Performance-based repair of concrete structures

A four-year programme to improve the durability and effectiveness of repairs to concrete structures is now underway – Stuart Matthews reports.

The European Commission is providing four years’ financial support to establish an international network in which hundreds of participants will collaborate on the issue of performance-based rehabilitation of reinforced concrete structures.

The network, known as CON REP NET will help to foster technological co-operation between research centres, universities, knowledge and industrial organisations and property owners, primarily in Europe but also with participants from around the world.

Rehabilitating buildings and infrastructure

Rehabilitating existing buildings, structures and facilities is critical to maintaining an effective operational infrastructure in Europe. It is estimated that more than 50% of Europe’s annual construction budget is spent on the rehabilitation and refurbishment of existing structures – a figure that is certain to increase as the existing infrastructure ages.

One aspect of these works is the repair and rehabilitation of concrete structures that can be subject to a number of deterioration processes. The premature failure of some repairs and the uncertainty with some aspects of the performance of rehabilitated concrete structures, increases the difficulties that building and infrastructure owners have with managing their assets.

There is an enormous amount of repair work to be done. As well as infrastructure, large numbers of public buildings and other national facilities need cost-effective rehabilitation. To take just one instance, in the Czech Republic it is estimated that works on dwelling blocks alone will cost some 2.5 billion over the next 25 years. This situation provides both challenges and opportunities to the European concrete rehabilitation industry.

Among the key challenges are those of improving the durability and effectiveness of repairs to concrete structures. A better balance must be struck between ensuring longevity and short-term financial considerations – issues that also apply to other construction materials.

Reliable information on which rehabilitation processes are most effective is needed, along with activities to promote current best practices. Also, improved rehabilitation strategies and methods must be devised in order to get better value for the money spent and the resources applied.

Performance-based approach

Adopting a performance-based means of rehabilitation will provide a rational approach that could give a strong stimulus to future development. There are potentially large gains to be made. For example, it has been estimated that applying performance concepts to new construction could reduce total construction costs by as much as 25% in the long term.

With the involvement of stakeholders throughout the supply chain, the network aims to improve the performance of rehabilitated concrete structures by looking at past and current performance and at ways of improving future performance. This will include:

- cataloguing the performance of previously rehabilitated concrete structures
- mapping research technology and development activities concerned with deterioration and rehabilitation of concrete structures
- improving the understanding of current industry practice and drawing on the state-of-the-art in research

CON REP NET work programmes

<table>
<thead>
<tr>
<th>Work package (WP) no and title</th>
<th>Content</th>
<th>Contribution to objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>WP1: Network management</td>
<td>Steering committee, secretariat, website, communications infrastructure</td>
<td>Provides the basic infrastructure needed to operate the network</td>
</tr>
<tr>
<td>WP2: Past performance and practices</td>
<td>Catalogue of past performance, review of problems in achieving durable rehabilitation of concrete structures, identification of success factors in creating durable repairs and rehabilitation, benchmarks, and other factors, such as value for money.</td>
<td>Definition and understanding of the problems to be addressed, recognition of good performance achieved and relevant factors</td>
</tr>
<tr>
<td>WP3: Current performance and practices</td>
<td>Current industry practice, research reviews, best practice guidance and benchmarks, mapping of research and technological development (RTD) activities, Standards and regulations.</td>
<td>Definition of current practice in respect of answering the problems defined in WP2 and drawing out the success factors</td>
</tr>
<tr>
<td>WP4: Future performance-based concepts</td>
<td>Client aspirations for durable rehabilitation of concrete structures, development of industry response and methods of delivery, vision for performance concepts to achieve durable rehabilitation of concrete structures, future RTD needs, co-ordination of RTD and other activities, standardisation and continuing professional development issues.</td>
<td>Promotion of new and improved rehabilitation strategies and methods of delivery</td>
</tr>
<tr>
<td>WP5: Dissemination, communication, RTD exploitation and intellectual property rights</td>
<td>Promotion of findings from the technical activity areas (WPs) to the target audiences by means of a programme of activities, materials and publications.</td>
<td>Facilitate the transfer of information and understanding through the supply chain and from research to practice</td>
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The findings of this work will be widely disseminated.

The network

CON REP NET comprises three groups of members: a consortium of seven principal partners, including BRE as the network co-ordinator, about 40 members, who will contribute their experience and knowledge, and more than 300 participants who will contribute to and benefit from network public activities and events.

The first event involving members was the network launch in Madrid on 6–7 February 2003 hosted by Instituto Eduardo Torroja. The meeting began by reviewing members’ expectations for the network, their role and their aspirations of participation.

The technical discussion sessions considered past, present and future performance issues. Topics of immediate focus included suitable sources of key data required, structures, specification for data to be collected, methods of collection and peer-review criteria, together with obtaining agreement for access to this. Dissemination plans and actions were reviewed.

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