Press release

Fraunhofer Building Innovation Alliance at the BAU 2027 trade show

Transforming Construction: Safe, Affordable, Sustainable

To remain competitive, Germany's construction industry needs innovation—innovation that advances climate adaptation and climate neutrality, counters growing resource scarcity and skills shortages, and embraces digitalization. Under the theme *Transforming Construction: Safe, Affordable, Sustainable*, the Fraunhofer Building Innovation Alliance will be represented by ten institutes at the BAU trade show in Munich, January 11–15, 2027. Visitors to the joint booth in Hall C3, Booth 109, can explore exciting solutions in three themed areas: sustainability, productivity and resource resilience.

The construction industry faces intense pressure to change, and that transformation is happening now—not in the distant future. "At BAU 2027, we will showcase practical technologies and solutions that are already paving the way for a climate-neutral, resource-efficient and digital construction industry. Our goal is to put research into practice faster and work with companies, municipalities and policymakers to actively shape the future of construction," says Thomas Kirmayr, Managing Director of the Fraunhofer Building Innovation Alliance. At the joint Fraunhofer booth, visitors can do more than see the technologies of the future—they can experience them firsthand. They can explore innovative building materials, digital twins, augmented reality applications, monitoring systems and interactive demonstrators, and talk with researchers. The exhibits offer compelling examples of how research is helping make the construction industry more sustainable, productive and resilient.

From materials storage to a source of raw materials

The construction industry remains one of the world's largest consumers of resources and sources of carbon emissions. At BAU 2027, the Fraunhofer institutes will show how buildings of the future can become part of functioning material cycles and be designed to serve as carbon sinks. The focus will be on new building materials, methods and processes that conserve resources, reduce emissions and allow raw materials to be reused repeatedly. Examples include carbon-storing building materials that combine biogenic chars with recycled materials. This approach not only puts construction waste to use but also stores carbon in buildings over the long term. Another approach is biogenic lime synthesis, which uses cyanobacteria to produce novel mineral materials that capture CO_2 and could eventually pave the way for a new generation of sustainable building materials. Visitors can explore the latest research on circular aerated concrete, for example, which uses new processes to incorporate recycled construction waste into high-quality building materials. Another research project focuses on Roman

concrete, a cement-free material based on a millennia-old formula. Its exceptional durability and self-healing properties also offer significant potential for developing new building materials fit for the future. Research findings on geopolymers, another cement-free alternative with a wide range of applications, round out the booth's focus on sustainability.

Boosting productivity through digitalization and artificial intelligence

To meet the growing demand for construction and renovation while bringing costs down, the construction industry as a whole needs to work more efficiently. Digital methods and industrial production techniques offer one way to streamline planning and construction processes. A digital room data sheet, for example, provides a structured way to capture requirements early in the planning process, supporting an end-to-end BIM workflow. Another promising opportunity is to apply digital methods to serial renovation. The idea is to use standardized processes, open data structures and automation of individual steps to make modernizing existing buildings faster and more efficient. Augmented reality and WebXR connect the physical and digital worlds, allowing users to view and edit planning information and data on existing buildings directly in the physical space.

Research also focuses on modular construction. This calls for new approaches to prefabrication, robotics and automated manufacturing in the construction industry, along with innovative 3D printing techniques for building materials and building systems. At BAU 2027, the Fraunhofer institutes will showcase methods and exhibits that help address these needs.

Resilience for buildings, cities and infrastructure

Extreme weather events, aging infrastructure and growing expectations for urban quality of life have made resilience and climate adaptation an increasingly important focus of research. Fraunhofer solutions presented at BAU 2027 will show how structures can better withstand the challenges of climate change and other threats. Fraunhofer will also present new research results: smart systems that continuously monitor civil engineering structures and critical infrastructure, and programmable materials that allow adjustments to design and switching temperature, for example. Another exhibit focuses on smart window solutions that effectively reduce noise in buildings.

This themed area underscores once again that resilience in construction extends well beyond protection against extreme events. For buildings and infrastructure, the key is to detect changes and stresses early, respond flexibly and maintain functionality while safeguarding quality of life and comfort over the long term. Smart monitoring, material and building technologies offer new ways to achieve these goals.

Additional information

The **Fraunhofer Building Innovation Alliance** brings together expertise from numerous Fraunhofer institutes across the entire value chain of the built environment, making it one of Europe's largest construction research networks.

The alliance's research spans sustainable building materials, energy-efficient buildings, digitalization, industrial construction processes, infrastructure monitoring, the circular economy and climate-resilient urban development. It aims to turn research innovations into market-ready solutions and actively drive the transition to a more sustainable construction industry.

The following institutes will be represented at the Fraunhofer Building Innovation Alliance's joint booth at BAU 2027:
Fraunhofer Institute for Industrial Engineering IAO; Fraunhofer Institute for Applied Polymer Research IAP; Fraunhofer Institute for Building Physics IBP; Fraunhofer Institute for Electron Beam and Plasma Technology FEP; Fraunhofer Institute for Factory Operation and Automation IFF; Fraunhofer Institute for Production Systems and Design Technology IPK; Fraunhofer Institute for Solar Energy Systems ISE; Fraunhofer Institute for Machine Tools and Forming Technology IWU; Fraunhofer Institute for Environmental, Safety and Energy Technology UMSICHT; and Fraunhofer Institute for Nondestructive Testing IZFP.



Fig. 1 The joint Fraunhofer booth at the BAU 2027 trade show in Munich will showcase numerous exhibits on sustainability, resource resilience, digitalization and productivity.
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The Fraunhofer-Gesellschaft, headquartered in Germany, is one of the world's leading organizations for applied research. It plays a major role in innovation by prioritizing research on cutting-edge technologies and the transfer of results to industry to strengthen Germany's industrial base and for the benefit of society as a whole. Founded in 1949, the Fraunhofer-Gesellschaft currently operates 74 institutes and research units throughout Germany. Its roughly 30,000 employees, predominantly scientists and engineers, work with an annual business volume of 3.6 billion euros; 3.2 billion euros of this stems from contract research.

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