RRV Safety Improvement
Adelaide, 14 October 2013
RRV safety improvement

With a history of poor safety performance, coupled with intelligence gathered from industry, the ONRSR is concerned that these risks remain an ongoing threat and action is needed to improve safety.
Haig – Western Australia
Perth, City Link – Western Australia
Rinadeena - Tasmania
Purpose of workshops

- Build on **industry knowledge** sharing from earlier RRV workshops
- Highlight **known significant** RRV risk factors
- Suggest **tools and approaches** operators may consider in the assessment and management of RRV risks for their own situations
- **Update industry** on the development of the RISSB RRV standard
- Outline **ONRSR’s expectations** in terms of RRV safety improvement actions by operators.
ONRSR overview

National Focus on the RRV issues by ONRSR

• Overview of Approach
• Co- Regulatory Approach
• Evaluate and promote safety
• Inform industry of risks and actions required
• Check for compliance: eg, effective risk controls
• Enforce where required - graduated enforcement approach
ONRSR overview

- Rail Safety National Law 2012 (in SA)
- ONRSR (in Adelaide)
- Central Branch Structure
- Regulatory Interface with Industry

Questions on the new arrangements in Central Branch?
ONRSR approach to RRV safety

• Inform Industry of the issues:
  – National and strategic RRV issues (long term)
  – Accredited operator issues (here and now)
  – Inform industry of risks and actions expected
    • Workshops
    • Safety Bulletin
    • Tools (Bow Ties) on website
    • Accredited Operators and the contractors they employ
ONRSR approach to RRV safety

– Check for compliance e.g. –
  • have risks been re-assessed?
  • are effective risk controls in place?

– Enforce where required
  • ONRSR Compliance and Enforcement Policy
  • Proportionate response

Test at the end 😊
RRV types, use & operating modes

• Types: A/B/C & trailers

• Use
  – Running between worksites
  – Maintenance and inspection of track

• Operating modes
  – Possession (authority to operate within worksite)
  – Possession (running between worksites)
  – Possession (track maintenance and inspection)
  – Railing / off railing
  – Stowage on rail
Work to date

Non-technical issues identified

Standards

• Applicability of current rolling stock standards
• Proliferation of requirements (e.g., multiple RIMS etc)
• Differing terminology/classification systems (UK/local)
• Requirement for specific RRV national standard?
• Capture existing good work (LOR, JHR, V-line etc)
Items considered for inclusion in registration process

- Registration
- Twist Test
- Brake Test
- Rolling Stock Outline
- Electrical
- Ride Stability Test
- Flashing Light: linked
- Reversing Beeper
- Reversing Camera
- Insulated Wheels
- Super Singles
- Twin Tyred
- ROP’s / FOP’s
- Vigilance Control
- Event Recorder
- Distance Recorder
- Engineer’s Report
- Re – Registration
- Interlocking Systems
- Visual Displays
- Operator Control Device
- Audible Warning Device
- Height / Slew / Reach Indicator
- Hi-Rail Guidance Compliance Plates
- Vertical Load
- Safe Working Load
- Parking Brake Capability
- Speed Indicator Device
- EWPs Compliant to AS 2550
- Axle Load Compliant
- EPA Noise and Vibration Control
Items considered for inclusion in registration process

- Distance Recorder
- Engineer’s Report
- Re – Registration
- Interlocking Systems
- Visual Displays
- Operator Control Device
- Audible Warning Device
- Height / Slew / Reach Indicator
- Hi-Rail Guidance Compliance Plates

- Vertical Load
- Safe Working Load
- Parking Brake Capability
- Speed Indicator Device
- EWP’s Compliant to AS 2550
- Axle Load Compliant
- EPA Noise and Vibration Control
# Registration – the current criteria

Many variations between rail infrastructure managers

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
Work to date

• Data
  – No national approach to incident data collection
  – Ability to trend data
  – RISSB building capacity for data collection/analysis
  – Will strengthen risk basis of RISSB standards
Work to date

• Risk management
  – Accidents/incidents occurring despite controls
  – Control effectiveness??

• Road authority vs. rail compatibility
  – Expense of crash testing

• Competence and culture
  – National approach to be revised, and
  – Vehicle specific training
  – Difference between Gangs and Head office
  – Low literacy can be an issue
Work to date

Technical issues identified

- Fitment and use of ancillary fail-safe braking systems
- Familiarity and understanding of braking systems
- Unplanned or unprepared on/off tracking
- Use of temporary buffer stops around high risk RRV operations
Contributing factors framework analysis

- All three types have similar problems of runaway risks
- Forgetting handbrake
- Judgment errors
- Poor maintenance
- Type 9B has significant other risks
Background information on hi rails

- Although all three Hi-rail configurations are at risk of runaways, examination of incident data and a detailed risk assessment from UK’s Network Rail, determined that type 9B (high-ride) Hi-Rail vehicles posed the highest risk in terms of runaways.

- All three configurations share common runaway risks such forgetting the handbrake, errors of judgment and poor maintenance. However, type 9B Hi-rails have additional risks not shared by the other two configurations.
Analysis of the problem

• On review of various investigation reports, the biggest proportion of previous runaways has arisen during the on- or off tracking process where the operator placed the Hi-rail, with no brakes fitted to the rail wheels, into a free wheel, unbraked, condition.

• An engineering means to prevent this occurring is progressively being fitted on some Hi-rails both in the UK and Australia. In the meantime, the prevention of a freewheel condition occurring depends on the operator correctly following the on/off-tracking

• Other runaways have occurred during braking where the rails were wet and/or contaminated and gradient has also been a factor in other incidents.
CFF of RAIB report – runaway type

• Twelve of the 18 runaways resulted from uncontrolled movement occurring from rest, usually during the on or off-tracking process.

• The remaining six incidents involved the vehicle not being able to stop in time, often due the conditions of the track and site (eg, gradient and rail contamination), travelling at excessive speed, as well as a combination of both.
CFF of RAIB report – individual & team actions

• The vast majority of the incidents (16) involved some kind of human error while operating the road-rail vehicle, such as the operator:
  – putting the vehicle in an unbraked condition; or
  – adopting an inappropriate technique when operating the vehicle.

