

Standard

# Rolling Stock - Tram - Auxiliary Systems

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## 1 PURPOSE

The purpose of this document is to state the minimum requirements for safe maintenance of Auxiliary Systems on Yarra Trams' existing Rolling Stock fleet.

## 2 SCOPE

The requirements described in this standard apply to the maintenance of and modifications to existing trams. Consideration has been given to the different age profiles and tram designs in use at Yarra Trams, and any changes to the existing trams

This standard does not apply to the specification, design and procurement of new trams.

### 2.1 Maintenance of Existing Trams

This standard recognises that because the range of in-service ages of trams in each fleet is very wide, any previous designs or modifications to a tram system will have been designed to the standards in force at the time of the tram design and manufacture.

This standard recognises that some of the existing trams will have been designed to standards no longer in force and possibly no longer available. Accordingly, the 'as designed' or 'current modification level' performance characteristics and maintenance requirements for each tram type are documented in this standard.

Information on requirements for maintenance of existing trams has been derived from the following references:

- OEM manuals supplied at the time of manufacture
- Previous upgrades/ modifications undertaken since the time of manufacture
- The original specifications for the trams
- Standards available at the time of design
- Local Subject Matter Expert knowledge

### 2.2 Modifications to Existing Trams

Unless otherwise stated, application of this standard is not retrospective to existing trams that are not being modified.

Any future modifications or enhancements to trams, for example for obsolescence, safety or to improve performance, shall, so far as is reasonably practicable, seek to comply with this and other related, currently accepted standards.

## 3 COMPLIANCE

This standard shall be fully complied to when undertaking maintenance or modifications on the existing tram fleets.

Deviation from this standard is only permitted when a Waiver has been sought and approved by the Engineering Design Authority at Yarra Trams.



The Yarra Trams Engineering Change Management Procedure (CE-021-PR-0020) shall be followed in all circumstances where change is proposed to auxiliary systems. For the avoidance of doubt this shall include, but not be limited to:

- An engineering risk assessment in accordance with the Enterprise Risk Assessment and Assurance Framework (c016wi11).
- An assessment to determine the appropriate Safety Integrity Level (SIL) for any modification that has electrical/electronic/programmable electronic safety-related systems. The SIL assessment shall comply with International Electrotechnical Commission's (IEC) standard IEC 61508.
- Complying with the requirements of EN 50155 for any modification that has electronic equipment.
- A list of all applicable laws and standards to be complied with for that modification for review and agreement by Yarra Trams Engineering Design Authority.

A compliance schedule shall be completed and returned for any engineering change activities on key auxiliary systems. Assessment of compliance shall be provided for each requirement, defined by one of three permissible responses:

- Compliant;
- Partially Compliant;
- Non-Compliant.

Absolute requirements in this standard are defined within square brackets and a tolerance level as a percentage or range e.g. [AM 4000mm  $\pm$  1%. or 3960mm to 4040mm].

Compliance terminology defined in this standard shall be adhered to with the following definitions:

- 'Shall' statements are mandatory in the context of compliance with requirements stipulated in this standard.
- 'Should' statements are considerations in the context of compliance with requirements stipulated in this standard.
- 'Information' statements provide additional content for clarification purposes only and are not requirements in the context of compliance with this standard.
- 'So far as is reasonably practicable' statements must at a minimum result in the provision of an engineering risk assessment in accordance with the Enterprise Risk Assessment and Assurance Framework (c016wi11) and So Far As Is Reasonably (SFAIRP) Guidance Notes (Rail Safety Regulator).

**Note: All standards referred to within this document are correct at the time of writing. It is the responsibility of the user to always ensure the most current version of any standard is referred to when applying any given standard.**



## 4 REQUIREMENTS

### 4.1 Auxiliary Systems

**For information:** The auxiliary power supply system is powered from the onboard main power supply and provides power to all tram auxiliary systems in normal operation and in emergency conditions.

Any new or modified auxiliary systems or equipment shall consider the following requirements.

The following is a list of key tram auxiliary systems together with any minimum requirements for modifications to those systems. These requirements should be checked with Yarra Trams Engineering Design Authority prior to application to any system redesign or modification.

