

Office of Infrastructure Research and Development (R&D)

The Federal Highway Administration's (FHWA) Office of Infrastructure R&D conducts and oversees R&D programs and projects that address critical highway infrastructure needs and priorities of national importance. The Office of Infrastructure R&D's research focuses on the design, materials, construction, operation, and preservation of highway pavements, bridges, culverts, tunnels, and other structures. In addition, the Office of Infrastructure R&D provides expert technical assistance to other FHWA offices and Federal agencies, State and local transportation organizations, industry, and academic institutions.

PRIORITY RESEARCH AREAS

The Office of Infrastructure R&D focuses on important R&D activities where there is an appropriate Federal role by virtue of national need, scope, duration, or risk. Current priority research areas are as follows.

Designing Infrastructure for Safety, Durability, and Resiliency

Safe, durable, sustainable, and resilient highway infrastructure is essential to maintain the commercial and personal mobility that supports the U.S. economy and way of life. Advances in materials, tools, technologies, test methods, specifications, and guidance are needed to support cost-effective designs for bridges, tunnels, pavements, and other structures. Specific challenges that need to be addressed include the following:

- Design innovations to better meet highway infrastructure needs, including accelerated project delivery.
- Prediction, prevention, and mitigation of damage due to climate conditions and natural hazards.

- Test methods and guidance to support performance-related selection, design, and specification of infrastructure and infrastructure materials, whether new or recycled.
- Use of new and innovative materials to effectively address infrastructure design challenges and minimize environmental impacts.
- Integration of lifecycle engineering methodologies to consider both economic and environmental considerations in decisionmaking processes.
- Integration of infrastructure safety considerations into design, construction, maintenance, and assessment decisionmaking.
- Data, methods, and tools to assess and quantify the safety,

durability, sustainability, and resiliency of infrastructure design decisions.

- Assessment of how autonomous vehicles and electric charging technologies may impact the Nation's infrastructure.



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Infrastructure Performance Management

Advancements in infrastructure performance management processes, tools, technologies, and guidance are needed to optimize performance management decisionmaking. Specific challenges to be addressed include the following:

- Understanding and prediction of long-term infrastructure performance, including, but not limited to, the impacts of both traffic loads and the environment through the Long-Term Pavement Performance and Long-Term Bridge Performance Programs as well as highway infrastructure engineering data on FHWA InfoHighway™ portals.⁽¹⁾
- Guidance, tools, and technologies to support sound characterization asset condition and safety for lifecycle planning and cross-asset tradeoff analysis.
- Methodologies, tools, and guidance to support risk-based asset management.
- Guidance and decision support tools to assist in target setting and achieving and sustaining desired state of good repair over the entire asset lifecycle at minimum practicable costs.
- Guidance and tools that enable more effective decisionmaking based on increased accessibility and integration of data from planning, design, construction, operation, and maintenance.

- Identification and development of next-generation performance measures.

Infrastructure Construction, Preservation, and Rehabilitation

As transportation agencies strive to maintain the Nation's highways in a state of good repair, the need for improved construction, preservation, and rehabilitation practices that result in economical, long-lasting bridges, pavements, tunnels, and other structures has never been greater. Challenges and needs to be addressed include the following:

- Delivering projects more effectively and efficiently by advancing digital delivery approaches to project design, bidding, and construction.
- Overcoming impediments to efficient, rapid construction, preservation, and rehabilitation while achieving high quality.
- Guiding the selection, timing, and application of preservation treatments for maximum effectiveness.
- Balancing the risks appropriately among the public and private sector organizations involved in both traditional and innovative contracting processes.

APPLIED INFRASTRUCTURE RESEARCH

In addition the Office of Infrastructure R&D conducts applied research in its 10 laboratories housed within the TFHRC. Experimental and

forensic research is performed on all highway infrastructure components, such as pavements, bridges, culverts, and geotechnical assets. The purpose of each of the 10 laboratories is described in the TFHRC laboratories factsheet.

BENEFITS

The outcomes delivered through the Office of Infrastructure R&D's research will benefit the American public by enabling improvements in the safety, performance, resilience, and sustainability of the Nation's highway infrastructure while minimizing its impact on the environment. The results will reduce highway congestion, improve highway safety and resilience, and enhance the overall experience of all highway users.

The Office of Infrastructure R&D is uniquely positioned to address the continuum of highway infrastructure research from high-risk, exploratory, and advanced research to the applied, problem-specific research necessary to address current issues and immediate problems. This broad range of research capability provides a high likelihood of success that is critical for efficiently managing the Nation's highway infrastructure assets.

REFERENCE

1. Federal Highway Administration. 2023. "FHWA InfoHighway" (web page). <https://infohighway.fhwa.dot.gov/>, last accessed September 12, 2023.