• Some errors (2) occurred during preparation, such as:
  – the conditions of the track/site were not taking into account into the risk assessment; and
  – poor choice of on-off tracking location

• A few (4) errors also occurred due to a lack of communication between the operator and other track maintenance personnel (i.e. not communicating safety-critical information). There was one potential violation identified where the operator was using the vehicle in a manner contrary to procedures.
CFF of RAIB report – technical failures

• Out of the 18 incidents, only three incidents were found to result from technical failure. These were due to:
  – inadequate maintenance of the vehicle (i.e. tyre pressure not maintained);
  – the design of the park brake (which was unable to be applied due to uncoupling of the hydraulic brake and oil being trapped in the system); and
  – sub-optimal load sharing between the road wheels and the rail wheels of the vehicle.

• Lack of functionality of the road-rail vehicle and equipment was found to contribute to two incidents.
Work to date: ONRSR safety bulletin

Safety Bulletin
Managing the risks associated with road/rail vehicles
No. 1 – August 2013

The Office of the National Rail Safety Regulator (ONRSR) has been working closely with the rail industry to assist in the identification and management of risks associated with the operation of Road/Rail Vehicles (RRVs).

With a history of poor safety performance, coupled with intelligence gathered from industry, the ONRSR is concerned that these risks remain an ongoing threat and action is needed to improve safety.

In this, the first Safety Bulletin published by the ONRSR, the background to the risks associated with RRV operation and the work undertaken to date by the ONRSR in conjunction with industry is explored.

The ONRSR remains committed to working with industry to help manage these risks and this bulletin outlines the regulator’s future intentions in assisting industry to improve the safety of RRV operations.

Safety performance:
There has been a significant number of RRV occurrences in recent years, some with fatal consequences.

Recent incidents include:
- 4 June 2013 – Richmond Tasmania, RRV collision, serious injury and multiple minor injuries
- 24 May 2012 – Holig Western Australia, track worker struck and killed by RRV
- 30 December 2011 – Perth Western Australia, track worker struck and killed by RRV.

Based on the known incidents data, supported by intelligence gathered from industry, the ONRSR is concerned that the risk associated with the operation of these vehicles remains unacceptably high and that action is needed to improve safety performance.

The issues surrounding RRV safety are compounded by the large range of RRV types, the range of incidents experienced and the many sources of risk that require effective management.
Work to date: PHA results & bow ties

Top Events
- Runaway
- Collision
  - On/Off Railing
- Derailment
- RRV Fire
- Equipment failure
  - Electro / hydraulic pneumatic / mechanical
  - Inadequate design (interlocking)
  - Unfit for purpose
  - Inadequate maintenance
  - Lack of pre-work inspection / daily checks
  - Lack of annunciation
  - Lack of physical barriers (for stowage)
- Inadequate interface management between infrastructure contractors – inconsistent standards
  - Inadequate incident reporting
  - Safe work practice (inc. SWMS, pre-work insp. etc.)
  - Inadequate policies / procedures / rules
  - Time, budget, resource constraints
  - Poor organisation culture
  - No MOU with emergency services
  - No road licence
  - Complexity of operation
- Gradient / location / terrain
  - Weather events
  - Bugs / insects
  - Rail / track interface (coefficient of friction), contamination
  - Lack of visibility
  - Inadequate condition of base for on / off railing
  - Vandalism (during stowage)
  - Site constraints
- Fatigue
  - Inadequate incident reporting
  - Operator error / violation
  - Inadequate communication
  - Lack of visibility
  - Error annunciation
  - Human performance limitation
  - Infrequent emergency rehearsals / contingency planning
  - Competency / capacity / knowledge / decision making
  - Driver incapacitation
- Overrun territory
- Overrun authority
- Damage to plant / infrastructure / equipment / reputation
- Personnel injury (LTI) / fatality
- Loss of insurance
- Loss of accreditation
- Public liability
- Prosecution
- Electrocution
- Loss of productivity

Refer to control slide

RRV Runaway 1 of 3
Runaway control

Technical (technical failures)
- Equipment failure [Control ID: 1, 2, 3, 5, 6, 7, 8, 12, 14, 20, 22, 23, 24, 25, 26, 32, 33, 35, 36, 38]
  - Electro / hydraulic / pneumatic / mechanical
- Inadequate design (interlocking) [Control ID: 2, 3, 5, 9, 11, 12, 18, 32, 33]
- Unfit for purpose [Control ID: 1, 2, 3, 5, 6, 7, 12, 14, 18, 22, 32, 33, 38, 39]
- Inadequate maintenance [Control ID: 1, 5, 6, 7, 8, 9, 10, 11, 13, 18, 32, 33, 38, 39]
- Lack of pre-work inspection / daily checks [Control ID: 1, 6, 7, 8, 9, 10, 11, 13, 18, 38, 39]
- Lack of annunciation [Control ID: 2, 3, 5, 6, 7, 9, 10, 11, 12, 13]
- Lack of physical barriers (for stowage) [Control ID: 1, 6, 10, 13, 15, 16, 18, 21, 22, 23, 24, 38]

Environment (local conditions)
- Gradient / location / terrain [Control ID: 1, 4, 5, 6, 9, 10, 13, 14, 15, 16, 17, 18, 19, 20, 21, 23, 24, 25, 26, 29, 31, 32, 33, 35, 36, 37, 38]
- Weather events [Control ID: 1, 10, 13, 16, 17, 18, 19, 26, 30, 35, 37, 38]
- Bugs / insects [Control ID: as per weather events]
- Rail / track interface (coefficient of friction), contamination [Control ID: 1, 2, 3, 6, 7, 9, 10, 14, 16, 17, 18, 21, 23, 24, 26, 35, 36, 37, 38, 39]
- Lack of visibility [Control ID: 12, 10, 14, 15, 16, 17, 18, 19, 21, 26, 30, 31, 37, 38, 39]
- Inadequate condition of base for on / off railing [Control ID: 1, 2, 3, 7, 9, 10, 14, 16, 18, 20, 21, 26, 30, 32, 35, 36, 38, 39]
- Vandalism (during stowage) [Control ID: 1, 2, 3, 9, 10, 18, 21, 22, 23, 24, 21]
- Site constraints [Control ID: 1, 2, 3, 10, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 26, 30, 31, 35, 36, 37, 38, 39]

