest how to reach these ambitious goals by means of research, development and innovation. The 9 main priorities for the sector have been identified by ECTP members as:

1. Technologies for healthy, safe, accessible and stimulating indoor climate for all
2. Innovative use of the underground space
3. New technologies, concepts and high tech materials for efficient and clean buildings
4. Reduce environmental and man-made impacts of built environment and cities
5. Sustainable management of transports and utilities networks
6. A living cultural heritage for an attractive Europe
7. Improve safety and security within the construction sector
8. New integrated processes for the construction sector
9. High added value construction materials

Through a concerted effort of major players from the construction industry, the Joint Technology Initiative Energy Efficient Buildings (JTI E2B) has finally taken flight in 2008. ENCORD fully backs the efforts and is actively involved in attaining support from industrial partners. You can find more information below.

**Energy Efficient Buildings Joint Technology Initiative (E2B JTI) on the subject of Energy:**

“The overall objective of E2B JTI is to deliver, implement and optimise building and district concepts that have the technical, economic and societal potential to drastically cut the energy consumption and reduce CO₂ emissions due to existing and new buildings at the overall scale of 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, with the main purpose of reaching the goals set forth for 2020 and 2050 to address climate change issues and contribute to improve EU energy independence thereby transforming these challenges into a business opportunity.”

All relevant information on E2B JTI can be found on the website [http://www.e2b-jti.eu/](http://www.e2b-jti.eu/).