KiwiRail

Engineering and Asset Management

Civil Specification

C-SP-AE-64322

Installation of Utility Structures on Railway Land

Document Control

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This is a 'living' document, that will be updated every five years or earlier if KiwiRail determines that changes to the document are required.

If changes arise from the review this document will be reissued, however, if no changes arise from the review, the current version of this document will remain in force.

Table of Contents

List of Tables

Table on Figures

1. Purpose

This specification sets out the conditions governing the installation and maintenance of Utility Structures on, over or under Railway Land (land owned by the Crown and leased to KiwiRail).

This document replaces E1322 Specification for the Installation of Pipelines on Railway Land Version four dated 1 June 2015.

2. Scope

Utility Structures are most commonly water or gas carrying pipes or ducts carrying cables buried beneath or running parallel to railway tracks, but also include overhead conductors and cables. This specification is intended as a guide to engineers and contractors engaged on behalf of Utility Operators (UOs), in designing and installing Utility Structures on Railway Land.

2.1 Use in the field

Where required as reference to complete the task, this document can be opened in the field on an iPad via 'iKon'.

The controlled version is held on KiwiRail EDMS, and controlled copies are available through SharePoint. All other electronic copies and all printed versions are uncontrolled.

2.2 Objective

This specification sets out:

- a summary of the procedure for obtaining permission from KiwiRail (the Corridor Manager) to install a Utility Structure on Railway Land
- the technical design requirements that the Utility Structure must meet
- the Works (site) requirements that apply when installing the Utility Structure.

2.3 Uncommon situations

This specification is intended for the most commonly occurring situations of a Utility Structure being installed on, over or under Railway Land. Should a situation occur that is not prescribed by this specification, the Corridor Manager will apply the general intent of this specification and apply engineering judgement in determining the appropriate requirements for such situation.

Utilities in or close to tunnels should be avoided because the available space is typically constrained, the environment is challenging, and access to install, inspect, maintain and decommission the utility is restricted. Any works in or close to tunnels must be undertaken in accordance with B-ST-TU-3115.

2.4 Other authorities

This specification does not supplant or override any conditions imposed by KiwiRail in entering into an agreement or executing a license with the UO. Where Public Statutes, Local Government Ordinances,

Bylaws or Orders of a Public Authority prescribe a higher degree of protection, than specified herein, then the higher degree of protection so prescribed will be deemed a part of this specification.

This specification is consistent with, and augments (but does not replace), the NZ Utilities Advisory Group's National Code of Practice for Utility Operators' Access to Transport Corridors.

2.5 KiwiRail use only

This specification is specific to KiwiRail and is for use on the KiwiRail network and connected private sidings where KiwiRail rolling stock operates. KiwiRail takes no responsibility for its application to non-KiwiRail railways.

2.6 Corridor manager

The Corridor Manager may defer to other officers within KiwiRail for decisions relating to technical requirements, acceptable locations and installation of Utility Structures. Such other officers may be the Engineer or the local Asset Engineer.

3. Associated Documents

Level	Number	Title
4	C-TI-GU-4215	Application to Install a Utility Structure
3	S-ST-CW-2140	Construction of Cable Duct Routes
3	C-ST-CU-4103	Culverts
3	C-TI-GE-4201	Geotechnical Investigation Requirements
4	C-TI-CU-4210	Culvert Renewal
3	T-ST-DE-5200	Track Design
		New Zealand Utilities Advisory Group (NZUAG) National Code of Practice
		Health and Safety at Work Act 2015 and Regulations
		WorkSafe New Zealand 2016 – Excavation Safety
	CE100 600	Pipelines Under a Track Carrying Non-Flammable Materials, KiwiRail 2007
	CE100 601	Pipelines Under a Track Carrying Flammable Materials, KiwiRail 2007
	EG1000	Power Line Preferred Layout Typical, KiwiRail 2012
	CE 100 862	Formation and Drainage Details
	CE 100 892	Exclusion Zones for Cables and Ducting Running Along Rail Track

	G-ST-AL-9112	Engineering Drawing Issue and Control
4	KFN-PRO56-PRD01	Application for a Grant of Right (KiwiRail iKon – internal link) Application for a Grant of Right (KiwiRail website – external link)
	E-SP-AE-61318	AEA Earthing and Bonding
	E-ST-WE-0115	WEA Earthing & Bonding Design
	CST/330	25 kV AC Electrified Areas Earthing & Bonding Principles and Rules
	CSG/705	25 kV AC Electrified Areas, Earthing & Bonding of Miscellaneous Items
	EN50122-2	Railway Applications – Fixed Installations – Electrical safety, earthing and the return circuit Part 2: Provisions against the effects of stray currents caused by DC traction systems
	AS/NZS 3000	Electrical installations – Known as the Australian/New Zealand Wiring Rules
	NZECP 34	Code of Practice for Electrical Safe Distances

3.1 Withdrawn, closed and superseded

Old Reference	Title	Replaced by
E1322	Specification for the Installation of Pipelines on Railway Land	C-SP-AE-64322

4. Acronyms and Definitions

Phrase	Definition / Meaning
Asset Engineer	The local Asset Engineer of KiwiRail responsible for the geographical area in which the Utility Structure is located
Cable	A conductor which carries electric power or telecommunications signals
Corridor Access Request	An application by a Utility Operator to carry out Works in the Railway Corridor
Corridor Manager	The licensed access provider who controls access to the Railway Land
Electrical awareness	Training given to personnel by KiwiRail when working near an overhead traction wire system
Electrical safety Permit to Work	A permit, called a Permit to Work, issued to personnel by the KiwiRail when working within 4 m of an overhead traction wire or other KiwiRail overhead power line system
Encasement	An external concrete (or approved other) surround to the pipe
Encasing Pipe	A protective pipe through which the Utility Structure is placed
Engineer	KiwiRail's Professional Head – Civil Engineering or the Professional Head of the appropriate discipline to whom they may defer
Grant of Right	A grant of rights to access Railway Land given pursuant to section 35 New Zealand Railways Corporation Act 1981 (previously known as a Deed of Grant)
KiwiRail	KiwiRail Limited
KiwiRail's PHTEE	KiwiRail's Professional Head – Traction and Electrical Engineering
NZUAG	New Zealand Utilities Advisory Group
Permit to Enter	Written authority from KiwiRail to enable physical access to Railway Land
Preliminary Notification	The preliminary notification issued in respect of Works pursuant to NZUAG Code of Practice, section 4.2
Project Works	Works in the Railway Corridor running parallel to a railway track
Rail Level	The top surface of the rail on which train wheels run. On curves, this means the lower rail

Railway Corridor	The linear transport corridor formed by contiguous Railway Land

Phrase	Definition / Meaning
Railway Land	Any Land leased to KiwiRail Limited by the Crown and NZRC pursuant to the memorandum of lease dated 20 December 1991, as varied from time to time
Railway Protection Officer	A person appointed by KiwiRail to ensure that railway operations are protected during the Works
Statement of Works	A formal description of how the UO intends to undertake the Works
Track	The construction on which railway vehicles run that comprises two rails on individual sleepers or within a slab. The track centreline is the point halfway between the two rails. Where a track has been removed, or is yet to be placed the position of the track will be as defined by the Corridor Manager.
Traction and Electrical Engineer	The Professional Head – Traction and Electrical Engineering of KiwiRail
UO	Utility Operator – the authority, body, applicant or licensee, or any party applying for, being granted, installing, using or maintaining any pipeline or crossing in or on Railway Land
Utility Structure	Any pipe, duct or aerial conductor or cable intended to convey liquid, gas, electric power or telecommunication signals, including supporting structures and access chambers
Work(s)	Construction or maintenance work in, on, along, over, across or under the Railway Corridor

5. Preliminary Considerations

Installing a Utility Structure on Railway Land (or maintaining or removing an existing one) requires formal permission from the Corridor Manager.

The Corridor Manager considers the design of proposed Utility Structures and co- ordinates their positions and alignments.

The permission procedure is detailed in the NZUAG National Code of Practice, Section 4 and summarized in this section.

Forms relating to the procedure are contained in the appendices of C-TI-GU-4215 Making Application to Install a Utility Structure.

5.1 Grant Agreement

1. The Utility Operator (UO) of a Utility Structure to be placed in or over Railway Land will be required to apply for and obtain a Grant of Right from KiwiRail prior to construction works commencing.
2. The Grant of Right states the conditions under which the Utility Structure may be installed and remain within Railway Land and is an agreement to pay to KiwiRail such fees that may be fixed by KiwiRail from time to time.

   Refer to document C-TI-GU-4215 Application to Install a Utility Structure for the procedure for applying for a Grant of Right.

5.2 Renewal or replacement of utility structure

A renewal or replacement of an existing Utility Structure or encasing pipe will be considered as a new installation and will be subject to the requirements of this specification.

5.3 Entry onto railway land

1. Investigations and surveys leading to the design of the Utility Structure may require the UO to enter onto Railway Land. The UO may only enter Railway Land when in possession of a **Permit to Enter**. Unauthorized persons on Railway Land without a Permit to Enter are trespassing.
2. The UO will require a **Permit to Enter** to be able to enter and undertake work on Railway Land. No work may commence until a permit has been obtained.
3. The UO will require a Permit to Dig if the proposed Utility Structure includes any groundbreaking works within the rail corridor.
4. Where KiwiRail's traction overhead wires are present (Auckland metro area, Wellington metro area and Palmerston North to Hamilton), a separate and additional **Electrical Safety Permit to Work** may also be required by the UO when undertaking work on Railway Land. Persons working near or within four meters of the electric overhead wires must receive specific Electrification Awareness instruction.

