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Issue	2
Date	August 2004

Design & Construction of Undertrack Crossings (formerly RT/CE/S/044)

This temporary front sheet facilitates change to the new Network Rail Standards referencing nomenclature.

The Ref above will be formally allocated to this standard when it is next changed in the meantime the contents, date and issue number of this Network Rail Standard are UNCHANGED and with immediate effect it should be referred to as “(new ref) formerly (old ref)”.

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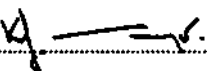
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Business Process Document

Specification Volume SW(G) 2 Design & Construction of Undertrack Crossings

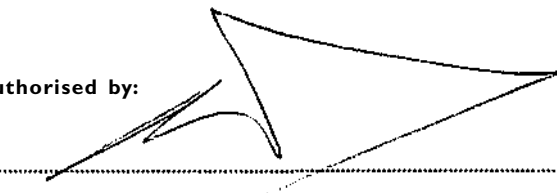
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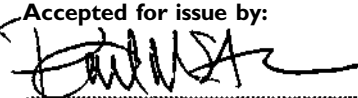
K. Teager, Professional Head of Structures Engineering

Authorised by:



A. McNaughton, Chief Engineer

Accepted for issue by:



P. McAleer, Head of Standards Development Process

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Issue Record

Issue	Date	Comments
Issue 1	April 1998	New Specification
Issue 2	August 2004	Modified to suit new Group Standard GI/RT7008

This Specification will be updated when necessary by distribution of a complete replacement. Amended or additional parts of revised pages will be marked by a vertical black line in the margin.

Implementation

The provisions of this Specification are mandatory and shall be applied from November 2004.

Compliance

This Specification shall be complied with by persons responsible for the Design and construction of Undertrack Crossings on Network Rail infrastructure and by persons responsible for managing the Design and construction process for such Undertrack Crossings.

Except as indicated below action to bring existing Undertrack Crossings into compliance is not required.

Where it is known, or becomes known, that an existing Undertrack Crossing does not comply with the requirements of this document or part of this document, action to bring them into compliance is required as follows:

- a) when the Undertrack Crossing is modified
- b) when any major component of the Undertrack Crossing is replaced.

Where it is considered not reasonably practicable, to comply with the requirements set out in this document, authorisation not to comply should be sought in accordance with the Approval in Principle procedure.

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purpose other than that for which it was prepared except where it can be shown to have acted in bad faith or there has been wilful default.

Supply

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1 Purpose

The purpose of this Network Rail Business Process Document is to define the requirements for the Design and construction of Undertrack Crossings.

This Specification contains requirements supplementary to Network Rail Company Standard [RT/CE/P/044](#) - “Managing Structures Works”, in respect of the scope of this Specification. Compliance with this Specification, and with the Procedures and Specifications referenced herein, will ensure compliance with the Railway Group Standards as listed in Appendix A in respect of the Design and construction of Undertrack Crossings.

2 Scope

This Specification applies to the design and construction of all Undertrack Crossings on Network Rail infrastructure and to those appointed by Network Rail to be responsible for the management of such Undertrack Crossings, to the extent that the Undertrack Crossings affect safe train operations and/or the movement and control of people to and from the trains.

This Specification does not cover the requirements for the Undertrack Crossing to carry the service within it or the performance of the service within the Undertrack Crossing.

The group of Company Standards for the Management of Structures Works is shown on [RT/CE/P/044](#) – “Managing Structures Works”. Within this document, references to Specifications within the Group of Company Standards for Structures Works are made in relation to the Structure Categories, or group of Specifications for Project Management, as listed in Appendix B, i.e. SW(A) to (H), and the Volume number, as well as the Network Rail Standard number.

This document does not apply to:

- surface laid cables, including cables laid immediately below rail level;
- Culverts.

