Transport Asset Standards Authority

T HR CI 12090 ST

Standard

Airspace and External Developments

Version 1.0

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Important message

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Standard governance

Owner: Director Civil Engineering Infrastructure, Asset Management Branch

Authoriser: Director Engineering, Asset Management Branch

Approver: Executive Director Asset Management Branch on behalf of the Asset Management Branch Configuration Control Board

Document history

Version	Summary of changes
1.0	First issue

Preface

The Asset Management Branch (AMB), formerly known as the Asset Standards Authority (ASA), is a key strategic branch of Transport for NSW (TfNSW). As the network design and standards authority for NSW Transport Assets, as specified in the *ASA Charter*, the ASA identifies, selects, develops, publishes, maintains and controls a suite of requirements documents on behalf of TfNSW, the asset owner.

The ASA deploys TfNSW requirements for asset and safety assurance by creating and managing TfNSW's governance models, documents and processes. To achieve this, the ASA focuses on four primary tasks:

- publishing and managing TfNSW's process and requirements documents including TfNSW plans, standards, manuals and guides
- deploying TfNSW's Authorised Engineering Organisation (AEO) framework
- continuously improving TfNSW's Asset Management Framework
- collaborating with the Transport cluster and industry through open engagement

The AEO framework authorises engineering organisations to supply and provide asset related products and services to TfNSW. It works to assure the safety, quality and fitness for purpose of those products and services over the asset's whole-of-life. AEOs are expected to demonstrate how they have applied the requirements of ASA documents, including TfNSW plans, standards and guides, when delivering assets and related services for TfNSW.

Compliance with ASA requirements by itself is not sufficient to ensure satisfactory outcomes for NSW Transport Assets. The ASA expects that professional judgement be used by competent personnel when using ASA requirements to produce those outcomes.

About this document

This standard provides the design requirements for airspace developments and technical requirements for the interface between external developments and the rail corridor.

This standard has been developed by merging T HR CI 12075 ST *Airspace Developments,* v1.0 and T HR CI 12080 ST *External Developments,* v1.0 both of which are now superseded by this standard.

The changes from the previous content include the following:

- combines content from T HR CI 12075 ST and T HR CI 12080 ST
- updates to electrical requirements
- updates to durability requirements
- updates to the requirements for configuration of airspace developments

- addition of waterproofing requirements
- clarification of requirements for station concourses
- updates to risk assessment and collision protection requirements
- updates to the use of ground anchors
- removal of details for derailment containment devices
- removal of details for decommissioning and disposal

This standard is a first issue.

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1. Introduction

Transport for NSW (TfNSW) reviews planning approval applications such as development applications (DAs) and State significant developments (SSDs) and the like for projects over or adjacent to railways, that is over or external to the rail corridor, as required by the *Environmental Planning and Assessment Act 1979* to ensure the following:

- existing and foreseeable future rail infrastructure facilities are not adversely affected by the proposed development
- railway operations are not affected during and after the proposed construction

Within the context of this standard, developments near railways are categorised as follows:

- Airspace developments:

  An airspace development is a structure, built over above-ground rail corridor that provides office, retail, civic precincts, residential accommodation, car parks and similar functions.

  Airspace developments are commonly located above a railway station.

  Bridges are not considered to be airspace developments, however some airspace developments may support vehicular traffic, for example car parks and loading docks.

  Station concourses are a special type of airspace development.

- External developments:

  An external development (also referred to as adjoining or adjacent development) is non-TNSW work undertaken within a specified distance from the rail corridor (as defined by the *State Environmental Planning Policy (Infrastructure) 2007 (*ISEPP)) or which can have an impact on the rail corridor or railway operations regardless of distance.

  External developments can include the demolition, extension or construction of any new non-TfNSW infrastructure adjacent to TfNSW above ground rail infrastructure facilities.

Further information regarding requirements for building over or near railways can be obtained from Sydney Trains website.

2. Purpose

The purpose of this document is to provide technical requirements to facilitate the design, construction, maintenance and decommissioning of civil components of airspace developments and external developments so as to manage the effect upon the TfNSW facilities and trains. The intention of the standard is to minimise effect upon the track and network user disruption across the full life cycle of the airspace development.

This standard specifies the technical requirements for airspace and external development structures within the metropolitan rail area and the country rail area.

These requirements extend across the asset life cycle and are in addition to requirements in legislation and Australian standards.

2.1. Scope

This standard covers the requirements for the whole-of-life, from design through to decommissioning, for airspace and external development structures.

The airspace structures within scope of this standard includes the following:

- airspace transfer works (ATW) up to the top of the transfer level (this includes all associated supports and any lift shaft that extends down to platforms), and elements of airspace balance of works (ABW), for a new airspace development; see Section 7.1
- upgrades of existing airspace developments; see Section 20.2

Station concourses are considered airspace developments within the context of this document; see Section 7.1.2.

This standard covers external developments that may have an impact on the rail corridor; see Section 7.2.

This standard does not cover developments near underground stations or railway tunnels; refer to T HR CI 12051 ST *Development Near Rail Tunnels* for more information.

This standard does not provide the process for obtaining approvals. Refer to the TfNSW website for more information.

2.2. Application

This standard applies to all developments that can impact on the rail corridor.

This standard applies to all persons and organisations engaged in the provision of services related to developments that fall within scope of this standard.

Certain works are required to be undertaken by an Authorised Engineering Organisation (AEO. Refer to *TfNSW Guidelines on External and Developer-led Works Affecting Transport Assets* for more information regarding AEOs.

The requirements of this standard with respect to risk assessment and related outcomes, applies to all parties including TfNSW.

If when using this standard, it is considered that the intent of stated requirements is unclear, then a clarification should be obtained from the Director Civil Engineering Infrastructure, Asset Management Branch (AMB) by email to standards@transport.nsw.gov.au.

3. Reference documents

The following documents are cited in the text. For dated references, only the cited edition applies. For undated references, the latest edition of the referenced document applies.

International standards

ISO 10137 Bases for design of structures – Serviceability of buildings and walkways against vibrations

ISO 23469 Bases for design of structures – Seismic actions for designing geotechnical works

Australian standards

AS 1170.4 Structural design actions – Part 4: Earthquake actions in Australia

AS 1530.4 Methods for fire tests on building materials, components and structures – Part 4: Fire-resistance tests for elements of construction

AS 1668 The use of ventilation and air conditioning in buildings (all parts)

AS 1726 Geotechnical site investigations

AS 5100 Bridge design (all parts)

AS 5100.1:2017 Bridge design – Part 1: Scope and general principles

AS 5100.2: 2017 Bridge design – Part 2: Design loads

AS/NZS 1170.0 Structural design actions – Part 0: General principles

AS/NZS 1170.2 Structural design actions – Part 2: Wind actions

AS/NZS 7000 Overhead line design

Transport for NSW standards

ESB 000 Introduction

ESB 001 Design Context and Process

ESB 002 Design Principles

ESB 003 Station Functional Spaces

ESB 004 Station Services and Systems

ESC 215 Transit Space

ESC 302 Structures Defect limits

ESC 340 Tunnels

T HR CI 12002 ST Durability Requirements for Civil Infrastructure

T HR CI 12003 ST Civil Infrastructure Construction

T HR CI 12030 ST Overbridges and Footbridges

T HR CI 12040 ST Overhead Wiring Structures and Signal Gantries

T HR CI 12051 ST Developments Near Rail Tunnels

T HR CI 12060 ST Boundary Fences

T HR CI 12065 ST Station Platforms

T HR CI 12073 ST Safe Places

T HR CI 12130 ST Track Drainage

T HR CI 12190 ST Service Installations within the Rail Corridor

T HR EL 00007 ST Management of Activities within RailCorp Easements and Close to the RailCorp HV Distribution System

T HR EL 08001 ST Safety Screens and Barriers for 1500 V OHW Equipment

T HR EL 08006 ST Services Erected Above Overhead Wiring

T HR EL 08012 ST Overhead Wiring Standards for Design and Construction

T HR EL 10001 ST HV Aerial Line Standards for Design and Construction

T HR EL 12002 GU Electrolysis from Stray DC Current

T HR EL 12004 ST Low Voltage Distribution and Installations Earthing

T HR EL 12005 ST Bonding for 1500 V DC Traction Systems

T HR EL 20004 ST High Voltage AC and 1500 V DC Traction Power Supply Cable Infrastructure – Standards for Design and Construction

T HR SS 80001 ST Infrastructure Lighting

TMC 331 Design of Overhead Wiring Structures & Signal Gantries

T MU MD 00006 ST Engineering Drawings and CAD requirements

T MU AM 01003 ST Development of Technical Maintenance Plans

T MU AM 06006 GU Systems Engineering

T MU AM 06006 ST Systems Engineering

T MU MD 20001 ST System Safety Standard for New or Altered Assets

T MU MD 20002 ST Risk Criteria for Use by Organisations Providing Engineering Services

T MU SY 20001 ST Surface Transport Fixed Infrastructure Physical Security Standard (for access to the standard please contact standards@transport.nsw.gov.au)

Legislation

Electricity Supply (Safety and Network Management) Regulation 2014

Environmental Planning and Assessment Act 1979

Environmental Planning and Assessment Regulation 2000

State Environmental Planning Policy (Infrastructure) 2007

Heritage Act 1977

Work Health and Safety Act 2011

Other reference documents

Australian Building Codes Board, National Construction Code (all volumes)

Department of Planning 2008, Development Near Rail Corridors and Busy Roads – Interim Guidelines

Office of Environment and Heritage 2005, State Agency Heritage Guide – Management of Heritage Assets by NSW Government Agencies

RailCorp Section 170 Heritage and Conservation Register

RailCorp Section 170 Heritage and Conservation Register - Movable heritage

RailSafe, SMS-06-GD-0268 Working around Electrical Equipment

RISSB Code of Practice, Derailment containment and protection for rail underbridges

Sydney Trains, MN A 00100 Civil and Track Technical Maintenance

Sydney Trains, MN C 10301 Structures Examination

TfNSW 2019, TfNSW Guidelines on External and Developer-led Works Affecting Transport Assets