Note: In other locations, wires on poles that may appear to be telephone wires are 3.3 kV power wires.

5. Permission to enter rail freight terminals, shunting yards, sidings, rolling stock maintenance depots and other railway facilities should, additionally, be sought from the site manager of the facility.
6. Refer to document C-TI-GU-4215 Application to Install a Utility Structure for the procedure for obtaining a permit.

5.4 Submitting a design

1. The application for a Utility Structure must include sufficient detail to show the location, size, depth, configuration and construction methodology to enable KiwiRail to determine its compliance with this specification and its suitability to enter Railway Land.
2. All design requires pipe spipe Specification and must include separation distances from KiwiRail structures - including Signalling cabinets, Radio and traction poles, pits and, level crossing barrier arms etc
3. UOs to provide maintenance and inspection program/detail for above ground structure
4. Where applicable UO to provide details/timings for structure maintenance/asset testing.
5. UO to provide to KiwiRail, maintenance tests once completed (for proof of asset testing)
6. For pipes and ducts, the UO must submit drawings, etc as follows:

Table 5.1: Amount of information to be supplied with submission

Utility Structure size	Submission requirements
Minor Works (eg simple < 100 mm diameter pipe under a single track)	In lieu of engineering drawings, construction methodology, an accurate sketch may suffice showing pipe or duct alignment, access points and other pertinent information.
Pipes and ducts < 300 mm diameter and of straight forward installation	• Engineering drawings • Construction methodology
Pipes > 300 and < 600 mm diameter	• Engineering design (including calculations) • Engineering drawings (including cross section) • Ground investigation results • Construction methodology
Pipes and ducts > 600 mm diameter or complex or unusual projects	• Engineering design (including calculations) • Engineering drawings (including cross section) • Ground investigation results • Construction Management Plan • Producer statements (where applicable)

Flammable-substance pipe	In addition to any applicable requirement relevant to the size of the pipe, the UO must provide a specific emergency plan to deal with any potential leakage during construction or thereafter (refer to section 8.3 for more details).
Metal pipes, conduits, metal sheathed cables or other metal-enclosed services in electrified areas	Earthing and Bonding mitigations

7. Location of proposed valves, pits, masts/ poles and other fixtures and fittings, where applicable.
8. In addition, and for other forms of Utility Structures (under or above ground), the UO shall submit such other relevant information as specified on C-SP-AE-64322 Installation of Utility Structures on Railway Land and requested by the Corridor Manager.
9. Details of markers as specified in Section 13 or other protection devices to be installed
10. Full details of the requirements can be found in the document C-TI-GU-4215 Application to Install a Utility Structure.

5.5 Locating existing services

The Utility Operator is to check the proposed route to determine the presence, location and depth of existing utility structures prior to submitting the design for approval and prior to commencing works. KiwiRail services within the KiwiRail boundary will be determined through permit process, and service searches for non-rail (external) services are to be undertaken by UO with the relevant authorities in accordance with industry-standard procedures.

5.6 Tracks and rails

For clarity, a railway track is the whole construction on which trains run and comprises of two steel rails mounted on timber, concrete or composite sleepers. The track centerline is defined as a datum halfway between the two rails and defines the track's position on engineering drawings.

Rail level is defined as the top (running surface) of the railhead. On curves where the rails are at different heights, the measurement shall be made as per below guidance for any:

1. service below track infrastructure, the measurement must be given to the lowest rail.
2. structure above track level, the measurement must be given to the highest rail, to know the lowest overhead clearance.
3. The UO should check the rail level with the Corridor Manager for mothballed lines or areas reserved for future rail development.
4. Rail designated land where there is no track now, the rail level shall be given to the top of the formation. If there is no formation, then the rail level shall be no greater than

the top of the surveyed existing ground level.

5.7 Measuring distances

Generally, horizontal distances are measured from the track centerline, as per below guidance:

1. Rails may have an electrical current running through them to detect the presence of trains for signaling purposes. Metallic tapes or levels placed between the rails would complete the circuit and activate the signals. Metallic tapes and levels must not be used when measuring between rails.
2. In addition, metallic tapes and metallic levelling staffs must not be used in the presence of overhead wires.

6. Design Requirements – General

This section sets out general design requirements for Utility Structures located on Railway Land.

Additional requirements are set out in:

- Section 7 Design Requirements: Non-Flammable Substance Pipes
- Section 8 Design Requirements: Flammable-Substance Pipes
- Section 9 Design Requirements: Cable Ducts
- Section 10 Design Guidelines: Toxic and Corrosive Substances Pipes
- Section 11 Design Guidelines: High-Pressure Steam Pipes
- Section 12 Pipe and Duct Specifications.

These design requirements form part (and only part) of the information required to accompany a Corridor Access Request, as set out in the NZAUG National Code of Practice, section 4.9, rev 4, 9 October 2024

6.1 Positioning of utility structures

This section sets out the location requirements for Utility Structures that are:

- transverse (across track), buried
- longitudinal (parallel to track), both buried and above ground

For aerial structures, refer to section 6.4 Aerial utility structures (guidelines).

6.1.1 Service Pits Requirement within rail corridor

1. The service pits to comply the Load Rating classification according to AS/NZS 3996 standards, rated to Class C for any pit within the rail corridor and pits in publicly accessible areas such as stations and cycleways to meet anti-slip requirements in accordance with AS/NZS 4586.

2. Swept bends to provide at pit entrance to make it easier for installing cables to

preventing damage. Add clear markers inside the service pits to see the direction of the conduit. This should be placed outside the railway loading zone to allow workers and equipment to avoid the risk of entering into loading zone during construction.

3. Maintain a clear zone of approx. 3m x 3m opposite to any service entry into a pit to allow safe access for haulage equipment and to minimise risk of contact with any arial electrical cable.

4. Design of underground duct alignments to consider slope stability , and should not be allowed on the crest of embankments

6.1.2 Transverse structures

1. Transverse Utility Structures (across the tracks) must be located so that, where practicable, they cross railway tracks at approximately right angles. In special cases, the Corridor Manager may give permission to cross the tracks at other angles such as where Utility Structures are laid in a road that makes an oblique crossing with the railway.
2. Utility structures shall not have bends within the rail corridor.
3. Utility Structures must be laid clear of structures, cattle pits or stops, drains, 2.0m from signaling equipment, overhead masts, buildings, (refer 6.8 of S-ST-CW-2140), points and crossings.
4. For Utility Structures laid on over bridges and under railway bridges, refer to section 6.6 Utility structures at bridges.
5. Utility Structures cannot be placed through culverts as they will inhibit the capacity of the waterway and the ability to clean or replace them.
6. Multiple pipes over 200 mm internal diameter and less than three meters below ground level must be spaced apart by the same amount as the larger of their diameters.
7. Where metal Utility Structures cross the track in electrified areas (Auckland Metro, Wellington Metro and NIMT Palmerston North to Hamilton) they must be insulated from the surrounding subsoil per the requirements of E-SP-AE-61318.This requirement should also be considered on unelectrified areas likely to be electrified in the future (consult with PHTEE). Extra precautions must be taken in the Wellington Metro in accordance with EN50122-2 to protect against stray DC currents.

6.1.3 Longitudinal structures

1. Longitudinal Utility Structures (parallel to the track) in Railway Land must be located at the relevant distance specified in Table 6.1.

Table 6.1: Location of longitudinal structures

Distance	From
< 3 m	Boundary of Railway Land
> 0.5 m	Any fence
> 5 m*	Track centreline
> 2 m	Toe of embankments
> 3 m	Top edge of cuttings

* Note: Refer to drawing CE 100 892 for exclusion zone minimal requirements.

2. At locations where the railway corridor is narrow or already congested, the Corridor Manager may elect to only allow KiwiRail and Utility Structures of national importance to be located there.
3. The UO must check that a proposed longitudinal Utility Structure will not encounter an obstruction and that an above ground Utility Structure will not create an obstruction for the vision of a train or signal. The UO must also determine that clearances are compliant and adequate at points of conflict. This check should be done in conjunction with the Corridor Manager.
4. The UO must give special consideration to Utility Structures in station yards, so that subsequent alterations to the Utility Structures are minimised when railway facilities are expanded or siding connections made to adjoining land.
5. Manholes or access pits on Railway Land should be avoided. If they cannot be avoided, then they must be roadway strength (Class D) and located:

Table 6.2: Location of manholes or access pits

Distance	From
> 1.5 m	Boundary of the Railway Land[1]
> 5 m	Track centerline
> 2 m	Toe of embankments
> 3 m	Top edge of cuttings

6. Metal Utility Structures within electrified areas (Auckland Metro, Wellington Metro and NIMT Palmerston North to Hamilton) that run parallel to the track for 200 m or more must be earthed in accordance with E-SP-AE-61318. This requirement should also be considered on unelectrified areas likely to be electrified in the future (consult with be earthed in accordance with E-SP-AE-61318. This requirement should also be

considered on unelectrified areas likely to be electrified in the future (consult with PHTEE). Extra precaution must be taken in the Wellington Metro in accordance with EN50122-2 to protect against stray DC currents.