People (individual / team actions)
- Fatigue [Control ID: 1, 8, 10, 13, 15, 34, 38]
- Inadequate incident reporting [Control ID: 1, 5, 9, 10, 11, 13, 14, 18, 33, 38]
- Operator error / violation [Control ID: 1, 5, 6, 8, 9, 10, 13, 15, 16, 17, 18, 20, 21, 25, 26, 27, 30, 33, 35, 36, 37]
- Inadequate communication [Control ID: 1, 5, 6, 10, 12, 13, 19, 30, 38, 38, 15]
- Lack of visibility (???)
- Error announcement (???)
- Human performance limitation (???)
- Infrequent emergency rehearsals / contingency planning [Control ID: 1, 2, 5, 10, 13, 23, 37, 38]
- Competency / capacity / knowledge / decision making [Control ID: 1, 5, 8, 10, 13, 38]
- Driver incapacitation [Control ID: 1, 3, 5, 8, 10, 13, 36, 38]

Systems (organisational factors)
- Inadequate interface management between infrastructure contractors – inconsistent standards [Control ID: 1, 2, 4, 5, 6, 7, 11, 14, 16]
- Inadequate incident reporting [Control ID: 1, 5, 10, 11]
- Safe work practice (inc. SWMS, pre-work insp. etc.) [Control ID: 1, 4, 5, 18, 10, 11]
- Inadequate policies / procedures / rules [Control ID: 1, 11, 16, 18]
- Time, budget, resource constraints [Control ID: 1, 1, 2, 6, 7, 12, 14, 33]
- Poor organisation culture [Control ID: 11, 13, 18, 1, 4, 5, 10, 15, 38]
- No MOU with emergency services [Control ID: 1, 6, 4, 5, 10, 11, 14, 18]
- No road licence [Control ID: 1, 5, 6, 10, 13, 38]
- Complexity of operation [Control ID: 1, 5, 7, 9, 10, 13, 38]
<table>
<thead>
<tr>
<th>Hazardous event</th>
<th>Potential Cause(s)</th>
<th>Potential Consequence(s)</th>
<th>Existing control(s)</th>
<th>Proposed control(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RRV Runaway 3 of 3</td>
<td>Technical (technical failures)</td>
<td>• Collision with train / vehicle / other plant / infrastructure / personnel / personnel</td>
<td>1. SOPs / JSAs / SWMS / Management standards</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Equipment failure [Control ID: 1, 2, 3, 5, 6, 7, 8, 12, 14, 20, 22, 23, 24, 25, 26, 32, 33, 35, 36, 38]</td>
<td>• Deraiment / rollover / SPAD / overrun territory / overrun authority / damage to plant / equipment / infrastructure / reputation / personnel injury (LTI) / fatality / loss of insurance / accreditation / public liability / prosecution / electrocution / loss to productivity</td>
<td>2. Technical and performance specifications</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Electro / hydraulic pneumatic / mechanical</td>
<td></td>
<td>3. Design input</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Inadequate design (interlocking) [Control ID: 2, 3, 5, 39, 9, 11, 12, 18, 32, 33]</td>
<td></td>
<td>4. Accreditation of organisation / equipment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Unfit for purpose [Control ID: 1, 2, 3, 5, 6, 7, 9, 12, 14, 18, 22, 32, 33, 38, 39]</td>
<td></td>
<td>5. Technical registration / certification / training</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Inadequate maintenance [Control ID: 1, 5, 6, 7, 8, 9, 10, 11, 12, 13, 18, 32, 33, 38, 39]</td>
<td></td>
<td>6. System checks – sampling of procedural controls</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Lack of pre-work inspection / daily checks [Control ID: 1, 6, 7, 8, 9, 10, 11, 13, 18, 38, 39]</td>
<td></td>
<td>7. Long-term monitoring</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Lack of announcement [Control ID: 2, 3, 5, 6, 7, 9, 10, 11, 12, 13]</td>
<td></td>
<td>8. Fatigue, D&amp;A management</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Lack of physical barriers (for stowage) [Control ID: 1, 6, 10, 13, 15, 16, 18, 21, 22, 23, 24, 38]</td>
<td></td>
<td>9. Maintenance / inspection schedules &amp; plans</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Environment (local conditions)</td>
<td></td>
<td>10. Inductions</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Gradient / location / terrain [Control ID: 1, 4, 5, 6, 9, 10, 13, 14, 15, 16, 17, 18, 19, 20, 21, 23, 24, 25, 26, 31, 32, 33, 35, 36, 37, 38]</td>
<td></td>
<td>11. Industry / regulator interactions / alerts</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Weather events [Control ID: 1, 10, 13, 16, 17, 18, 19, 26, 30, 35, 37, 38]</td>
<td></td>
<td>12. Procurement processes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Bugs / insects [Control ID: as per weather events]</td>
<td></td>
<td>13. People management – discipline arrangements / training / culture</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Rail / track interface (coefficient of friction), contamination</td>
<td></td>
<td>14. Interface management</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Lack of visibility [Control ID: 12, 10, 14, 15, 16, 17, 18, 19, 21, 26, 30, 31, 37, 38, 39]</td>
<td></td>
<td>15. Possession management / coordination / network registration</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Inadequate condition of base for on / off raling [Control ID: 1, 2, 3, 7, 9, 10, 14, 16, 17, 18, 21, 23, 24, 26, 35, 36, 37, 38, 39]</td>
<td></td>
<td>16. Network rules</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Site constraints [Control ID: 1, 2, 3, 10, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 26, 30, 31, 35, 36, 37, 38, 39]</td>
<td></td>
<td>17. Route competency</td>
<td></td>
</tr>
<tr>
<td></td>
<td>People (individual / team actions)</td>
<td></td>
<td>18. Workplace inspections / investigations / training</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Fatigue [Control ID: 1, 8, 10, 13, 15, 34, 38]</td>
<td></td>
<td>19. Secondary / alternate comms.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Inadequate incident reporting [Control ID: 1, 5, 9, 10, 11, 13, 14, 18, 33, 38]</td>
<td></td>
<td>20. Derailers / level crossing infrastructure</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Operator error / violation [Control ID: 1, 5, 6, 8, 9, 10, 13, 15, 16, 17, 18, 20, 21, 25, 26, 27, 30, 33, 35, 36, 37]</td>
<td></td>
<td>21. Catch points / derailers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Inadequate communication [Control ID: 1, 5, 6, 10, 12, 13, 19, 30, 38, 15]</td>
<td></td>
<td>22. Site security (for stowage)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Lack of visibility (????)</td>
<td></td>
<td>23. Chocks for stowage (for stowage)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Error annunciation (????)</td>
<td></td>
<td>24. Stow vehicle off-track</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Human performance limitation (???)</td>
<td></td>
<td>25. derailers, skids, speed limiters</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Infrequent emergency rehearsals / contingency planning [Control ID: 1, 2, 5, 10, 13, 23, 38]</td>
<td></td>
<td>26. braking systems</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Competency / capacity / knowledge / decision making [Control ID: 1, 3, 5, 8, 10, 13, 38]</td>
<td></td>
<td>27. speed board</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Driver incapacitation [Control ID: 1, 3, 5, 8, 10, 13, 36, 38]</td>
<td></td>
<td>28. data logger</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Systems (organisational factors)</td>
<td></td>
<td>29. GPS tracking</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Inadequate interface management between infrastructure contractors – inconsistent standards [Control ID: 1, 2, 4, 5, 6, 7, 11, 14, 16]</td>
<td></td>
<td>30. Comms. Protocols</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Inadequate incident reporting [Control ID: 1, 5, 10, 11]</td>
<td></td>
<td>31. Train protection</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Safe work practice (inc. SWMS, pre-work insp., etc.) [Control ID: 1, 4, 5, 18, 10, 11]</td>
<td></td>
<td>32. Asset lifecycle management</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Inadequate policies / procedures / rules [Control ID: 1, 11, 16, 18]</td>
<td></td>
<td>33. Change management</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Time, budget, resource constraints [Control ID: 1, 2, 6, 7, 12, 14, 33]</td>
<td></td>
<td>34. Health standards</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Poor organisation culture [Control ID: 11, 13, 18, 1, 4, 5, 10, 15, 38]</td>
<td></td>
<td>35. on/off track pads</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• No MOU with emergency services [Control ID: 1, 6, 4, 5, 10, 11, 14, 18]</td>
<td></td>
<td>36. interlocks</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• No road licence [Control ID: 1, 5, 6, 10, 13, 38]</td>
<td></td>
<td>37. Weather monitoring</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Complexity of operation [Control ID: 1, 5, 7, 9, 10, 13, 38]</td>
<td></td>
<td>38. supervision</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>39. Rail safety investigations</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>40. Driver safety systems</td>
<td></td>
</tr>
</tbody>
</table>
Collision

