Standard

# Rolling Stock - Tram - Fire Safety Systems

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PROUD OPERATOR OF

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# 1 PURPOSE

The purpose of this document is to specify the minimum function, performance and maintenance requirements for fire safety systems and the prevention of fire onboard a tram in the existing Yarra Trams rolling stock fleet.

# 2 SCOPE

The requirements described in this standard apply to the maintenance and modifications to existing trams in the Yarra Trams fleet.

This standard does not specify requirements for design or procurement of fire safety systems and equipment for new trams.

Maintenance of fire safety systems is important for the prevention of fire on Yarra Trams rolling stock. Maintenance of fire safety systems must take into account the differing age profiles and tram designs in use and any changes to the existing trams. This standard considers the differing age profiles and tram designs in use, and any changes to the existing trams.

The requirements stated in this standard recognise that, given the age range of the existing Yarra Trams rolling stock fleets, any previous designs or modifications to a fire safety system will have been designed to the standards in force at the time of the tram design and manufacture. Some of the existing trams in the Yarra Trams fleet will have been designed to standards no longer in force and possibly no longer available. Accordingly, this standard only documents the 'as designed' or current modification level functional and performance characteristics, and maintenance requirements for each tram type.

The requirements in this standard are derived from the following sources:

- OEM manuals supplied at the time of manufacture
- Previous upgrades and modifications undertaken since the time of manufacture
- Original specifications for the tram type and variant
- Standards available at the time of design
- Local Subject Matter Expert knowledge

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, comply with currently accepted standards to minimise the risk of a fire starting and to control hazards to the safety of occupants in the event of a fire.

All design and review activity on Yarra Trams assets shall comply with requirements of the Yarra Trams 'Manage Design Procedure' (CE-021-PR-0006).

# 3 COMPLIANCE

This standard shall be fully complied with when undertaking maintenance or modifications on existing trams. 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. For the avoidance of doubt this shall include, but not be limited to:

- An engineering risk assessment in accordance with the Yarra Trams Safety Management System
- 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 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 existing Yarra Trams assets. 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 ± 10%. 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 Maintenance of Existing Trams

### 4.1.1 Fire Extinguishers

4.1.1.1 Fire extinguishers shall be fitted to all trams and shall be mounted in each cab in a readily accessible location.

4.1.1.2 Fire extinguishers shall be suitable for all classes of fires that may occur on the tram. If existing fire extinguishers are modified, new fire extinguishers shall be compliant with AS 1841 and AS 2444.

4.1.1.3 Expiry dates for fire extinguishers shall be checked on maintenance and replaced as required.

### 4.1.2 Fire Detection Systems

4.1.2.1 Smoke detectors where fitted on the tram shall be tested on maintenance in accordance with the manufacturer's instructions.

## 4.2 Modifications to Existing Trams

Any modifications to trams shall consider the following requirements.

### 4.2.1 Design Principle

4.2.1.1 Fire prevention is the fundamental principle, in respect of fire performance, which shall be applied when developing modifications to an existing design of tram.

4.2.1.2 Any modifications shall comply with the requirements of the current issue of EN 45545.

### 4.2.2 Materials

4.2.2.1 Material selection shall ensure that hazards are managed compliant to a tram meeting the requirements of EN 45545 Operational Category 1 and EN 45545 Design Category N.

4.2.2.2 Material selection shall ensure that hazards are managed such that in the event of a fire being initiated, it shall not be self-sustaining (i.e. once the source of ignition has been consumed or removed, the fire shall self-extinguish).

4.2.2.3 Material selection shall ensure that hazards are managed such that substances used shall not be capable of emitting harmful fumes or objectionable odors in their normal or degraded state particularly when subject to heat or fire.

4.2.2.4 Any liquids used on trams other than windscreen washing shall be subject to a risk assessment to quantify the risks associated with fire.

### 4.2.3 Cabling

4.2.3.1 Cables shall comply with R15 and R16 of EN 45545-2.

### 4.2.4 Detectors

4.2.4.1 New detectors shall be activated by the presence of smoke and should be activated in response to temperature.

4.2.4.2 New detectors shall comply with the requirements of EN 50155, EN 50121 and AS 5062.

4.2.4.3 New detectors shall be fitted to all occupied compartments.

4.2.4.4 The location of any new detectors should consider the interface with Heating Ventilation and Air Conditioning (HVAC) for ventilation management.

4.2.4.5 If specified by Yarra Trams Engineering Design Authority, new detectors should have the ability to control the ventilation system to prevent the spread of smoke and combustion products;

- Within the car,
- Between cars,
- From the exterior environment to the interior of the car(s).

4.2.4.6 New detectors should interface with CCTV for driver situation awareness.

### 4.2.5 Materials Inventory

4.2.5.1 A product supplier shall be required to produce and maintain an inventory of all materials to be used in the product.

4.2.5.2 The materials inventory shall list all materials and their characteristics.

4.2.5.3 The materials inventory shall be used to identify components and sub-assemblies which require to be fire tested.

4.2.5.4 The materials in Table 1 shall be considered inclusion within the inventory list.

*Table 1: Materials inventory list*

| Furniture | Interior | Electrical Components |
|---|---|---|
| Passenger seats<br>Upholstery for passenger seats and head rest<br>Armrests<br>Passenger seat shell<br>Head rest<br>Loose upholstery items<br>Curtains and sun blinds<br>Tables | Horizontal/Vertical Interior Surfaces<br>Surfaces of enclosures containing technical equipment<br>Strips<br>Light Diffusers<br>Luggage Storage Areas<br>Interior surfaces of gangways<br>Window frames | Devices for passenger information<br>Cables<br>Wiring and printed circuit boards |

| Furniture | Interior | Electrical Components |
|---|---|---|
| Litter bins<br>Driver's desk | Containers<br>Air ducts<br>Air filters<br>Floor composites<br>Interior seals | |

# 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 |
| IEC 61508 | Functional Safety |
| AS 1841 | Portable Fire Extinguishers |
| AS 2444 | Portable Fire Extinguishers and Fire Blankets |
| AS 5062 | Fire Protection for Mobile and Transportable Equipment |
| EN 50155 | Railway Applications - Rolling Stock - Electronic Equipment |
| EN 45545 | Railway Applications - Fire Protection on Railway Vehicles |
| EN 50121 | Railway Applications - Electromagnetic compatibility |

# 6 DOCUMENT VERSION CONTROL

| Version History | Date | Detail |
|---|---|---|
| 1.0 | 13 March 2020 | Original Approved Issue |

# 7 GLOSSARY

| Term | Definition |
|---|---|
| CCTV | Closed Circuit Television |
| 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 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. |

| Term | Definition |
|---|---|
| HVAC | Heating, Ventilation and Air Conditioning |
| IEC | International Electrotechnical Commission |
| OEM | Original Equipment Manufacturers |
| SIL | Safety Integrity Level |
| Waiver | Waiver process as per EMS05 Deviation from Standards Procedure |