6.2 Buried utility structures

This section sets out the requirements for buried Utility Structures, both transverse and longitudinal.

Ground investigations may be a prerequisite to installing a buried Utility Structure. Refer to section 5.4 Submitting a design.

6.2.1 Depths

The tops of buried Utility Structures must be located at the relevant depth specified on **Table 6.3**.

Table 6.3: Depth of utility structures

Distance	From
> 1.5 m(note[2])	Rail level of running lines (ie where trains are in motion)
> 1.0 m	Rail level of sidings (ie where trains are parked)
> 0.7 m	Bottom of drainage channels or at such additional depth as directed by the Corridor Manager. This means the depth below rail level may be greater than as required above.
> 0.9 m	Ground level elsewhere on Railway Land.

6.2.2 Extent of depth

Transverse Utility Structures must maintain the required depth and strength for the following extent:

Table 6.4: Extent of depth of transverse utility structures

Extent	Beyond
> 3.5 m	Track centreline[3] for continuous Utility Structures (e.g. cable duct)
> 5.0 m	Track centreline[4] for encasing pipes[4]

The Corridor Manager may ask for the required depth of a transverse crossing to be maintained for the full width of the Railway Corridor where future expansion of railway tracks and facilities is likely.

[1]This is to provide clearance for road vehicles and to not undermine any fence

[2] Pipe cover may be shallower, provided compliance with the relevant AS/NZS standards for KiwiRail design loadings can be met (Refer to section 6.2.3 of this document).

[3] measured at right angles.

[4] Encasing pipes require the extra extension so that installation pits are beyond the limits inside which a protection person would be required for rail safety purposes.

6.2.3 Loading

1. A pipe which crosses under a railway line (or potential site of a railway line) must be able to withstand design railway loading at its installed depth.

Table 6.5: Design railway loading

Depth	Loading
> 3.5 m	Track centreline[2] for continuous Utility Structures (e.g. cable duct)
> 5.0 m	Track centreline[2] for encasing pipes[3].

Depth	Loading
Static load less than three meters below rail level	The basic load is a set of three axles of 250 kN at 1.6 meters spacing. The load shall be multiplied by an impact factor of 1.6 meters.
Static load more than three meters below rail level	The basic load above is followed by further sets of axles at alternating four meters and 6.7 meters between outer axles of each set. A diagram of the spacing can be provided on request. No impact factor is required.

2. Pipes or ducts that are unable to withstand the design railway loading must be encased with a pipe that can do so (refer below).
3. Longitudinal Utility Structures that pass under an access roadway must be designed for the expected road vehicle loading.

6.2.4 Bedding

1. Bedding of both un-encased Utility Structures and encasing pipes must be in accordance with bedding type HS2 of AS/NZS 3725.
2. Where required, the backfilling must be thermally stable around ducts containing high power electric cables.
3. Pipes installed using trenchless methods (drilling) must be backfilled as set out in section 14.8 Trenchless pipe installation.

6.2.5 Encasing pipes

1. An encasing pipe is used to form a duct though which the *carrier* pipe passes. An encasement protects the carrier pipe from impact damage or overloading, and it also provides a passage to carry away any leakage that could erode the ground beneath the track or cause pollution or explosion.
2. Utility Structures (pipes and ducts) passing under a track must be encased when the carrier pipe or duct:
   - cannot withstand the design railway loading (refer above) or
   - is carrying a liquid under pressure (eg is pumped) and is larger than 45 mm inside

diameter or

- is carrying flammable, toxic or corrosive substances.

Note: this section is not applicable to Culverts. Culverts must be in compliance with C-ST-CU-210 standard.

3. When an encasement is used below a railway track, **the encasement becomes the criterion** upon which all requirements are based. This allows a lesser strength carrier pipe or duct to continue as the same material through the Railway Corridor.
4. The inside diameter (ID) of the encasing pipe must be greater than the outside diameter (OD) of the carrier pipe, its joints, couplings or insulation, by at least the following ratios:

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Table 6.6: Ratio of encasing pipe to carrier pipe diameter

Carrier pipe greatest OD	Encasing pipe ID
< 250 mm	1.40×
250 – 400 mm	1.33×
> 400 mm	1.25×
For example, if the maximum OD of the carrier pipe is 300 mm, the minimum ID of the encasing pipe is 300 × 1.33 = 400 mm.	

5. Multiple pipes carrying compatible contents may share an encasement.
6. An encasing pipe containing multiple carrier pipes must be large enough to enable individual carrier pipes to be removed, allowing for the increased diameter of pipe couplers.
7. The annulus between an encasing pipe and a carrier pipe may be filled with solid fill material unless it is required to be vented. The fill material must be non- electrolytic if a cathodic protection system is being employed. Where a carrier pipe has spacers to keep it concentric with the encasing pipe, the spacers must allow the encasing pipe to deflect without loading the carrier pipe (eg not placed at 12 o'clock position).
8. When a pressure carrier pipe is placed inside an encasing pipe without any confinement, the pipe designer must verify that the carrier pipe can cope with being un-confined inside the encasing pipe; that is not requiring surrounding soil for support or restraint for thrust loads (eg thermal, water hammer).
9. Where possible, the encasing pipe should slope to one end for drainage and the upper end should be sealed. The lower end may be sealed but must be capable of being blown out by the pipe's working pressure for non-vented encasing pipes. The seal must be fixed in place for vented encasing pipes.
10. The length of an encasing pipe is usually determined by the need for it to extend beyond the track centerline by five meters so that installation pits are beyond the limits inside which a protection person would be required for rail safety purposes. At some locations, KiwiRail may direct that the encasing pipe run a greater length or the full width of the Railway Corridor to allow for future railway track to be placed.
11. Where the Utility Structure is under an embankment, the encasing pipe must extend

two meters beyond the toe of the embankment so that the installation pit is beyond the ground loading influence of the embankment.

12. Steel encasing pipes are not allowed in the electrified traction areas. Please refer to Section **Error! Reference source not found.** for more details including protection requirement.

6.2.6 Markers

Buried Utility Structures must be marked, identified and overlaid with warning tape as set out in section 13 Marking of utility structures

6.2.7 Service pits

Service pits and access chambers for non-rail services shall be located outside the rail corridor. In special cases where it is not possible, the corridor manager may agree with the pits located within rail corridor provided it is in compliant with S-ST-CW-2140 Construction of Cable Duct Routes specification.

6.2.8 Redundant services

The UO's are responsible for removal of any abandoned or redundant or decommissioned ducts or cables and pits from KiwiRail Corridor. Abandoned or redundant ducts or pipework shall be removed within the rail corridor and capped on the boundary. Post-removal – Reinstate the formation in accordance with C-ST-FO-4110, reinstate other surface types in accordance with the requirements outlined in the NZUAG National Code of Practice for Road Carriageway, Shoulders and footpaths.

6.3 Above ground (longitudinal) utility structures

6.3.1 Introduction

This section sets out requirements for above-ground Utility Structures. These are not necessarily longitudinal (parallel to the track).

This section does not apply to overhead electric power conductors or telecommunication wires suspended from poles. For these refer to 6.4 Aerial Utility Structures (guidelines).

They must retain clearances to the track centerline in compliance with Track Standard T-ST-DE-5212 Clearances. (refer appendix 2 300205)

Should not be positioned in a manner that impedes access to any railway corridor infrastructure.(refer section 17 in S-ST-CW-2140)

6.3.2 Supports

1. Supports for the Utility Structure must be of robust design and made from non-combustible, durable and corrosion-resistant material.
2. If the supports are not mounted on, or set in, concrete bases they must be protected from corrosion or decay caused by ground contact.

6.3.3 Height

Pipes should be at least 300 mm above ground level to allow vegetation control.

6.3.4 Access ways

Utility Structures must not block access ways. At such locations they should, preferably, be placed below ground level, by either burying or encasement in a concrete or specially constructed channel. Refer to section 6.2 Buried utility structures.

6.3.5 Valves

1. Valves and other devices requiring personnel attention must be easily accessible.
2. The location of valves will be subject to the approval of the Corridor Manager.
3. Valves must not drain the contents of the Utility Structure onto Railway Land

6.3.6 Markers

Above-ground Utility Structures must be identified as set out in section 13 Marking of utility structures.

6.3.7 Vegetation control

1. The UO must keep the areas beneath, and for a distance of at least two meters beyond, the outer limits of any above-ground Utility Structures clear of all flammable material.
2. The means of vegetation control and disposal of flammable material will be subject to the approval of the Corridor Manager.

6.4 Aerial utility structures (guidelines)

6.4.1 Introduction

This section sets out guidelines for the design of aerial conductors and cables (in this context, ‘aerial’ means raised above ground for all or most of its length on Railway Land).

These are guidelines only because all applications for the placement or replacement of aerial Utility Structures will be subject to the specific requirements of KiwiRail’s PHT&E, in each and every case.

6.4.2 Pole location

1. Poles must be located as follows:

Table 6.7: Location of poles carrying aerial utility structures

Distance	From Closest Edge of Pole to
> 5 m	Track centreline
> 2 m	Edge of any access road alongside railway

2. Pole lines along the railway, where practical, should be placed near the Railway Land boundary.

6.4.3 Pole material

1. Poles should be of concrete or steel of a design approved by the Corridor Manager.
2. The Corridor Manager may request that timber poles be used in particular circumstances.