Technical Failures (Technical)
- Travelling outside kinematic envelope
- Mechanical failure
- Failure of RRV to activate signals / telemetry
- No track protection at a breakdown
- Equipment design (e.g. Deadman / vigilance)
- Poor tyre tread condition
- Brake failure
- Not fit for purpose
- Equipment failure
- No brakes
- Design modification
- Inadequate design

Local Conditions (Environment)
- Temporary works unknown
- Line of sight
- Flooding, Rain, mud, cold, heat, animals etc.
- Adverse weather conditions
- Crossings
- Infrastructure impedes travel (due to failure)
- Track obstructions (tree or work tools, vandalism etc)
- Wheel / track interface (coefficient of friction)
- Track defect
- Accident by road vehicle at level crossing
- Contamination on rail
- Gradient
- Sun glare

Individual / Team Action (People)
- Poor / non existent communications (radio protocols)
- Lack of situational awareness
- Poor possession management / level of knowledge
- Poor speed management
- Line of sight
- Route knowledge / competency
- Fitness for work
- Violation
- SPAD
- Driver incapacitation
- Vehicle attachment not stowed
- Competency
- Violation
- Lack of skills in emergency situation
- Communication error

Organisational Factors (Systems)
- Poor / non existent communications (radio protocols)
- Poor possession management / level of knowledge
- Time pressures / work patterns
- Moving in convoy

Collision with train
Collision with vehicle / other plant
Collision with infrastructure
Collision with personnel
Damage to plant / infrastructure / equipment / reputation
Environmental damage
Personnel injury (LTI) / fatality
Loss of insurance
Loss of accreditation
Public liability
Prosecution
Electrocution
Loss of productivity

RRV Collision 1 of 5
Collision control (off rail)

Technical (technical failures)
- Travelling outside kinematic envelope [Control ID: 1, 2, 5, 10, 8, 17, 20, 25]
- Loss of load / trailer [Control ID: 1, 2, 3, 4, 5, 6, 8, 9, 10, 12, 13, 17, 19, 20, 22, 23, 25]
- Mechanical failure [Control ID: 1, 2, 3, 5, 6, 10, 13, 15, 17, 18, 19, 20, 25]
- Failure of RRV to activate signals / telemetry [Control ID: 1, 2, 3, 5, 7, 8, 10, 17, 19, 20, 25]
- No track protection at a breakdown [Control ID: 1, 2, 3, 8, 17, 18, 20, 25]
- Equipment design (e.g. Deadman / vigilance) [Control ID: 1, 2, 4, 5, 8, 10, 13, 15, 19, 20]
- Poor tyre tread condition [Control ID: 1, 2, 3, 4, 5, 6, 8, 10, 13, 17, 19, 20, 23, 24, 25]
- Brake failure [Control ID: 1, 2, 3, 5, 6, 10, 13, 15, 17, 18, 19, 20, 24, 25]
- Not fit for purpose [Control ID: 1, 3, 2, 4, 5, 8, 10, 13, 15, 19, 20]