WorkCover NSW (now SafeWork NSW) 2019, Safe Design of Structures Code of Practice

4. Terms and definitions

The following terms and definitions apply in this document:

AEO Authorised Engineering Organisation

AEP annual exceedance probability

ABW airspace balance of works; a second stage structure constructed on top of the ATW and it can be an office, retail, accommodation and the like

airspace development a structure or structures built over the rail track(s) to accommodate station concourses, overhead offices, shops, accommodation, carparks and the like

ATW airspace transfer works; a first stage structure built over the rail corridor that provides support to ABW built on top of it

AMB Asset Management Branch

country rail area that part of the NSW rail network (as defined in the *Transport Administration Act*) not within the metropolitan rail area (*Transport Administration Act*)

dc direct current

developer for the purpose of this standard, is the applicant or proponent for the development; the developer can be a private or government organisation

development refers to either an airspace or external development

EDC earthquake design category

EMC electromagnetic compatibility

EPR earth potential rise

external development is any development proposal outside the rail corridor that can trigger a referral or concurrence to a rail authority as required by planning legislation

FLS fire and life safety

ISEPP State Environmental Planning Policy (Infrastructure) 2007

metropolitan rail area the rail freight network and the heavy rail passenger network within the metropolitan rail area bounded by Newcastle (in the north), Richmond (in the northwest), Bowenfels (in the west), Macarthur (in the southwest) and Bomaderry (in the south), and all connection lines and sidings within these areas, but excluding private sidings

NCC National Construction Code

OHW overhead wiring

paid area an area within the station inside the barriers or the ticket control point

PMF probable maximum flood

rail authority rail authority for a rail corridor means -

(a) in relation to a rail corridor that is vested in or owned by ARTC or is the subject of an ARTC arrangement—ARTC, and

(b) in relation to any other rail corridor—Transport for NSW

(ISEPP)

> *Note: It should be noted that the TfNSW Secretary has delegated this function to individuals and rail entities via instruments of delegation. Delegation framework of TfNSW should be consulted, included the delegation of the relevant rail entity (for example, Sydney Trains) to ascertain any sub-delegations.*

rail corridor means land –

(a) that is owned, leased, managed or controlled by a public authority for the purpose of a railway or rail infrastructure facilities, or

(b) that is zoned under an environmental planning instrument predominantly or solely for development for the purpose of a railway or rail infrastructure facilities, or

(c) in respect of which the Minister has granted approval under Part 3A or Division 5.2 or (before its repeal) Division 4 of Part 5 of the Act, or consent under Part 4 of the Act, for the carrying out of development (or for a concept plan for a project comprising or including development) for the purpose of a railway or rail infrastructure facilities

Note—

Copies of the Minister's approvals are available on the website of the Department of Planning and Environment.

(ISEPP)

rail Infrastructure the facilities that are necessary to enable a railway to operate and includes:

(a) railway tracks and associated railway track structures

(b) service roads, signalling systems, communications systems, rolling stock control systems, train control systems and data management systems

(c) notices and signs

(d) electrical power supply and electric traction systems

(e) associated buildings, workshops, depots and yards

(f) plant, machinery and equipment

But it does not include:

(g) rolling stock

(h) any facility, or facility of a class, that is prescribed by the national regulations not to be rail infrastructure

(Rail Safety National Law (NSW))

railway operations railway operations means any of the following -

(a) the construction of a railway, railway tracks and associated railway track structures;

(b) the construction of rolling stock;

(c) the management, commissioning, maintenance, repair, modification, installation, operation or decommissioning of rail infrastructure;

(d) the commissioning, use, modification, maintenance, repair or decommissioning of rolling stock;

(e) the operation or movement, or causing the operation or movement by any means, of rolling stock on a railway (including for the purposes of construction or restoration of rail infrastructure);

(f) the movement, or causing the movement, of rolling stock for the purposes of operating a railway service;

(g) the scheduling, control and monitoring of rolling stock being operated or moved on rail infrastructure

(Rail Safety National Law (NSW))

RIM rail infrastructure manager; in relation to rail infrastructure of a railway, means the person who has effective control and management of the rail infrastructure, whether or not the person—

(a) owns the rail infrastructure; or

(b) has a statutory or contractual right to use the rail infrastructure or to control, or provide, access to it

(Rail Safety National Law (NSW) 2012)

services utility assets used to transfer, transmit or transport data, electricity, liquids, solids, gases and the like. Services are installed above ground and below ground within and outside rail corridors

SFAIRP so far as is reasonably practicable

TAHE Transport Asset Holding Entity of New South Wales; a State Owned Corporation constituted under Part 2 of Transport Administration Act

transfer level the level at the top of the ATW, that serves to delineate the boundary between ATW and ABW

TfNSW Transport for NSW

unpaid area an area of a train station outside the barriers or ticket control point

5. Safety requirements

Safe design is mandated in the *Work Health and Safety Act 2011* and shall be incorporated into the design of structures. Guidance on the safe design of structures can be found in *Safe Design of Structures Code of Practice*.

5.1. Safety in design

The requirements of Section 5.1 apply to all airspace developments and those external developments nominated by TfNSW through the review process.

The design of developments, including the refurbishment of existing developments, shall include safety considerations for construction, operational maintenance and decommissioning workers, and the potential users of the structures.

The designer shall establish and implement a design process that manages safety across the full life cycle of the structure. The design process shall comply with T MU MD 20001 ST *System Safety Standard for New or Altered Assets* and *Safe Design of Structures Code of Practice*.

Provisions for structural redundancy and resilience to avoid catastrophic failure, and provisions for hardening and blast resistance to prevent disproportionate collapse, shall be considered in the design.

For airspace developments, the requirements for safety in design in the *National Construction Code* (*NCC)* and Section 5.5 shall be included.

5.2. Fire and life safety objectives

Fire and life safety (FLS) risks can be created by the development, or can be created as a result of foreseeable future development in the rail corridor.

Fire safety objectives include the following:

- safe egress of members of public and staff and access for emergency services personnel within the rail corridor
- facilitation of effective emergency services intervention
- protection of adjoining properties (including railway property) and third parties
- minimisation of interruption to railway operations in the event of fire
- minimisation of damage to property

See Section 13.10 for specific fire requirements for airspace developments.

A risk assessment shall determine possible fire sources within the rail corridor such as passenger and freight train fires, see Section 13.10.

5.3. Risk assessment

A risk assessment shall be carried out for developments within the scope of this standard where required in the standard or by TfNSW. Risk assessments shall be in accordance with T MU MD 20002 ST *Risk Criteria for Use by Organisations Providing Engineering Services*.

The potential effects of the development on the rail corridor and rail operations shall be identified and mitigated to ensure safety so far as is reasonably practicable (SFAIRP) in accordance with the requirements of this document.

Risk assessments shall be undertaken only by suitably qualified risk professionals experienced in rail related risk and hazard assessment, accepted by TfNSW.

The risk of extensive network user disruption including train line and station closure shall be assessed. This can happen as a consequence of a development damaged by a fire incident or other damaging event.

Where the proximity or arrangement between an existing development and the rail corridor or track changes, for example rail corridor or track alteration project, a risk assessment shall be undertaken by TfNSW to determine the level of protection required as part of the project.

Prior to the commencement of any works on site, the developer shall submit a risk assessment that includes all risks for the rail environment to TfNSW for endorsement.

The risk factors that can be considered are as follows:

- General:
    - controls to manage the risk to rail infrastructure facilities
    - hazards and associated risks to the development and to rail infrastructure facilities
    - the location of the development in relation to the rail level, for example whether at the top of a cutting, bottom of an embankment, or at-grade
    - potential for collision from a derailed train
    - safety of people in the derailed train
    - safety of people occupying the development
    - safety of people on platforms or in trains under or near the building
    - cladding panels becoming detached and falling into the rail corridor
    - cladding panel reflecting sunlight into the eyes of train drivers
    - increase in traffic in the streets around the development
    - pedestrian crossings and pedestrian access
- Structural:
    - structural damage to the building or adjacent structures
    - potential for a development to collapse onto the rail corridor
    - disproportionate collapse of parts of the development if a support or supports are removed in the event of a train derailment

- positioning of supports to avoid 'domino' effect in the event of derailment collision
- use of walls rather than columns where appropriate
- safe demolition of the structure

- Track:
  - proximity of the supports to the tracks
  - horizontal track geometry (tangent or curved track)
  - the vertical alignment of the railway approach and potential speeds of out of control trains
  - presence of track components and hazards at the site, for example turnouts and sharp curves
  - the nature, speed and frequency of trains using the track
  - configuration of the proposed development with respect to position of the railway tracks and other railway infrastructure (spacing of supports and redundancy)
- Security:
  - adverse public perceptions of the dangers of transporting dangerous goods through enclosed platforms, especially security related issues
  - debris being thrown onto rail infrastructure facilities
  - potential for blasts and explosions
  - potential explosion or fire associated with loss of containment of dangerous goods, whether or not involving a train derailment
  - risk resulting from transporting dangerous goods by train through areas of increasing population and infrastructure density
  - act of terrorism along the railway corridor or within the development
  - trespass by members of the public into the railway corridor through the development
  - vandalism of the railway corridor and the development
  - interference with rail infrastructure facilities, especially overhead line equipment
  - impingement on railway corridor operations and/or damage to the railway corridor itself

- Commercial:
  - business interruptions and financial loss to building occupants in the event of railway incidents affecting the building
  - commercial risks in the potential loss of freight and passenger business in the event of incidents
- Electrical:
  - electromagnetic interference on railway operations
  - electromagnetic interference to the operation of equipment located within the development from rail infrastructure and railway operations
  - exposure of persons within the development to electromagnetic energy due to the railway and persons within the railway to electromagnetic energy due to the development
  - explosive nature of oil filled electrical equipment
  - high voltage transmission lines and infrastructure
  - use of lighting and reflective material that can interfere with railway operations
- Other:
  - human factors
  - any aspects not complying with current standards - concessions

Additional information regarding derailment risk factors associated with rail infrastructure and operations, and risk management tools and techniques can be obtained from RISSB Code of Practice *Derailment containment and protection for rail underbridges*.