6.4.4 Crossing points

Where a conductor or cable spans a railway track, the poles on each side of the track must be:

- double armed
- blocked.

6.4.5 Impact protection

Poles closer than ten meters from the track centerline must be protected from impact when they support conductors that span the track and are carrying 33 kV or higher.

The impact protection shall be a reinforced concrete wall that:

- extends two meters each side of the pole or tower leg center.
- has the top at 900 mm above rail level.
- is founded at least 900 mm below ground level.
- has a minimum thickness of 450 mm.
- has deflection features at both ends and no abrupt faces.
- has a minimum of one percent vertical and horizontal reinforcement steel.
- is no closer than 1m from the pole.

6.5 Spans over railway

6.5.1 General requirements

Any conductor or cable that spans a railway track must not have:

- a joint
- a span of more than 50 meters.

6.5.2 Electrified railway tracks

1. On electrified railways, power wires may cross the overhead traction wires only if their voltage is greater than that of the traction wires. Traction system voltages are:

Table 6.8: Railway traction system voltages

Traction System	Voltage
Wellington Metro area	1500V DC
Palmerston North to Hamilton	25 kV AC 50 Hz
Auckland Metro area	25 kV AC 50 Hz
Note 3.3 kV overhead conductors for signals also run along or adjacent to some railway corridors.	

2. Power wires of a lesser voltage must be placed under the railway track.
3. Where existing power lines cross an unelectrified line that is then electrified, the power lines may cross the overhead traction wires regardless of voltage, provided the minimum separation requirements are met.
4. Aerial fibre optic cables must not span over traction wires.

6.5.3 Minimum Heights and Separation Distances (Source Reference NZECP 34)

Conductors or Cables can only cross above Railway Tracks if the voltage is higher than the voltage of the rail system. If the voltage is lower, cables shall be installed in cable ducts going under neath the railway line. In all instances the design approval of the PH Traction and Electrical and the PH civil need to be sought.

Conductors or cables must be placed at the following minimum heights above property of KiwiRail or any buildings or station used for the Railway. This is a generalization over a wide range of Ac voltages and span lengths and should be refined by Engineering calculation for specific voltages and span lengths. DC voltages are not covered and should be requested.

Table 6.9: Minimum height and Separation of Conductors over railway assets

MAXIMUM VOLTAGE IN KV, RMS PHASE-TO-PHASE	Earth, up to 1 kV	1kV up to 11kV	11kV up to 33kV	33kV up to 110kV	110kV up to 220kV		Above 220kV
Above non-electrified **Tracks**				Clearance in Meters			
Where electrification is **unlikely.**	5.5	6.0	6.7	8.0	8.5		9.3
Where electrification is **likely**:				Clearance in Meters			
Single supply line crossing over open railway lines.	9.5	9.7	9.9	10.7	11.2		12.7
All multiple supply line crossings and single supply line crossings at stations, yards and at level crossings.	11.0	11.3	11.5	12.2	12.7		14.2
Above road surfaces, platforms and other access ways.	6.0	6.3	6.5	7.3	8.0		9.3
Above footbridges.	4.6	4.8	5.0	6.0	7.0		8.0
Above Electrified Tracks				Clearance in Meters			
To “live” conductors and return conductors on electrification structures.	N/A	N/A	2.3	3.0	3.5		5.0
To communication lines, other power lines, between power lines and cradles. (Includes earth wires)	0.6	0.75	1.0	1.8	2.2		3.8

-Only Transpower with approval from PH T&E

6.5.4 Maximum sag

The minimum heights must be achieved at the conductor or cable's maximum sag, due to temperature or snow load.

6.5.5 Earth pegs

Earth pegs are not permitted.

6.5.6 Drawing

A drawing showing a plan and elevation of the installation must be supplied with the application. Appendix 2 Drawing CE100 601 shows a typical format and guide to the information that must be shown.

6.6 Utility structures at bridges

6.6.1 Introduction

This section sets out the requirements for Utility Structures that are on a:

- bridge over the railway (eg a pipe attached to a road overbridge)
- railway bridge (eg a pipe running parallel to the track)

- the design of the support bracket and location on the bridge to be approved by Structures Engineering
- under a railway bridge (eg a pipe crossing under the track).
- Any installation on bridges, tunnels or viaducts requires approval from Structures Inspectorate Engineer (SIE) prior to installation
- Requirement for M37 Alteration to bridge needs to be submitted at completion of installation.

6.6.2 Agreement granting right

Most bridges **over the railway** are owned by a Territorial Authority or the New Zealand Transport Agency.

Most **railway-carrying** bridges are owned by KiwiRail.

An Agreement Granting Right is required for Utility Services on or under both types of bridge, even if they are not on Railway Land.

6.6.3 Supports

1. Supports (attached to a bridge and carrying the Utility Structure) must be made of durable material such as galvanised steel and shall not impact on the structural integrity of the bridge
2. Fasteners, attaching the support to the bridge, must be made of corrosion- resistant material such as galvanised or stainless steel.
3. Supports can only be attached to steel or timber components of the bridge by

clamping; no drilling or welding of steel or timber is permitted.

4. Concrete may be drilled, but only after the position of reinforcing steel and stressing tendon ducts has been established.
5. Allowance in the design of the supports shall be made for movement between the Utility Structure and the bridge.
6. Supports must be spaced sufficiently closely that the Utility Structure remains safely supported when an adjacent support fails.
7. Services and fixings shall not prevent access for inspection and maintenance of the bridge.
8. Allowance in the design of the supports shall be made if within an electrified area.

6.6.4 Bridges over the railway

1. If possible, supports and pipes should be placed so that people cannot stand on them. Guards must be provided at the ends of pipes to prevent unauthorised access to them.
2. No joint in a pipe or duct is permitted within two and a half meters each side of a track centerline.
3. Ducts or pipes over electrified lines should be plastic if possible. Metal pipes must be electrically bonded or otherwise protected in accordance with E-SP-AE-61318, E-ST-WE-0115 or CST/330 & CSG/705.

6.6.5 Utility structures on railway bridges

1. If possible, the Utility Structures should be mounted on the piers and should be designed to be self-supporting between them.
2. On electrified lines, metal pipes must be electrically bonded or otherwise protected in accordance with E-SP-AE-61318, E-ST-WE-0115 or CST/330 & CSG/705.
3. The Utility structures shall not create an obstruction that cause water to pond or debris to accumulate on the bridge structure
4. No elements shall be attached to railway sleepers or walkways. All structures must remain clear of the railway to ensure full access for inspection and the replacement of key components.

6.6.6 Utility structures under railway bridges

1. Where a Utility Structure passes under a railway bridge (at right angles to the track), it should, if possible, be placed near the center of a span.
2. UOs should note that bridges are inspected regularly. Such inspections involve excavation around timber piers.
3. In all cases, the Utility Structure shall be at least 1m from the furthest projecting faces of the adjacent piers. The faces may be an underground foundation, and the utility structure installation shall not undermine the bridge footing or lead to instability or siding of the abutment or pier

4. Excavating the ground between piers could remove the restraining force that stabilizes abutments. The methodology for the excavation must include a means for providing continued lateral restraint to the bridge abutment(s) until the ground is replaced. The stability of the abutment or pier shall be checked for any temporary open trench condition adjacent to the railway bridge.
5. A marker must be placed on the nearest pier or adjacent to it to advise the location and details of a buried Utility Structure. Refer to section 13 Marking of utility structures.

6.7 Utility Structures above railway tunnel portal

Utility structures that are proposed to be in or near to tunnels (including portal structures and infrastructure) must meet the requirements of B-ST-TU-3115 in addition to this standard refer appendix 2 300205 in T-ST-DE-5212 clearance for the track clearance for tunnel.

7. Design Requirements: Non-Flammable Substance Pipes

This section sets out design requirements for Utility Structures (pipes) carrying non- flammable substances (eg water, storm water, sewage, some food products).

These requirements are in addition to those in section 6 Design Requirements – General.

Refer to Appendix 1 Drawing CE100 600.

7.1 Pressure pipes

1. Pipes carrying liquid or other substances under pressure (ie pumped) must be encased as follows:

Table 7.1: Pressure pipe size requirement for encasement

Pressure Pipe Inside Diameter	Encasement
> 45 mm	Required
< 45 mm	Not required

2. The Corridor Manager may approve the use of a solid, suitably reinforced concrete encasement of suitable cross-sectional dimensions.

7.2 Gravitational pipes

Utility Structures operating under gravity have no additional requirements to those in section 6 Design Requirements – General.

7.3 Irrigation pipes and channels

1. Unless otherwise specifically approved by the Corridor Manager, irrigation pipes must be of reinforced concrete and correctly bedded, as set out in:
   a. Section 6.2 Buried utility structures
   b. section 12 Pipe and Duct Specifications
2. The full supply level of the approach channel within Railway Land must be at least 700

mm below rail level.

3. The pipe must have an end wall brought up to 600 mm above full supply level of the approach channel. Provision must be made for the free flow of drainage along Railway Land.
4. Where any irrigation pipe flows full, is under a pressure head or acts as a syphon, the pipe must have flexible rubber ring joints.
5. End walls and an apron must be provided where any irrigation pipe under the track connects to unlined channels on Railway Land.
6. Any pipe that feeds an unlined drain on Railway Land must have an end wall and apron to the satisfaction of the Corridor Manager.

