

A photograph of a CSX locomotive, number 3141, crossing a bridge over a river. The locomotive is green with yellow accents and the CSX logo. The background shows a lush, green forested hillside under a cloudy sky.

WHERE SERVICE MEETS SAFETY

CSX Bridge Resource Guide
January 2016





ABOUT CSX

CSX, based in Jacksonville, Florida, is a premier transportation company. We provide rail, intermodal and rail-to-truck transload services and solutions to customers across a broad array of markets, including energy, industrial, construction, agricultural and consumer products. For nearly 190 years, we have played a critical role in economic expansion and industrial development across the eastern United States and parts of Canada.

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INTRODUCTION

To the communities we serve:

There are more than 600,000 bridges in the U.S., with one in six, or 100,000, found along the nation's rail network. Virtually no two bridges are the same. Each has a unique history, structure and engineering challenge – whether it was built in Ohio or Tennessee, constructed in 1874 or 1994. Understanding these unique characteristics is critical to ensuring CSX bridges are safe and suitable for railroad operations.

The CSX transportation network provides freight rail services to every major metropolitan area east of the Mississippi River and parts of Canada. Safe and durable bridges allow us to move millions of tons of goods each year, over roads, waterways and other rail lines. They are critical to the operation of our business, and to the essential contribution we make to the smooth flow of commerce across North America. That's why we have strict and well-established policies and protocols for bridge inspection, maintenance and incident response.

This Bridge Resource Guide is intended to help government transportation officials understand how we inspect and maintain our bridges. It may also be used as a resource to respond to inquiries from local government or citizens regarding CSX structures in your state or province.

The Guide offers a closer look at how we ensure the safety of our bridges, including:

- How and when CSX bridges are inspected;
- What inspectors look for;
- How new bridges are manufactured and tested for quality control; and
- How CSX responds to public comments about bridges or bridge maintenance.

CSX is committed to maintaining its infrastructure in ways that ensure the safety of the communities we serve, our employees and the freight we are entrusted to deliver. In addition to the policies and protocols you'll learn about here, CSX invests significant private capital into our network and equipment – more than \$23 billion since 2003.

Safety is at the core of everything we do. It is the foundation of every decision we make regarding employees, customers and communities. Thank you for the opportunity to tell you more about our work.



CSX Bridges

There are more than 14,000 bridges on our network, stretching across 21,000 miles of track, 23 states and two Canadian provinces.

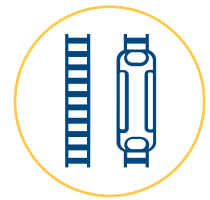
Bridge Types



Undergrade



Overhead



Adjacent

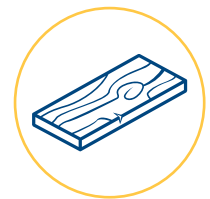
Bridge Materials



Steel



Concrete



Timber

CSX Standards

We take our roles as safety leaders seriously. That means drawing on what we know about railroad best practices and working together to meet or exceed what is required by law. This chart is a summary of CSX inspection standards and how they compare to inspection mandates by the Federal Highway Administration (FHWA) and Federal Railroad Administration (FRA):

Bridge Inspections: Federal Requirements Versus CSX Standards			
	Federal Highway Administration (FHWA)	Federal Railroad Administration (FRA)	CSX
Frequency	<ul style="list-style-type: none"> Bridges must be inspected at regular intervals at least once every 24 months. 	<ul style="list-style-type: none"> Bridges must be inspected at least once every 12 months, with no more than 540 days between inspections. 	<ul style="list-style-type: none"> Bridges must be inspected at least once every 12 months, with some bridge types requiring more frequent review.
Team Qualifications	<ul style="list-style-type: none"> Inspections must be conducted in teams and overseen by a team leader. 	<ul style="list-style-type: none"> A bridge inspector who is technically competent to view, measure, report and record the condition of a bridge and its components must be present. 	<ul style="list-style-type: none"> Bridge inspectors must be technically competent and demonstrate their knowledge through regular coursework and on-the-job training. They must pass three annual examinations: the CSX Operating Rules test, CSX Safety Rules and Roadway Worker Protection certification and FRA Track Safety Standards test.
Oversight and Review	<ul style="list-style-type: none"> Quality control and assurance procedures should include periodic review of inspection teams, refresher training as well as independent review of inspection reports and computations. 	<ul style="list-style-type: none"> Bridge inspections shall be reviewed by railroad bridge supervisors and engineers. 	<ul style="list-style-type: none"> Bridge managers must review all annual bridge inspections, perform follow-up inspections and plan maintenance as needed.