#### 4.1.1 General Auxiliary Requirements

4.1.1.1 Electrical circuits used on Rolling Stock shall comply with relevant part of

- EN 50155 Railway Applications – Electronic Equipment Used on Rolling Stock
- EN 50153 Railway Applications – Rolling Stock – Protective Provisions Relating to Electrical Hazards
- IEC 60077 -1 Railway Applications – Electric equipment for rolling stock – Part 1: General Service conditions and general rules
- IEC 61287 Railway applications - Power converters installed on board rolling stock - Part 1: Characteristics and test methods
- AS 60038

4.1.1.2 Installation of cabling shall comply with the requirements of EN 50343

4.1.1.3 Rotating electrical machines shall comply with the requirements of IEC 60034 and IEC 60349

4.1.1.4 Electrical measuring instruments shall comply with the requirements of IEC 60051

4.1.1.5 Rolling stock equipment shock and vibration tests shall comply with the requirements of IEC 61373

#### 4.1.2 Automatic Vehicle Location System (AVL)

4.1.2.1 See Yarra Trams Standard, Rolling Stock - Tram - Communication Systems (CE-021-ST-0027) for requirements.

#### 4.1.3 Battery System

4.1.3.1 See Yarra Trams Standard, Rolling Stock - Tram - Power Systems (CE-021-ST-0020) for requirements.



### **4.1.4 CCTV**

4.1.4.1 See Yarra Trams Standard, Rolling Stock - Tram - Communication Systems (CE-021-ST-0027) for requirements.

### **4.1.5 Disabled Passenger Communications System (DPC)**

4.1.5.1 See Yarra Trams Standard, Rolling Stock - Tram - Communication Systems (CE-021-ST-0027) for requirements.

### **4.1.6 Display Screen System (DSS)**

4.1.6.1 See Yarra Trams Standard, Rolling Stock - Tram - Communication Systems (CE-021-ST-0027) for requirements.

### **4.1.7 Doors (electrically controlled and/or operated)**

4.1.7.1 See Yarra Trams Standard, Rolling Stock - Tram - Access and Egress (CE-021-ST-0028) and for requirements.

### **4.1.8 Drivers Communication System (DCS)**

4.1.8.1 See Yarra Trams Standard, Rolling Stock - Tram - Communication Systems (CE-021-ST-0027) for requirements.

### **4.1.9 Exterior lighting**

4.1.9.1 Exterior lighting shall meet the latest Australian Design Rules (ADRs) national standards for vehicle safety.

4.1.9.2 Exterior lighting shall meet the Vehicle Standard (Australian Design Rule 13/00 – Installation of Lighting and Light Signalling Devices).

### **4.1.10 Fire and Smoke Detection System (FMS)**

4.1.10.1 See Yarra Trams Standard, Rolling Stock - Tram - Fire Safety Systems (CE-021-ST-0024) for requirements.

### **4.1.11 Foot heater (E-class)**

4.1.11.1 The foot heater shall be capable of being switched on and off by the driver as desired.

### **4.1.12 General purpose outlet (GPO)**

4.1.12.1 Any GPO fitted to trams shall be capable of supplying 230V AC 50Hz 10A power.

4.1.12.2 The location of any new GPOs to trams shall be agreed by Yarra Trams Engineering Design Authority.

4.1.12.3 Any new GPO fitted shall comply to the wiring rules in AS/NZS 3000 and tested in accordance with AS/NZS 3112.



### **4.1.13 Gong/Horn**

4.1.13.1 See Yarra Trams Standard, Rolling Stock - Tram - Communication Systems (CE-021-ST-0027) for requirements.

### **4.1.14 HVAC - Cab**

4.1.14.1 See Yarra Trams Standards, Rolling Stock - Tram - Environmental Systems (CE-021-ST-0025) for requirements.

### **4.1.15 HVAC - Saloon**

4.1.15.1 See Yarra Trams Standards, Rolling Stock - Tram - Environmental Systems (CE-021-ST-0025) for requirements.

### **4.1.16 Lighting**

4.1.16.1 For information, the requirements to be met by tram interior lighting are based on the following criteria:

- Illuminance
- Uniformity
- Limitation of glare
- Colour temperature and colour rendering

4.1.16.2 The saloon of all trams shall be provided with interior lighting compliant with EN 13272 unless through a Waiver approved by Yarra Trams Engineering Design Authority.

4.1.16.3 Each doorway shall be provided with additional lighting compliant with EN 13272 which shall also operate in emergency and without the tram being supplied by the traction supply.

4.1.16.4 The cab shall have lighting compliant with EN 13272 unless through a Waiver approved by Yarra Trams Engineering Design Authority.

### **4.1.17 On Tram Monitoring Recorder (OTMR)**

4.1.17.1 See Yarra Trams Standard, Rolling Stock - Tram - Communication Systems (CE-021-ST-0027) for requirements.

### **4.1.18 Passenger Counting System**

4.1.18.1 See Yarra Trams Standard, Rolling Stock - Tram - Communication Systems (CE-021-ST-0027) for requirements.

### **4.1.19 Passenger Information System (PIS)**

4.1.19.1 See Yarra Trams Standard, Rolling Stock - Tram - Communication Systems (CE-021-ST-0027) for requirements.



## 4.1.20 Sanding

4.1.20.1 See Yarra Trams Standard, Rolling Stock - Tram – Sanding Systems (CE-021-ST-0016) for requirements.

## 4.1.21 Washers/wipers and demisters

4.1.21.1 Wipers and demisters shall be provided to ensure the driver has a clear and uninterrupted view through the windscreen to the external environment which shall remain clear of any condensation or other obscuration at all times.