8. Design Requirements: Flammable-Substance Pipes

This chapter sets out design requirements for Utility Structures (pipes) carrying flammable substances.

These requirements are in addition to those in section 6 Design Requirements – General.

Refer to Appendix 2 Drawing 100601.

8.1 General requirements

8.1.1 Pipe design

1. Pipes carrying oil, gas (LPG, CNG, etc.) or other flammable substances must conform to AS/NZS 2885.1:12018 and the additional requirements of this specification.
2. Strength requirements for pipes in the railway corridor must apply for the full extent that the pipe is within Railway Land.
3. The pipe must be laid with sufficient slack so that it is not in tension.

8.1.2 Shut-off valves

1. Except as noted below, pipes carrying flammable substances must have emergency shut-off and reflux valves that are accessible and installed within effective distances (ie to evacuate the pipe) on each side of the track.
2. The locations of all valves are subject to the approval of the Corridor Manager.
3. Shut-off valves must have permanently fixed to them instructions relating to their operation.
4. Pipe that has automatic control stations at locations approved by the Corridor Manager do not require additional valves

8.1.3 Pumping stations

Pumping stations are not permitted within or on Railway Land unless specifically authorised by the Corridor Manager.

8.2 Flammable-substance pipes below ground

8.2.1 Location of pipe

Flammable-substance pipes will not be permitted through railway culverts, along railway carrying bridges, nor closer than 15 metres to any portion of a bridge over the railway, railway building or other important structure, except in special cases and then only if the pipe is encased and the design and condition have been specifically approved by the Corridor Manager.

8.2.2 Depth of pipe

The top of a buried flammable-substance pipe must be located as follows:

Table 8.1: Depth of buried flammable-substance pipe

Depth	Below
> 2.0 m	Rail level of running lines (ie where trains are in motion)
> 1.5 m	Rail level of sidings (ie where trains are parked)
> 1.2 m	Bottom of drainage channels or at such additional depth as directed by the Corridor Manager. This means the depth below rail level may be greater than as required above.
> 1.2 m	Ground level elsewhere on Railway Land

8.2.3 Extent of depth

1. Transverse buried flammable-substance pipes must maintain the required depth and strength for the following extent:

Table 8.2: Extent of depth of buried flammable-substance pipe

Depth	Below
> 2.0 m[6]	beyond the toe if under an embankment
> 8.0 m[6]	track centerline

2. The Corridor Manager may ask for the required depth of a transverse crossing to be maintained for the full width of the Railway Corridor where future expansion of railway tracks and facilities is likely.

8.2.4 Encasing pipe

1. Pipes that contain a flammable-substance, except low-pressure gas, that pass under a railway track must be encased in a steel pipe in accordance with section 6.2 Buried utility structures.

2. Gas pipes not greater than 75 mm in diameter and with pressures not exceeding 70 kPa may be installed without an encasing pipe.
3. Encasing pipes must be so constructed as to prevent leakage of any substance from the casing throughout its length, or through any portion of the vent pipes other than at the outer end of the vent pipe. The ends of the encasing pipe must be suitably sealed to the outside of the carrier pipe.

[6] Measured at right angles.

4. The inside diameter of the encasing pipe must be such as to allow the carrier pipe to be removed subsequently without disturbing the encasing pipe. All joints or coupling supports, insulators or centering devices for the carrier pipe within an encasing pipe under railway tracks should be taken into account.
5. In addition, a minimum vertical deflection of the encasing pipe of three per cent of its own diameter, plus 12 mm clearance must be provided so that loads from the roadbed track traffic or encasing pipe itself are transmitted to the carrier pipe.
6. When insulation is used on the carrier pipe, the inside diameter of the encasing pipe must be at least 50 mm greater than the outside diameter of the carrier pipe for pipes less that 200 mm in diameter; at least 80 mm greater for pipes 200 mm to 400 mm inclusive in diameter, and at least 112 mm greater for pipes 450 mm in diameter and over.
7. Encasement of pipes under railway tracks must extend to the greater of the following distances, measure at right angles to the object:

a. A minimum of two meters beyond toe of bank; or
b. A minimum distance of eight meters from centerline of track.

8. Pipes must be suitably insulated from underground conduits carrying electric wires or power cables within Railway Land.
9. Encasing pipes must be properly vented. Venting is not required if the annulus to the carrier pipe is filled.

8.2.5 Vent pipes construction

1. Vent pipes must:
   a) be of sufficient diameter, but not less than 50 mm.
   b) extend not less than 1.2 meters above the ground surface.
   c) in locations subject to flooding, extend to half a meter beyond the maximum expected high water and be supported and protected in a manner approved by the Corridor Manager.
   d) be fitted at the top with a relief valve or down-turned elbow and in either case must be properly screened and flame-trapped.

8.2.6 Vent pipe locations

1. Vent pipes must be located near each end of the encasing pipe and must project through the ground surface:
   - At least 15 meters from the centerline of the nearest track, but hard against the fence if the fence is closer than 15 meters from the track.
   - Otherwise, unless otherwise approved by the Corridor Manager, at least 4.5 meters from the fence or at least 3.5 meters from top of a cutting or the toe of a bank.
2. Vent pipes must be at least 4.5 meters measured horizontally from any aerial wires.
3. Example locations of vent pipes are shown in Appendix 2 Drawing 100601.

8.2.7 Electrical insulation

Flammable-substance pipes, encasing pipes and vent pipes must be suitably insulated from underground conduits carrying electrical wires or cables within Railway Land.

8.2.8 Cathodic protection

Steel flammable-substance pipes must be protected by a cathodic protection system that conforms to AS/NZS 2832.1 Cathodic protection of metals Part 1: Pipes and cables. The cathodic protection of the carrier pipe must be electrically isolated from the casing. This means that the end seals or annulus filling material must not use an electrolytic material such as Portland cement.

8.3 Flammable-substance pipes above ground

8.3.1 Location of utility structure

1. Pipes carrying inflammable substances laid above ground level must be located within the following parameters except where the design and conditions have been specifically approved by the Corridor Manager:
   - Not less than 15 metres from the outer rail of the nearest adjacent track or of the nearest part of any bridge or any other important structure, or
   - Less than 4.5 metres from the boundary fence.
2. The pipe must be placed underground at access roadways and other locations required by the Corridor Manager.

8.3.2 Supports

1. Pipes must be adequately supported on robust non-combustible pedestals. The design of the supports must prevent mechanical abrasion of the pipe and seating.
2. The areas beneath, and for a distance of at least two meters outside, the outer limits of any installation must be kept clear of all inflammable substance by the Utility Operator. The method of vegetation control and disposal of inflammable substance will be subject to the approval of the Corridor Manager.
3. Piping, fittings, attachments and pedestals must be protected against corrosion and

mechanical damage.

9. Design Requirements: Cable Ducts

This section sets out the design requirements for:

- electrical cable ducts
- telecommunication ducts.

These requirements are in addition to those in section 6 Design Requirements – General.

9.1 General

Cables passing through Railway Land must be contained in ducts and electric cables must comply with AS/NZS 3000:2018 'Electrical Installations'.

9.2 Separation between services

1. Ducts carrying electric cables must be separated from other services by the following minimum amounts:

Table 9.1: Separation distances between services

Service Type	Distance
Low voltage power, signals and low pressure (<300kPa) and medium (<2000 kPa) gas pipes	150 mm
High voltage (>650 V) power	450 mm
Low and medium pressure gas	150 mm
High (> 2000 kPa) pressure gas	600 mm
Waste/Stormwater mains	450 mm
Telstra Clear fibre-optic cable	1000 mm

2. Ducts installed by a trenchless method must be 500 mm from any KiwiRail or railway operator's cable.

9.3 Multiple ducts

A combination of:

- three or fewer ducts (each up to 100 mm nominal diameter) that are carrying only cables may be placed in a bored hole that is then filled around the pipes. Refer to section 14.8.4 of this specification for requirements.
- four or more services installed by a trenchless method must be contained within an encasing pipe to ensure the integrity of the surrounding ground.

9.4 Earth pegs

Any other party's earth pegs must have a minimum lateral clearance as follows:

Table 9.2: Earth peg minimum lateral clearance

Distance	From
Three meters	any KiwiRail earth peg or closest edge of a railway track sleeper.
One meter	any KiwiRail cable.

9.5 Restoration of thermal fill

Thermally stable backfill around an electric cable that is replaced or disturbed must be restored with matching backfill.

10. Design Guidelines: Toxic and Corrosive Substances Pipes

10.1 Introduction

This section contains guidelines for pipes on Railway Land carrying toxic or corrosive substances.

10.2 Risk assessment

The UO shall conduct a risk analysis and construction impact assessment for consideration by KiwiRail Engineering before the pipe's location is finally determined.

10.3 Requirements

Pipelines containing toxic or corrosive substances must be installed in a manner that:

- is an established current best practice proven by international or domestic experience.
- is acceptable to NZTA for use under State Highways.
- is constructed of corrosion-resistant materials or, if accessible, is protected by a coating that has a minimum 10-year life.
- will contain any leak and divert it away from the railway corridor without any impact on the ground below the railway
- has a ready means to isolate the section of pipe under the railway corridor.
- has an agreed emergency response plan.

