ASSOCIATION OF AMERICAN RAILROADS

DO TRAINS RUN WHEN IT'S REALLY HOT?

Key Takeaways

- Extreme heat puts added stress on track, equipment, infrastructure and employees.
- Railroads prepare year-round through maintenance, inspections, weather monitoring and advanced technology.
- When temperatures reach established thresholds, railroads protect employees, inspect higher-risk areas, slow trains when needed and return to normal operations only after conditions are safe.

Freight railroads have operated across North America for nearly 200 years. That experience helps them understand how heat affects track, equipment, infrastructure, and employees. Today, railroads pair that knowledge with modern technology. They use both to spot heat-related risks early, protect employees, and keep trains moving safely as heat waves become more frequent.

How do railroads spot heat risks early?

Extreme heat can develop quickly, so railroads monitor weather and rail conditions 24/7. Engineering and operations teams use forecasting tools, in-house meteorologists or private weather services, and information from the National Weather Service to track changing conditions before they affect the network.

Rail temperature matters as much as air temperature.

Railroads look at much more than air temperature. Direct sunlight, wind, cloud cover, overnight cooling, humidity, rainfall, and even track direction can all affect rail temperature. Teams combine that information with local knowledge of recently maintained track and areas with a history of heat-related movement.

They also use readings from special thermometers temporarily attached to rails. Together, these inputs help railroads decide where to add inspections, slow trains, or make other operating adjustments before problems develop.

How do railroads prevent track buckling?

Extreme heat makes track buckling a major challenge for freight railroads. Steel rail expands as it heats and contracts as it cools. On long sections of continuous welded rail, that expansion creates tremendous pressure. The full track structure, including ballast, ties, fasteners, and anchors, must hold the rail in place. Direct sunlight can make steel rail 20 to 35 degrees hotter than the surrounding air. In higher-risk locations, that added heat can push rail out of alignment and create a track buckle, also called a heat kink or sun kink.

Rail is designed for local conditions.

To help control that risk, railroads design, maintain, and closely monitor their track. Railroads install continuous welded rail based on local climate and a planned rail neutral temperature (RNT). The RNT is the approximate temperature at which the rail is under little internal tension or compression. That target varies across the network, meaning track in Arizona is designed for different conditions than track in Minnesota or Canada.

Railroad maintain the entire track structure.

When crews replace ties, add ballast, resurface track, or adjust rail, the work can temporarily reduce track stability while the ballast settles and compacts. Railroads often add inspections, temporary speed restrictions, or specialized equipment to recently maintained areas until the track regains its full strength. Bridges need similar attention. Like rail, bridge steel expands and contracts with temperature swings, so railroads use special rail expansion joints near bridges to manage that movement.

Rail employees use technology to find risks faster.

Technology provides another layer of protection. Track geometry cars use lasers to measure rail alignment, drones inspect track and bridges, and wayside detectors and digital train inspection portals identify overheated wheels and other mechanical issues. Employees combine this information with data on rail temperature, track conditions, train forces, and maintenance history. AI helps identify where track buckling is most likely so railroads can prioritize inspections and maintenance.

Technology has reduced track buckling-related accidents.

MxV Rail, AAR's research and testing subsidiary, is building on those capabilities through full-scale track buckling experiments and computer modeling. The research helps engineers better understand how track responds to extreme heat and refine the tools railroads use to manage heat-related risks. Along with approximately $25 billion in annual private investment, these advances helped reduce Class I mainline track buckling-related accidents by 61% between 2010 and 2025.

What do railroads do when it gets really hot?

When temperatures reach established thresholds, railroads put their established heat plans into action. Depending on local conditions, they may move employees and equipment, prepare repair crews, adjust maintenance schedules, and notify customers if heat-related restrictions could affect service. As conditions change, railroads keep monitoring the network and adjust their response as needed.

Railroads protect employees first when it's really hot.

Protecting employees is always the highest priority. Railroads reduce heat exposure by providing drinking water, scheduling rest breaks, and offering shaded or air-conditioned recovery areas. When practical, they shift physically demanding work to cooler parts of the day. They also train employees to recognize the signs of heat illness, use buddy systems and regular check-ins, and respond immediately if someone shows symptoms of heat stroke.

Rail employees check higher-risk track.

Railroads also increase visual track inspections in higher-risk areas. Qualified employees conduct these "track patrol inspections" by vehicle, hi-rail truck, or on foot. They often inspect during the hottest part of the day, when heat-related movement is most likely. Inspectors look for changes in track alignment, disturbed ballast, loose fasteners, unstable track shoulders, and other signs that the track is beginning to move. If they identify a concern, the railroad may increase monitoring, impose temporary speed restrictions, make repairs, or remove the track from service until it is safe.

Railroads slow trains when needed.

Temporary speed restrictions are one of the most effective ways to reduce stress on the track. Slower speeds reduce the forces placed on the rail and give train crews more time to respond if they encounter an irregularity. Railroads may apply these restrictions across an entire route or only in specific locations. They keep them in place while crews complete inspections and repairs or until temperatures moderate.

When do trains start running again?

Railroads don't automatically remove restrictions when the weather cools. Before returning to normal operations, employees confirm that the track is stable and infrastructure is working as intended. They may inspect recently repaired areas again and test equipment exposed to prolonged heat before returning it to service. Railroads lift restrictions only after they determine that temporary protections are no longer needed.

THE BOTTOM LINE: Extreme heat is a routine challenge for freight railroads. Railroads manage that risk through year-round maintenance, inspections, advanced technology, and trained employees. These efforts help them identify problems early, protect their workforce, and keep freight moving safely.