

The I-95 Interchange 43 Design/Build Project

Steven Shankar, P.E., Senior Structural Engineer at Hardesty & Hanover (H&H)

The I-95 Interchange 43 Improvements project in West Haven, Connecticut, is a CTDOT Design-Build bridge replacement project, delivering a complex interchange reconstruction by integrating design and construction. The structural objectives for this project included emphasis on limiting bridge elements that require high maintenance, such as overall bridge length, beam ends, bridge bearings, and expansion joints. The project also required roadway and bridge widening with operational lane improvements for I-95.

The project addresses the poor condition of two multi-span bridges by replacing each with a single-span bridge and widened embankment approach structures. The newly designed bridges feature built-up multi-girder steel superstructures, heavy skews, and high bridge width-to-length ratios. Railroads, aerial power lines, poor subsurface conditions and protected environmental areas directly impact the project limits, constraining the design approach.

Geotechnical investigations identified weak, compressible soils requiring innovative embankment solutions to eliminate bridge spans and construct the embankments. To mitigate settlement and improve global stability, embankments were supported using a combination of foamed glass aggregate lightweight fill (FGA) paired with over-excavation, significantly reducing embankment loads and the need for soil improvement measures, lengthy preload scenarios, and the possibilities of existing foundation settlement. Geosynthetic Reinforced Soil (GRS) abutments and supplementary wire-wall stabilization was incorporated as well to accelerate construction and minimize deep foundations.

This Connecticut DOT Design-Build project demonstrates the viability of current technologies combined with innovative materials to develop solutions that reduce maintenance intensive structural elements. This project provides insight for future projects involving constrained sites, poor soils, and active rail corridors.



Walk Vertical Lift Bridge - Lift Towers Aesthetics, Design, Fabrication, Erection

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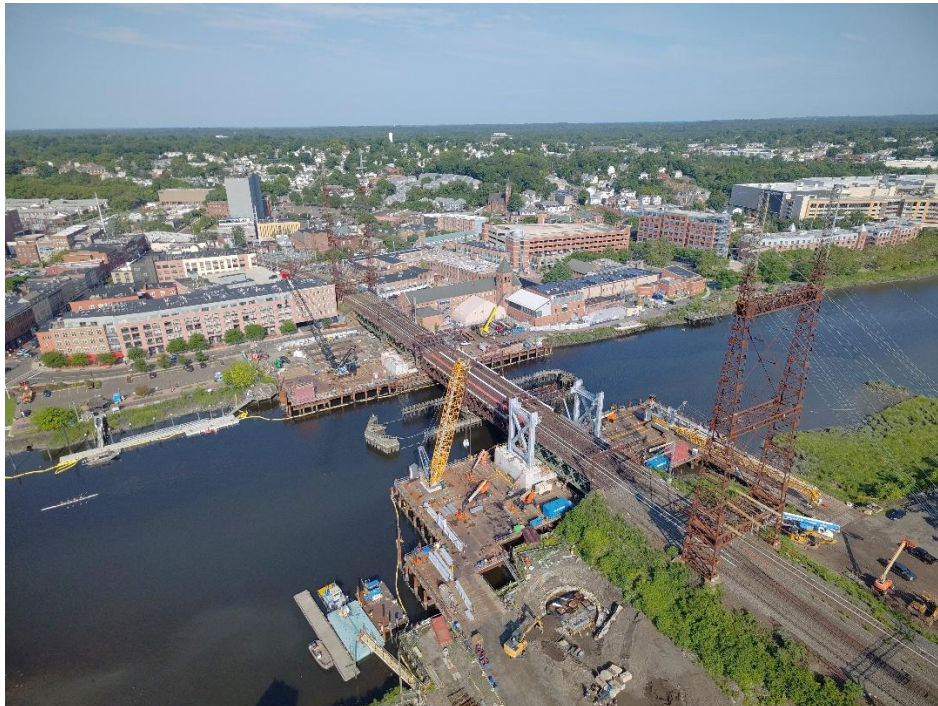
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Walk Bridge, a critical crossing on the Metro-North Railroad New Haven Line, carries four tracks over the Norwalk River in Norwalk, Connecticut. The century-old swing bridge is being replaced with two parallel vertical-lift spans supported by a shared system of lift towers, presenting unique engineering, construction, and architectural challenges.

To maintain rail service throughout construction, the replacement is being executed through an inline staged sequence. The first lift span is placed into service following partial demolition of the existing bridge, while the second span is constructed after removal of the remaining portions of the original structure. This approach creates significant temporary unbalanced loading conditions on the lift towers that influence structural behavior, camber development, and erection geometry.

The project also transforms one of the riverfront's most recognizable visual features. Existing overhead utility crossings are being replaced with utility tunnels beneath the river, allowing the removal of the utility towers that have historically defined the skyline. In collaboration with the Norwalk Design Advisory Committee, the project team developed a pointed-arch architectural expression for the lift towers that provides both a distinctive civic presence and an efficient structural load path.

This presentation will discuss the development of the tower architecture, design of the structural system, accommodation of staged construction loading, fabrication considerations, and the ongoing erection of one of the Northeast's most significant movable bridge replacement projects.



