Superseded by T HR TE 61001 ST v2.0

T HR TE 61001 ST

Standard

Emergency Telephone Systems

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Document Control

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Preface

The Asset Standards Authority (ASA) develops, controls, maintains, and publishes standards and documentation for transport assets for New South Wales, using expertise from the engineering functions of the ASA and industry.

ASA publications include the network and asset standards for NSW rail assets. Currently ASA publications include RailCorp engineering standards that were applicable to the Transport for New South Wales (TfNSW) rail assets as at 30 June 2013.

This standard supersedes RailCorp standard ESM 108 *Emergency Telephone System*, 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

Emergency telephone systems are required to be installed in new railway tunnels. New construction, extensions and upgrades of emergency telephone systems need to conform to a standard. This document defines the standard for these systems.

2. Purpose

Transport for New South Wales (TfNSW) tunnels standard ESC 340 requires emergency telephones to be installed in new TfNSW railway tunnels using electric passenger rolling stock. This document establishes the standard requirements for these emergency telephones and the network environment in which they operate.

3. Scope and application

The scope of this document covers the wider telecommunications network in which tunnel emergency telephones operate as tunnel emergency telephone systems. For the remainder of this document the term system, systems or the system shall refer to tunnel emergency telephone systems.

This standard is applicable to systems in tunnels as required by ESC 340 and also applicable to provision of new and replacement systems in tunnels which may pre-date ESC 340 and so may not meet that standard, particularly with respect to the dimension of refuges.

This standard also has scope to include telephones at locations outside but near tunnel portals where they may be useful in coordinating a response to an emergency incident in tunnels.

The type of emergency the system is intended to deal with is non specific, even though parts of this standard may seem to be specifically dealing with the need to a fire emergency.

This standard is not applicable to any general emergency telephone systems outside of tunnels or emergency warning and intercommunication system (EWIS) that may be required on underground stations and which may interface with tunnels.

4. References documents

Australian and international standards

AS/CA S008 Requirements for customer cabling products

AS/CA S009 Installation requirements for customer cabling (Wiring rules)

AS 3013 Electrical installations – Classification of fire and mechanical performance of wiring system elements

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BSC 6387 Specification for performance requirements for cables required to maintain circuit integrity under fire conditions

Transport standards - as published on the ASA website

ESC 340 Tunnels

SPM 0082 Analogue Two Wire Weatherproof Field Telephones

SPG 1572 Emergency Telephone Location Lights for Underground Railway

T HR TE 01001 ST Communications Outdoor Cabling Standard

T HR TE 01002 ST Signalling Bungalow Telecommunications Cabling

T HR TE 21001 ST Telecommunications Equipment Rooms

T HR TE 61002 SP Analogue Two Wire Weatherproof Field Telephones

Transport standards drawings

MET SK 0142 Emergency Telephone Sign for Tunnel Installation

MET CP 2101 ESR Emergency Phones Telecommunications Cable Schematic – Sheet 2 of 8

MET MCH 0012 Firephone Termination Cabinet ESR Underground

MET MCH 0008 Firephone Termination Cabinet (Remote Telephone)

MET SC 0330 Heavy Duty Slope Top Weatherproof MDF Enclosure for 2 x 27 Way Frames Standard Configuration

5. Terms and definitions

AEO Authorised Engineering Organisation

ASA Asset Standards Authority

DRC Disaster Recovery Centre (for the RMC)

EWIS Emergency Warning and Intercommunication System

IDF Intermediate Distribution Frame

IP65 Ingress protection rating 65

MDF Main Distribution Frame

PABX Private Automatic Branch Exchange

RMC Rail Management Centre

System tunnel emergency telephone system

TfNSW Transport for New South Wales

VDC Volts Direct Current

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WAN Wide Area Network

6. General requirements

The system shall provide a highly reliable and high availability telephone communications as a means of reporting and aiding a response to emergency situations that may arise in tunnels.

The system shall be simple in operation to allow use of telephones by untrained AEO staff, emergency services staff and anyone from the general public that may be caught up in an emergency situation in a tunnel.

To keep the system simple, static and clear on ownership and accountabilities, it shall be dedicated to its purpose and independent of:

- the public telephone network
- administrative telephone networks
- administrative data networks

The system shall maintain full service for two hours in the event of a fire and then at least limited services in any particular tunnel segment after the event.

Alternate telephones shall be fed via cabling and equipment from opposite ends of the tunnel segment they are in.

