



MHSC

Mine Health and Safety Council

**ANALYSIS OF RAILBOUND EQUIPMENT (RBE) SAFETY
PERFORMANCE DATA (2017 – 2025) TO GENERATE ACTIONABLE
INSIGHTS THAT SUPPORT MHSC'S ZERO HARM OBJECTIVES**

Scraper Winches Day of Learning

**Bureau of Market Research (Pty) Ltd
30 July 2026**

Every mine worker returning from work unharmed every day. Striving for zero harm in our lifetime.

Why this Study Matters

Understanding Railbound Equipment Safety Performance to Advance Zero Harm

MINING

29,445

Mining accidents reviewed



RAIL

3,152

Railbound equipment records identified



DATA

2,258

RBE incidents analysed



ACTION

Evidence → Insight → Action

Transforming data into safer
Railbound Equipment operations

PURPOSE OF THE STUDY

To identify where Railbound Equipment risk is concentrated, understand the drivers of fatalities and injuries, and generate evidence to strengthen targeted safety interventions across the South African mining industry.

DATA → INSIGHT → ACTION

From Data to Action: Transforming Safety Intelligence into Practical Interventions

The RBE Safety Story

Where is Railbound Equipment Risk Concentrated?



LOCOMOTIVE OPERATIONS

Dominant Source of RBE Risk



COUPLING & UNCOUPLING

Highest Operational Exposure



UNDERGROUND HAULAGES & CROSSCUTS

Highest-Risk Work Environment



PLATINUM & GOLD MINES

Over 90% of National RBE Risk



UNDERGROUND LOCOMOTIVE DRIVERS

Highest Occupational Exposure



NORTH WEST REGION

Greatest Geographic Concentration



SYSTEMIC RISK

Engineering • Infrastructure • Maintenance • Leadership

KEY INSIGHT

The analysis shows that Railbound Equipment incidents are highly concentrated rather than evenly distributed across the South African mining industry.

RBE risk is concentrated within specific equipment, activities, workplaces, commodities, occupations and regions.

Targeting these priority areas offers the greatest opportunity to reduce fatalities, injuries and productivity losses.

RISK → PRIORITY → ACTION

Concentrated Risk Requires Targeted Safety Interventions

Railbound Equipment Safety at a Glance

Executive Dashboard (2017–2025)

2,258

RBE Incidents Analysed

56

Fatalities

2,190

Injuries

70,536

Lost Workdays

7.7%

Share of All Mining Incidents

KEY FINDINGS

The analysis of 2,258 Railbound Equipment incidents (2017–2025) shows that although RBE incidents account for only 7.7% of all reported mining incidents, they continue to have substantial human and operational consequences.

Across the study period, 56 fatalities, 2,190 injuries and 70,536 lost workdays were recorded, highlighting the importance of strengthening critical controls and focusing interventions where risk is greatest.