11. Design Guidelines: High-Pressure Steam Pipes

11.1 Introduction

This section contains guidelines for pipes crossing the Railway Corridor that contain high-pressure steam.

11.2 Risk assessment

The UO shall conduct a risk analysis and construction impact assessment for consideration by the Corridor Manager before the pipe's location is finally determined.

11.3 Requirements

Pipelines containing steam at over 650 kPa (eg geothermal steam) must be installed in a manner that:

- is an established current best practice proven by international or domestic experience.
- is acceptable to NZTA for use under State Highways.
- is constructed of corrosion-resistant materials or, if accessible, is protected by a coating that has a minimum 10-year life.
- will contain any leak or explosion of steam and divert it away from the railway corridor without any impact on the ground below the railway.
- does not allow the permeation of steam or water into the ground within five meters of a railway track under either normal or fault situations.
- have shut-off valves that can isolate the section of pipe under the railway corridor.
- does not have exposed hot (beyond skin touch tolerance) surfaces.
- has an agreed emergency response plan.

12. Pipe and Duct Specifications

12.1 Polyethylene (PE) pipes

1. PE pipes must comply with AS/NZS 4130:2009 'Polyethylene (PE) pipes for pressure applications' and AS/NZS 2566.1:1998 'Buried flexible pipelines Structural design'.
2. PE pipes must **not** be more than 400 mm outside diameter if they are under a railway track unless they are contained within an encasing pipe.
3. PE pipes must be a minimum of **PN10** if they are under a railway track. Pipe supplied shall be PE100 (HDPE).
4. PE pipes that are inside an encasing pipe or are not in an area subject to heavy loading may be of a lower strength grade.

12.2 Polyvinylchloride (PVC) pipes

1. PVC pipes must **not** be more than 375 mm nominal bore unless they are contained within an encasing pipe.
2. For non-pressure applications uPVC pipes must be a minimum of class **SN16**. They must comply with either AS/NZS 1254:2010 'PVC-U pipes and fittings for storm water and surface water applications' or 'AS/NZS 1260:2017 'PVC-U pipes and fittings for drain, waste and vent applications'.
3. For pressure applications uPVC and mPVC pipes must be a minimum of class **PN16**. They must comply with AS/NZS 1477:2017 'PVC pipes and fittings for pressure applications' or 'AS/NZS 4765:2022 'Modified PVC (PVC-M) pipes for pressure applications'.
4. PVC pipes that are inside an encasing pipe or are not in an area subject to heavy loading may be of a lower strength grade.

12.3 Conduits and fittings

Electrical installations must comply with AS/NZS 2053.1:2001 and conduit systems must comply with AS/NZS 2053.1:2001

12.4 Steel pipes

1. Steel pipes must be manufactured from steel complying with an approved specification approved by the Corridor Manager and have a minimum yield stress of 240 MPa.
2. Steel pipes must have a means of corrosion protection such as galvanizing, specialist coating system, Denso tape, Polyken wrap or similar unless a thicker unprotected option is used.
3. Pipes that are laid using an open trench installation method must be protected.
4. Steel pipes must have a minimum wall thickness as follows:

Table 12.1: Steel pipe wall thickness

Outside Diameter (mm)	Minimum Wall Thickness (mm)	
	Protected	Unprotected
100 mm and under	Heavy wall	Not permitted
Over 100 mm and under 340 mm	6 mm	7 mm
356 mm, 406 mm, 457 mm	7.9 mm	9.5 mm
508 mm, 559 mm	9 mm	12.7 mm
610 mm, 660 mm	10 mm	14.2 mm
711 mm, 762 mm	12.7 mm	15.8 mm
813 mm, 864 mm, 914 mm	15.8 mm	17.4 mm
> 950 mm	Subject to KiwiRail Engineering approval	

12.5 Reinforced concrete pipes

1. Reinforced concrete pipes must comply with AS/NZS 4058:2007 'Pre-cast concrete pipes (pressure and non-pressure)'.
2. Concrete pipes that are within five metres of the track centreline or within the formation embankment must be Class 4 (old Class Z) pipes.
3. Elsewhere, other than described in section 12.3 2) above, concrete pipes must be Class 2 (old Class X) unless otherwise directed by the Corridor Manager.

12.6 Protection against electrolysis or corrosion

When required by KiwiRail, protection against electrolysis or corrosion must be provided and maintained by the UO to the satisfaction of the Engineer.

In electrified traction areas, all metallic services and metal Utility Structures in a network (ie not just an encasing pipe) within Railway Land must be provided with an electrical insulating coating approved by the Engineer.

All new Utility Structures immediately beyond the current electrified Metro Areas up to the next center of population should be electrically insulated to allow for the future extensions of electrification of the railway.

13. Marking of Utility Structures

13.1 Markers

1. Markers must be provided to show the location of:
   a) buried pressure pipes of 50 mm and greater inside diameter
   b) buried pipes carrying flammable substances
   c) buried electric cables.
   d) pipes and cables passing under railway bridges.
2. Markers must be provided for other pipes or ducts.
3. any abandoned pipes/ ducts as a result of relocation/ decommission of utility services.
4. Markers must clearly describe the nature of the Utility Structure, its depth below ground level and UO's contact details.
5. Markers must be of robust construction and made from incombustible material.
6. They may, as appropriate, either:
   - stand out of the ground at least 600 mm or
   - be a tablet fixed in the ground.
7. Markers indicating buried Utility Structures must be located above the structures and within Railway Land:
   - at the points of entry into Railway Land and
   - at any changes of direction and
   - at intervals of no more than 40 meters on continuous straight runs.
8. Markers for Utility Structures passing under railway bridges should be located as set

out in section 6.6.6.

9. Markers are not required for above pipes or ducts under the roadbed at level crossings. However, markers may be placed in an offset position with an indication of the utility's location, if the Utility Operator wishes.

13.2 Identification

1. All Utility Structures (both buried and above ground) must be identifiable by means of colour or lettering.
2. Above-ground (longitudinal) Utility Structures must be identified (the contents or the UO) at 100 meters intervals.
3. Standard colours are:

Table 13.1: Pipe identification colours

Utility Type	Colour
Water	Blue or White
Sewer	Light grey
Stormwater	Dark grey
Electricity	Orange
Gas	Yellow
Telecommunications	Colour adopted by Company e.g. Chorus = light green

4. Identification colours may be stripes on pipes that are manufactured in a neutral colour.

13.3 Warning tape

Plastic warning tape must be laid 500 mm above pipes and ducts that have been buried in trenches. The tape should be about 75 mm wide, distinctly coloured and carry a warning about the presence of the pipe or duct below it.

13.4 Maintenance

The UO's are responsible for regular inspection and maintenance of their utility markers to ensure that the marker signs are not damaged, obscured or removed, at all the time including replacement where required.

14. Carrying out the Works

14.1 Introduction

This section sets out requirements for carrying out the Works (installing, maintaining or removing a Utility Structure) on Railway Land.

These requirements are critical to:

- ensuring health and safety

- ensuring the integrity of the railway and
- maintaining railway operation.

In making a Corridor Access Request, the UO must state how these and other requirements are to be met. Refer to the NZUAG National Code of Practice, section 4.

Such statements should be presented as a formal Statement Works (refer Section 14.9 for a checklist for preparing a Statement of Works).

14.2 Permission to undertake works

1. No work can be started on Railway Land for the installation, maintenance or removal of any Utility Structure until the UO holds the following:
   - Agreement Granting Right
   - Permit to Enter
   - Permit to Dig (if required)
   - B4UDIG information (to identifies external services)
   - EF201 Isolation permit (if required)

     Refer to section 5 of document C-TI-GU-4215 Application to Install a Utility Structure, which outlines the procedure for obtaining the two permits.
2. The Work must be carried out only in the manner and at such times as directed by the Corridor Manager and to their entire satisfaction.
3. The Corridor Manager has power to suspend the Work if they consider that it is being performed in an unsafe or unsatisfactory manner.
4. Blasting can only be carried out in accordance with the conditions laid down by the Corridor Manager.

14.3 Health and safety

Construction work, by its very nature, presents a risk to those undertaking the work, the public nearby and the users of the Railway. Procedures and actions must be employed that reduce the risk of harm to people, animals and property.

14.3.1 General requirements

1. The health and safety of persons undertaking the Works, railway staff and the public are of paramount importance.
2. The NZUAG National Code of Practice, section 2.5, sets out health and safety requirements for all Works in a Transport Corridor, including the Railway Corridor.

   Critical among these requirements are adhering to:
   - Relevant health and safety legislation, code of practice
   - a site-specific Health and Safety Plan.

3. All Works undertaken on Railway Land must comply with the relevant health and safety and other codes, including the:
    - Health and Safety at Work Act 2015 and Regulations
    - WorkSafe New Zealand July 2016 – Good Practice Guidelines – Excavation Safety
    - Railways Act 2005
    - Building Act 2004.

14.3.2 Health and safety plan

The UO must prepare and observe a site-specific Health and Safety Plan for all Works.

The Health and Safety Plan must identify all hazards arising from:

- the Works
- the local environment
- working in or near the Railway Corridor

The Health and Safety Plan must describe how each hazard has been assessed in line with the hierarchy of controls such as elimination, substitution, isolation, engineering, administrative and PPE.