People (individual / team actions)
- Poor / non existent communications (radio protocols) [Control ID: 3, 17, 8, 10, 16, 25]
- Lack of situational awareness [Control ID: 16, 8, 17, 21, 25, 24]
- Poor speed management [Control ID: 6, 15, 16, 14, 21, 24, 25]
- Violation [Control ID: 9, 6, 24, 8, 11, 21]
- Route knowledge / competency [Control ID: 3, 6, 8, 14, 24, 25]
- Fitness for work [Control ID: 3, 21, 25]
- Moving in convoy [Control ID: 1, 3, 6, 5, 10, 8, 9, 17, 12, 14, 25, 24, 18, 7]

Environment (local conditions)
- Temporary works unknown [Control ID: 1, 2, 3, 6, 8, 9, 12, 13, 20, 17, 25, 14]
- line of sight [Control ID: 1, 2, 3, 5, 6, 8, 9, 10, 12, 17, 20, 21, 24, 25]
- Flooding, Rain, mud, cold, heat, animals etc. [Control ID: 2, 24, 4, 6, 21, 8, 10, 12, 13, 14, 20, 17, 24, 25]
- Adverse weather conditions [Control ID: Refer to flooding etc.]
- Crossings [Control ID: 1, 2, 3, 4, 5, 6, 8, 9, 10, 12, 13, 17, 18, 20, 24, 25]
- Infrastructure impedes travel (due to failure) [Control ID: 1, 2, 3, 6, 8, 12, 14, 17, 18, 20, 25]
- Track obstructions (tree or work tools, vandalism etc) [Control ID: 2, 3, 6, 8, 12, 13, 17, 20, 25]
- Wheel / track interface (coefficient of friction) [Control ID: 1, 2, 3, 4, 5, 6, 8, 9, 12, 10, 13, 17, 19, 25, 20, 24, 23]
- Track defect [Control ID: 1, 2, 3, 4, 5, 6, 14, 8, 12, 17, 19, 20, 25, 24]

Systems (organisational factors)
- Poor / non existent communications (radio protocols) [Control ID: 8, 17, 18, 3, 5]
- poor possession management / level of knowledge [Control ID: 3, 8, 20, 17, 25, 18]
- Time pressures / work patterns [Control ID: 8, 20, 21, 25, 3]
- Moving in convoy [Control ID: 1, 3, 6, 5, 10, 8, 9, 17, 12, 14, 25, 24, 18, 7]
Collision control (off rail)

Non-emergency

Technical (technical failures) [Control ID: 7, 8]
- Equipment failure
- No brakes
- Design modification
- Inadequate design

Environment (local conditions) [Control ID: 1, 3]
- Accident by road vehicle at level crossing
- Contamination on rail
- Gradient
- Sun glare

People (individual / team actions)
- Travelling in convoy (poor communication protocol) [Control ID: 6, 7]
- Not sticking to plan [Control ID: 6, 7]
- Not competent on type of equipment [Control ID: 5]
- Not questioning authority if in doubt (safety culture) [Control ID: 3]
- Violations [Control ID: 1, 3, 5, 6, 7]
- Fitness for duty – fatigue, D&A, incapacitation

Systems (organisational factors)
- Inadequate training processes [Control ID: 4, 5, 7, 8]
- Inadequate procedures [Control ID: 9, 10]
- Inadequate standards [Control ID: 9, 10]
- Production demands [Control ID: 6, 7, 8, 9, 10]
- Inadequate resourcing [Control ID: 5, 11]
- Not competent on type of equipment [Control ID: 4, 5, 7, 8]
- Inadequate change management [Control ID: 3, 7, 6]

Emergency

Technical (technical failures) [Control ID: 6, 8]
- Unable to move machine
- No brakes
- Design modification
- Inadequate design

Environment (local conditions) [Control ID: 1, 4, 6, 2]
- Off rail at non specified location / inappropriate location
- Contamination
- Gradient
- Visibility
- Terrain / infrastructure problem
- Washaway
- Bushfires / snow

People (individual / team actions) [Control ID: 1, 2, 3, 4, 5, 6, 7, 8, 9]
- Competency
- Violation
- Lack of skills in emergency situation
- Communication error