Subsequent to a fire in any tunnel segment, or any other failure of the system at a common point, the system shall maintain operation of at least each alternate telephone along the length of all tunnel segments. The intent of this requirement is to meet two primary purposes:

- so that where a user encounters a failed telephone, then the next telephone along in the tunnel segment will not be affected by the same failure
- so that failure of any one network element will allow limited emergency telephone services and avoid the need for suspension of train services through the tunnel

The system shall include remote monitoring and supervision arrangements designed for ease of maintenance and to minimise the requirement for maintenance personnel to enter the tunnels.

The system shall be integrally comprised of the following basic elements:

- telephones
- answering point
- emergency telephone location lights
- signage
- cabling and termination frames
- PABX(s)

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- telephone testing sub-system
- backbone telecommunications network

The system design and construction shall be coordinated with that of other tunnel infrastructure, with particular attention to emergency tunnel lighting and cable route.

7. Telephones

7.1 Emergency telephones

Emergency telephones shall be in accordance with T HR TE 61002 SP which provides for basic requirements summarised as follows:

- weather resistant
- vandal resistant
- line powered
- enabled for automated testing
- red in colour
- simple in operation involving no dialling

Emergency telephones shall be of common make and model throughout the system with appropriate spares kept in signal maintenance depots and signal store for maintenance purposes.

7.2 Control room telephones

Control room telephones are to be installed in the control room on station platforms that adjoin a tunnel portal. Other locations on the stations should also be considered on a site by site basis for additional telephone(s) where appropriate to aid in response to a tunnel emergency situation.

The function of these telephones is to allow communications between the Rail Management Centre and the Station to aid the response to a tunnel emergency.

These telephones shall be PABX system integrated to provide identification of connected parties and one key operation to access other parties cooperating in the system.

The emergency telephone functionality may be incorporated into telephones intended for operational communications with the rail management centre where combining the functionality is beneficial to meeting total telephony requirements and ensure the telephone is regularly tested. In these cases the telephone's access key/button should clearly be labelled as 'Emergency – RMC'.

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8. Answering point

The answering point for calls from each emergency telephone shall generally be the Train Controller at the Rail Management Centre in control of the section of track where the emergency telephone is situated.

Emergency calls shall be directed to a target on the Train Controllers' integrated voice communications facility and be automatically identified as an emergency call from the particular location of the telephone.

The Train Controllers' facility shall be configured to allow calling of each particular telephone or by group call to all telephones within particular tunnel segments. Group calling for long segments of tunnel may be split into logical sub-segments to fall within the technical limits of the group calling facility of the answering point which is sometimes limited to a maximum of 20.

The system shall allow for calls to be automatically diverted to an alternate answering point at a Disaster Recovery Centre when triggered by failure or by manual blocking of the RMC PABX.

9. Emergency telephone location lights (blue lights)

Emergency telephone location lights, also referred to as 'blue lights', shall be in accordance with SPG 1572, which provides for basic requirements summarised as follows:

- indicate the location of an emergency telephone in the tunnel
- flash to indicate that the associated telephone is ringing[1]
- weather resistant
- vandal resistant
- blue in colour
- visible from 90 m in tunnel situations

Blue lights shall generally be powered and monitored from the same low voltage circuits and systems that power and monitor the tunnel emergency lighting.

Blue lights shall be of common make and model throughout the system.

Appropriate spare units shall be provided and kept in maintenance depots and/or store for maintenance purposes.

[1] Inside a tunnel it is often difficult to judge which telephone is ringing due to echoing of ring signal off the tunnel walls

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10. Cabling

10.1 General

Cabling and cabling products shall generally be in accordance with AS/CA S008, AS/CA S009 and T HR TE 01001 ST, with the additions requirements included in this standard.

Fire safe cable shall be specifically designed to address issues of fire management and safety and include properties of low smoke generation, flame retardant, not support combustion, not contain jelly, not contain halogen or other materials that would produce poisonous or corrosive gas in a fire.

Fire rated cables shall be fire safe and be rated either at 2 hours to AS3013 (WS 5X) or 3 hours to BSC6387 CWZ.