14.3.3 Railway-specific requirements

In addition to the above, the following railway-specific requirements must be adhered to:

1. KiwiRail requires that all persons working in the rail corridor undergo Rail SHE Induction Session and where required the Electrical Awareness training in KLE to acquaint them with procedures and hazards of the railway environment.
2. The UO should arrange this with the Corridor Manager.
3. Red or green flags must not be displayed on Railway Land.
4. Persons working in the railway corridor must fulfil the medical requirement as per NRSS if working within 4 meters of the track centreline of the rail corridor and wear the Personal Protection Equipment shown according to the work being performed by or around them. Refer to table 1-standard requirements for minimum PPE in 04-STD-005-SHE

Minimum PPE Requirement			
	Eye Protection must be worn when in the Rail Environment. The type of eye protection worn is dependent on the task being performed and the environment where it is occurring.		Orange full body cover must be adhered to at all times when working in an outdoor environment and exposed to outdoor risks. Full body cover means ankle to elbow coverage.
	Hi Visibility clothing must be compliant to AS/NZS 4602 Class D/N and Orange in colour.		Steel toe-capped, above ankle **laced up boots** are the minimum requirement. Steel toe-capped **gumboots** or waders may be worn in wet or muddy conditions.
Site Specific Requirements			
	Hard hats must be worn when working around diggers or cranes, under structures and in tunnels.		Ear muffs must be worn by all workers when noisy plant and equipment is operating or being operated.
	The type of hand protection worn is dependent on the task being performed and the environment where it is occurring.		Knee pads to be considered if task involves prolonged kneeling.
Specialist			
	**Chaps** must be worn when operating a chainsaw. **Spats** must be worn when grinding, rail sawing or creating sparks.		When working at height always use a safety harness, unless other protection is in place.
	Appropriate RPE must be worn when there is risk of exposure to fumes, gases, vapours and dust.		Face shield must be worn when there is a risk of sparks/particles.

Figure 14.1: Minimum PPE requirement

Rails may have an electrical current running through them, which would be shorted out by a metal measuring tape between them. Metallic tapes must not be used when measuring

between rails. Metallic tapes and metallic levelling staffs must not be used in the presence of overhead wires.

Any incident occurring during the event of works within the KiwiRail corridor shall be reported to the Corridor Manager immediately and not more than 24hours from the time of the event.

14.4 Planning

When undertaking work around a working railway, prior consideration must be made to foresee eventualities that could cause the work to be delayed or the operation of the railway to be halted. The planning process shall identify hazards associated with the proposed installation and shall develop work methods to mitigate the hazard as required.

This section sets out factors that must be considered when planning and preparing to undertake Works on Railway Land.

14.4.1 Access for excavation/trenchless boring

Although an excavation may be planned to be undertaken entirely from one side of the track, on occasions an unforeseen obstruction may require access from the other side. This eventuality needs to be anticipated by identifying an alternative excavation access point on the other side of the track.

14.4.2 Contingency plan

The UO must plan for contingencies during the Works (eg a shackle or chain breaks, a hole collapses, a drill breaks down).

The UO must prepare a contingency plan detailing measure to remedy such events, including having relevant resources on site during the Works, so that the contingency does not leave the site in a dangerous state or compromise the operation of the railway.

14.4.3 Disturbance

Planning must address environmental issues such as:

- sediment control
- noise abatement
- dust mitigation
- contaminant prevention
- spoil removal.

The UO is responsible for ensuring that disturbance to people, the environment and property is minimised and is within the limits set by the Territorial Authority or the Corridor Manager

14.4.4 Site security

1. The UO must plan where site storage is to be located and how plant, materials and accommodation are to be secured against theft and vandalism.

2. Plant and material left unsecured could be placed on the railway track and cause a derailment.

14.4.5 Public passage

The UO must plan and suitably protect the Works site so that the public and railway staff can always pass by safely or be directed to an acceptable alternative route with signage.

14.5 Other services

This section sets out the UO's responsibilities with respect to railway services (eg signaling system cables) and other Utility Structures (in this section together termed 'other services').

14.5.1 Responsibility

1. The UO is responsible for the activities of its agents (consultants and contractors) who are working around other services.
2. However, the onus is on the party undertaking the Works (usually a contractor) to establish the location of other services before digging and to obtain emergency contact details of the services' owners.

14.5.2 Notification

The UO must notify the owners of other services that are adjacent to or may be affected by the new Utility Structure and obtain their approval prior to commencing the Works.

14.5.3 Locating other services

1. The UO must apply for a permit to dig, in order to locate, mark and identify other service along the route of the proposed Utility Structure.
2. This is particularly important at level crossings, as the road corridor frequently contains a multitude of other services, both above and below ground.
3. The Corridor Manager can arrange to identify KiwiRail services.

14.5.4 Pot Holing

1. Unless otherwise agreed with the Corridor Manager, the UO must use potholing by vacuum excavation when in close proximity to the marked location of other services. Potholing by hand excavation may be considered on a case -by-case basis.
2. If pot holing does not reveal any expected other service, either at or in close proximity to its marked location, the UO should contact the owner of that other service and seek assistance.
3. If pot holing locates.an unmapped or inaccurately mapped other service, the UO should contact promptly all likely owners of the other service to identify the owner and resolve any issues

14.5.5 When to locate

Such locating and marking of services should be undertaken both:

- prior to submitting the design and
- prior to commencing the works.

14.6 Track settlement

This section sets out the procedures for monitoring track settlement during any ground disturbance works such as trenching, tunnelling and drilling operations.

It is essential that work does not disturb the alignment of the railway track to a degree that causes railway operations to be restricted, halted or risk a train derailment.

14.6.1 Monitoring

1. Track levels are to be taken of each rail in one-meter increments for a length of 20 meters either side of the work centreline or for 20 meters beyond either end of the worksite before, during and after such work is carried out.
2. The UO must repeat the measurements at every three meters of progress of the pipe's installation or hole boring under the track.
3. After the installation, the monitoring must continue for a period determined by the Corridor Manager, to establish that no further settlement is occurring.
4. The measured levels must be given to the Corridor Manager.
5. At the same time, the UO must visually monitor the track's horizontal alignment.

14.6.2 If settlement occurs

1. Settlement here includes changes in both the rail level and track alignment.
2. Should any measured change in rail level or visible change in track alignment exceed the limits in Table 14.1, the UO must halt all work and notify the Corridor Manager immediately as affected routes may need to be closed to rail traffic. The UO may choose to apply lower thresholds to give advance warning of any movement before rail services are affected.

Table 14.1: Track settlement limits

Criterion	Limit
Maximum allowable gradient of any existing railway tracks due to construction of the proposed works	1/500
Loss of design cant between opposite rails	>15 mm
Maximum 'twist' (four-meter base) of any live railway track	15 mm total between opposite corners of a four meters box between adjacent rails.
Maximum vertical movement of any live railway track	5 mm over a five-meter length of track. Maximum total vertical movement 14 mm over 20 meters.
Maximum horizontal movement of any live railway track	5 mm over a five-meter length of track. Maximum total horizontal movement 15 mm over 20 meters.

3. For pipes over 900 mm diameter, a railway protection person must be on site throughout the installation. That protection person is responsible for halting all rail services should any settlement exceeding the above limits occur.
4. All work must cease while the Corridor Manager reviews the situation and undertakes any work required to reopen the railway lines. All costs associated with this will be at the UO's expense.
5. The UO is responsible for correcting any settlement. Noticeable settlement of the track requires immediate remedial action, which may be undertaken by KiwiRail at the UO's expense if necessary to maintain continued safe operation of the railway.
6. Road carriageways and footpaths must be rectified within 48 hours of notification by the Corridor Manager.

14.7 Trenching and tunnelling under tracks

14.7.1 General restrictions

1. For any drilling on slopes or embankments, the drilling contractor needs to consider and implement temporary stability measures as necessary, e.g. drilling at the toe of an embankment which may require earthworks/excavation for the drilling platform. Excavation work shall not commence without a geotechnical risk assessment and implementation of appropriate controls identified.

2. Trenching and tunnelling is not permitted at any location under, or within 10 metres of turnouts / catch points / expansion switches / diamonds/ slips/ double junctions, unless otherwise consulted or advised by KiwiRail Engineering.

3. Trenching and tunnelling may only be undertaken at pre-determined times when the railway track is in operation with appropriate protection arrangements or during a Block of Line (line closed).
4. People and machines (at maximum reach) must not approach closer than the distances below without the supervision of designated railway staff (a protection person).

Table 14.2: Minimum approach distances without protection

Distance	From
Five meters	Track centerline
Four meters	Overhead wires

5. If the machine is working further away than the limits above and its height means any failure could encroach within these limits, then appropriate protection arrangements must be arranged.

6. Machine operators must be particularly alert to the approach of trains and must cease operating unless permitted to continue by the Rail Protection Officer.
7. Mechanical appliances for excavating or lifting must not be used under overhead structures or aerial cables, unless the UO has established to Corridor Manager's satisfaction that there is adequate clearance.
8. Appropriate erosion and sedimentation control measures shall be adopted, if required.

14.7.2 Barriers

1. Open excavations and access pits adjacent to access ways must be surrounded by barriers, provided that they are more than three meters away from the track centreline.
2. Excavations closer than three meters to track centreline must not be left open during darkness.
3. Warning lights must be placed around open excavations during darkness, but not so as to be confused with railway signals.