Systems (organisational factors)
- Safe work component [Control ID: 1, 2]
- Inadequate consideration of all aspects of an “emergency” [Control ID: 1, 2, 3, 4]
- Production demands [Control ID: 1, 2, 7]
- Inadequate training procedures [Control ID: 3, 6]
- Inadequate resourcing [Control ID: 9, 6]
- Inadequate procedure [Control ID: 10]
<table>
<thead>
<tr>
<th>Hazardous event</th>
<th>Potential Cause(s)</th>
<th>Potential Consequence(s)</th>
<th>Existing control(s)</th>
<th>Proposed control(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RRV Collision</td>
<td>Technical (technical failures)</td>
<td>• Environmental damage</td>
<td>1. OEM / RIM standards</td>
<td>Separation alarm systems</td>
</tr>
<tr>
<td></td>
<td>• Travelling outside kinematic envelope</td>
<td>• Collision with train / vehicle / other plant / infrastructure / personnel</td>
<td>2. Visual inspections</td>
<td>All trailers brake system fitted</td>
</tr>
<tr>
<td></td>
<td>• Loss of load / trailer</td>
<td>• Derailment / rollover</td>
<td>3. Training</td>
<td>Clarification of where vigilance control systems are required</td>
</tr>
<tr>
<td></td>
<td>• Mechanical failure</td>
<td>• SPAD</td>
<td>4. Weight guides</td>
<td>Clarify design consistency needs (RIM/OEM engineering issues)</td>
</tr>
<tr>
<td></td>
<td>• Failure of RRV to activate signals / telemetry</td>
<td>• Overrun territory</td>
<td>5. Vehicle maintenance</td>
<td>Proximity sensors</td>
</tr>
<tr>
<td></td>
<td>• No track protection at a breakdown</td>
<td>• Overrun authority</td>
<td>6. Driving to conditions</td>
<td>Audible alarms (loss of traction (better alarms automated))</td>
</tr>
<tr>
<td></td>
<td>• Equipment design (e.g. Deadman / vigilance)</td>
<td>• Damage to plant, equipment, infrastructure, reputation</td>
<td>7. Vigilance system</td>
<td>Coupling rules (physical connections rules in context with equipment)</td>
</tr>
<tr>
<td></td>
<td>• Poor tyre tread condition</td>
<td>• Personnel injury (LTI) / fatality</td>
<td>8. Rules &amp; procedures</td>
<td>Emergency response (expanded scenarios)</td>
</tr>
<tr>
<td></td>
<td>• Brake failure</td>
<td>• Loss of insurance / accreditation</td>
<td>9. Cameras, audible alarms (some RRVs)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Not fit for purpose</td>
<td>• Public liability</td>
<td>10. Maintenance</td>
<td></td>
</tr>
<tr>
<td>Environment (local conditions)</td>
<td>• Temporary works unknown</td>
<td>• Prosecution</td>
<td>11. 6m Rule (some)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• line of sight</td>
<td>• Electrocution</td>
<td>12. 15km/h limit (some)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Flooding, Rain, mud, cold, heat, animals etc.</td>
<td>• Environmental damage</td>
<td>13. Braking systems</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Adverse weather conditions</td>
<td>• Environmental damage</td>
<td>14. Speed board</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Infrastructure impedes travel (due to failure)</td>
<td>• Collision with train / vehicle / other plant / infrastructure / personnel</td>
<td>15. Data logger</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Track obstructions (tree or work tools, vandalism etc)</td>
<td>• Derailment / rollover</td>
<td>16. GPS tracking</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Wheel / track interface (coefficient of friction)</td>
<td>• SPAD</td>
<td>17. Comms. Protocols</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Track defect</td>
<td>• Overrun territory</td>
<td>18. Train protection and worksite protection</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• People (individual / team actions)</td>
<td>• Overrun authority</td>
<td>19. Asset lifecycle management</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Poor / non existing communications (radio protocols)</td>
<td>• Damage to plant, equipment, infrastructure, reputation</td>
<td>20. Change management</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Lack of situational awareness</td>
<td>• Personnel injury (LTI) / fatality</td>
<td>21. Health standards / fatigue management</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• poor possession management / level of knowledge</td>
<td>• Loss of insurance / accreditation</td>
<td>22. on/off track pads</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Poor speed management</td>
<td>• Public liability</td>
<td>23. interlocks</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• line of sight</td>
<td>• Prosecution</td>
<td>24. Weather monitoring</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Route knowledge / competency</td>
<td>• Electrocution</td>
<td>25. supervision</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Fitness for work</td>
<td>• Collision with train / vehicle / other plant / infrastructure / personnel</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Violation</td>
<td>• Derailment / rollover</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• SPAD</td>
<td>• Overrun territory</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Driver incapacitation</td>
<td>• Overrun authority</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Vehicle attachment not stowed</td>
<td>• Damage to plant, equipment, infrastructure, reputation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Systems (organisational factors)</td>
<td>• Poor / non existing communications (radio protocols)</td>
<td>• Personnel injury (LTI) / fatality</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• poor possession management / level of knowledge</td>
<td>• Loss of insurance / accreditation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Time pressures / work patterns</td>
<td>• Public liability</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Moving in convoy</td>
<td>• Prosecution</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hazardous event</td>
<td>Potential Cause(s)</td>
<td>Potential Consequence(s)</td>
<td>Existing control(s)</td>
<td>Proposed control(s)</td>
</tr>
<tr>
<td>----------------</td>
<td>-------------------</td>
<td>--------------------------</td>
<td>---------------------</td>
<td>---------------------</td>
</tr>
</tbody>
</table>
| RRV Collision (specific to off rail) | Technical (technical failures) [Control ID: 7, 8]  
  - Equipment failure  
  - No brakes  
  - Design modification  
  - Inadequate design  
  Environment (local conditions) [Control ID: 1, 3]  
  - Accident by road vehicle at level crossing  
  - Contamination on rail  
  - Gradient  
  - Sun glare  
  People (individual / team actions)  
  - Travelling in convoy (poor communication protocol) [Control ID: 6, 7]  
  - Not sticking to plan [Control ID: 6, 7]  
  - Not competent on type of equipment [Control ID: 5]  
  - Not questioning authority if in doubt (safety culture) [Control ID: 3]  
  - Violations [Control ID: 1, 3, 5, 6, 7]  
  - Fitness for duty – fatigue, D&A, incapacitation  
  Systems (organisational factors)  
  - Inadequate training processes [Control ID: 4, 5, 7, 8]  
  - Inadequate procedures [Control ID: 9, 10]  
  - Inadequate standards [Control ID: 9, 10]  
  - Production demands [Control ID: 6, 7, 8, 9, 10]  
  - Inadequate resourcing [Control ID: 5, 11]  
  - Not competent on type of equipment [Control ID: 4, 5, 7, 8]  
  - Inadequate change management [Control ID: 3, 7, 6] | • Environmental damage  
  • Collision with train / vehicle / other plant / infrastructure / personnel  
  • Derailment / rollover  
  • SPAD  
  • Overrun territory  
  • Overrun authority  
  • Damage to plant, equipment, infrastructure, reputation  
  • Personnel injury (LTI) / fatality  
  • Loss of insurance / accreditation  
  • Public liability  
  • Prosecution  
  • Electrocuton  
  • Loss to productivity  
  • Delayed emergency services  
  • Delay of services  
  • Fire | 1. Protection/SAFEwoorking  
  2. Education  
  3. Communication  
  4. Up skilling  
  5. competencies  
  6. Network rules  
  7. Procedures  
  8. Standards  
  9. Project review  
  10. SMS review  
  11. Resourcing capacity  
  12. Fit to task / people / equipment |
| RRV Collision (specific to emergency off rail) | Technical (technical failures) [Control ID: 6, 8]  
  - Unable to move machine  
  - No brakes  
  - Design modification  
  - Inadequate design  
  Environment (local conditions) [Control ID:1, 4, 6, 2]  
  - Off rail at non specified location / inappropriate location  
  - Contamination  
  - Gradient  
  - Visibility  
  - Terrain / infrastructure problem  
  - Washaway  
  - Bushfires / snow  
  People (individual / team actions) [Control ID: 1, 2, 3, 4, 5, 6, 7, 8, 9]  
  - Competency  
  - Violation  
  - Lack of skills in emergency situation  
  - Communication error  
  Systems (organisational factors)  
  - Safe work component [Control ID: 1, 2]  
  - Inadequate consideration of all aspects of an “emergency” [Control ID: 1, 2, 3, 4]  
  - Production demands [Control ID: 1, 2, 7]  
  - Inadequate training procedures [Control ID: 3, 6]  
  - Inadequate resourcing [Control ID: 9, 6]  
  - Inadequate procedure [Control ID: 10] | • Environmental damage  
  • Collision with train / vehicle / other plant / infrastructure / personnel  
  • Derailment / rollover  
  • SPAD  
  • Overrun territory  
  • Overrun authority  
  • Damage to plant, equipment, infrastructure, reputation  
  • Personnel injury (LTI) / fatality  
  • Loss of insurance / accreditation  
  • Public liability  
  • Prosecution  
  • Electrocuton  
  • Loss to productivity  
  • Delayed emergency services  
  • Delay of services  
  • Fire | 1. Protection / safetyworking  
  2. Communication  
  3. Training  
  4. Competencies  
  5. Fit to task / PPL and equipment  
  6. Procedures  
  7. Network rules  
  8. Engineering standards  
  9. Resourcing  
  10. SMS review |
Derailment