5.4. Protection of the rail corridor

Roof top terraces and openings in a development shall not facilitate the throwing of objects onto rail infrastructure facilities or into the rail corridor.

Balconies or windows that face the rail corridor and are up to 20 m from the boundary of the rail corridor shall be fully enclosed or restricted to a maximum opening of 80 mm.

Terraces shall be fitted with protection screens in accordance with AS 5100 *Bridge design* (all parts) on the side facing the rail corridor.

5.5. Security

Requirements for security and crime prevention strategies shall be determined in consultation with TfNSW and in accordance with T MU SY 20001 ST *Surface Transport Fixed Infrastructure Physical Security Standard*.

5.6. Dangerous goods

Storage of large quantities of dangerous goods such as gases, flammable liquids and solids, substances liable to spontaneous combustion, substances which on contact with water emit flammable gases, oxidising substances, organic peroxides, and so on are not permitted in airspace developments, unless approved by TfNSW.

A risk assessment shall be undertaken where the storage of diesel fuel is a required to provide for standby power generation equipment.

The design of developments shall minimise the effects of fire, explosion, chemical spill, and liquid fuel spill or gas emission on rail infrastructure facilities.

6. Environmental requirements

Section 6.1 to Section 6.3 provide environmental requirements and guidance that shall be taken into account in the design of airspace and external developments.

6.1. Green infrastructure

Plant species used in landscaping the precinct around the development shall be carefully selected to ensure that they do not accelerate the deterioration, or prevent the examination of the supporting structure of an airspace development.

Only low maintenance species with non-invasive root systems shall be planted on areas adjacent to rail infrastructure.

6.2. Noise and vibration

The effects of noise and vibration from railway operations shall be taken into account in the design of developments. The noise from construction combined with railway operations shall be assessed against statutory and project noise vibration limit requirements. Refer to the ISEPP for more information.

TfNSW does not accept liability for the generation of noise and vibration from normal railway operations (including track maintenance), or for its transmission into developments.

Where an airspace development is designed as a tunnel or an enclosed structure environment, operational airborne noise within the enclosed environment shall not be greater than pre-development levels.

An acoustic and vibration report shall be prepared to determine how the proposed development can minimise noise and vibration from the railway corridor. The acoustic and vibration modelling should consider the following where relevant:

- the running of long freight trains hauled by diesel locomotives as well as electric multiple units
- diesel powered track maintenance machinery, including equipment with audible reversing alarms and significant vibration generation
- projected increases in railway traffic, including future tracks and platforms

Where vibration isolation bearings are proposed, the maintenance and replacement of the bearings shall not disrupt railway operations.

Where noise barriers are proposed by the developer, the noise barriers shall have the following characteristics:

- located outside the road-rail corridor
- constructed from materials that are fire resistant; do not produce toxic fumes when burnt; do not cause flames to spread easily when ignited; do not result in toxic or environmentally harmful ash from burnt material
- vandal resistant and not easily disfigured by scratching with sharp implements
- do not block access to the rail corridor
- designed in accordance with AS 5100

Prior to the issue of an occupation certificate, a report shall be prepared certifying that the completed development meets the requirements of the ISEPP and *Development Near Rail Corridors and Busy Roads - Interim Guidelines*. The report shall include external and internal noise levels to ensure that the external noise levels during the test are representative of the typical maximum levels that can occur at this development. The developer shall ensure that noise levels meet the required dB(A) levels.

6.3. Heritage

Heritage management is governed by the *Heritage Act 1977.* The *Environmental Planning and Assessment Act 1979* and *Environmental Planning and Assessment Regulation 2000* require that environmental impacts resulting from the development be appropriately assessed. This includes impact on heritage items. The *Heritage Act 1977* is designed to protect, conserve and manage environmental heritage, including items of archaeological significance.

Where items of heritage significance are affected by the design of developments, the following requirements shall apply:

- the provisions of the *Heritage Act 1977* for all items listed on the *State Heritage Register*
- the principles and relevant guidelines contained in the *State Agency Heritage Guide – Management of Heritage Assets by NSW Government Agencies* for all items listed in the *RailCorp Section 170 Heritage and Conservation Register* and *RailCorp Section 170 Heritage and Conservation Register – Movable heritage*

All environmental factors, including heritage significance, should be considered at a sufficiently early stage of a project in order to influence concept designs. Any development within curtilage of a rail corridor shall respect heritage values and address heritage issues where applicable. Appropriate consideration should be given to the three dimensional characteristics of developments, including analysis of impacts upon heritage values. Such analysis should not be limited to impacts on individual buildings and structures; however it should also include consideration of likely impacts upon curtilage, view corridors, landscape, and general contextual setting. Developments should not generate undue adverse impacts upon heritage significance or upon the amenity of a precinct; they should seek to reinforce or enhance existing qualities or activities where possible.

Long-term conservation and maintenance of heritage items shall not be affected or constrained by the airspace development, and any future development shall take account of anticipated maintenance requirements for heritage fabric.

7. Configuration

7.1. Airspace developments

A new airspace development comprises the following two discrete stages for the purpose of defining design requirements:

- ATW that provides a structural canopy over the rail corridor, in order to provide support
- ABW constructed above the ATW; examples include commercial and residential accommodation

All new airspace developments shall have the following characteristics:

- the ATW shall have a clear span over the railway corridor, except above railway stations, where supports may be positioned on platforms; see Section 13.9 for the requirements for supports on platforms
- the vertical clearance from the top of rail to the underside of the deck of the ATW shall be not less than specified in Section 9

- the soffit of the ATW shall be located above the cadastral boundary where relevant
- work on any stage of the airspace development across the full life cycle shall not interrupt railway operations except as agreed with TfNSW

See Figure 1 and Figure 2 for typical details of airspace developments.

Railway corridors are frequently upgraded to increase the capacity of the network, to minimise maintenance, and in response to legislative changes aimed at improving safety, sustainability and amenity.

Developments shall take into account any foreseen future rail expansion projects. Information shall be obtained from TfNSW regarding planned and proposed future changes to rail infrastructure facilities.

