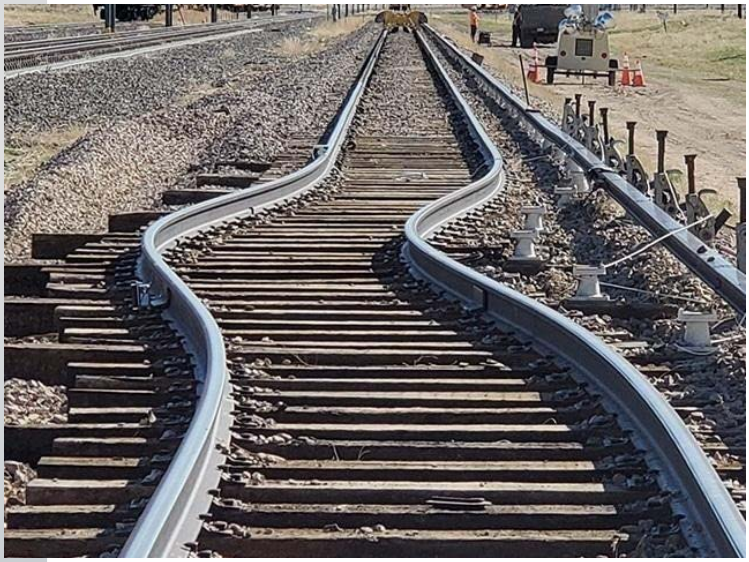
MONITORING BRIDGE & RAIL MOVEMENT TO PREVENT FAILURE

Seasonal temperature changes cause continuous expansion and contraction in bridges, a **longstanding challenge in civil engineering**. Expansion joints are commonly used to accommodate this movement, helping to prevent structural stress and damage. The issue is also critical in railway bridges, where thermal expansion can be extreme. In some climates, a one-mile section of rail can expand by as much as four feet across a 100°F temperature swing.

Sun kink railroadUncontrolled expansion can lead to rail buckling, commonly referred to as a "*sun kink*," which poses a serious safety risk and can result in train derailments. While advances in steel metallurgy and prestressing techniques have improved the ability of rails and joints to tolerate thermal movement, many rail operators and mass transit authorities are now taking a more proactive approach **by directly monitoring bridge and track movement in real time**.

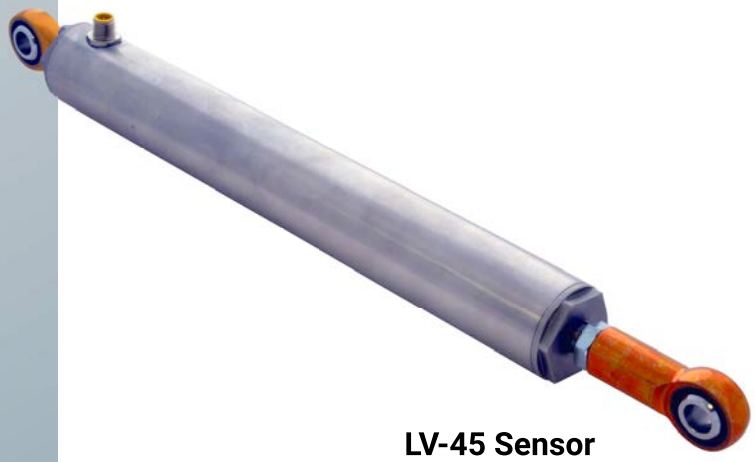
By instrumenting bridges, engineers can quantify exactly how much structural movement is occurring, identify abnormal behavior, and determine whether track shifting or structural degradation has taken place. This **data driven approach enables railway operators to detect buckling or misalignment early**, divert traffic if necessary, and schedule corrective maintenance before a safety incident occurs.

This need is especially significant given the scale of rail infrastructure. There are more than 110,000 railroad bridges in North America, each of which is required to undergo annual inspection. However, most inspections remain largely visual in nature, limiting their ability to capture subtle movement trends or early-stage structural issues.



Sun kink railroad

To address this gap, Alliance Sensors Group's **LVIT Inductive Linear Position Sensor LV-45** Series are integrated into bridge and rail monitoring systems that provide continuous measurement of structural and track displacement. This data supports real time analysis, long term trending, and early detection of abnormal movement patterns.



LV-45 Sensor

The LV-45 sensor is specifically designed for h**arsh outdoor and rail environments**. It operates reliably in high humidity, blowing snow, driving rain, and wide temperature extremes ranging from 40°F below zero to 200°F. The sensor also **withstands the shock and vibration** associated with passing trains. Its IP67 rated housing and availability of multiple connector and cable configurations allow it to be deployed in virtually any rail or bridge environment.

In a typical pier to bridge interface installation, **LV-45** sensors are rigidly mounted between the bridge structure and the supporting pier. Ball joint swivel rod ends are used to accommodate minor misalignment during installation while maintaining precise measurement capability. This configuration allows the system to measure movement along all three axes and to track those changes over time.

By trending both short term and long-term displacement data, engineers can identify developing issues, detect abnormal movement patterns, and highlight potential structural problems well before failure occurs. The result is a more predictive, **data driven approach to rail and bridge safety**, one that improves reliability, reduces risk, and supports smarter maintenance decisions.

Need help selecting the right sensor for your application?
Speak directly with an experienced application engineer at H. G. Schaevitz Alliance Sensors Group by calling 856-727-0250 or emailing us at Sales@alliancesensors.com.

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