4.1.21.2 The windscreen wiper system shall sweep the full area of the windscreen viewed by the driver with no compromise or reduction to the view of the driver.

4.1.21.3 The windscreen wipers should be capable of operation in automatic, low speed, variable speed and highspeed modes selectable by the driver. In automatic mode a rain detector shall trigger the wiper operation.

4.1.21.4 Wipers shall automatically return to their 'parked' position when not in use.

4.1.21.5 Wipers shall not obscure the necessary sightlines when in their parked position.

4.1.21.6 Where electric elements are used for demisting these shall be unobtrusive to the driver.

4.1.21.7 There should be a method of indicating a low washer fluid level.

## 4.2 Electromagnetic Compatibility (EMC)

4.2.1.1 Should any modifications be required that includes electrical/electronic equipment, EMC for railway applications are given in EN 50121 series.

## 5 RELATED LEGISLATION & DOCUMENTS

| Document Number | Name                                                                                        |
|-----------------|---------------------------------------------------------------------------------------------|
| CE-021-PR-0006  | EMS04 Manage Design Procedure                                                               |
| CE-021-PR-0020  | EMS06 Engineering Change Management Procedure                                               |
| CE-021-PR-0004  | EMS05 Deviation from Standards Procedure                                                    |
| c016wi11        | Enterprise Risk Assessment and Assurance Framework                                          |
| EN 50155        | Railway Applications - Rolling Stock - Electronic Equipment                                 |
| EN 13272        | Railway Applications - Electrical lighting for rolling stock in public transport systems    |
| EN 50153        | Railway Applications - Rolling Stock - Protective provisions relating to electrical hazards |
| EN 50343        | Railway Applications - Rolling Stock - Rules for installation of cabling                    |





| Document Number  | Name                                                                                                                |
|------------------|---------------------------------------------------------------------------------------------------------------------|
| EN 50121         | Railway Applications - Electromagnetic Compatibility                                                                |
| IEC 61508        | Functional Safety                                                                                                   |
| IEC 60034        | Rotating electrical machines                                                                                        |
| IEC 60349        | Electric traction - Rotating electrical machines for rail and road vehicles                                         |
| IEC 60051        | Direct acting indicating analogue electrical measuring instruments and their accessories                            |
| IEC 61373        | Railway applications - Rolling stock equipment - Shock and vibration tests                                          |
| IEC 60077        | Railway Applications - Electric equipment for rolling stock                                                         |
| IEC 61287        | Railway applications - Power convertors installed onboard rolling stock                                             |
| AS 60038         | Standard Voltages                                                                                                   |
| AS/NZS 3000      | Wiring Rules                                                                                                        |
| AS/NZS 3112      | Approval and test specification - Plugs and socket-outlets.                                                         |
| Vehicle Standard | Australian Design Rule 13/00 - Installation of Lighting and Light Signalling Devices on other than L-Group Vehicles |
| CE-021-ST-0028   | Rolling Stock - Tram - Access and Egress                                                                            |
| CE-021-ST-0027   | Rolling Stock - Tram - Communication Systems                                                                        |
| CE-021-ST-0025   | Rolling Stock - Tram - Environmental Systems                                                                        |
| CE-021-ST-0024   | Rolling Stock - Tram - Fire Safety Systems                                                                          |
| CE-021-ST-0016   | Rolling Stock - Tram – Sanding Systems                                                                              |
| CE-021-ST-0020   | Rolling Stock - Tram - Power Systems                                                                                |

## 6 DOCUMENT VERSION CONTROL

| Version History | Date       | Detail                              |
|-----------------|------------|-------------------------------------|
| 1.0             | 12/03/2023 | Original approved issue             |
| 1.01            | 20/02/2023 | Author change                       |
| 1.02            | 12/05/2025 | Periodic review. Authoriser update. |
| 1.03            | 23/06/2026 | Logo update to YJM.                 |

## 7 GLOSSARY

| Term                         | Definition                                                                                                                                       |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| Engineering Design Authority | The person or position designated by the Franchisee with the authority to approve engineering design changes, modifications and the TMPs under a |



| Term        | Definition                                                                                                                                                               |
|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|             | system which complies with AS/NZS ISO 9001 Quality Management Systems or similar standard and AS4292 Railway Safety Management as applicable to rolling stock providers. |
| IEC         | International Electrotechnical Commission                                                                                                                                |
| Illuminance | Ratio of the luminous flux incident on a surface to the area of the illuminated surface.                                                                                 |
| Lux (lx)    | Unit for illuminance.                                                                                                                                                    |
| OEM         | Original Equipment Manufacturer                                                                                                                                          |
| SIL         | Safety Integrity Level                                                                                                                                                   |
| Waiver      | Waiver process as per EMS05 Deviation from Standards Procedure.                                                                                                          |