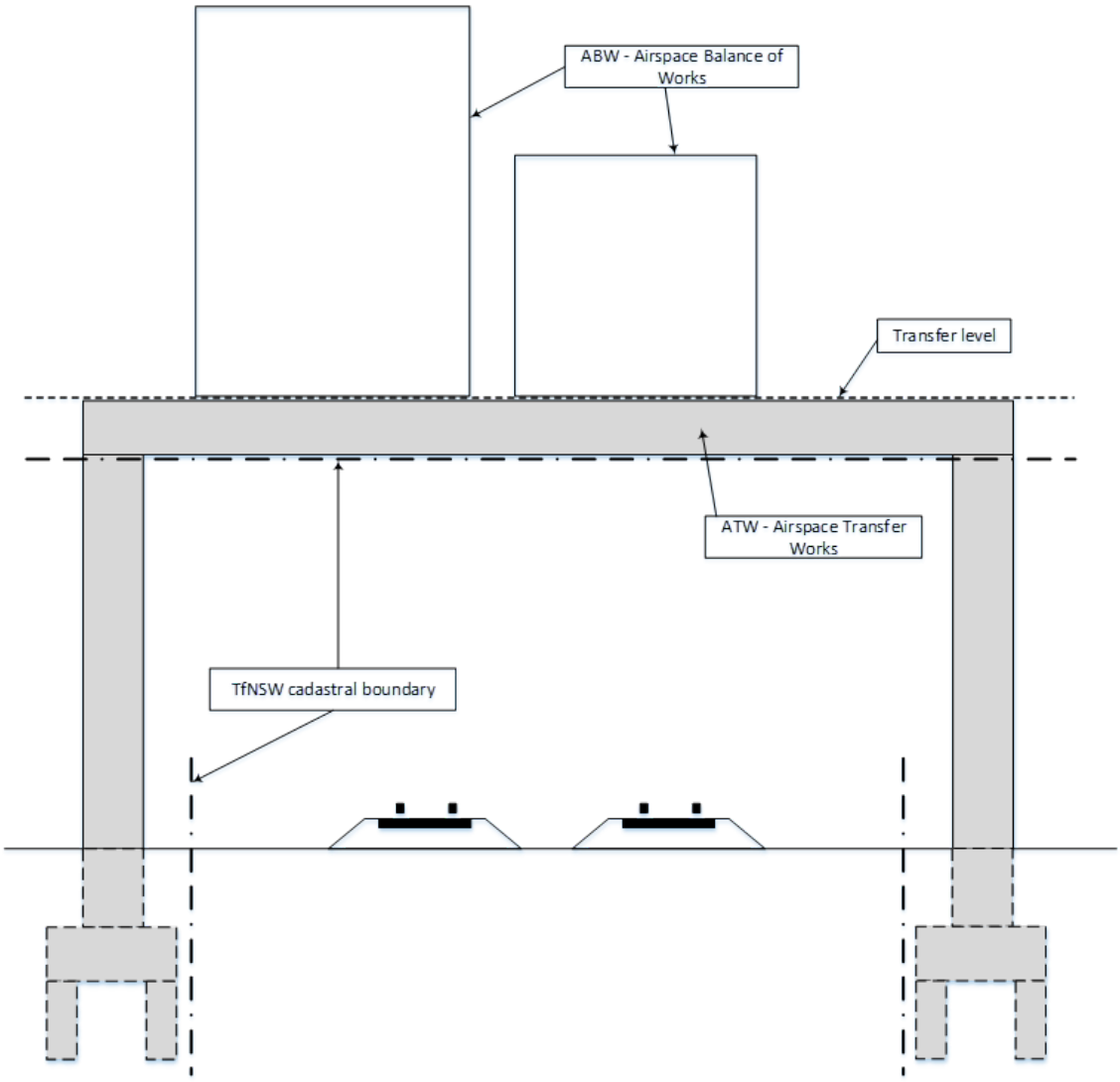

Figure 1 – Airspace development in open track

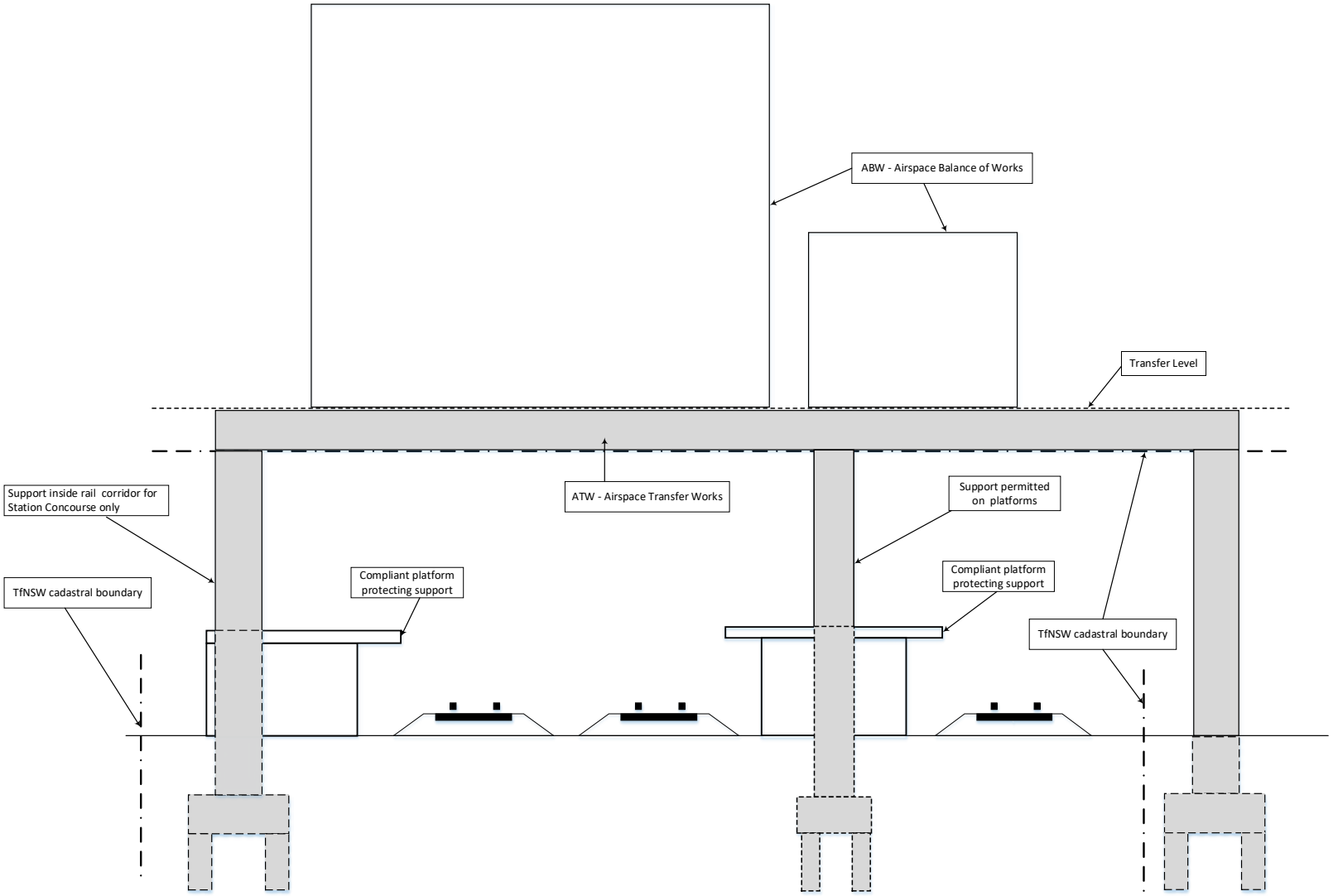

Figure 2 – Airspace developments at station

The developer shall identify rail infrastructure facilities that may be affected and shall provide for life cycle requirements (for example maintenance access) of affected rail infrastructure facilities.

Design of the ATW shall be undertaken by an AEO. Refer to *TfNSW Guidelines on External and Developer-led Works Affecting Transport Assets* for other information regarding AEOs.

7.1.1. Transfer level

The transfer level is defined as the level of the top-most structural element of the ATW. The transfer level may be horizontal, stepped or inclined, to follow the profile of the top of the ATW.

A clear separation may not be present between the ATW and the ABW in existing airspace developments. In such cases, the transfer level shall be taken as the top of the structural elements above the rail corridor at the finished floor level, excluding floor finishes. The transfer level for an existing airspace development is relevant where the airspace is upgraded to the extent that compliance with this standard is required, in order to define design requirements.

7.1.2. Station concourse

A station concourse is an airspace development constructed for the primary purpose of providing paid area access to station platforms below, by means of combination of stairs, escalators, ramps and lifts. It can also provide unpaid area access over the rail corridor.

The concourse floor area can support ticketing offices, amenities, retail outlets, kiosk concession, and vending machines.

Station concourse ABW structures are generally single storey structures above rail track or rail tracks within the rail corridor. However, a station concourse may be integrated into a larger over station development (OSD).

Supports for station concourses are permitted in the rail corridor in accordance with the following requirements:

- supports located between tracks are prohibited except where positioned on platforms (see Section 13.9 for the requirements of supports on platforms)
- supports shall comply with clearance requirements specified in Section 9
- all supports shall be protected against derailment collision in accordance with Section 11

A station concourse can have integrated walkways, ramp and lift access to streets or to adjacent overbridges. Integrated walkway access shall be regarded as part of the station concourse or airspace development, where applicable. A separated walkway access linked to the station concourse shall be regarded as a footbridge and comply with T HR CI 12030 ST *Overbridges and Footbridges*.

Parts of a station concourse that only extend over platforms and not over tracks, for example a linking access way to stairs or escalators, are not regarded as airspace development.

Design requirements for access linking slabs and supports, stairs, ramps, escalators and lifts leading from the station concourse to platforms are in T HR CI 12030 ST and in other TfNSW standards listed in Section 13.1. Access linking slabs and their supports shall be designed as footbridges in accordance with T HR CI 12030 ST but not subject to derailment collision load or protection.

7.2. External developments

For the purpose of this standard, an external development is any development proposal outside the rail corridor that can trigger a referral or concurrence to a rail authority (this is the term used in the ISEPP) as required by planning legislation.

External developments shall ensure that the safety or structural integrity, and the safe and effective operation of existing rail infrastructure facilities in the rail corridor are protected during undertaking of the works and on completion of the development.

For the purpose of this standard, underground rail infrastructure facilities that are outside the rail corridor, for example high voltage cable routes, shall be referred to TfNSW for requirements, see Section 8 for further requirements.

7.3. Prohibited configurations

Section 7.3.1 and Section 7.3.2 provide requirements for ground anchors and frangible supports that are prohibited in airspace and external developments.

7.3.1. Ground anchors

Permanent or temporary ground anchors extending into TfNSW property are prohibited unless they provide demonstrated geotechnical and property development benefits to TfNSW, supported by an engineering report, see Section 14. Benefits to TfNSW include the following:

- reduction in ground movement effects on existing rail infrastructure facilities
- reduction in access requirements
- reduction in the length of time that an excavation remains open or unsupported

See Section 14.5 for requirements for anchors that have been approved for use.

7.3.2. Frangible supports

Frangible supports shall not be used.

8. Services

General requirements for services are as follows:

- the developer shall conduct a services search to determine the type and extent of existing services in the development area
- services search shall be carried out in accordance with T HR CI 12190 ST *Service Installations within the Rail Corridor*
- where TfNSW services on TfNSW land are affected by the development, the proposed development shall make full provision for supporting, relocating and accommodating all existing TfNSW services leading to, and on the development site in accordance with all relevant standards
- existing services and utilities under a railway corridor shall be protected from increased loads during the construction and operation of the development
- the developer shall comply with the requirements for protection of underground power lines in the *Electricity Supply (Safety and Network Management) Regulation 2014*

Specific requirements for airspace developments are found in Section 13.15.

9. Clearances

Section 9.1 to Section 9.3 provide requirements for track clearances, viaduct clearances and electrical clearances, respectively.

9.1. Track clearances

Refer to ESC 215 for horizontal and vertical clearance requirements. The developer shall take into account the height of existing transport infrastructure equipment and facilities.

Provision shall be made for any future railway track as advised by TfNSW.

The design of trackside structures shall also provide clearances for safe places as detailed in T HR CI 12073 ST *Safe Places*.

Clearances from the track to piling equipment during the construction of the ATW shall take into account of transit space, safe working and construction requirements.

No part of the development shall infringe the clearance limits without the approval of TfNSW.

9.2. Viaduct clearances

Proposed developments shall be within their legal property boundary and setback based on the required clearance to construct and maintain their building without encroaching across that boundary.

See Section 7.2 for requirements for land use under viaduct structures.

9.3. Electrical clearances

Developments shall be designed to ensure that minimum clearances are observed to HV aerial lines, 1500 V dc overhead traction wiring and equipment, and exposed low voltage equipment.

Refer to T HR EL 08012 ST for requirements.

Minimum clearances to HV aerial conductors shall be complied with. Refer to T HR EL 10001 ST and AS/NZS 7000 *Overhead line design* for requirements on clearances to aerial lines.

Clearance above substations and sectioning huts shall allow for the uses of mobile cranes and heavy lifting equipment. Clearance requirements for maintenance above substations and sectioning huts shall be obtained from TfNSW.

10. Temporary components and works

Any temporary components, for example, shoring systems, formwork and falsework, that are located such that their failure has the potential to affect rail infrastructure facilities or operations shall have a minimum service life of 10 years. Temporary works shall also comply with *NCC* requirements.

Certain temporary works may also need to be designed by an AEO. See *TfNSW Guidelines on External and Developer-led Works Affecting Transport Assets* for more information regarding AEOs.

11. Supports and collision protection

Supports for developments can be at risk of impact from a derailed train that can result in collapse of the structure onto rail infrastructure facilities or trains below.

Unless otherwise noted in this standard, all supports for developments shall comply with the minimum requirements of AS 5100.1:2017 *Bridge design – Part 1: Scope and general principles* for collision protection arrangement and configuration, and for the minimum collision loads specified in AS 5100.2:2017 *Bridge design – Part 2: Design loads*.

