RSU Appendix H – Automatic Equipment Identification

Version 1.0

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Standard governance

Owner: Lead Engineer Rolling Stock, Asset Standards Authority
Authoriser: Chief Engineer Rail, Asset Standards Authority
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Document history

<table>
<thead>
<tr>
<th>Version</th>
<th>Summary of change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>First issue</td>
</tr>
</tbody>
</table>

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Preface

The Asset Standards Authority (ASA) is an independent unit within Transport for NSW (TfNSW) and is the network design and standards authority for defined NSW transport assets.

The ASA is responsible for developing engineering governance frameworks to support industry delivery in the assurance of design, safety, integrity, construction, and commissioning of transport assets for the whole asset life cycle. In order to achieve this, the ASA effectively discharges obligations as the authority for various technical, process, and planning matters across the asset life cycle.

The ASA collaborates with industry using stakeholder engagement activities to assist in achieving its mission. These activities help align the ASA to broader government expectations of making it clearer, simpler, and more attractive to do business within the NSW transport industry, allowing the supply chain to deliver safe, efficient, and competent transport services.

The ASA develops, maintains, controls, and publishes a suite of standards and other documentation for transport assets of TfNSW. Further, the ASA ensures that these standards are performance based to create opportunities for innovation and improve access to a broader competitive supply chain.

This document supersedes RailCorp standard ESR 0001-H - RSU Appendix H - minimum operating standards for rolling stock – automatic equipment identification, Version 1.2. The changes to previous content include the following:

- replacement of RailCorp organisation roles and processes with those applicable to the current ASA organisational context
- minor amendments and clarification to content
- conversion of the standard to ASA format and style
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1. **Introduction**

TfNSW has installed electronic equipment to monitor vehicle condition, such as, train loads, hot bearings, hot wheels and dragging equipment. These monitoring stations have facilities to read data automatically from the automatic equipment identification (AEI) tags fitted to the vehicle to identify the vehicle and vehicle information.

2. **Scope**

This section describes the electronic AEI that is required for all rail vehicles operating on the RailCorp network, except for infrastructure maintenance vehicles and road/rail vehicles operating solely in worksites.

The prescribed requirements are applicable to freight vehicles, locomotives, passenger vehicles, on-track maintenance vehicles, and rail compatible freight trailers.

This document also specifies the location, fitting, and data fields for AEI tags.

3. **Application**

This standard is intended to be used by all owners of vehicles operating on the RailCorp network. All rail bound vehicles shall be fitted with correctly coded and operable AEI tags, as specified by this standard.

4. **Reference documents**

Association of American Railroads (AAR) standard S-918 Standard for Automatic Equipment Identification (AEI) contained in Section K Part III Wayside Electronics and Mobile Worker Communications Architecture of AAR Manual of Standards and Recommended Practices available from the AAR website¹

The TfNSW manual TS TOC 1 Train Operating Conditions Manual

The TfNSW standard T HR RS 00100 ST Minimum Operating Standards for Rolling Stock – General Interface Standards

5. **General principles**

An interrogation unit (or reader) operating in UHF radio waves shall decode the modulated radio waves reflected by the tag. The tag itself shall not be a transmitter, but shall act as a field disturbance device, modifying and reflecting the signal transmitted by the reader system.

¹ [www.aar.com](http://www.aar.com)
6. **AEI system requirements**

The design, construction, operation, performance, and coding principles for the AEI system shall comply with Association of American Railroads (AAR) standard S-918 in section K of the AAR Manual of Standards and Recommended Practices.

7. **Australian application of transponder tags for rolling stock**

Certain administration provisions of AAR standard S-918 are not applicable to electronic AEI as intended by this standard. The coding of AEI tags for Australian use is detailed in Section 7.1.

AAR AEI tags operate in the frequency range 902 to 928 MHz. The AEI readers used in the RailCorp network operate in the frequency range 918 to 928 MHz.

For Australian applications, the first ten fields, 1 to 10, are compulsory. Fields 11 to 19 are optional or system generated. Data to be entered shall match data listed in the Locomotive and Rolling Stock Data or Track Maintenance Vehicle Data sections of the transport standard TS TOC 1 Train Operating Conditions Manual.

