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Bridge rehabilitation: meeting evolving safety, performance and durability demands for aging infrastructure

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Key Takeaways summarised by AI

- Aging bridges need targeted strengthening—not full rebuilds—to meet modern load and code demands.
- Hilti's new shear reinforcement system simplifies installation and enhances compliance.
- Innovative anchors act like post-installed stirrups, installed perpendicular to cracks for optimal shear resistance.
- System backed by extensive testing and German national approval for broad use.
- Strengthening solutions reduce embodied carbon and support sustainable infrastructure renewal.

Session transcribed by OtterAI, then summarised using ChatGPT

Detailed AI Session Summary:

As bridge infrastructure across Europe continues to age, structural strengthening has become a critical priority, especially with rising traffic loads and evolving code requirements. The session began by outlining the challenges facing bridges built in the post-war motorway boom, highlighting inadequate shear capacity, environmental deterioration, and increased freight demands. A key case study—the collapse of the Carolabrücke in Dresden—was referenced to underline the risks of deferred action, particularly where corrosion remains undetected. Full replacement is disruptive and carbon-intensive, and the session emphasized the value of repair and reinforcement as a more sustainable, economical route.

Hilti presented a new shear reinforcement system tailored for simplifying bridge rehabilitation. Traditional strengthening methods often involve complex drilling angles and disruption to existing reinforcement or tension cables. The new system uses perpendicular post-installed rods combined with mortar to mimic the action of internal stirrups, enhancing shear resistance with standard tools and procedures familiar to contractors. The design benefits from streamlined installation, reduced clearance loss, and compatibility with Eurocode provisions. Comprehensive testing—covering static, fatigue, corrosion, and installation tolerances—was carried out with partners in Germany, leading to formal national approval.

The session concluded with a view toward sustainability and digital enablement. The system is integrated into Hilti's web-based design software for engineers, ensuring that site work reflects design intentions. Reinforcing existing assets rather than demolishing them can save between 15–70% in embodied carbon, a finding supported by a recent Schleswig-Holstein state study. By enabling more efficient, code-compliant retrofit options, this innovation represents a practical pathway toward safer, longer-lasting, and greener bridge infrastructure.

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