Further requirements for supports are as follows:

- Supports shall be non-frangible and shall be designed to avoid disproportionate collapse of the structure in the event of damage to a support; see Section 7.3.2.
- Supports that are at risk from head-on collision shall be protected by a deflection wall in accordance with AS 5100.

- For the application of requirements in AS 5100, supports for developments are considered as piers.
- For the application of this standard, the collision protection requirements in clause 15.3 of AS 5100.1:2017 shall also apply to supports for external developments.
- A risk assessment may determine that more stringent protection requirements are required.
- Where a development is located above or adjacent to a track operating at low speed (no more than 15 km/h), or has a low risk of out of control speed, such as a storage siding or stabling yard, a reduction in AS 5100 collision protection requirements that are substantiated by a risk assessment may be considered by the Director Civil Engineering Infrastructure, AMB, through the concession process. Irrespective of relaxation of protection requirements that may be sought, the collision loads in AS 5100.2:2017 shall not be reduced.

See Section 13.9 for requirements for airspace developments supports that are located on platforms.

12. Electrical requirements

12.1. General electrical requirements

Developments shall comply with the minimum clearances specified in Section 9.3, other requirements of the standards referenced in Section 12.1, and the requirements of the relevant electricity distributor for the following:

- HV aerial lines and cables that may be located outside of the rail corridor
- HV and 1500 V direct current (dc) traction power supply cables
- 1500 V dc overhead wiring (OHW) and equipment
- low voltage equipment

Requirements for activities within TfNSW electricity easements and close to the Transport Asset Holding Entity of New South Wales (TAHE) HV distribution systems are in the following standards:

- T HR EL 00007 ST *Management of Activities Within RailCorp Easements and Close to the RailCorp HV Distribution System*
- T HR EL 10001 ST *HV Aerial Line Standards for Design and Construction* for HV aerial line requirements
- T HR EL 08012 ST *Overhead Wiring Standards for Design and Construction*

- T HR EL 08001 ST *Safety Screens and Barriers for 1500 V OHW Equipment* for OHW requirements
- T HR EL 20004 ST *High Voltage AC and 1500 V DC Traction Power Supply Cable Infrastructure – Standards for Design and Construction* for HV and 1500 V dc traction power supply cables requirements

12.2. Electrolysis

The potential effects of stray electrical currents and electrolysis in the electrified area of the rail network shall be subject to a risk assessment across the full life cycle of the asset.

12.3. Lighting and reflective materials

Developments that require illumination at night or special lighting during daylight hours shall be planned and implemented so that railway operations, train drivers or fixed signals are not affected. Interference with train drivers includes, restriction of visibility of signals and signage distraction, and glare.

The designer shall seek approval for any such lighting from the rail infrastructure manager (RIM) in advance of construction of works.

Developments shall not introduce obstructions or reflections which adversely affect signal sighting. Night time lighting shall not generate colours that can cause signal misinterpretation.

The risk assessment for a development shall take into account the risks associated with lighting and reflective materials.

13. Special requirements for airspace developments

The requirements in Section 13 apply specifically to airspace developments, and are in addition to all other requirements in this standard.

13.1. Design standards

13.1.1. Developments without paid areas

The design of the ATW up to the transfer level shall comply with the requirements specified in this standard and AS 5100. Construction of the ATW shall be in accordance with T HR CI 12003 ST *Civil Infrastructure Construction*. The design of the ATW shall be carried out by an AEO.

The design of the ABW shall be in accordance with the requirements specified in this standard and the *NCC*.

Design documentation shall identify applicable standards for construction, including construction methods, processes and materials.

Where a conflict in requirements exists between this standard and any other referenced standard or document, the *NCC* shall take precedence, followed by this standard, followed by other TfNSW standards. Unless otherwise approved, the more onerous design requirements between all the standards shall be adopted.

13.1.2. Developments with paid areas and station concourses

The requirements in Section 13.1.1 shall also apply to station concourses and paid areas. In addition, station concourses and paid area requirements are covered in the following:

- ESB 000 *Introduction*
- ESB 001 *Design Context and Process*
- ESB 002 *Design Principles*
- ESB 003 *Station Functional Spaces*
- ESB 004 *Station Services and Systems*

13.2. Durability

The durability requirement for ATW up to the transfer level, or other elements as specified, shall be in accordance with T HR CI 12002 ST *Durability Requirements for Civil Infrastructure*.

13.3. Design life

The design life of the ATW up to the transfer level, or other elements as specified, shall be in accordance with T HR CI 12002 ST.

The design life of the ABW shall be in accordance with *NCC* requirements.

13.4. Materials and components

Approved construction materials for all structural elements for the ATW are steel and concrete.

See Section 13.4.1 for formwork requirements.

Timber shall not be used as a permanent material in the ATW and shall be removed after temporary use.

Anti-graffiti paints shall be applied in areas where TfNSW determines a high risk of graffiti.

13.4.1. Permanent formwork

Permanent formwork shall not contribute to the strength of the structure.

Permanent formwork located above 1500 V dc OHW equipment shall be comprised of non-corroding and non-conductive materials in order to eliminate the potential safety risk of deterioration and subsequent contact with the equipment.

Acceptable products for permanent formwork above electrified tracks include fibrous cement sheet, reinforced concrete and glass reinforced polymer (GRP).

13.4.2. New and infrequently used materials

Any products used for structural elements in the ATW specified in the design documentation that can reasonably be deemed to be new or infrequently used shall be identified by the designer and referred to the Director Civil Engineering Infrastructure, AMB for approval by email sent to standards@nsw.gov.au.

The designer shall ensure that the manufacturer, constructor and maintainer of the product understand any special requirements or practices relating to the use of the product in the rail environment prior to release of the design documentation. The design documentation shall include these special requirements.

13.5. Importance level and annual exceedance probability

The importance level and the annual exceedance probability (AEP) for wind and seismic events are in AS/NZS 1170.0 *Structural design actions – Part 0: General principles*. The importance level and AEP shall be as set out in Section 13.5.1 for the ATW and Section 13.5.2 for the ABW.

13.5.1. Airspace transfer works

For wind and earthquake design of new airspaces, the ATW shall have importance level 4 in accordance with AS/NZS 1170.0.

For wind and earthquake design events, the AEP for the ATW shall be determined by hazard analysis and shall have probabilities less than or equal to 1/2500. The designer shall obtain advice from a relevant subject matter expert.

A special study shall be carried out for importance level 4 structures to ensure they remain serviceable for immediate use following the design event associated with importance level 2 structures. The serviceability acceptance criteria shall be agreed with by the Director Civil Engineering Infrastructure, AMB prior to commencement of the special study.

For the design of the ATW, the nominal shear and overturning moment at the base of the ABW shall be determined for the same AEP as the ATW. The designer shall develop an overall integrated model for the whole development in order to determine these transfer loads.

For drainage system design, the top surface of the ATW shall be designed for a rainfall event of 1% AEP.

13.5.2. Airspace balance of works

The importance level for new airspace ABW shall be determined in accordance with the *NCC*, but not less than importance level 3 in accordance with AS/NZS 1170.0.

For the design of the ABW, for wind and earthquake design events the AEP shall be determined in accordance with the *NCC*, but shall have probabilities less than or equal to 1/1500.

For the design of the ABW connection to the ATW, the nominal shear and overturning moment and axial forces at the base of the ABW shall be based on the same AEP as the ATW.

13.6. Additional loads on ATW

13.6.1. Live load on ATW

The ATW shall be designed for a minimum live load of 10 kPa applied to the area outside the footprint of the ABW. This live load is to account for the possibility of future stacking of materials and placement of plant and equipment.

13.6.2. Superimposed dead load on underside of ATW

In addition to known permanent loads, the underside of the ATW shall be designed to a minimum superimposed dead load of 5 kPa to allow for future attachment of additional services, unless otherwise advised by TfNSW.

13.7. Serviceability wind design

The development lateral (along wind, across wind and torsional) accelerations due to wind induced vibration shall be assessed for at least 1, 5 and 10-year serviceability return intervals and compliance with AS 1170.2 *Structural design actions – Part 2: Wind actions* and ISO 10137 *Bases for design of structures – Serviceability of buildings and walkways against vibrations* shall be achieved and verified by appropriate wind tunnel testing.

13.8. Earthquake design

Airspace developments shall be designed for seismic loading in accordance with AS 1170.4 *Structural design actions – Part 4: Earthquake actions in Australia*. The AS 1170.4 hazard design factor shall be based on the geographic location of the proposed development.

13.8.1. Airspace transfer works

The ATW up to the transfer level shall be designed as earthquake design category (EDC) III as defined in AS 1170.4.

Specialist reference material includes ISO 23469 *Bases for design of structures – Seismic actions for designing geotechnical works*.

13.8.2. Airspace balance of works

The ATB shall be designed as earthquake design category EDC III.

13.8.3. Parts and components

The non-structural elements, parts and components within the ATW and ABW shall be designed for the same earthquake design actions and importance level as the structure, as required in AS 1170.4.

13.9. Supports on platforms

Supports for airspace developments, including development lift shafts extending down to platform level that provide support to the development, are permitted on existing and new platforms where the following conditions are satisfied:

- supports in the rail corridor shall have been approved by TfNSW first before such a design is submitted
- platforms are earth-filled and comply with T HR CI 12065 ST *Station Platforms*
- the transverse distance from the outside face of the platform wall (ignoring coping overhang where present) to the nearest face of the support is 1.7 m or more
- the transverse location of the face of a support (with respect to the design centreline of track) is in accordance with ESC 215 *Transit Space* (that is, 4.3 m or more from the design centreline of the adjacent track)
- the longitudinal distance of a support (with respect to track) is more than 20 m from the end of a ramped platform (excluding the length of the ramp), or is more than 4 m from the end of a vertical (non-ramped) platform
- the length of the platform between support and the platform end is capable of resisting the collision loads specified in clause 11.4.2 of AS 5100.2: 2017
- the platform is isolated from transferring collision load onto the support

Supports on platforms that comply with these requirements are not required to be protected by a deflection wall.