ATTENTIVENESS TO BRIDGE SAFETY BEGINS WITH CSX LEADERSHIP AND EXTENDS TO EACH EMPLOYEE REGARDLESS OF TITLE, JOB RESPONSIBILITIES OR GEOGRAPHIC LOCATION. WE FOSTER A CULTURE OF SAFETY THAT ENCOURAGES EVERYONE TO ACT IN A SAFE MANNER AND CONSIDER THE WELFARE OF OTHERS.

CSX has 7,500 employees dedicated entirely to the maintenance and safety of our infrastructure. We work closely with public and private-sector partners to ensure that inspection standards are upheld and that bridges are safe and well-maintained. For example:

Internal Auditing	CSX's Internal Audit & Compliance (IA&C) group performs rigorous reviews of our bridge management program as part of our compliance risk assessment. Audits were performed in 2015, 2012 and 2010, confirming that CSX bridge protocols are compliant with internal standards as well as FRA's bridge management requirements. FRA, an agency within the U.S. Department of Transportation, is a leading authority on bridge inspection, maintenance and regulations. It is tasked with bridge and structure safety oversight.
Inspections and Oversight	In keeping with the Rail Safety Improvement Act (RSIA), passed by Congress in 2008, FRA has reviewed hundreds of bridge safety management programs. These programs cover approximately two-thirds of all railroad bridges in the U.S. During the last two years, FRA has also conducted nearly 4,000 bridge observations and conducted more than 800 field audits of railroad bridge inspection reports. FRA has examined the bridge safety management programs of all seven major railroads, including CSX.

Bridge Inspections

We conduct a thorough examination of every bridge on our network at least once each calendar year. Dedicated teams of bridge inspectors and bridge managers look for any signs of unexpected wear, weakness or damage that might indicate fatigue or premature aging of the structure. They rely on detailed inspection protocols and extensive knowledge of engineering standards to identify characteristics that may require maintenance or repair.

CSX inspectors often use free climbing to conduct their inspections, allowing them to access areas of bridges that otherwise might not be visible. Depending on the location of the bridge and type of inspection, they also use trucks, ladders and man lifts.

Inspectors enter their reports into an electronic database for review by a bridge manager. If an inspector observes an area of concern, the bridge manager is required to conduct a follow-up visit, or an "intermediate inspection." This two-step process helps ensure that issues are evaluated by more than one employee and that maintenance plans are developed and implemented quickly.

Inspections include a careful evaluation of all the key components of a bridge – the deck, superstructure and substructure – noting any exceptional condition that suggests unusual wear or deterioration. If an issue is identified that compromises the safety of our employees, local residents, rail equipment or customers' freight, inspectors are empowered to take immediate action based on the conditions they see. That includes taking the bridge out of service or reducing the allowable train speed until further inspections or repairs are complete.

CSX maintains a bridge safety record that rivals industry averages and sets a high bar for operational safety.



CSX recently designed and built a climbing structure for inspection training, helping to ensure safe bridge climbing techniques and high-quality inspections across the network.



Our documentation process requires a close inspection of more than a dozen individual components, including the:

- Track
- Bridge deck
- Girders
- Beams
- Trusses
- Arches
- Piers
- Towers
- Bents
- Abutments



Safety Precautions

We offer safety training courses throughout the year at CSX's Railroad Education and Development Institute (REDI) in Atlanta. We also encourage inspectors to wear personal protection equipment (PPE), including a fall harness and a SPOT personal satellite-tracking device. In the event of an emergency, they can use the device to trigger an alert system and call for immediate assistance.

Timing and Frequency

Some bridge types require more frequent review to ensure that they are suitable for railroad operations. This includes drawbridges, which are inspected by CSX personnel on a quarterly basis. Other bridge types require special underwater inspections, conducted by CSX contractors approximately every five years using scuba gear.

To supplement the routine inspection process and prevent issues from arising between examinations, CSX maintenance-of-way employees also conduct informal bridge checks. One or more times per week, our trained track inspectors traverse the rails looking for track deviations and other wear-related issues, escalating items that may require examination from a bridge inspector or bridge manager.

Key Personnel

Bridge inspectors are often our first line of defense. Their performance is regularly evaluated in the field, by senior inspectors and managers who share their years of experience by providing field coaching and guidance. Inspectors also receive regular formal training, in their home locations and at the CSX Railroad Education and Development Institute (REDI), a state-of-the-art education center for railroad employees, customers and others. Through this training, CSX ensures that inspectors are technically competent to view, measure, report and record the condition of a bridge structure and its individual components, with demonstrated knowledge of the railroad industry, bridge construction and engineering. Inspectors also learn safe climbing techniques to allow them to access all areas of CSX bridges.