Technical Failures (Technical)
- Poor interoperability
- Not fit for purpose
- Rail gear not correctly engaged
- Rail gear not correctly aligned
- Wrong sized tyres
- Incorrect tyre pressures
- Tyre puncture
- Poor tyre tread condition
- Brake failure
- Stub axle failure
- Loading

Local Conditions (Environment)
- Substandard infrastructure
- Variability in operating areas (weathers, heat etc)
- Time of day for operation
- Points moving under vehicle
- Track obstructions
- Wheel / track interface (friction coefficient)
- Track defect

Individual / Team Action (People)
- Planned derailment
- Error / violation / Distractions
- Competency
- Rail gear not correctly engaged
- Overspeeding
- Exceed authority

Organisational Factors (Systems)
- Inappropriate speed limitations
- Inappropriate loading limits
- Planned derailment
- Substandard pre-work inspections / maintenance

Environmental damage
Collision with train
Collision with vehicle / other plant
Overrun territory
Overrun authority
Damage to plant / infrastructure / equipment / reputation
Personnel injury (LTI) / fatality
Loss of insurance
Loss of accreditation
Public liability
Prosecution
Electrocution
Loss of productivity

Refer to control slide
Derailment control

Technical (technical failures)
- Poor interoperability (machine, network, operator) [Control ID: 26, 1, 3, 20, 5, 6, 13, 7, 8, 9, 10, 11, 12, 16, 17, 22]
- Not fit for purpose [Control ID: 1, 2, 3, 5, 4, 6, 8, 12, 13, 20, 23, 26]
- Rail gear not correctly engaged [Control ID: 2, 3, 5, 8, 12, 23]
- Rail gear not correctly aligned [Control ID: same as above]
- Wrong sized tyres [Control ID: 1, 2, 3, 5, 8, 12, 23, 19]
- Incorrect tyre pressures [Control ID: same as above]
- Tyre puncture [Control ID: 2, 5]
- Poor tyre tread condition [Control ID: 2, 5]
- Brake failure [Control ID: 2, 13, 1, 5, 4, 6]
- Stub axle failure [Control ID: 5, 3, 12, 13, 25, 23, 4]
- Loading [Control ID: 1, 2, 3, 4, 6, 8, 12, 13, 20, 25]

Environment (local conditions)
- Substandard infrastructure [Control ID: 1, 2, 3, 6, 8, 13, 25]
- Variability in operating areas (weathers, heat etc) [Control ID: 1, 3, 6, 8, 24]
- Time of day for operation [Control ID: 6]
- Points moving under vehicle [Control ID: 1, 3, 6, 8, 17]
- Track obstructions [Control ID: 6, 17, 24]
- Wheel / track interface (friction coefficient) [Control ID: 5, 2, 3, 1, 6, 8, 12]
- Track defect [Control ID: 6, 8, 17, 14]

People (individual / team actions)
- Planned derailment [Control ID: 9, 3, 17]
- Error / violation / Distractions [Control ID: 3, 6, 10, 11, 8, 12, 17, 14, 21, 25]
- Competency [Control ID: 1, 38, 12, 17, 25]
- Rail gear not correctly engaged [Control ID: 2, 3, 5, 8, 12, 23]
- Overspeeding [Control ID: 3, 6, 8, 14, 17, 25]
- Exceed authority [Control ID: 3, 8, 9, 17, 25]

Systems (organisational factors)
- Inappropriate speed limitations [Control ID: 1, 8, 14, 6, 25, 17]
- Inappropriate loading limits [Control ID: 1, 2, 4, 3, 8, 12, 25]
- Planned derailment [Control ID: 9, 3, 17]
- Substandard pre-work inspections / maintenance [Control ID: 1, 3, 8, 25]
<table>
<thead>
<tr>
<th>Hazardous event</th>
<th>Potential Cause(s)</th>
<th>Potential Consequence(s)</th>
<th>Existing control(s)</th>
<th>Proposed control(s)</th>
</tr>
</thead>
</table>
| RRV Derailment  | Technical (technical failures) | • Environmental damage
• Collision with train / vehicle / other plant / infrastructure / personnel
• Derailment / rollover
• SPAD
• Overrun territory
• Overrun authority
• Damage to plant, equipment, infrastructure, reputation
• Personnel injury (LTI) / fatality
• Loss of insurance / accreditation
• Public liability
• Prosecution
• Electrocution
• Loss to productivity | 1. OEM / RIM standards
2. Visual inspections
3. training
4. weight guides
5. vehicle maintenance
6. driving to conditions
7. vigilance system
8. rules & procedures
9. derailleurs, skids, speed limiters
10. D&A testing
11. Fatigue management
12. Pre-work inspections
13. braking systems
14. speed board (including TSR)
15. data logger
16. GPS tracking
17. Comms. Protocols
18. Train protection
19. Asset lifecycle management
20. Change management
21. Health standards
22. on/off track pads
23. interlocks
24. Weather monitoring
25. supervision
26. Ergonomics |
Technical Failures (Technical):
- Engine failure
- Failure generating sparks
- Friction heat
- Exhaust heat
- Equipment damage
- Non-compliance maintenance procedures
- Poor design