The data fields are summarised in Section 7.1.

For reference, the complete AAR data tables are reproduced in Section 9.

7.1. **Information to be entered on AEI tags**

Summary of AEI tag data requirements (part 1):

- vehicle type (equipment group code):
  - 5 = locomotives (including passenger cab control cars and multiple unit cars)
  - 19 = freight vehicles, passenger vehicles, and infrastructure maintenance vehicles (excluding passenger cab control cars and multiple unit cars)

- tag type: this is the physical properties of the tag. This is determined by programming software.

- vehicle class (alpha code):
  - for example, locomotives – for NR87 enter ‘NR’, T381 enter ‘T’. For locomotives with only a numeric code, such as ‘4819’, enter ‘LOCO’
  - freight – NDFF2201 enter ‘NDFF’, L1174 enter ‘L’, SWT5 enter ‘SWT’
  - passenger cars – DCM8021 enter ‘DCM’, T4005 enter ‘T’, FAM2391 enter FAM, AK2382 enter ‘AK’
  - infrastructure vehicles – TJ091 enter TJ, BTM07 enter BTM, RR24 enter RR
vehicle class and number (numeric only):
  - for example, locomotives 2201, 42303, 4819, 8021, for NR87 enter ‘87’, T381 enter ‘381’, L251 enter ‘251’
  - freight – NDFF2201 enter ‘2201’, L1174 enter ‘1174’, SWT6 enter ‘6’
  - passenger cars – DCM8021 enter ‘8021’, T4005 enter ‘4005’, FAM2391, AK2382 enter ‘2382’
  - infrastructure vehicles – 42303, TJ091 enter ‘091’, BTM06 enter ‘06’, RR24 enter ‘24’
  - see Note below

Note: As a number of different types of vehicles share codes or numbers, it is important that the data entered in fields 1, 3, and 4 are entered correctly.

Examples of shared codes are locomotive L 274 and freight vehicle L 1174, locomotive T 286 and electric car T 4005.

Examples of shared vehicle numbers are locomotive 8021 and electric car DCM 8021, Infrastructure vehicles BTM 7, REG 7, INF 007 and diesel rail car CPH 7.

Reuse of AEI tags is not permitted

Summary of AEI tag data requirements (part 2):

- vehicle side (left or right): enter ‘0’ for the left side and ‘1’ for the right side
- vehicle length:
  - enter the coupled length as listed in the TfNSW Train Operating Conditions (TOC) manual in decimetres. That is multiply the length in metres by 10
  - for example, a 48 class locomotive is 14.8 metres, enter ‘148’
- number of axles: enter the number of axles (minimum 1, maximum 32)
- bearing type:
  - 0 = plain bearings
  - 1 = roller bearings, not otherwise classified
  - 2 = roller bearings, inboard
  - 3 = roller bearings, 3 axle bogie, 1 axle obstructed (Buckeye design)
  - 4 = roller bearings, in plain bearing housing
5 = roller bearings, cylindrical oil filled
6 = reserved
7 = reserved

- platform identifier for multipack freight vehicles only. For Australian applications, the allocation of data values for platform identification in Clause 1.9 of Appendix A of AAR Standard S-918 are not appropriate, and shall be amended as follows:
  0 = single platform vehicle
  1 = ‘A’ platform
  2 = ‘B’ platform
  3 = ‘C’ platform
  4 = ‘D’ platform
  5 = ‘E’ platform
  6 to 14 applies to ‘F’ to ‘N’ platforms
  15 = ‘O’ platform and any platforms beyond the 15th

8. Location of AEI tags on rolling stock

AEI tags shall be located and fastened to vehicles in accordance with the criteria specified below and AAR Standard S-918.

Detailed requirements for the location and mounting of tags on various types of vehicles and equipment are prescribed in clauses 9.1 to 9.7 of AAR Standard S-918.

For tank vehicles, tags and their mounting plates shall not be attached to the tank shell. Tags shall be attached only to the tank vehicle underframe or boundary members.