Bridge managers review every annual inspection report and are responsible for intermediate inspections as well as maintenance planning. They organize and lead the workforce necessary to keep the railroad moving safely.

Bridge Maintenance

Our bridge maintenance program integrates seamlessly with the inspection process. It is designed to maximize available resources and resolve issues as quickly and efficiently as possible.

Railroad bridges, like most engineered structures, require maintenance and upkeep over time. Our bridge maintenance program focuses above all else on structural integrity and suitability for railroad operations. It does not emphasize the aesthetic appearance of bridge structures; appearance is not necessarily an indication of structural weakness.

In addition to repairs and replacements, we concentrate on maintaining proper site conditions in the communities we serve. This requires careful observation of:

- Utilities near (or attached to) CSX bridges
- Adjacent property development
- Vegetation growth
- Erosion
- Vandalism

As a rule, this does not include bridge aesthetics. Cosmetic repairs are costly and may need to be repeated frequently throughout the year. While reports of graffiti are promptly addressed by the company, we do not routinely fund aesthetic maintenance. We focus instead on bridge safety and structural soundness.

Manufacturing and Design

Because bridges and their components are essential to the safe operation of the railroad, we maintain our own in-house bridge fabrication shop. Strategically located in Barboursville, West Virginia – near the geographic center of our network – the facility employs highly skilled craftspeople working under the direction of experienced manufacturing managers. These individuals work with design engineers to fabricate new parts and replacement materials for bridges.

New Bridges

In partnership with the team in Barboursville, CSX rebuilds several bridges on the network each year, using inspection reports and reliability metrics as the basis for prioritizing these critical investments. Led by a team of design engineers, we start by creating a plan that meets industry



AN INSPECTION IS A SNAPSHOT IN TIME, WITNESSED AND DOCUMENTED BY A TRAINED BRIDGE INSPECTOR.

– Ed Sparks, Assistant Chief Engineer of Structures





requirements as well as our own internal standards. For example, we design bridges with features that facilitate construction, inspection and maintenance, recognizing that new bridges will stand for many, many decades.

Quality Control

Once a bridge is designed, fabrication and construction begin. To ensure that the structure is developed safely and to the correct specifications, a field manager and design lead visit the site throughout the building process. Once the bridge is complete, it is immediately entered into CSX's regular inspection process for annual review.

Incident Response

CSX bridges are occasionally impacted by highway vehicles, waterborne vessels, natural disasters and other unforeseeable events. When incidents occur, we take immediate action to assess bridge damage and, where appropriate, restrict train traffic.

We dispatch local bridge inspectors who conduct in-person examinations as soon as it is safe to do so. Then, working with our engineering design staff we determine whether a bridge is structurally sound or whether it requires repair by our maintenance team. Because we operate our own bridge fabrication shop, new parts can be produced and installed efficiently, under the direct oversight of a CSX bridge manager.

Community

We take pride in being good neighbors and investing in the communities where we operate. With a relentless focus on safety, CSX dedicates approximately 25 percent of our workforce to maintaining and improving track, signals, grade crossings and bridges. We also invest more than \$1 billion annually in making the network safe through infrastructure maintenance and upgrades.

CSX is a critical link for communities and businesses across the eastern U.S. Every day, we operate hundreds of freight trains that deliver raw materials to manufacturers and finished goods to consumer markets. We have a long history of working with government leaders, local businesses and community residents to respond to public inquiries.

Contacting CSX

CSX is sensitive to residents' concerns about our infrastructure and operations. There are many ways to contact us about to report emergencies or ask questions.