Where a platform does not comply with the preceding requirements, for example open or suspended platforms, a support is permitted on the platform, provided the platform is designed to provide protection to the support, and the platform is designed for collision loads specified in clause 11.4.2 of AS 5100.2: 2017. The platform shall not transfer the collision loads to the support.

Supports on platforms shall be designed for collision loads specified in clause 11.4.2 of AS 5100.2: 2017. Blade shaped wall supports are preferred where practical instead of columns.

13.10. Fire performance

The fire safety design objective for an airspace development is to provide an adequate level of fire safety for occupants of both the railway and facilities supported by the airspace development, firefighters, maintenance and other emergency services personnel.

The airspace development shall provide a level of fire resistance in order to maintain its structural stability and fire separation in case of a fire incident, appropriate to the following:

- time required for evacuation of railway users and airspace development occupants
- time required for emergency services intervention
- characteristics of fires for which structural stability and fire separation is expected
- potential consequences of failure of structural elements and/or fire separating elements, including openings
- expected rail traffic mix, including the potential presence of diesel powered track maintenance, freight or passenger rolling stock, as well as the potential presence of dangerous goods
- other fire safety systems present, such as fire suppression
- fire safety objectives in Section 5.2, particularly asset protection and rail line operational continuity in the event of a fire incident
- smoke exhaust management system and new fans under the ATW if required

Emergency egress from the ABW shall not be through the rail space underneath.

The FLS strategy of the ABW shall have minimal impact on the rail space below, that is, smoke from the ABW shall not be directed into the rail space so if the ABW is evacuated the rail space remains in operation.

Intumescent paint shall not be used on any part of the ATW.

The developer shall submit a copy of the annual fire statement report to local government and to the RIM.

13.10.1. Deemed to satisfy solutions

The deemed to satisfy solutions help in demonstrating compliance to meet the fire safety performance objectives and requirements.

The developer shall seek advice from the RIM to ascertain if the airspace development will be over freight rolling stock lines.

Fire separation requirements can be deemed to be satisfied for airspace developments over TfNSW rail lines that are not operated with freight rolling stock by demonstrating compliance with the following requirements:

- the ATW up to the transfer level shall provide a fire resistance level of not less than 240/240/240 when exposed to the standard (cellulosic) fire curve of AS 1530.4 *Methods for fire tests on building materials, components and structures – Part 4: Fire-resistance tests for elements of construction* from below the airspace development (for example, a train fire)
- the ATW up to the transfer level shall provide a fire resistance level of not less than 240/240/240 when exposed from within the ABW to a building fire to the standard (cellulosic) fire curve of AS 1530.4

Fire separation requirements can be deemed to be satisfied for airspace developments over TfNSW rail lines that are operated with freight rolling stock by demonstrating compliance with the following requirements:

- when exposed to the full duration of the RABT-ZTV (rail) hydrocarbon fire curve specified in AS 5100.1:2017 from below the ATW, structural stability and strength is not reduced below the applicable limits as defined in AS 5100
- when exposed to the standard (cellulosic) fire curve as defined in AS 1530.4 from below the ATW, the ATW provides fire resisting separation of not less than 240 minutes of fire resisting integrity and 240 minutes of fire resisting insulation
- the ATW up to the transfer level shall provide a fire resistance level of not less than 240/240/240 when exposed from within the ABW to a building fire to the standard (cellulosic) fire curve as defined in AS 1530.4
- egress routes from facilities supported by the supporting structure shall satisfy the following:
    - be independent from the egress routes from the rail corridor
    - ensure that all pathways required for emergency egress and access for the airspace development are located within the airspace development lots and are independent of the station concourse lots, and vice versa

- be fire separated from the rail corridor by construction that provides a fire resistance level of not less than 240/240/240 when exposed to the standard (cellulosic) fire curve defined in AS 1530.4
- discharge to a point which is on a road or an open space which is not on the affected structure that is suspended over the rail corridor

13.10.2. Tunnels and underground enclosures

Where a new airspace development results in the creation of a tunnel as defined in ESC 340 *Tunnels*, the developer shall be responsible for the design and installation of all necessary FLS arrangements in accordance with ESC 340.

An airspace development can create an underground or enclosed station condition if the platforms and the tracks to which it is adjacent are covered by any part of the airspace development for more than 80 m.

Where an airspace development results in the creation of an underground or enclosed station condition, the developer shall be responsible for the design and installation of FLS requirements subject to a FLS risk assessment.

13.11. Waterproofing

ATW shall be designed to ensure a water tight and weather proof building envelope is maintained in the event that the ABW construction does not immediately follow the construction of the ATW.

All top surfaces of ATW, in particular landscaping and water features that are not protected by the ABW, shall be waterproofed to protect the ATW.

Waterproofing products that have a minimum proven durable performance life of not less than 20 years shall be used. The replacement of the waterproofing membrane shall be accounted for in the design and the durability and maintenance plans.

The use of concrete additives that enhance durability may be considered in the durability plan for the ATW.

Maintenance and replacement of temporary and permanent waterproofing shall be carried out from the transfer level without interruption to railway operations.

13.12. Slab joints

Movement joints in the ATW shall be watertight.

Joints shall be accessible and maintainable from above the transfer level and without interruption to railway operations.

13.13. Ventilation systems

The developer shall ensure that all rail infrastructure facilities affected by the airspace development are ventilated, air conditioned, or both and comply with AS 1668 *The use of ventilation and air conditioning in buildings* (all parts) and local government health code requirements.

13.14. Electrical requirements for airspace developments

The requirements of Section 13.14 are in addition to the general requirements in Section 12.

Airspace developments shall take into account electrical requirements in relation to maintenance access for substations and sectioning huts, stray currents, electrolysis, earthing and bonding, electromagnetic compatibility (EMC), OHW and lighting.

Where an airspace development changes the risk profile of an existing substation or sectioning hut, or requires the construction of a substation room within the development, the developer shall engage an authorised AEO to design, review and manage the risks associated with these electrical assets.

Requirements for low voltage services shall be obtained from the Director Interchanges and Buildings, AMB.

13.14.1. Stray current

An airspace development built over dc traction infrastructure is exposed to the risk of stray dc current. TfNSW does not accept any liability for damages resulting from the transfer of any stray current to the airspace development structure. Stray current risk shall be managed in accordance with T HR EL 12002 GU *Electrolysis from Stray DC Current*. See Section 12.2.

13.14.2. Earthing and bonding

The design shall identify and manage the risks associated with earthing and bonding of electrical services. Any airspace development in the vicinity of HV earthing systems at substations or aerial lines can be subject to risks from earth potential rise (EPR). The designer shall identify and manage these risks.

A site-specific earthing and bonding strategy is required for all airspace developments to identify and manage the risks associated with stray current interference and electrolysis, 1500 V dc traction infrastructure and EPR for developments in the vicinity of HV earthing systems.

The earthing and bonding strategy adopted for airspace developments shall not increase the risk to the rail infrastructure facilities and vice versa.

The ATW shall be provided with access to continuous reinforcement for purposes of testing, earthing and bonding from the airspace development to rail infrastructure facilities and to earth.

The developer shall confirm through testing that the ATW meets the requirements of the earthing and bonding strategy.

Refer to the following for earthing, bonding and electrolysis requirements associated with the airspace development and the electrical installations within the development:

- T HR EL 12004 ST *Low Voltage Distribution and Installations Earthing*
- T HR EL 12005 ST *Bonding for 1500 V DC Traction Systems*
- T HR EL 12002 GU

13.14.3. Electromagnetic compatibility

The potential for EMC on railway operations shall be taken into account in the design of airspace developments.

The potential for EMC to the operation of equipment located within the development from rail infrastructure and railway operations shall also be taken into account in the design of the airspace development.

The development shall be designed to ensure EMC exists between the development and the railway. This includes the radiated emissions from traction systems, effects on railway signalling and control systems and compatibility with persons in the railway and the development.

EMC is covered in more detail in T MU AM 06006 ST *Systems Engineering* and T MU AM 06006 GU *Systems Engineering*.

13.14.4. Overhead wiring

OHW shall not be supported by the ATW unless approved by the Director Civil Engineering Infrastructure, AMB and Director Energy Networks and Systems (AMB).

OHW may be supported from a station concourse where approved by the RIM and the concourse ATW is TfNSW property.

Refer to the following for requirements where OHW attachment is approved:

- T HR CI 12040 ST *Overhead Wiring Structures and Signal Gantries*
- TMC 331 *Design of Overhead Wiring Structures & Signal Gantries*

13.14.5. Lighting

Rail infrastructure facilities covered by an airspace development require illumination. Refer to T HR SS 80001 ST *Infrastructure Lighting*. This illumination shall be provided as part of the development. This includes platforms and all other areas of railway operations. The level of lighting provided shall be not less than the current level of lighting. Lighting required for rail infrastructure facilities shall connect to the rail electrical reticulation system.

TfNSW does not accept liability for the generation of lighting from normal railway operations (including track maintenance), or for its transmission into airspace developments.