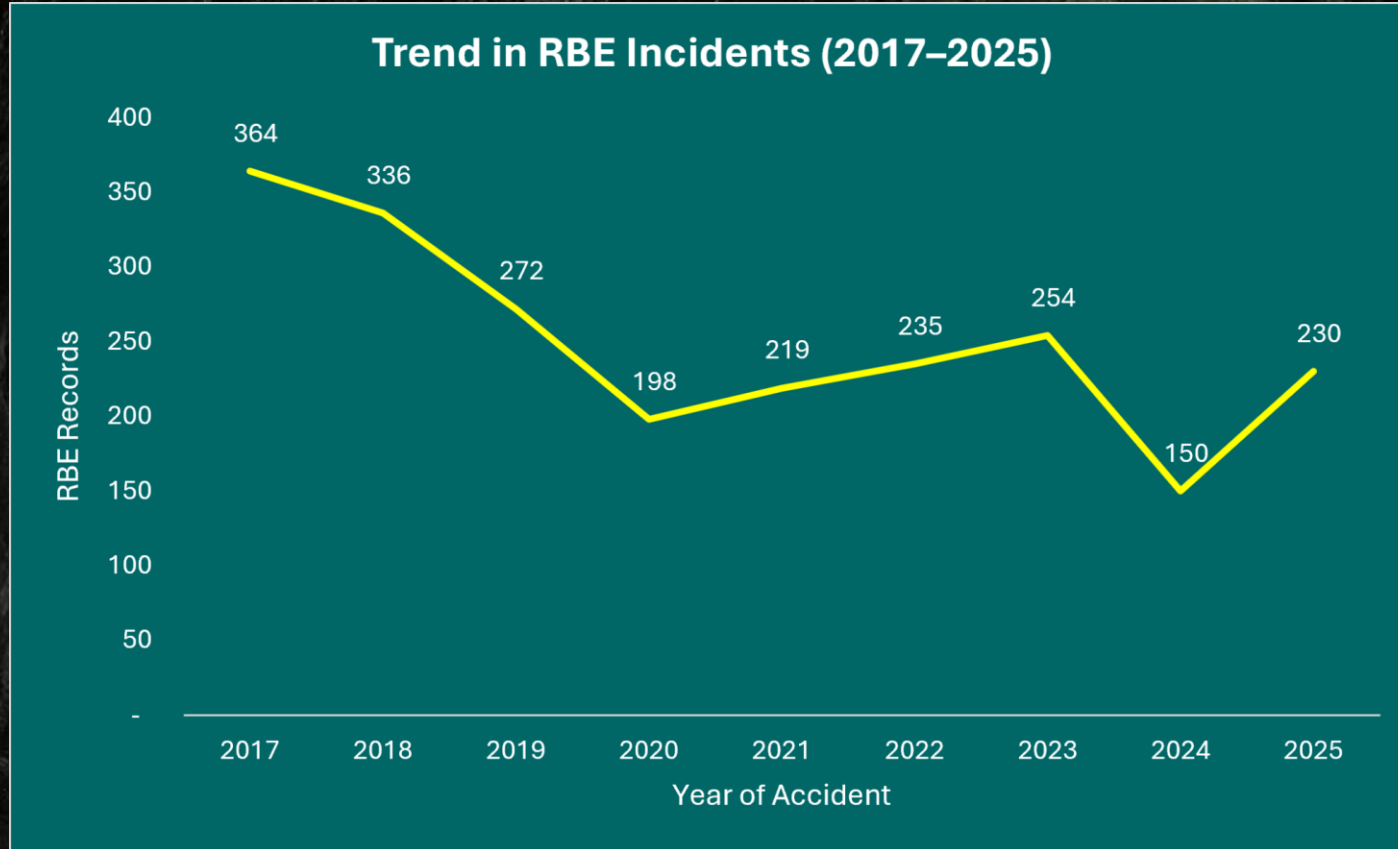
RISK → PRIORITY → ACTION

DATA → EVIDENCE → DECISIONS

Understanding the Scale of the Challenge Before Targeting Solutions

Annual Trend in Railbound Equipment Incidents

How RBE Safety Performance Changed (2017–2025)



KEY TRENDS

2017–2020: Incidents declined by 46% (364 to 198), reflecting sustained improvements in safety performance.

2021–2023: A gradual increase suggests renewed operational exposure and production activity.

2024: The lowest annual total (150 incidents) was recorded during the study period.

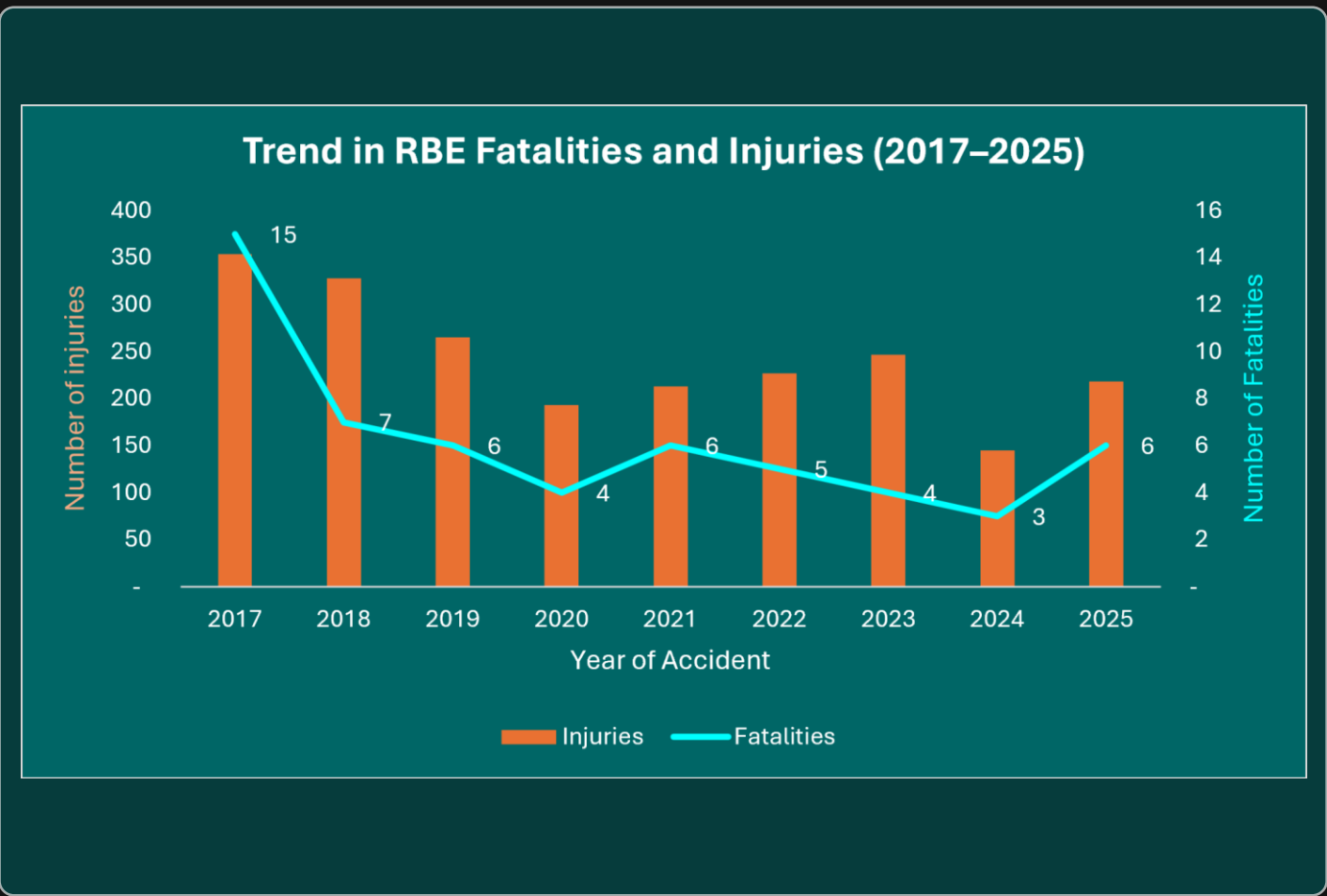
2025: Incidents increased to 230, highlighting the need for sustained implementation of critical controls.