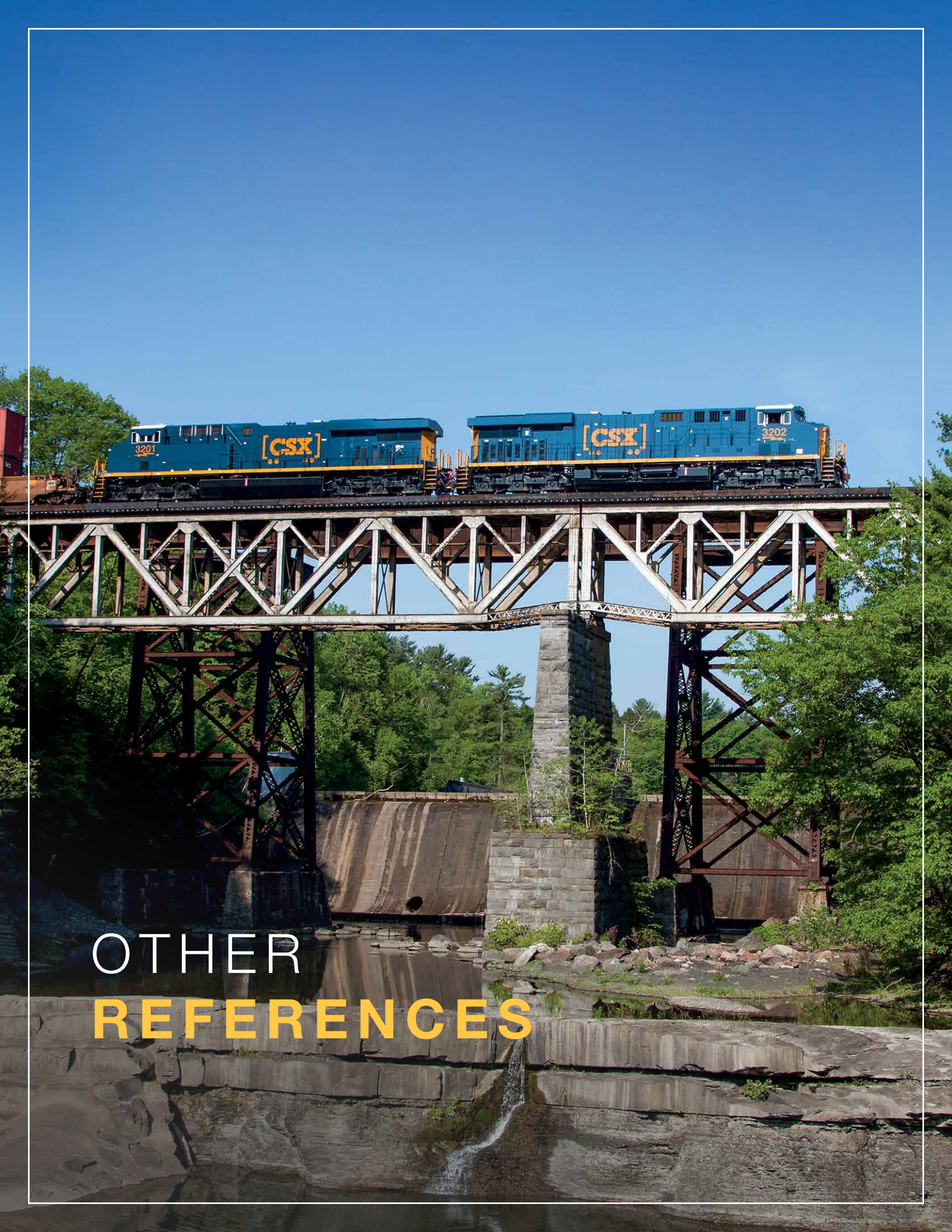
Safety concerns should be reported to the CSX Public Safety Communications Center at 1-800-232-0144.

These include:

- **Bridge Impact by Highway Vehicle or Waterborne Vessel:** Report impacts to CSX bridges
- **Crossing Malfunction:** Any gate or signal issues
- **Blocked Crossing:** Train currently blocking a crossing
- **Crossing Accident:** Auto or train collision at a crossing
- **Blocked Track:** Car or object on the tracks
- **Theft/Vandalism:** Report theft or vandalism on CSX property
- **Trespassing:** Report trespassing on CSX property

For non-emergency issues, our community affairs contact center is available to receive questions and respond to concerns. That number is 877-835-5279 (877-TellCSX). TellCSX was created in 2007 to provide a resource for the communities CSX serves to correspond directly with the company. The TellCSX team, based in Jacksonville, is responsible for tracking all non-emergency issues and responding in real time to community members.