3 Reference Documentation

Railway Group Standards	
GE/RT8015	Electromagnetic Compatibility between Railway Infrastructure and Trains

GI/RC7503	Recommendations for Management of Construction Work in the Operational Railway Environment
GI/RT7003	Management of Construction Work in the Operational Railway Environment
GI/RT7008	Pipelines, Buried Services and Undertrack Crossings
GI/RT7033	Lineside Operational Safety Signs
GO/RT3471	Incident Response Planning

Network Rail Standards Forming the Group of Standards for Structures Works

RT/CE/P/044	“Managing Structures Works”
Section A - Specification for the Design of Bridges and Culverts	
RT/CE/S/020	Volume SW(A) I - “Design of Bridges and Culverts”
Section H – Project Management	
RT/CE/S/003	Volume SW(H) I - “Technical Approval of Design, Construction and Maintenance of Civil Engineering Infrastructure”

Other Network Rail Standards

RT/CE/S/006	“Track Ballast and Stoneblower Aggregate”
RT/CE/S/102	“Track Construction Standards”
RT/CE/S/104	“Track Maintenance Requirements”
RT/E/S/19608	“Level Crossing Infrastructure (Inspection and Maintenance) Handbook”

Other Documents

“Guide for Best Practice for the Installation of Pipe Jacks and Microtunnels” - Pipe Jacking Association
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4 Definitions

Access Manhole

A structure provided to give access for installation, maintenance and renewal of a Buried Service. The term includes cable draw pits, drainage catch pits, thrust and reception pits.

AIP Submission

The submission for Approval in Principle as required by Specification Volume SW(H) I – “Technical Approval of Design, Construction and Maintenance of Civil Engineering Infrastructure” ([RT/CE/S/003](#)).

Approval in Principle means that a professionally competent person or body is satisfied that:

- the Design Concept proposals for the Scheme meet the requirements of the Remit and of this Specification;
- suitable standards and/or Design criteria are proposed for the detailed Design and Design Check.

Bridge

A structure with a span or diameter greater than or equal to 1800mm whose primary purpose is to carry traffic or services over an obstruction or gap, but excluding Culverts.

Buried Service

All cables (including surrounds or ducting) and Pipelines used for the conveyance of electricity, signalling, telecommunications, gas, water, petrochemicals, effluents, etc which are below ground level. This definition does include services that are only nominally covered by the ballast.

Culvert

A structure with a span or diameter greater than 450 mm and less than 1800 mm whose primary purpose is usually, but not exclusively, to permit water or services to pass under or adjacent to a railway, road or other Network Rail infrastructure. The term excludes Outside Party Pipelines.

Depth

The vertical distance from the underside of a sleeper to the top surface of the Buried Service (including any surround or ducting) or Undertrack Crossing. In respect of steel sleepers, the measurement of Depth is from the lowest point of the sleeper.

Design

Information in the form of drawings, diagrams, calculations and/or specifications (performance, materials and workmanship) which together describe in detail what is to be constructed and, where applicable, how it is to be constructed. The term is also used to describe the process by which such information is produced.

High-Voltage

Voltages exceeding Low-Voltage (see Low-Voltage).

Low-Voltage

Voltages not exceeding 1000 V rms ac or 1500 V dc between conductors, 600 V rms ac or 900 V dc between conductors and earth.

Open Cut Method

The method used to construct an Undertrack Crossing when the service is laid in a trench excavated by hand or by machine and subsequently backfilled.

Pipeline

A pipe used to transport liquids or gases that may or may not be pressurised. Pipelines that are not carried in Undertrack Crossings are excluded from this Specification.

Remit

The formal document issued by Network Rail describing the purpose, scope and objectives for a project, an outline of the service required, key responsibilities and outputs to be delivered at completion of the project phases.

Undertrack Crossing

A Buried Service route passing under the track(s) below the level of the underside of the sleepers or track slab, which is neither a Bridge nor a Culvert. The term excludes services laid through a Bridge span or in the roadway beneath a Bridge span.

5 Roles, Responsibilities and Competencies

Those appointing persons to positions with responsibilities in accordance with the roles in this Specification shall ensure that appointees are competent to carry out their duties and understand their responsibilities. Appointments, responsibilities and duties shall be documented.

Roles, responsibilities and competencies of those involved in the production and checking of a Design shall be in accordance with Specification Volume SW(H) 1 - "Technical Approval of Design, Construction and Maintenance of Civil Engineering Infrastructure" ([RT/CE/S/003](#)).