10.2 PABX cabling[2]

Cabling from the PABX equipment to PABX termination points shall be fire safe or made fire safe by containment in a fire safe covering, with the exception of the following situations where standard cabling used for the PABX may be used:

a) where cabling is contained within the same equipment rack as the PABX

b) where cabling is contained within a room that is not part of an underground station or other underground facility

c) where cabling is contained within a room that is protected by a fire suppression system

10.3 Telephone cabling[3]

Telephone cabling shall be fire rated with the exception of the following situations:

a) where not at all used for emergency telephones

b) where contained in a cable route outside (but leading into) the tunnel or underground facility

c) telephone cable between the telephone and its closest termination point shall be 2 pair[4]

d) telephone cabling distribution should be arranged to feed alternate telephones along each tunnel segment from PABX equipment at opposite ends of the segment[5]

e) minimise the number of termination points and keep terminations to a maximum of 10 between the PABX and telephones[6]

[2] PABX cabling includes all cables required for the PABX installation such as line interface cable, power and earth cable, data cable, and so on.

[3] Telephone cabling includes all cabling required to build a telephone line between the PABX termination point and a telephone plus cabling between a telephone line and a blue light.

[4] The two pair cable includes one operational pair plus one spare maintenance pair.

[5] Where it is not possible to strictly adhere to the “alternate phones from opposite ends” arrangement in complex tunnel sections such as crossovers and terminal roads, then a closest fit to this arrangement should be provided.

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f) use full unjointed cable lengths between termination points

g) use multiple paired cable rather than multiple 2 pair cables where appropriate to improve cable manageability

Typical cable distribution arrangements are shown on drawing MET CP 2101.

10.4 Joints

The system shall not use any joints in cabling.

Full lengths of cable between termination points shall be used for maintenance and repair work on the system and appropriate lengths of cable shall be kept in store for this purpose.

Where emergency repairs cannot be undertaken without jointing of cable, replacement of any jointed section shall be scheduled as high priority remedial works under routine maintenance.

10.5 Signals IDFs

Signals IDF shall be located between the PABX terminations in the telecommunications equipment room and the first termination point within any tunnel segment to provide demarcation in responsibility between telecommunications and signalling disciplines. This IDF shall preferably be installed within a signalling equipment room, and where this is not reasonably possible or appropriate, it should be installed in a location that is agreed between telecommunications maintenance and signals maintenance stakeholders.

The signals IDF may also be used for termination of other signals related telecommunications cabling that appears within the same room (such as cabling for signal post telephones and signals data lines).

10.6 Tunnel IDFs

Tunnel IDF shall be installed at the location of emergency telephones where required in the tunnel to provide an intermediate point for cable distribution.

The purpose of the tunnel IDF is to provide a termination and test point for local cable distribution and the connecting cables to the telephone and blue light at that location.

The tunnel IDF basic requirements are:

a) weatherproof to IP66

b) vandal resistant

c) constructed of materials that are fire safe and resistant to corrosive ground waters and with the main enclosure constructed from 316 grade stainless steel

d) secured by Falcon 17 lock

[6] Based on the number of terminations required in a 20 pair cable providing 40 services.

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e) suitable for surface mounting underneath an emergency telephone

A typical tunnel IDF is shown in drawing MET MCH 0012.

Where appropriate the tunnel IDF may provide a shared resource with cabling for trackside signal telephone cabling in the same tunnel segment.

10.7 Tunnel test box

Tunnel test boxes shall be provided at the location of emergency telephones where there is no tunnel IDF located.

The purpose of the tunnel test box is to provide a test point for the telephone and a connection point for the blue light and avoid the need for opening of the telephone casing for testing or cable connection.

The tunnel test box has similar basic requirements to the tunnel IDF but will be smaller and will be dedicated to the emergency telephone at that location.

A typical tunnel test box is shown in drawing MET MCH 0008.

10.8 Outdoor IDFs

Outdoor IDFs shall be installed at locations where required outside the tunnel to provide an intermediate point for cable distribution.

The purpose of the outdoor IDF is to provide a termination and test point for local cable distribution and a transition point between the different types and specification of cable required within the tunnel and outside a tunnel.

The outdoor IDF basic requirements are:

a) weatherproof to IP66

b) vandal resistant

c) constructed of materials that are fire safe and resistant to corrosive ground waters and with the main enclosure constructed from 316 grade stainless steel

d) secured by Falcon 17 lock

e) suitable for surface mounting underneath an emergency telephone

f) dimensioned to cater for multiple tunnels and other required services such as signal post telephone cable

A typical Outdoor IDF is shown in drawing MET SC 0330.

Where appropriate the outdoor IDF may provide a shared resource with other cabling required for signals related communications.

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10.9 Cable route

Design, location and construction of cable route for the system shall be coordinated with that of routes required by other services within the tunnel.

