

Rail Stress Management

What is the situation?

The management of rail stress to prevent track buckles is one of the highest track risks on the network.

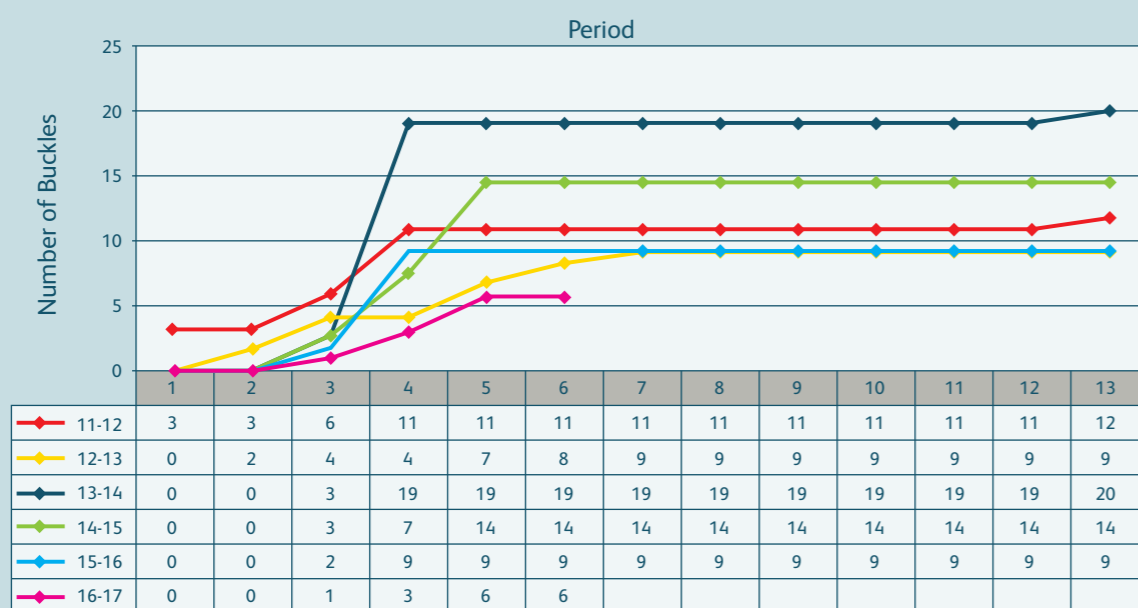
The causes of buckles with jointed track are: not adequately rail adjusted, bolts over tightened, lack of ballast and others. While continually welded rail (CWR) and switches and crossings suffer from a lack of stress and ballast.

Despite understanding the controls necessary to maintain and manage a safe and reliable railway, we continue to suffer from track buckles each year.

Systems for capturing and informing of rail stress aren't integrated and are out of date. These deficiencies can lead to train delays and impact on customers.

Additionally, the ability to measure rail stress non-destructively, is still difficult. The only approved method for measuring rail stress, the VERSE testing equipment, has several limitations.

Track buckles since 2011



Priority problems

Specific priority problems

- Lack of intelligent systems to integrate all stress data, Ellipse and Geogis(asset data) to provide decision support information.
- Lack of clarity in TRK/3011 standard especially for stressing in switches and crossings (S&C) Lack of access for maintenance with increased capacity (i.e. Digital railway).
- Lack of suitable training material for stressing competence in S&C
- Lack of non-destructive testing for S&C.
- Poor quality reporting of work or ballast disturbance/deficiency.