TREND → INSIGHT → ACTION

Monitoring Trends to Drive Proactive Railbound Equipment Safety

Fatalities vs Injuries

Frequency vs Consequence (2017–2025)



KEY INSIGHTS

Long-term improvement

Fatalities declined from 15 in 2017 to 3 in 2024, indicating sustained improvements in RBE safety performance before the increase observed in 2025.

Severity warning

The 2025 increase to 6 fatalities signals renewed exposure to high-consequence rail hazards.

Different risk profiles

Injury reduction does not automatically prevent fatal events; both indicators require separate monitoring.

Priority response

Strengthen critical controls for collisions, runaways, derailments and worker-equipment interactions.

SEVERITY → CONTROLS → PREVENTION

Reducing Fatalities Requires Continuous Verification of Critical Controls and Proactive Management of High-Consequence Risks

Where is Railbound Equipment Risk Concentrated?

Identifying the Highest-Risk Operational Environments

LOCOMOTIVE OPERATIONS

Primary source of RBE incidents

UNDERGROUND HAULAGES

Highest-risk workplace

PLATINUM MINES

Greatest commodity exposure

LOCOMOTIVE DRIVERS

Highest occupational exposure

KEY INSIGHTS

Railbound Equipment incidents are not evenly distributed across the mining industry. Risk is concentrated within locomotive operations, underground haulages, platinum mines and among locomotive drivers.

Targeting engineering controls, maintenance, supervision and behavioural safety initiatives in these priority areas offers the greatest opportunity to reduce fatalities and injuries.

RISK → PRIORITY → INTERVENTION

Concentrated Risk Requires Targeted Safety Interventions

What Drives Railbound Equipment Incidents?

Understanding the Systemic Factors Contributing to RBE Safety Risk

INFRASTRUCTURE & TRACK CONDITION

Strongest relationship with severe incidents and lost workdays

MAINTENANCE RELIABILITY

Equipment failures associated with high-consequence events

PROCEDURES & PLANNING

Operational discipline, planning and procedural compliance

MANAGEMENT SYSTEMS

Leadership, supervision and organisational controls

HUMAN FACTORS

Worker positioning, situational awareness and human-system interaction

KEY INSIGHTS

The analysis demonstrates that Railbound Equipment incidents are influenced by interconnected engineering, organisational and human-system factors rather than isolated unsafe acts.

Infrastructure and track-condition deficiencies generated the greatest productivity losses, while maintenance failures, procedural weaknesses and management-system shortcomings contributed disproportionately to severe outcomes.

These findings reinforce the need for integrated critical controls across engineering, operations and leadership.

SYSTEMS → CRITICAL CONTROLS → ZERO HARM

How is the Risk Landscape Changing?