Tags shall be fitted towards the right hand end of a vehicle when facing the side of the vehicle.

For location of AEI tags on vehicles refer to the following figures:

- Figure 1 - Location of AEI tags on vehicles (AAR S-918 Figure 9.1)
- Figure 2 - Location of AEI tags – Four axle freight & passenger vehicles (AAR S-918 Exhibit A)
- Figure 3 - Location of AEI tags – Two axle vehicles (AAR S-918 Exhibit A)
- Figure 4 - Location of AEI tags – Six axle locomotive (AAR S-918 Exhibit B)
- Figure 5 - Location of AEI tags – Four axle locomotive (AAR S-918 Exhibit B)

TfNSW prefers that the AEI tags be above platform level, that is, 1120 mm above rail level.
Figure 1 - Location of AEI tags on vehicles

Reference: AAR Manual of Standards and Recommended Practices S-918 Figure 9.2

The centre of the AEI tag shall be within the location box shown in Figure 1.

Figure 2 - Location of AEI tags – Four axle freight & passenger vehicles

Reference: AAR Manual of Standards and Recommended Practices S-918 Exhibit A
Figure 3 - Location of AEI tags – Two axle vehicles

Reference: AAR Manual of Standards and Recommended Practices S-918 Exhibit A

Figure 4 - Location of AEI tags – Six axle locomotive

Reference: AAR Manual of Standards and Recommended Practices S-918 Exhibit B
8.1. **Tag mounting clearance**

Clearance around AEI tags shall be provided to prevent any part of the vehicle body or structure shielding the AEI tag from the tag readers. Clearance shall be provided in accordance with Figure 6.
Figure 6 - Tag mounting clearance

Reference: AAR Manual of Standards and Recommended Practices S-918 Figure 9.2

AEI tags and mounting hardware when mounted on the vehicle body shall be within the rolling stock outline. See T HR RS 00100 ST (RSU 110) for the applicable rolling stock outline.

9. **AAR data field tables**

*Note: Data to be entered as detailed in Section 7.1. The AAR field tables are provided only for programmers to show properties of the data fields.*
9.1. Freight, passenger, and infrastructure maintenance vehicles

Table 1 - Data fields for vehicles

<table>
<thead>
<tr>
<th>Entry</th>
<th>Bits required</th>
<th>Tag data sequence</th>
<th>Minimum value</th>
<th>Maximum value</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment group code</td>
<td>5</td>
<td>0-4</td>
<td>0</td>
<td>31</td>
<td>Type code</td>
</tr>
<tr>
<td>Tag type</td>
<td>2</td>
<td>5-6</td>
<td>1</td>
<td>4</td>
<td>Type code</td>
</tr>
<tr>
<td>Vehicle class (code)</td>
<td>19</td>
<td>7-25</td>
<td>A</td>
<td>ZZZZ</td>
<td>Alpha</td>
</tr>
<tr>
<td>Vehicle number</td>
<td>20</td>
<td>26-45</td>
<td>0</td>
<td>999999</td>
<td>Numeric</td>
</tr>
<tr>
<td>Side indicator code</td>
<td>1</td>
<td>46</td>
<td>0</td>
<td>1</td>
<td>Side code</td>
</tr>
<tr>
<td>Length (see note 1)</td>
<td>12</td>
<td>94-96, 47-55</td>
<td>0</td>
<td>4095</td>
<td>Decimetres</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>1343</td>
<td>Feet</td>
</tr>
<tr>
<td>Number of axles</td>
<td>5</td>
<td>56-59, 64</td>
<td>1</td>
<td>32</td>
<td>Axles</td>
</tr>
<tr>
<td>First check sum</td>
<td>2</td>
<td>60-61</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reserved frame marker</td>
<td>2</td>
<td>62-63</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bearing type code</td>
<td>3</td>
<td>65-67</td>
<td>0</td>
<td>7</td>
<td>Type code</td>
</tr>
<tr>
<td>Platform identifier code</td>
<td>4</td>
<td>68-71</td>
<td>0</td>
<td>15</td>
<td>Platform code</td>
</tr>
<tr>
<td>Owners identification</td>
<td>5</td>
<td>72-76</td>
<td></td>
<td></td>
<td>Alpha</td>
</tr>
<tr>
<td>Spare #2</td>
<td>10</td>
<td>77-86</td>
<td></td>
<td></td>
<td>Owners use</td>
</tr>
<tr>
<td>Spare #3</td>
<td>7</td>
<td>87-93</td>
<td></td>
<td></td>
<td>Owners use</td>
</tr>
<tr>
<td>Reserved</td>
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<td>97-105</td>
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<td></td>
<td>For future use</td>
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<tr>
<td>Security</td>
<td>12</td>
<td>106-117</td>
<td></td>
<td></td>
<td>Security or owners use</td>
</tr>
<tr>
<td>Data format code</td>
<td>6</td>
<td>118-123</td>
<td>0</td>
<td>63</td>
<td>Format code</td>
</tr>
<tr>
<td>Second check sum</td>
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<td>124-125</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frame marker</td>
<td>2</td>
<td>126-127</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Reference: AAR Manual of Standards and Recommended Practices S-918 Appendix A