The main cable route for telephone cabling in tunnel segments shall consist of a heavy duty tray that is constructed of materials that are fire safe and resistant to corrosive ground waters.

A dedicated tray or dedicated and segregated space within a general communications tray shall be provided for the system. This dedicated tray or segregated space shall be clearly labelled at approximately 3 m intervals as emergency telephone.

The emergency telephone cable tray or space shall not be used for other purposes with the exception of:

a) cable associated with signal telephones in the same tunnel segment

b) optical fibre used by the responsible AEO to provide backbone networks that support the system

Conduits used for minor routes or crossings shall be:

a) vandal resistant

b) constructed of materials that are fire safe and resistant to corrosive ground waters

11. PABX(s)

PABXs shall be incorporated into the wider TfNSW rail operations control telephone network and configured to allow calls to be routed to the answering point at RMC and alternate answering point at the DRC.

PABXs shall be dedicated to the purpose of the system with the exception where small numbers[7] of telephones in particular tunnel segments may be provided from an operations control PABX where appropriate.

PABXs shall be installed in a telecommunications equipment room[8] and powered from the room's 48 V dc power supply, which shall have a minimum nominal battery backup time of 12 hours.

PABX network design shall be referred to the responsible AEO at concept design stage for direction and/or advice on networking aspects including:

a) where the PABXs are to fit into the wider network

b) suitability of the model of PABX proposed

[7] Maximum of 15 telephones based on the number of services that can be provided by a typical PABX extension interface card less one reserved as a test line and that introduction of small PABXs are generally detrimental to reliability and maintainability of the wider network.

[8] As described in T HR TE 21001 ST.

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c) availability and suitability of use of existing rooms

PABX installation and configuration design shall be referred to AEO designers at detail design stage for direction and/or advice on site aspects including:

a) rack location within the room and any cable tray work required

b) MDF allocation for cable termination or any MDF extension required

c) DC circuit breaker allocation or any DC power supply extension required

d) number allocation

e) routing plans

f) trunk signalling protocols

g) synchronisation plans

12. Telephone testing subsystem

The system shall utilise an automated remote telephone testing sub-system designed to cooperate with that remote testing feature within the telephones.

The purpose and functions of this subsystem are:

a) to provide early detection and reporting of any out of order telephones by way of a scheduled automated testing routine

b) to enable remote diagnosis of the nature of reported telephone faults

c) reduce the frequency of routine inspections within the tunnel[9]

The telephone testing sub-system shall be comprised of:

a) a carrier grade server installed in a telecommunications equipment room and maintained by the responsible AEO

b) test lines connected between the server and the PABX associated with the answering point

c) dedicated terminals installed in appropriate signal maintenance depots connected to the server by a TfNSW rail WAN

d) remote access by the responsible AEO maintenance staffs by way of both dial up and WAN

To avoid the need of providing and maintaining multiple testing sub-systems, the telephone testing sub-system shall preferably provide a shared resource between multiple emergency tunnel telephone systems and other trackside signals related telephones that are enabled with a compatible remote testing facility.

[9] Routine tunnel inspections would not be eliminated; however any reduction would be an improvement to maintenance staff safety and operational cost.

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13. Emergency telephone location

Telephones shall be located as required by ESC 340 in line with the following principles.

The principles for selection of location of emergency are summarised below:

a) only in nominated safe locations such as refuges or walkways with appropriate clearance from the track

b) no more than 90 m from the next telephone along in the tunnel

c) at track crossovers or other complex tunnel configuration

d) near tunnel portals, inside the tunnel

e) appropriate outdoor locations near tunnel portals where they may be useful in coordinating a response to an emergency incident in the tunnel

In legacy tunnels, which pre-date ESC 340, it may be necessary to locate emergency telephones in refuges that do not meet the requirements of the standard. In this situation, attention shall be given to selecting the most appropriate refuges. Examples of inappropriate refuges are:

a) refuges which are under size and have other equipment mounted on the walls

b) refuges overly affected by ground water seepage

Each location where an emergency telephone is installed shall also be fitted out with:

a) the emergency telephone

b) emergency lighting

c) an emergency telephone location light visible from the location of the next telephones along in the tunnel segment[10]

d) a sign, generally in accordance with drawing SK 0142, adjacent to the location to depict the purpose of the telephone

[10] At refuges that provide a crossing between adjacent tunnels, location lights should be provided in each tunnel.

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