

# UKTTE19

## Diagnose and repair faults on Tram vehicle assets, components, equipment and systems



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### Overview

This standard is about diagnosing and repairing faults on Tram vehicle assets, components, equipment and systems. You will be able to use fault finding methods and techniques to locate, diagnose and repair faults that involve the following interactive technologies: mechanical, electrical, electronic, hydraulic, pneumatic, fixtures and fittings and ancillary systems. The type and range of problems and faults could be complex and involve the interaction between two or more assets, components, equipment and systems. Fault diagnosis could include continual and intermittent faults and be affected by factors such as environmental, ageing, human error and inherent design problems. From the evidence gained, you will be expected to identify the fault and probable cause. You will be able to confirm the repair activities to be undertaken and carry out these repairs within the limits of your own authority.

Your underpinning knowledge will provide a good understanding of your work and an informed approach when applying fault diagnosis procedures within an integrated system. You will understand the various fault diagnosis methods and techniques used, and their application. You will know how to apply and interpret information obtained from diagnostic aids and equipment, in adequate depth to provide a sound basis for carrying out the activities and identifying faults or conditions that are outside the required specification. You will know about the interaction of the other associated integrated technologies and will have sufficient knowledge to carry out effective fault diagnosis of the Integrated system.

You will understand the safety precautions required when carrying out the fault diagnosis activities, especially those for isolating the equipment and for taking the necessary safeguards to protect yourself and others in the workplace.

This standard is for those who work in the Tram engineering environment at supervisor/technician level.

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### Performance criteria

*You must be able to:*

- P1 interpret and analyse **information** on the symptoms and problems associated with the Tram vehicle assets, components, equipment and systems
- P2 identify the **fault finding activities and diagnostic tests** to be carried out in line with organisational approved procedures
- P3 prepare **diagnostic tools and equipment** in line with organisational requirements
- P4 take action to prevent damage or interference with other components, equipment or systems during fault finding activities
- P5 select, use and apply diagnostic techniques, tools and aids to locate faults
- P6 complete the fault diagnosis within the agreed time and inform the appropriate people when this cannot be achieved
- P7 investigate and analyse diagnostic results to draw conclusions about the **nature and probable cause of the fault**
- P8 establish the implications of the fault on other work and for safety considerations
- P9 confirm the repair activities to be undertaken and the resources required
- P10 obtain approval for repair activities to take place
- P11 carry out **repair activities** on Tram vehicle assets, components, equipment and systems in line with organisational procedures
- P12 carry out **integrity test and checks** on the repaired Tram vehicle asset, component, equipment or system to confirm it is functioning correctly
- P13 record details on the extent and location of the faults and repairs in line with organisational requirements

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#### Knowledge and understanding

*You need to know and understand:*

- K1 the general operational and functional principles of Tram vehicle assets, components, equipment and **systems**
- K2 the relationship between an ancillary system and Tram vehicle assets, components, equipment and systems
- K3 the types of diagnostic tests, aids and equipment available
- K4 how to analyse information available for fault diagnosis
- K5 the **hazards** associated with carrying out fault diagnosis on Tram vehicle assets, components, equipment and systems
- K6 the range of actions that can be taken to prevent damage or interference with other components, equipment and systems
- K7 the methods and techniques for diagnosing faults on Tram vehicle asset, components, equipment and systems
- K8 the methods and techniques for analysing and determining diagnostic results
- K9 how to assess the risks arising from faults and how the faults can affect the performance and safety of Tram vehicle assets, components, equipment and systems
- K10 how to prioritise repair activities
- K11 the methods and techniques for carrying out repair activities on Tram vehicle, assets, components, equipment and systems
- K12 the importance of carrying out integrity tests and checks prior to a Tram vehicle returning to operational service
- K13 the types of integrity tests and checks that can be undertaken
- K14 when independent testing may be required
- K15 the extent of your own authority and to whom you should report if you have problems that you cannot resolve

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### Additional Information

#### Scope related to performance criteria

P1 **Information** may include; electronic or paper records and documents (drawings, defect history, fault reports, handbooks, manuals, charts, maintenance specifications/schedules, maintenance history, images, warrantee, instructions, schedules, catalogues, logbooks), eye witness accounts, operator reports, sensory (sight, smell, touch, sound).

P2 **Fault finding activities and diagnostic tests** may include; inspection (wear, breaks/bends, signs of overheating/fretting, missing parts, loose components/fittings, sensory input, leaks, software interactions), Measurement (voltage/resistance/frequency, torque, temperature, dial test, luminescence, power, continuity, current, flow, half-split technique, emergent sequence, unit substitution, input/output, function/performance testing, six point technique, injection, sampling, equipment self-diagnostics), operational (systematic testing, alignment checks, pressure checks, vibration checks, thermal checks, calibration, simulation).

P3 **Diagnostic tools and equipment** may include; computer test equipment, in built management system, algorithms, manuals, analysis charts, trouble shooting guides, probability charts, fault analysis charts, diagrams and specifications, manufacturers manuals, measuring devices and indicators.

P7 **Nature and probable cause of the fault** may include; environmental, aging, accidental, human error, inherent/intermittent design problem, recurrent defect, component defect, fitting defect, partial failure, reduced performance, out of specification, maintenance technique, maintenance frequency, complete breakdown.

P11 **Repair activities** may include; rectification, replacement, monitoring, referral.

P12 **integrity test and checks** may include; inspection, count, security, profile, labelling, configuration, correlation, compliance, physical condition, continuity, interference, resistance, frequency, performance, insulation, function, magnetic.

#### Scope related to knowledge criteria

K1 **Systems** may include ancillary systems such as; security cameras, CCTV, digital recording systems, air systems, audio/visual equipment, two way radio, route information systems, global positioning systems, in cab signalling systems, cleaning systems and equipment.

K5 **Hazards** may include; stored pressure/force, electrical contact, electrical/electronic interfaces, handling fluids, using faulty/damaged tools and equipment, using unauthorised procedures, working at height, working in confined spaces.

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### Additional Information

#### Glossary

##### **Tram**

Tramcars, tram vehicle, and any other rail vehicles that operate on tramways. It includes one or more trams coupled together and includes non-passenger-carrying vehicles.

##### **Tramway environment**

Includes the tramway (a set of rails, switches and crossings which form the route of a Tram) , infrastructure (fixed assets used for the running of the Tram transport system, including, the tramway, bridges, tunnels, stops, stations and fixed equipment for signalling, communications and electrification), depots, stabling yards.

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