The Evolution of the RBE Risk Profile (2017–2025)

2017 RISK PROFILE

- Locomotive operations
- Gold mining
- Crosscuts
- Locomotive drivers
- Behaviour-focused view

STRUCTURAL SHIFT

- Transport-system evolution
- Diversified risk
- Engineering + Human + Organisation

2025 RISK PROFILE

- Coupling & uncoupling
- Railway-line & track work
- Haulages
- North West
- Platinum mining
- Infrastructure integrity
- Organisational controls
- Human-machine interaction

2017



2025

KEY INSIGHT:

RBE risk has evolved from a locomotive-centred operational problem to an integrated transport-system risk requiring engineering, operational and organisational controls.

Strategic Framework for Reducing RBE Risk

A Phased Strategy for Safer, More Reliable Railbound Operations

PHASE 1 2026–2027

STABILISE

- Critical controls
- Haulage safety
- Leadership

Target:

- 20% incidents
- 50% fatalities



PHASE 2 2028–2029

OPTIMISE

- Infrastructure
- Maintenance
- Analytics

Target:

- 35% incidents
- 75% fatalities



PHASE 3 2030

TRANSFORM

- Smart rail
- Automation
- Centre of Excellence

Target: Zero fatalities

- 50% incidents

KEY MESSAGE: Sustainable RBE risk reduction requires a phased transition from stabilising critical controls, to optimising infrastructure and maintenance systems, and ultimately transforming railbound operations through innovation and technology.

Industry Priorities

Heatmap-Based Prioritisation of Railbound Equipment Risk

Rank	Priority Risk Combination	Risk
1	Platinum × Haulages	EXTREME
2	Locomotives × Locomotive Operations	EXTREME
3	Rail Cars × Coupling / Uncoupling	EXTREME
4	Underground Locomotive Drivers × Poor Judgement	EXTREME
5	North West × Fatality Severity	EXTREME

EXECUTIVE INSIGHT

Heatmap analysis shows that RBE risk is concentrated in a small number of high-consequence combinations. Prioritising these hotspots offers the greatest opportunity to reduce fatalities, injuries and productivity losses.

Critical Controls and Implementation Roadmap

Embedding Critical Control Management Across the Railbound Equipment System

Locomotive
Operations

Coupling /
Uncoupling

Shunting

Rerailing

Haulage
Safety

Worker-
Equipment
Interaction

Critical Control Management Lifecycle

Prevent

Mitigate

Verify

Assure

Phase 1

- Critical Controls
- Leadership
- Haulage Safety

Phase 2

- Infrastructure
- Maintenance
- Predictive Analytics

Phase 3

- Smart Rail
- Automation
- Centre of Excellence

Executive Conclusions

From Evidence to Action

1. RBE risk is concentrated in identifiable operations, locations and commodities.
2. Engineering, organisational and human factors must be managed as an integrated system.
3. Critical Control Management is the most effective strategy for reducing high-consequence events.
4. Infrastructure renewal, maintenance and technology strengthen both safety and operational performance.
5. A proactive, evidence-based approach is essential to achieve MHSC's Zero Harm vision.

CALL TO ACTION

Focus resources on the highest-risk railbound operations, strengthen critical controls, modernise infrastructure, and embed proactive risk management to accelerate progress towards MHSC's Zero Harm vision.

Research Report:

ANALYSIS OF RAILBOUND EQUIPMENT (RBE) SAFETY PERFORMANCE DATA (2017 – 2025) TO GENERATE ACTIONABLE INSIGHTS THAT SUPPORT MHSC'S ZERO HARM OBJECTIVES

CHAPTER 1: INTRODUCTION

CHAPTER 2: RESEARCH METHODOLOGY

CHAPTER 3: PROFILE OF RAILBOUND EQUIPMENT INCIDENTS

CHAPTER 4: ECONOMIC AND PRODUCTIVITY IMPACT OF RBE INCIDENTS

CHAPTER 5: CORRELATION AND RELATIONSHIP ANALYSIS

CHAPTER 6: EVOLUTION OF RBE RISK DRIVERS (STRUCTURAL SHIFT)

CHAPTER 7: STRATEGIC FRAMEWORK FOR REDUCING RBE RISK

CHAPTER 8: COST–BENEFIT ANALYSIS OF THE PROPOSED STRATEGY

CHAPTER 9: RISK HEATMAP ANALYSIS AND PRIORITISATION FRAMEWORK

CHAPTER 10: CRITICAL CONTROL FRAMEWORK FOR RBE OPERATIONS

CHAPTER 11: MHSC IMPLEMENTATION ROADMAP (2026–2030)

CHAPTER 12: CONCLUSIONS AND RECOMMENDATIONS

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Industry Collaboration Partner

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The successful completion of this study reflects a shared commitment to improving railbound equipment safety and advancing Zero Harm in the South African mining industry.



**Every mine worker returning from work unharmed every day.
Striving for zero harm in our lifetime.**



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