Local Conditions (Environment):
- Bushfire
- Vandalism

Individual / Team Action (People):
- Smoking
- Human error

Organisational Factors (Systems):
- None identified

Refer to control slide
Fire control

Technical (technical failures)
- engine failure [Control ID: 1, 2, 3, 5, 6, 7, 8, 9, 10]
- failure generating sparks [Control ID: 1, 2, 3, 6, 7, 8, 9]
- friction heat [Control ID: 1, 2, 3, 6, 7, 8]
- exhaust heat [Control ID: 1, 2, 3, 6, 7, 8]
- equipment damage [Control ID: refer to engine failure]
- Non-compliance maintenance procedures [Control ID: 1, 4, 6, 7, 9, 10]
- poor design [Control ID: 3]

Environment (local conditions)
- bushfire [Control ID: 1, 9, 10, 7, 6, 4]
- vandalism [Control ID: 6, 7, 9, 10, 4, 1, 7]

People (individual / team actions)
- smoking [Control ID: 1, 4, 6, 9, 10]
- human error [Control ID: as above]

Systems (organisational factors) [Control ID: 1, 6, 9, 10]

RRV Fire 2 of 3
<table>
<thead>
<tr>
<th>Hazardous event</th>
<th>Potential Cause(s)</th>
<th>Potential Consequence(s)</th>
<th>Existing control(s)</th>
<th>Proposed control(s)</th>
</tr>
</thead>
</table>
| RRV Fire       | Technical (technical failures)  
• engine failure [Control ID: 1, 2, 3, 5, 6, 7, 8, 9, 10]  
• failure generating sparks [Control ID: 1, 2, 3, 6, 7, 8, 9]  
• friction heat [Control ID: 1, 2, 3, 6, 7, 8]  
• exhaust heat [Control ID: 1, 2, 3, 6, 7, 8]  
• equipment damage [Control ID: refer to engine failure]  
• Non-compliance maintenance procedures [Control ID: 1, 4, 6, 7, 9, 10]  
• poor design [Control ID: 3]  
Environment (local conditions)  
• bushfire [Control ID: 1, 9, 10, 7, 6, 4]  
• vandalism [Control ID: 6, 7, 9, 10, 4, 1, 7]  
People (individual / team actions)  
• smoking [Control ID: 1, 4, 6, 9, 10]  
• human error [Control ID: as above]  
Systems (organisational factors) [Control ID: 1, 6, 9, 10] | Runaway | 1. Extinguishers  
2. spark suppression (some)  
3. design standards  
4. Rules & procedures  
5. Dust suppression (some)  
6. Maintenance procedures / SOPs  
7. Pre-work inspections  
8. System checks  
9. People management / training / culture  
10. Supervision |
Key issues for use of bow-ties

Consider:

- the RTO operating environment, including the scale and complexity of such operations
- the specific physical and operational characteristics of the RRVs that are operated
- the specific nature of operations of the RRVs, including where vehicles are placed on track, operated and taken off track
- the competencies of the personnel operating the equipment.
- Any controls identified through the RTO risk assessments should be integrated within operating procedures, training programs, competency assessments and assessed for effectiveness.
- Importantly, contractors that operate under an RTO’s safety management system should be assessed by the RTO to ensure they also have effective controls in place.
Issues of concern

• Competency
• RIM Approaches
• Variety of Equipment
• Rolling Stock vs RRVs
• Standards
• Complacency
ONRSR expectations

• Inform Industry of the issues.
  – National and Strategic RRV Issues – (long term)
  – Accredited Operator Issues – (here and now)
  – Inform industry of risks and actions expected
  – Questionnaire.

• Check for compliance
  – have risks been re-assessed?
  – are effective risk controls in place?

• Enforce where required
  – ONRSR Compliance and Enforcement Policy
  – Proportionate response
ONRSR expectations

What will ONRSR be looking for in its questionnaire?

• Data collection to gather and share intelligence on RRV use,
• RRV types and number?
• What are your arrangements with contractors?
• How you collect incident data and what you do with it?
• What would you like improved on data collection?
• Training and competency for RRV’s – who and what resources do you use?
• Internal audit processes – when was RRV safety last audited by your organisation?
• What additional hazards have you identified since the workshop?
• What controls did you implement as a result?
• What do you do well?
ONRSR expectations

Questionnaire timings

• 3 months post this workshop questionnaire will be sent out to organisations.
• 14 days to respond.
• You will need to take action before the questionnaire arrives!

• Focus of compliance activities based on questionnaire response
• No response means you will get a visit!
• De-identified information will be shared with RISSB and the RISSB standards development team.
ONRSR expectations: compliance

Not here to tell you how to fix it

• Demonstrate that your current risk register is adequately controlling the risks identified and supporting risk assessments remain valid.
  – Access to risk registers
  – Risk assessments
  – Reviews/internal audits

• Confirm identified controls are in place and effective.
ONRSR expectations

Compliance activities

• Focus throughout 2014

• Will be included in all programmed audits – systems and hazard analysis

• Additional compliance inspections – focused site inspection periods.
Results

• Knowledge sharing
  – Better knowledge of the number/ type and use of RRVs
  – Better understanding of the National Risk profile of RRV Operations

• Improve RRV Safety through improved knowledge and risk based actions
End presentation