Freight Rail Infrastructure Safety

Key Takeaway: America's freight rail infrastructure is safe and is recognized as the best infrastructure in America by the ASCE. Adhering to the mantra "a well-run railroad is a safe railroad," the industry's commitment to robust investment and technological modernization make tracks, bridges, tunnels, rail cars and locomotives safer and operations more efficient.

Every four years, the American Society of Civil Engineers — the nation's oldest engineering society — provides a comprehensive infrastructure assessment of America's infrastructure using a simple A to F school report card format. The highly-respected ASCE Infrastructure Report Card examines the condition, needs and recommendations for 17 major categories of infrastructure, including rail. For the last two report cards, rail has received the highest grade thanks in part to freight rail's massive annual investments.

Data show a direct correlation between increased investment in the rail network and enhanced safety performance; since 2000, America's Class I railroads have spent $439 billion on network maintenance and capital expenditures, while the total train accident rate has decreased 27% since 2000. The last decade was the safest ever for railroads.

Part of these safety gains is due to investments in the development and deployment of new inspection technologies — from track-side detectors to ultrasound, machine imaging, big data and drones — designed to monitor infrastructure and equipment health. Railroads use these tools to increase both the frequency and accuracy of inspections — often above and beyond federal regulatory requirements — while the resulting data informs proactive maintenance plans. Thanks to these and other efforts, America's freight rail network is largely regarded as the safest, most efficient rail network in the world.

Railroad Bridge Safety

Thousands of bridges are vital to rail's expansive network, which allow trains to cross rivers, gorges and ravines. Railroad overpasses also help pedestrian and highway vehicle traffic flow better. Without strong and structurally sound bridges, America's freight rail network would not work. That is why freight railroads invest billions of dollars annually, employ the most-well trained bridge safety personnel, and annually inspect the more than 61,000 Class I railroad bridges in the United States.

Regardless of age, history, traffic or conditions, regular inspection of railroad bridges contributes more to the ability to carry trains than any other component of bridge maintenance safely. In adherence with federal regulations, trained experts inspect railroad bridges at least once a year.

More frequent inspections occur for bridges with more intensive traffic or whose conditions may warrant closer monitoring. Railroads follow an aggressive "safety first" policy and immediately alter or suspend service on any bridge until all concerns are addressed and, if necessary, repairs are made.

Every railroad has a bridge program.

Federal Railroad Administration (FRA) regulations mandate that railroads maintain comprehensive bridge safety management programs. These programs, accessible to relevant personnel, guide inspection, evaluation, and structural work methods.

The FRA, along with state oversight, ensures compliance by participating in accident investigations, performing assessments, providing technical guidance, and issuing penalties or emergency orders if necessary. Each bridge management program documents details such as safe loads, weights, and speeds for all railroad bridges, while also outlining inspection schedules, repair processes, and additional assessments required after accidents or adverse weather events.

Furthermore, these programs restrict the transportation of loads beyond approved limits, with exceptions made by qualified railroad bridge engineers. They mandate annual inspections of all rail bridges, specify repair processes, and require additional assessments after incidents that may affect structural integrity. Regular internal and FRA audits ensure program effectiveness, validate inspection reports and inventory data, verify correct movement restrictions, and confirm adherence to program requirements by railroads.

Specialized teams inspect railroad bridges.

Railroads assign a specialized team, including a railroad bridge engineer, inspector, and supervisor, to develop custom inspection procedures tailored to each bridge. These procedures aim to detect and address potential hazards, with a focus on mitigating specific threats to bridge safety, such as seismic risks in earthquake-prone areas. The inspection team visually reviews all components, including underwater analysis when necessary, and employs advanced techniques like 'sounding' or 'boring' for non-visible elements.

Identified anomalies, such as cracks, loose connections, or structural distortions, prompt further analysis. Inspection findings are promptly filed with the railroad's bridge management program, reviewed by supervisors and engineers, and shared with the FRA for assessment. The railroad allocates funds for and executes necessary maintenance, repairs, or replacement, with bridge supervisors ensuring compliance with design specifications for safe train operation.

Technology makes bridges safer.

Railroads are increasingly incorporating drones for bridge inspections, with a focus on advancing predictive maintenance strategies. Exploration of alternative bridge designs and materials, including retrofits and innovative constructions, is underway to enhance structural resilience. The integration of science-based inspection methods, robotic-assisted tools, machine vision, and onboard detection capabilities aims to deliver more accurate information for informed capital and maintenance decisions.

Looking ahead, selected bridges may feature in-track, self-diagnosing condition monitoring systems, foreseeing potential failures well in advance. Leveraging wireless communication systems, smart sensor networks have the potential to provide actionable insights into the structural integrity of bridges, further optimizing maintenance efforts for railroads.

Cosmetic imperfections on railroad bridges don't necessarily indicate safety issues.

With over 61,000 unique Class I railroad bridges in the United States, each with a distinct history and task, assessing safety involves considering complex factors. Freight railroads, for instance, analyze natural forces, cargo weight distribution, and evolving industry trends, such as the changing nature of locomotives.

Older bridges, designed for heavier locomotives, remain structurally sound due to engineering advancements. Trained rail bridge inspectors, equipped to look beyond visible flaws, collaborate with organizations like the FRA to ensure safety is determined by factual analysis rather than casual observation.