Related goals

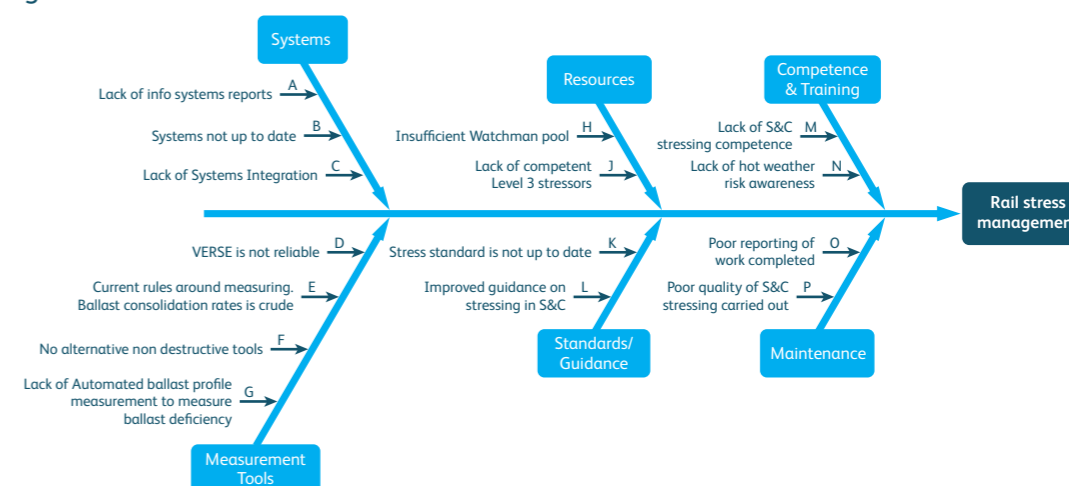
- Develop more effective and integrated decision support tools for rail stress and critical rail temperature management linked to Ellipse.
- Update and publish TRK/3011.
- Improve training material aligned to TRK/3011 standard rewrite.
- Investigate feasibility of non-destructive or autonomous rail stress system/tool for Plainline CWR and S&C.
- Automate reporting of ballast deficiency.
- Improved understanding of rate of ballast consolidation.

Benefits

- Reduction in track buckles.
- Reduction in heat-related train delays.
- Improved clarification of stressing standards and associated training material.
- Safety benefits and efficiency for managing and maintaining rail stress.
- Better quality data to manage hot weather risk.
- Application of improved risk mitigations following disturbance.

Analysis of causes

Top causes of track buckles relate to the lack of measurement tools, systems information, standards update and training.



Scope

Various track data systems require integration to link work activity to rail stress and weather forecasting. This provides support information to maintenance engineers to help them make the decisions to mitigate track buckle risks during hot weather.

Research into alternative, non-destructive testing is a key requirement of this challenge. New tools used to determine residual and actual stress in rails will help to prioritise work and implement appropriate risk mitigation to minimise service disruption. The R&D will also support strategic decisions for more effective maintenance of compressive stresses in the track asset, which will provide whole life cost benefits.

Additional research into ballast consolidation rates, especially on lower tonnage routes, will support work activity planning and delivery. This will help provide robust and effective track solutions maintaining the required performance levels needed to run reliable services.

To address these challenges it is expected that R&D actions will need to address the following issues:

- Are there alternative non-destructive means of measuring rail stress, including residual stresses in the rail from manufacture?
- Can the current systems be better aligned to provide predictive and trend analysis of how the asset performs in certain conditions/with certain features (E.g on high cant curves or in complex S&C)?
- Do we have sufficient understanding of ballast consolidation rates and how this links with compressive stress disturbance in rails?
- Do we understand the gradual rate of loss of compressive stress in rail over the life cycle of the asset?
- Are there ways of automating inspections to provide accurate measurements of deficiencies in the track asset that may result in weaknesses that could lead to track buckles?
- Any research and development around this area may consider prevention of track buckling risk as a whole and does not have to be solely limited to rail stress management.

Expected impact & benefits

- The R&D initiatives included in this challenge will improve our ability to prevent track buckles and train delays.
- Safety and efficiency benefits will also be realised along with improved data quality and system alignment for better decision making.
- Development of a risk matrix relating to management of the track asset in hot weather will help to focus resources and activity on the areas that offer the biggest benefit to safety, performance and resilience of the infrastructure.