14.7.3 Shoring

4. Excavations must be adequately timbered, as specified by the Corridor Manager. The top of the tunnel timbering must be at least two meters below rail level.
5. For all trenches, the UO must consider providing temporary shoring (or other support alternatives) in order to provide lateral support to the excavation and shoring should be placed at least three meters away from the track centerline to ensure the safe passage of trains.
6. Alternative support may include battering, ground stabilisation and sheet piling. This work must be certified in accordance with the requirements of the Building Act 2004.
7. At the Corridor Manager's sole discretion, the cost of temporary supports will be borne by the UO.

14.7.4 Pipe laying

Pipes must be installed in accordance with AS/NZS 2566 or the relevant NZ Standard Specification.

14.7.5 Backfilling

8. Backfilling should aim to:
    - be in compliance with formation standard (refer C-ST-FO-4110 Formation)
    - restore a permanent quality surface
    - ensure the integrity of the railway, road and utility assets
    - achieve a stable subsurface structure.
2. The requirements:
    - excavations under tracks and for a distance of at least three meters beyond the outer rails and including the whole of any embankment and under roadways,

- The base of the trench, bedding of the pipe and backfill on the sides and above the pipe must comply specifically with the instructions set in documents C-TI-CU-4210 Culvert Renewal or S-ST-CW-2140 Construction of Cable Duct Routes.

3. All other excavations must be backfilled with material approved by Corridor Manager and properly compacted.
4. Warning tape must be placed. Refer to section 13.3.
5. Thermally stable backfill may be required for power cables.
6. When excavations strike power cables laid in thermally stable backfill, that backfill must be restored to the standard applying before the excavation.
7. In such cases, the Corridor Manager and the Utility Operator must agree on the compaction and standard, prior to works commencing.
8. The minimum compaction requirements as follows:
   - Compaction to not less than 90% Standard Density up to the mid-height of the pipe,
   - Greater than 95% Standard Density from the mid height of the pipe to 300mm below the bottom of ballast
   - Greater that 98% Standard Density from that level to the top of the formation/bottom of ballast.

Standard Density as determined by NZS 4402.1:1986 Methods of testing soils for civil engineering purposes

14.7.6 Spoil removal

1. The UO must deposit material from excavations in a position and manner approved by the Corridor Manager.
2. Material from excavations must be kept clear of track ballast so as to avoid fouling the ballast and blocking track drainage.
3. Under no circumstances can excavated soil be thrown directly on to the track ballast.
4. When it is necessary to place excavated material between the rails or upon the ballast shoulders, a suitable screen of hessian, timber or other approved material must be used to protect the ballast.
5. The screen must be removed on completion.
6. Under no circumstances can excavated soil be thrown or placed blocking waterways, drainage structures or overloading banks of slopes in the railway corridor.

14.7.7 Clear site

No material can be left on the Railway Corridor and the site must be left clean and tidy.

14.8 Trenchless pipe installation

14.8.1 Introduction

For any drilling on slopes or embankment, drilling contractor need to consider and implement temporary stability measures as necessary, e.g. drilling at the toe of an embankment which may require earthworks/excavation for drilling platform. Excavation work shall not commence without a geotechnical risk assessment and implementation of appropriate controls.

7. This section sets out the requirements for trenchless (drilled hole) pipe installation on Railway Land.
8. Prerequisites to such Works include:
    - location of other underground services
    - access planning

    as set out in section 14.4 Planning.

    Expert contractor engagement is beneficial at an early stage.

14.8.2 General requirements

1. Thrusting must cease and track parameters checked prior to a rail movement entering the area. Installation can be undertaken with suitable rail protection
2. A track monitoring regime must be employed during and after the installation process for pipes 300 mm outside diameter or greater. Refer to section 14.6 Track settlement.
3. Pipes must be installed in accordance with AS/NZS 2566 or the relevant NZ Standard Specification.
4. The diameter of the bored hole must not exceed the diameter of the pipe by more than ten percent.

14.8.3 Drilling fluid

1. Drilling fluid must be contained so that there is no contamination of the ground or ballast.
2. If the drilled hole slopes, special care may be necessary to collect and dispose of the drilling fluid.
3. Drilling fluid must be prevented from rising through the ground and contaminating the ballast from underneath.

14.8.4 Backfilling

4. The cavity between the pipe and the hole must be filled using a method and material approved by the Corridor Manager.
5. Excess bentonite must be disposed of at an approved disposal site and must not be discarded on Railway Land.

14.8.5 Marking

The location of the service must be marked in accordance with section 13.

14.9 Statement of works planning checklist sample

Below is a checklist of activities that must be considered and the proposed actions stated in the Statement of Works to accompany the application for a Grant of Right.

Table 14.3: Statement of works planning checklist

Activity	Check
KiwiRail Induction, necessary medicals arranged	☐
Electrical awareness training arranged	☐
Electrical safety training arranged	☐
KiwiRail underground services located, marked, potholed	☐
Other underground services located, marked, potholed	☐
Agreement Granting Right obtained	☐
Permit to enter obtained	☐
Environmental issues managed	☐
Site storage planned	☐

Activity	Check
Health and Safety plan prepared	☐
Affected stakeholders identified and managed	
Pipe and duct alignment planned	☐
Containment of drilling fluid planned	☐
Excavation access planned	☐
Pipe jointing method planned	☐
Railway protection measures planned	☐
Benchmark established for track levels	☐
Spoil removal planned	☐
Filling of pipe annulus planned	☐
Contingency plan prepared	☐

15. After installation

This section sets out the UO's obligations following completion of the works

15.1 Pressure tests

Any pipes carrying liquid or gas must be pressure tested before being put into service, as described in section 7 Design Requirements: Non-Flammable Substance Pipes.

15.1.1 Inspection and test

The UO must inspect and pressure test all above-ground pipes, valves, fittings and attachments on commissioning of the system:

Upon completion of the test, the UO must certify in writing to the Corridor Manager that the whole installation is in sound order that it is safe for the purpose for which it is being used and that all automatic valves and safety devices are operating satisfactorily.

In the event that the inspection, or any future inspection, shows there to be a fault that may endanger the Railway Corridor, the UO must bring this fact to the attention of the Corridor Manager immediately.

15.1.2 Leakage

In the event of any leakage of flammable substances from any pipe on Railway Land, the UO must immediately confer with the regional infrastructure Manager or Asset engineer on actions to prevent further leakage and dispose of the leaked substance.

The UO must then take such actions at such times and with such precautions that are approved by the regional infrastructure Manager or Asset engineer.

Actions required to manage, contain and remediate the leakage any affected areas may be undertaken by KiwiRail at the UO's expense

15.2 Works completion notice

The UO must complete and submit to the Asset Engineer or Regional Infrastructure Manager the Works Completion Notice. Please refer to NZUAG National Code of Practice for the template.

Any variations to the approved plans must be clearly marked, particularly with respect to any change in location, depth of services and the plan along with the justification must be sent to KiwiRail for review and acceptance.

Information including technical aspects, agreements, maintenance responsibilities and contact details shall be included in the works completion notice.

15.3 As-built drawing

The UO must supply to KiwiRail Geographic Information System (GIS) meta data, drawings and models of the as-built Utility Structure.

The minimum requirements for the 3D model files are outlined under KiwiRail Digital Engineering Subsurface Utilities Identification and Modelling Guidance. For drawing and 2D model specific requirements, refer to G-ST-AL-9112 Engineering Drawing Issue and Control.

Geographic Information System (GIS) meta data requirements can be obtained from KiwiRail's Asset Information SharePoint.

Briefing Note(s) for C-SP-AE-64322 Installation of Utility Structures on Railway Land

Date Effective 1/07/2025 **Issue No.** Issues 2.0

Background

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Key changes / compliance

Click here to enter text.

Implementation

Click here to enter text.

Applicability (Select relevant boxes)	**General**	**Civil**	**Control Systems**	**Interoperability**	**Signals**	**Structures**	**Track**	**Traction and Electrical**
Zero Harm	☐							
Learning and Development	☐							
Project Management Office	☐							
Manager Property Revenue and Grants	☐							
National Train Control Centre	☐							
Engineering and Asset Management Manager	☐							
National Supply Chain and Distribution Manager	☐							
Technical Director of Engineering and Asset Management	☐							
Professional Head		☐	☐	☐	☐	☐	☐	☐
Network Services Managers		☐	☐	☐	☐	☐	☐	☐
Region Operations Managers		☐	☐	☐	☐	☐	☐	☐
STTE Managers		☐	☐	☐	☐	☐	☐	☐
Production Managers		☐	☐	☐	☐	☐	☐	☐
Asset Engineers		☐	☐	☐	☐	☐	☐	☐
Others to inform list here								

Document History

Note page numbers relate to the document at the time of amendment and may not match page numbers in current document.

Issue No.	Section	Description	Page(s)
2.0		Relevant documents of T&E requirements are included in the associated documents list.	iii
2.0		Section 4.2-Reference added to Management of Tunnels standard	10
2.0		Section 6.2.5-Removed Electrolytic Protection	18
2.0		Section 6.2.7 -added service pits protection	21
2.0		Section 6.2.8-added Redundant Services	21