13.15. Airspace developments services

See Section 8 for general services requirements. Additional requirements for airspace developments and station concourses are as follows:

- services shall not be located in the area between the underside of the ATW and the land of the rail corridor except on dedicated services floors and where permitted by TfNSW
- permitted services above OHW shall comply with T HR EL 08006 ST *Services Erected Above Overhead Wiring*
- service cores from an airspace development down to the station platform shall only be provided subject to approval from the Director Civil Engineering Infrastructure, AMB
- pipe work (for example, water or sewer pipes) shall only penetrate through any soffit or side of the structure where shown on drawings or otherwise approved, as-built locations of services shall be shown on drawings
- openings or penetrations for permitted services above and within 3 m horizontally of the OHW system are not permitted,
- gas, water, drainage, sewerage, mechanical, telephone, data, or electrical services for the airspace development shall be housed in service ducts and brought down to ground level at the street boundary
- station concourses and airspace developments shall be designed to ensure that all services required for the airspace development's use, operation and maintenance are located entirely within the airspace development lot and shall not pass through or into the station concourse lot unless specifically required by the relevant statutory authorities
- station concourse services shall be designed such that they do not pass through airspace development lots
- provision shall be made in the underside of the ATW to accommodate TfNSW services

13.16. Drainage systems for airspace developments

Requirements for drainage systems for airspace developments are in addition to general requirements in Section 16 and are as follows:

- Drainage systems from the airspace development shall not be suspended above the track or the rail corridor, nor shall be located within the rail corridor, except where approved by TfNSW.
- Overflow from airspace developments into the rail corridor for events greater than AEP defined in Section 13.5.1 and up to probable maximum flood (PMF) shall be contained and designed to be directed to areas within the rail corridor where it can be safely managed at track level and not directly onto tracks.
- Drainage systems from airspace developments shall not be connected to track drainage systems.
- ATW shall be designed to be waterproof to prevent leaking through to the railway corridor and infrastructure.
- Airspace developments drainage shall accommodate deck movements and structural settlements.
- Water and sewerage connections from supply and to discharge services shall be made outside the rail corridor. This requirement exists for both the construction and operational phases of the development.
- On site detention systems associated with airspace developments located below the transfer level are not permitted in the rail corridor.
- The drainage system for the airspace development shall be designed such that flows into external drainage systems are mitigated to existing flow rates.
- The drainage system for the airspace development shall be designed such that the water quality of discharge flows is equal or improved when compared to existing flows.

See Section 22.7 for drainage requirements during construction.

13.17. Drawing standards

Design drawings for ATW shall comply with T MU MD 00006 ST *Engineering Drawings and CAD Requirements*. The design drawings shall include the following:

- design loadings
- horizontal and vertical clearances of the ATW to rail infrastructure facilities
- any other information that is relevant to ensure that the new airspace development is constructed and maintained in accordance with the design

14. Geotechnical

Geotechnical requirements include geotechnical investigation, excavations, and approved ground anchors.

14.1. Geotechnical investigation

Where the proposed development has the potential to impact on rail infrastructure facilities, the developer shall carry out detailed geotechnical investigations of the soil or rock strata in accordance with AS 1726 *Geotechnical site investigations* alongside rail infrastructure facilities, as appropriate, to establish the existing ground conditions within the area affected by the proposed development.

Geotechnical investigation can comprise the following:

- drilling boreholes
- geophysical exploration
- in-situ tests
- geological mapping

Drilling boreholes (for subsurface investigation) can require a detailed study of existing arrangements to demonstrate that risk to the rail infrastructure facilities is appropriately managed for approval from TfNSW prior to drilling works.

Where an existing building occupies the entire site of the proposed development, a desktop study based on adjoining or nearby sites is acceptable subject to a geotechnical investigation being undertaken post local government approval and demolition of building to confirm desktop assumptions.

14.2. Engineering analysis and impact assessment

Where ground penetration is greater than 2 m within 25 m of the rail corridor, unless otherwise directed by TfNSW, the developer shall carry out an engineering analysis and impact assessment to demonstrate that the effects of the proposed development on the existing rail infrastructure facilities will not cause any adverse effect. This assessment shall be presented in an engineering assessment report.

The engineering analysis and impact assessment shall take into account other adjacent existing developments and activities planned for the future or that are taking place at the time of analysis. This information can be obtained from TfNSW.

Depending on the complexity of the development, a two dimensional or three dimensional numerical modelling (finite element (FE) or finite difference (FD)) shall be carried out to assess the effects on rail infrastructure facilities at different stages of construction and during operation

after commissioning. This shall include effects of associated temporary works such as crane and construction material loading.

The numerical modelling shall be based on the realistic geological model derived from the subsurface information gathered through the geotechnical investigation. It shall include critical geological features such as bedding planes, weak layers, joints and other discontinuities.

The numerical modelling results shall be verified. The predictions shall be validated during construction by carefully designed field monitoring instrumentation.

The numerical modelling shall also account for existing conditions of rail infrastructure facilities including defects such as cracks, drainage conditions and support conditions determined by dilapidation survey and in-situ strength tests as appropriate.

Where the proposed development is on TfNSW land the following applies:

- the engineering assessment report shall be prepared and endorsed by a suitably qualified person and shall be submitted to TfNSW
- TfNSW can request the developer to arrange for an independent verification of the engineering analysis and impact assessment based on the project complexity and potential effect rail infrastructure facilities

14.3. Engineering assessment report

The engineering assessment report shall comprise the following:

- geotechnical investigation report
- impact assessment report
- risk assessment report

14.3.1. Geotechnical investigation report

As a minimum the geotechnical investigation report shall include the following:

- accurate geological profile of the sections where the new development is proposed and the sections beyond the footprint where the development can potentially impact rail corridor
- borehole location plan, bore logs, test results, geological mapping, photographic documentation and other relevant information used for the analysis
- description of the soil profile of the area
- critical geological features such as bedding planes, joints, dykes and so on
- other relevant data from geotechnical investigation
- rock and soil properties, laboratory and in-situ test results

- existing in-situ stress states in soils and rocks
- ground water levels and condition
- detailed geotechnical model for the analysis including geotechnical design parameters
- recommended footing design, methods of shoring and excavation
- copy of all plans, geotechnical data, operations and maintenance records with any qualifications and limitations provided by TfNSW to the developer

14.3.2. Impact assessment report

As a minimum the impact assessment report shall include the following:

- detailed scope of the development
- verified survey plans by NSW registered surveyor showing the location of the proposed development in relation to the easements, rail protection reserves, track centre lines, and associated rail infrastructure
- zone of influence due to proposed development relative to rail corridor cadastral boundary
- detailed drawings depicting structural layout, foundation layout, foundation loads, drainage plans, temporary works such as dewatering, shoring and anchoring and permanent works of the proposed development
- structural drawings with designs for shoring plan and detail as recommended by the geotechnical engineer
- predicted displacements of existing rail infrastructure facilities due to proposed development at various stages such as pre-construction including demolition, during excavation, during construction and post-construction
- predicted stresses on rail infrastructure facilities elements at various stages of construction such as pre-construction including demolition, during excavation, during construction and post-construction
- structural assessment of likely effects of displacements and stresses on existing rail infrastructure facilities
- appropriate sensitivity analysis to ensure that the predictions are not adversely affected by reasonable variations in input parameters and different conditions that can occur during all stages of construction works
- assessment of the effects of the construction method on rail infrastructure facilities
- discussion on any design assumptions, qualifications or limitations that are not adequately considered as part of the sensitivity analysis that shall then be integrated as risks in the risk assessment

- recommendations of preventive and remedial action for any effects on rail infrastructure facilities as a consequence of the proposed development
- vibration assessment report (see Section 6.2)
- stray dc current signature report including risk assessment
- certification that the proposed development will produce no adverse effects on rail infrastructure facilities

14.3.3. Risk assessment report

The risk assessment report shall cover the following:

- safety in design (see Section 5.1)
- all stages of construction
- whole of asset life cycle

14.3.4. Independent verification

Where the development is on TfNSW property, TfNSW may require independent verification of the engineering analysis and impact assessment to be carried out as follows:

- independent verification shall be carried out by an organisation that is independent of the organisation that prepared the engineering analysis
- independent verification organisation shall be subject to the approval of TfNSW
- independent verification shall include a detailed engineering proof check of all aspects of the engineering analysis and design and impact assessment including any proposed temporary works
- independent verification organisation shall prepare a report that describes its verification activities and includes certification that the proposed development will produce no adverse effects on rail infrastructure facilities
- independent assessment report shall be submitted to TfNSW with the engineering assessment report

14.4. Ground penetrations

Excavations, retaining works and other ground penetration and disturbance works associated with a proposed development shall not affect rail safety and operational integrity or cause the destabilisation of rail infrastructure facilities.

The design of development shall ensure the following:

- the stability and integrity of rail infrastructure facilities through loading from the development and ground deformation shall not be affected
- no excavation shall be made within 25 m of rail infrastructures facilities without prior analysis of structure stability with respect to the effects of the excavation, and temporary supports, where necessary, are installed
- no excavation shall be made below the base of the footings of any rail infrastructure facilities (for example bridges, station concourses, retaining walls and station platform walls) without prior analysis of structure stability with respect to the effects of the excavation, and temporary supports, where necessary, are installed
- ground vibrations that can result during any excavation works shall be assessed to ensure that the rail infrastructure facilities do not have adverse effects
- temporary structures and batters shall not infringe the railway corridor, except where approved, and temporary structures or batters in the railway corridor shall be easily removed and the corridor returned to its previous condition
- fill, spoil or any other material shall not be stored in the railway corridor at any stage of construction
- no adverse effects on the rail corridor from fill placed adjacent to the rail corridor rail corridor shall
- retaining structures necessary to stabilise any excavations for an external development shall be located outside the railway corridor cadastral boundary

14.5. Approved ground anchors

Where they have been approved by TfNSW, requirements for ground anchors that extend into the railway corridor are as follows:

- anchors shall be temporary
- permanently stressed anchors shall not be used
- all anchors shall be designed so that they do not interfere with existing and planned railway infrastructure facilities
- the design life of temporary anchors left permanently in place shall not be less than 10 years
- temporary anchors left permanently in place shall be de-stressed and anchor heads removed following construction

- as-built drawings with anchor locations and details shall be submitted to TfNSW at completion of construction
- anchors used to retain excavations adjacent to the rail corridor shall be designed for applicable wind and earthquake loads based on an importance level of 3 and an AEP of 1/500 in accordance with AS 1170.0

The design of anchors shall be supported by a geotechnical and structural engineering report prepared by an AEO that confirms the works will not de-stabilise railway infrastructure facilities or place any unnecessary risk on the railway corridor. See Section 14.3 for report requirements.

15. Footings and basements

15.1. Footings

Requirements for footings are as follows:

- footings shall not physically intrude into the rail corridor, except for station concourses and where located on platforms, or otherwise approved by TfNSW
- footings shall not rely upon passive earth pressure from rail corridor land
- for footings located within 5 m of the centreline of an existing or proposed track, the top of the footings shall be no less than 1 m below ground level, in order to facilitate cess drainage and maintenance activities such as ballast cleaning and track reconditioning
- footings located beyond 5 m of the centreline of an existing or proposed track, shall have the top of the footing located no less than half a metre below finished ground level, or as advised by the RIM
- footings located at a platform shall be located with the top of footing no higher than the lowest track formation level at the platform wall
- platforms shall not be relied upon to provide lateral support to footings

15.2. Basements

Basements that are within 25 m of the rail corridor, or within the zone of influence from the rail corridor using a 45 degree angle measured from the ground level at the rail boundary to the basement excavation level, shall not have any adverse effect on existing or proposed rail infrastructure facilities.