OTHER
REFERENCES

Glossary

- **Abutment:** retaining wall that supports the end of a bridge on one side and the embankment carrying a track (or roadway) on the other.
- **Adjacent bridge:** runs parallel to another road or railway.
- **Aesthetics:** relating to art or beauty.
- **Arch:** bow-like curve that spans an opening and serves as a support.
- **Beam:** horizontal structure that supports vertical loads by resisting bending.
- **Bent:** supporting frame that consists of posts or piles with bracing, caps and sills.
- **Bridge inspector:** trained professional who views, measures, reports and records the condition of a bridge and its individual components. Qualifications include: demonstrated knowledge of bridge structures; completion of bridge training and safety courses; and extensive on-the-job training and coaching by senior inspectors.
- **Bridge manager:** management professional who reviews inspection reports, conducts intermediate inspections and oversees maintenance planning. The latter includes resource allocation, staffing, regulatory compliance and oversight.
- **Certified suitable for railroad operations:** industry classification signifying that bridge conditions meet operational standards.
- **Culvert:** drain, pipe or conduit that allows water to pass under a road or railroad embankment.
- **Deck:** flooring of a bridge.
- **Federal Highway Administration (FHWA):** agency within the U.S. Department of Transportation that supports state and local governments in the design, construction and maintenance of U.S. highways.
- **Federal Railroad Administration (FRA):** agency within the U.S. Department of Transportation that promotes and regulates safety throughout the nation's railroad industry, including safety oversight of bridges, tracks and structures. Through its field enforcement staff, the FRA participates in bridge accident investigations, performs bridge assessments and bridge management-program reviews and provides direction and technical advice in bridge inspection, maintenance and management.
- **Girder:** large, horizontal beam that supports vertical loads by resisting bending. It may be made of multiple metal plates that are riveted or welded together.
- **Intermediate inspection:** a secondary review conducted by a bridge manager to examine an area of concern and develop a maintenance plan for resolving it. An integral part of CSX's bridge management process, intermediate inspections help ensure that issues are evaluated by more than one employee and that maintenance plans are developed and implemented quickly.
- **Overhead bridge:** crosses under another road or railway.
- **Pier:** a supporting frame with just one column.
- **Railroad Education and Development Institute (REDI):** state-of-the-art training facility founded by CSX in 2005. Located in Atlanta, Georgia, the REDI provides beginning and advanced railroad training, as well as certifications in specific skills, such as bridge climbing and bridge safety.
- **Rail Safety Improvement Act (RSIA):** legislation passed by Congress in 2008, providing FRA with clear instructions on how to conduct its railroad bridge safety oversight program. RSIA requires the U.S. Secretary of Transportation to issue

specific regulatory requirements for track owners to create bridge safety management programs. It also requires each railroad track owner to develop and maintain an accurate bridge inventory; use professional railroad bridge engineers to determine bridge capacities; maintain records of safe load capacity, design documents and all repairs, modifications, and inspections; develop and enforce written procedures to prevent bridges from being loaded beyond their capacities; and conduct comprehensive bridge inspections at least once per year. In addition, RSIA requires FRA to conduct oversight reviews of bridge management programs and audit bridge inspection and maintenance data from railroads.

- **Substructure:** parts that support the superstructure, including:
 - Abutments or end-bents
 - Piers or interior bents
 - Foundation
 - Footings
 - Pilings
- **Superstructure:** parts that support the deck or riding surface and span the obstacle the bridge is intended to cross. Components include:
 - Trusses
 - Girders
 - Arches
 - Parapets, handrails and walkways
- **Structurally deficient:** Federal classification signifying that one or more important load-carrying elements are found to be in poor condition, often due to deterioration or aging. If a bridge is deemed “structurally deficient,” it does not imply that it is unsafe. A structurally deficient bridge, when left open to traffic, typically requires significant maintenance and repair to remain in service and eventual rehabilitation or replacement to address deficiencies. To remain in service, structurally deficient bridges are often posted with weight limits to restrict the gross weight of vehicles using the bridges to less than the maximum weight typically allowed by statute.
- **Tower:** tall substructure, typically made of steel, that supports a bridge superstructure and contains posts, diagonals and bracing.
- **Truss:** long-span superstructure, typically made of steel, that supports a bridge and contains a framework of chords, posts, hangars, diagonals, floorbeams, stringers and portals.
- **Undergrade bridge:** crosses over another road, railway or stream.

Common Abbreviations Used by CSX Bridge Inspectors

- CSXT = CSX Transportation
- NSRR = Norfolk Southern Railroad
- IT = Industrial Track
- RR = Railroad
- Rt = Running Track
- Ry = Railway
- SD = Subdivision
- SL = Shortline
- Term = Terminal
- Trib = Tributary

Additional Resources

- www.CSX.com
- Association of American Railroads (AAR)
- American Railway Engineering and Maintenance-of-Way Association (AREMA)
- National Bridge Inspection Standards (NBIS)
- U.S. Department of Transportation (USDOT)
- Federal Railroad Administration (FRA)
- Federal Highway Administration (FHWA)
- Your State or Provincial Department of Transportation

*Have questions about a CSX bridge or this Bridge Resource Guide? Contact us at
1-877-TELL-CSX or tellcsx@csx.com.*