Note 1: This field records the vehicle length in both feet and decimetres. Bit order shall be 94, 95, 96, 47, 48, 49, 50… 55.

Note 2: Multipack vehicles are vehicles with more than one underframe or platform or both forming one vehicle with one vehicle number. These vehicles to be fitted with only one AEI tag on each side of the multipack vehicle near the applicable end bogie.
9.2.  **Locomotives**

### Table 2 - Data fields for locomotives

<table>
<thead>
<tr>
<th>Entry</th>
<th>Bits required</th>
<th>Tag data sequence</th>
<th>Minimum value</th>
<th>Maximum value</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment group code – Note 1</td>
<td>5</td>
<td>0-4</td>
<td>0</td>
<td>31</td>
<td>Type code</td>
</tr>
<tr>
<td>Tag type</td>
<td>2</td>
<td>5-6</td>
<td>1</td>
<td>4</td>
<td>Type code</td>
</tr>
<tr>
<td>Equipment Initial (mark)</td>
<td>19</td>
<td>7-25</td>
<td>A</td>
<td>ZZZZ</td>
<td>Alpha</td>
</tr>
<tr>
<td>Locomotive number</td>
<td>20</td>
<td>26-45</td>
<td>0</td>
<td>999999</td>
<td>Numeric</td>
</tr>
<tr>
<td>Side indicator code</td>
<td>1</td>
<td>46</td>
<td>0</td>
<td>1</td>
<td>Side code</td>
</tr>
<tr>
<td>Length</td>
<td>9</td>
<td>47-55</td>
<td>0</td>
<td>510</td>
<td>Feet</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>167</td>
<td>Decimetres</td>
</tr>
<tr>
<td>Number of axles</td>
<td>5</td>
<td>56-59, 64</td>
<td>1</td>
<td>32</td>
<td>Axles</td>
</tr>
<tr>
<td>First check sum</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reserved frame marker</td>
<td>2</td>
<td>62-63</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Bearing type code</td>
<td>3</td>
<td>65-67</td>
<td>0</td>
<td>7</td>
<td>Type code</td>
</tr>
<tr>
<td>Owners identification</td>
<td>5</td>
<td>68-72</td>
<td></td>
<td></td>
<td>Alpha</td>
</tr>
<tr>
<td>Spare</td>
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<td>73-97</td>
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<td>Owners use</td>
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<td>Reserved for future use</td>
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<td>Security</td>
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<td>106-117</td>
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<td>Security or owners use</td>
</tr>
<tr>
<td>Data format code</td>
<td>6</td>
<td>118-123</td>
<td>0</td>
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<td>Format code</td>
</tr>
<tr>
<td>Second check sum</td>
<td>2</td>
<td>124-125</td>
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<td>Frame marker</td>
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<td>126-127</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

*Reference: AAR Manual of Standards and Recommended Practices S-918 Appendix B*