Sliding into the Future: Accelerated Replacement of the I-376 Commercial Street Bridge

Jason Fuller, P.E., Vice President and Senior Project Manager at HDR

The I-376 Commercial Street Bridge in Pittsburgh, PA, carries more than 100,000 vehicles daily. To avoid years of traffic impacts from staged construction, PennDOT selected Accelerated Bridge Construction (ABC) for the replacement. A new Arched Steel Delta Frame bridge weighing over 10,000 tons was built adjacent to the existing structure on temporary foundations. During a 17-day interstate closure in July 2026, the existing bridge was removed using conventional and explosive demolition, and the new bridge was slid 102 feet into place, making it one of the heaviest bridge slides ever executed. This presentation highlights the innovative design and construction strategies that made this landmark interstate bridge replacement possible.



Trends and Technologies Influencing Bridge Inspection Towards Enhanced Asset Management

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Highway bridges have been inspected primarily through visual methods for several decades. However, the extent, frequency, personnel qualifications, and overall quality of these inspections have varied considerably among owners. Historically, the central purpose of inspection guidelines has been public safety—specifically, preventing structural failures. As the role of infrastructure in modern society has evolved from simply moving people safely to backbone of commerce supporting economic competitiveness in a global environment, public expectations have shifted. In a resource-constrained setting, this shift places greater emphasis on preservation and mobility-focused asset management. This presentation discusses that evolution, recent changes to the NBIS aimed at advancing these goals and how emerging technologies (such as monitoring, drones, NDT/E, load testing, and robotics) can augment traditional visual inspections to support more effective preservation and asset management.



Heat Straightening Repair of Steel Bridges in Connecticut

Young moo Sohn, Ph.D., Professor at Central Connecticut State University

Heat straightening is a cost-effective and sustainable technique for repairing damaged or distorted steel bridge members. By restoring existing structural components rather than replacing them, heat straightening can reduce repair costs, shorten construction time, minimize material waste, and reduce the environmental impacts associated with fabrication and replacement. These benefits are particularly important as transportation agencies seek efficient strategies to maintain aging infrastructure under increasingly constrained budgets. Despite its advantages, successful heat straightening requires careful control of heating patterns, maximum temperatures, restraining forces, cooling procedures, and repair sequences. The absence of Connecticut-specific guidelines has presented challenges in establishing consistent procedures for the safe and effective implementation of heat straightening repairs. This presentation will discuss Connecticut's recent efforts to develop comprehensive heat straightening repair guidelines for steel bridges. A field implementation involving the emergency repair of a severely damaged steel bridge girder on Route 190 over I-91 in Enfield, Connecticut, will be presented as a case study. The presentation will describe the observed damage, repair planning, heating and restraining procedures, field challenges, and recovery of the damaged girder. Lessons learned from the field implementation will also be discussed. Finally, the presentation will introduce the proposed Connecticut Heat Straightening Repair Manual, including recommended procedures, limitations, and quality-control requirements intended to support safe, consistent, and effective heat straightening repairs throughout Connecticut.



Structural Engineers' Role in Natural Disaster Resilience, Mitigation, and Risk Management

William Hughes, Ph.D., P.E., Natural Catastrophe Specialist / Associate Research Scientist at Swiss Re

Natural disasters, such as hurricanes and tornadoes, can impose demands on structures far beyond those considered in typical day-to-day design loads, resulting in potentially significant structural damage, economic loss, and casualties. Structural engineers play an important role not only in designing and assessing individual structures, but also in understanding broader disaster risk, such as to inform retrofit strategies or support risk transfer through insurance. This presentation will provide an overview of how structural engineering expertise contributes to catastrophe risk modeling across research and (re)insurance industry applications. Examples will span several natural hazards and scales of analysis, including modeling residential building vulnerability to hurricane wind, coastal waves, and tornadoes; vulnerability modeling of electric transmission and distribution infrastructure; and decision-support tools for evaluating mitigation strategy effectiveness. The presentation will also examine how engineering-based vulnerability models are incorporated into reinsurance applications to estimate expected losses, such as from severe convective storms. Across these examples, the presentation will highlight how structural engineering concepts can be extended from individual structures to populations of buildings, infrastructure systems, and regional portfolios, emphasizing how engineering understanding of structural damage translates into probabilistic measures of risk and financial loss. Attendees will gain insights into the role structural engineers play in the field of natural disaster and catastrophe modeling, as well as the opportunities for engineering expertise to inform disaster resilience, mitigation, and risk management.





Practical AI in Structural Engineering

Adam Evans, P.E., Senior Associate at Wiss, Janney, Elstner Associates, Inc.

In 2026, artificial intelligence (AI) tools became extremely prevalent in structural engineering offices. The pace at which they are being introduced, and at which they continue to evolve, is starting to outrun the profession's ability to evaluate them. Engineers are handed capable tools with broad acceptable-use policies but little guidance on using them effectively. Firms are building guardrails as adoption is already underway, and professional organizations are only now developing training with structural engineers in mind. The result is broad access to these tools with no settled view of how or when to use them.

Many practitioners are rightly skeptical and cautious about adopting them. Given their nondeterministic nature (e.g., the same prompt can return very different responses), they can fail in ways that are easy to miss. They often produce plausible and confident-sounding answers that are ultimately incorrect.

This session looks at practical use cases for AI in structural engineering with an emphasis on remaining skeptical. It presents day-to-day applications including assisting in calculations, interacting with analysis models, reviewing large document sets, and auditing deliverables against firm and code requirements. Each is paired with a verification approach suited to the type of output it produces. Attendees will leave with specific, transferable uses for these tools, a sense of their current limits, and a framework for deciding when AI belongs in work product.