The skill, expertise, training and experience of those employed on a Design shall be appropriate to the nature and complexity of the Undertrack Crossing being designed. This competency shall be assessed by the person making the appointment.

The Construction (Design and Management) Regulations 1994 set out the requirements for those managing construction / Design work with respect to competency.

6 General Design Requirements

6.1 Structural Adequacy

Undertrack Crossings shall be designed such that, for the duration of their intended life and assuming appropriate standards of construction and maintenance:

- they provide adequate resistance to the intended applied loads (including self weight);

- they provide adequate resistance to the likely effects of external influences;
- they have sufficient robustness not to suffer damage due to accidental events or vandalism, to an extent that would be disproportionate to the severity of the cause.

When calculating the structural adequacy of an Undertrack Crossing, account shall be taken of the effect that an adjacent Undertrack Crossing or adjacent elements or spans within the same Undertrack Crossing may have on the size of the load to be carried and any lateral restraint that may be offered by the adjacent ground.

The Design of any temporary works shall afford adequate support to the tracks.

6.2 Intended Use

The loading to be supported shall be specified, with due consideration given to the likely or reasonably foreseeable future loading, including accidental loading and planned abnormal use. In all cases, the Design loading shall be stated explicitly in the AIP Submission.

6.3 Ground Investigation

The Design of Undertrack Crossings shall be based upon information obtained from a ground investigation on the line of the proposed Undertrack Crossing. If such information is not already available, a suitable ground investigation shall be undertaken. The results of this investigation shall be used to assist in selection of a suitable Design and method of construction. The results shall be submitted for Network Rail consideration as part of the Approval in Principle process.

Records shall be checked for presence of services before any ground investigation is undertaken and a Network Rail approved cable avoidance tool shall be used to check for services before excavation.

6.4 Alignment and Position

The location of an Undertrack Crossing shall be selected to minimise risks to the operational railway and with due regard to the maintenance of the stability of adjacent structures and lineside apparatus and to minimise the effect on the horizontal and vertical alignment of the track. Where practicable, Undertrack Crossings shall be located clear of switches and crossings and rail joints.

Undertrack Crossings shall also be positioned so their installation, including any associated temporary work, does not affect the structural integrity and performance of any adjacent track, structure or service, including supports to the service.

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Where reasonably practicable, Undertrack Crossings shall be perpendicular to the line of the rails so as to minimise disturbance of the track. For Undertrack Crossings constructed using a method other than Open Cut Method, unless agreed and justified as part of the Approval in Principle process, the angle between the centre line of the Undertrack Crossing and the tracks shall not be less than 75°.

Where reasonably practicable, the minimum clearance between any point of an Undertrack Crossing including any Access Manhole and the nearest a.c. electrification overhead line equipment mast or other structure shall be 3.0 metres.

At existing and proposed level crossings, where required to allow for future road widening or installation of anti trespass-guards, Access Manholes shall not be situated within 5.0 metres of an existing level crossing road surfacing measured along the tracks. The inspection and maintenance requirements of Network Rail Standard RT/E/S/19608 – “Level Crossing Infrastructure (Inspection and Maintenance) Handbook” shall also be considered when positioning Undertrack Crossings at level crossings.

In order to facilitate construction and future maintenance, Access Manholes shall, where practicable, be positioned so that the excavation for the Access Manhole is outside of the area shown in Appendix D.

If any strengthening work to adjacent structure or service is required in order to meet these requirements, such strengthening work shall be completed before installation of the Undertrack Crossing has started.

The placement of Buried Services shall take account of the locations of existing Buried Services, in particular the potential for electromagnetic interference. Requirements for electromagnetic compatibility are set out in Railway Group Standard [GE/RT8015](#) – “Electromagnetic Compatibility Between Railway Infrastructures and Trains”.

6.5 Depth of Undertrack Crossings

6.5.1 Open Cut Method

Undertrack Crossings constructed by the Open Cut Method shall be placed at a minimum Depth of 900 mm below the level of the underside of the sleeper, as shown in Appendix C.