Additional requirements for permanent retention systems for basements including floors, walls and columns up to ground level, that provides support to the rail corridor, are as follows:

- shall be designed for the earthquake AEP in Section 13.5 for the ATW
- surcharge from rail traffic shall be in accordance with AS 5100.2:2017

- the durability requirements for basements shall be in accordance with Section 13.2
- the design life for basements shall be in accordance with Section 13.3

16. Water and drainage

Requirements for development interaction with track drainage are in T HR CI 12130 ST *Track Drainage*. The requirements in Section 16 are in addition to those in T HR CI 12130 ST.

General drainage requirements are as follows:

- The development shall not cause stormwater, roof water, ponding, floodwater, any other drainage, to be directed to or increased or concentrated in a railway corridor, particularly around electrical assets such as substations and sectioning huts. This requirement exists for both the construction and operational phases of the development.
- Drainage systems shall be designed to prevent leakage onto the railway corridor.
- Piers and foundations shall be designed to allow free drainage along the formation and not cause ponding.
- The developments shall be designed to ensure that flooding of basement and ground floor areas of rail infrastructure facilities does not occur during the construction, operation and maintenance of the development in the event of a PMF.
- The development shall not obstruct any drainage, stormwater or floodwater flows from the railway corridor.
- Where existing natural flow is already towards the rail corridor and cannot be diverted uphill, the developer may develop alternate drainage solutions to deal with stormwater, subject to approval from TfNSW.

See Section 13.16 for drainage requirements for air space developments.

17. Survey

The developer shall ensure a land survey is conducted by a registered surveyor prior to the commencement of the design of the development. The survey shall include the following:

- location of the rail corridor cadastral boundary
- location of the development relative to the agreed rail corridor cadastral boundary and the rail infrastructure facilities
- location of tracks and all rail infrastructure facilities affected by the development - for external developments survey extent shall be up to the closest track only; for airspace developments the survey extent shall be the full width of rail corridor
- locations of overhead wiring structures (OHWSs) affected by an airspace development

- areas of the platform and platform features that are affected by an airspace development
- location of all affected services shown on the survey plan
- vertical and horizontal clearances of support structures to rail infrastructure

The accuracy and veracity of these locations shall be agreed and confirmed with TfNSW in advance of the commencement of construction.

This survey shall be completed in the current Australian Geospatial Reference System, namely GDA2020 and AHD.

17.1. Boundary definition

The location of the proposed development with respect to the railway corridor cadastral boundary shall be clearly identified on design, construction and as-built drawings. Cadastral boundaries between external developments and the rail corridor shall be taken as front, side or rear boundaries in terms of compliance with the *NCC*.

Boundary definition shall also include easements and right-of-way's (ROWs) and stratums.

17.2. Boundary fencing

Boundary fences between any external development and the rail corridor shall comply with T HR CI 12060 ST *Boundary Fences*.

Existing boundary fences shall not be assumed to be located along the rail corridor boundary. Where a fence is found not to be on boundary then the requirement is for the developer to set-out the legal boundary and re-fence in accordance with T HR CI 12030 ST.

18. Access

The ongoing ability to access the rail corridor for maintenance and emergency situations is critical to the safety, integrity and operation of the rail network.

The following access requirements shall be incorporated in the design of temporary and permanent works:

- Entry to the rail corridor shall be subject to the approval of the RIM.
- The developer shall obtain written approval from TfNSW for the suitability and capacity of passageways, steps, escalators, and so on, when it is proposed to change existing access between the station precinct and the adjacent public streets. The developer's submission shall identify the impact on TfNSW and the public due to the proposed changes to access.
- Approved arrangements shall be made for access for TfNSW customers and workers to platforms, and for workers' areas between tracks.

- The development shall ensure that access to rail infrastructure facilities does not disrupt train operations.
- The development shall not restrict existing easements for maintenance and emergency access to any rail infrastructure facility.
- Stations concourses and airspace developments shall be designed to ensure that all pathways required for maintenance access for the airspace development are located within the airspace development lot or lots and are independent of the station concourse lot or lots, and vice versa.

19. Signalling and communications

The Director Signals and Control Systems Engineering, AMB and Director Telecom Engineering, AMB shall be contacted for signalling and communications requirements, respectively.

20. Existing airspace developments

Section 20.1 to Section 20.3 provide requirements for existing airspace developments.

20.1. Refurbishment of existing airspace developments

The requirements of Section 20.2 do not apply where the works do not change the form and function of the airspace development, this could include minor maintenance and fitout or refurbishment of an individual shop, as they are considered refurbishment works.

However, if several shops are being refurbished at or around the same time, such work is considered as an upgrade as a whole rather than individually.

20.2. Upgrade of existing airspace developments

In addition to the requirements of the *NCC* to bring buildings into compliance, major upgrade works are defined to include any of the following:

- change of use
- any structural alterations to the supports
- any increase in the load on the columns or supports of more than five percent
- any works that increase the structural height of the airspace development
- any works to the development that trigger *NCC* requirements for the entire development to comply to current standards

Where a major upgrade of an existing airspace development is proposed, the structure shall be risk assessed for the proposed changes and, where required, treated as a new development

and the provisions of this standard shall apply. The supports shall be assessed for derailment collision protection in accordance with Section 5.3 and where collision protection is required, it shall be in accordance with Section 11**Error! Reference source not found.**.

20.3. Collision protection of existing airspace developments

Supports for developments can be at risk of impact form a derailed train that can result in collapse of the structure onto rail infrastructure facilities or trains below.

Collision protection requirements may also apply to an existing airspace development where work undertaken does not fall under the requirements for major upgrade.

Existing airspace developments may not comply with the provisions for collision loading and protection specified in AS 5100.

The risk profile at an existing location may change due to infrastructure configuration changes; for example, realignment of existing tracks closer to support piers, new tracks constructed, increase in track speeds and train frequency. The risk assessment shall be carried out by the instigator of the proposed configuration change.

For the purpose of this standard, an at-risk support is one that was not designed for collision loads where an impact from a derailed train could result in the removal of the support resulting in the collapse of the superstructure in part or in whole. At-risk supports include steel trestles, slender columns and slender rigid frame support legs and supports in close proximity to a rail line that are not located on platforms.

If the risk at a particular airspace development site changes as a result of proposed infrastructure changes, a risk assessment shall be undertaken to determine the level of derailment collision risk mitigation and support protection required. The risk assessment shall assess risk against the risk criteria defined in T MU MD 20002 ST.

The risk assessment shall be prepared and submitted to TfNSW for endorsement.

Where it is determined that the supports of an existing airspace development are at risk, mitigation actions shall be implemented so that the risk shall be reduced to SFAIRP.

21. Information to be submitted by developers

Information shall be provided in accordance with the service level agreement (SLA) issued by the RIM where applicable.

22. Construction

22.1. General construction requirements

The developer shall comply with the TfNSW conditions provided in the construction certificate (CC) prior to works commencing.

During construction, existing access to rail infrastructure facilities and station platforms shall be maintained for TfNSW customers and workers.

Construction work shall not disrupt train driver sighting of existing signals. Maintenance access to existing signalling infrastructure and other rail infrastructure facilities shall not be disrupted during the construction phase.

Prior to the final approval to commence construction, the developer shall ensure that all required legal agreements with TfNSW are in place.

Construction work shall include appropriate protection of the rail corridor and TfNSW facilities.

All construction carried out in the rail corridor shall comply with the requirements of the relevant authorities and legislation including work health and safety and environmental requirements.

22.2. Airspace developments

The ATW shall be constructed in accordance with T HR CI 12003 ST.

Elements of the ATW to be erected above the rail corridor should be assembled from precast or prefabricated elements to minimise the construction timeframe and disruption to railway operations.

ATWs shall incorporate sufficient provisions to enable the future construction of the ABWs without affecting railway operations.

The construction program for both ATW and ABW works shall be agreed with TfNSW in advance of the commencement of construction in order to minimise TfNSW network user disruption during the construction phase.

Airspace developments shall not be painted using the safe working colours of red, orange or green.

The colour and surface finish of paint on concrete surfaces within the rail corridor shall be approved by the RIM. The colour shall be similar to the unpainted surface or be transparent. Dark paint colours do not facilitate the periodic visual examination of a structure.

22.3. Dilapidation surveys

Prior to the commencement of construction works and prior to the issue of an occupation certificate, a joint site condition inspection and survey of the rail infrastructure facilities and all property in the vicinity of the proposed development shall be carried out by representatives of the developer and TfNSW.

A joint site condition inspection and survey during construction (that is, post commencement and before occupation certificate (OC)) may also be carried out, as required by TfNSW.

Photographs and videos supplied by the developer shall not replace a joint site condition inspection and survey.

The existing condition and survey position of the rail infrastructure facilities and all property in the vicinity shall be agreed and recorded. This work shall be recorded in a report to be produced by the developer and supplied to TfNSW.

A comprehensive photographic record of rail infrastructure facilities shall be produced by the developer prior to development construction. This photographic record shall be provided to TfNSW prior to the commencement of development construction.

The condition and survey position of rail infrastructure facilities and all property shall also be confirmed and recorded post-construction by the developer and TfNSW. This work shall be recorded in a report to be produced by the developer and supplied to TfNSW.

The condition and survey location of TfNSW facilities and all property shall be monitored by the developer during the construction of the works.

The need for continuing survey and condition monitoring by the developer post-construction is a risk based decision and shall be agreed with TfNSW in advance of construction.

22.4. Crane and other aerial operations

When in operation, cranes and other construction equipment such as, concrete pumps and access equipment shall not intrude into the rail corridor, except in time periods that are approved.

When not in operation, cranes are permitted to weathervane into the rail corridor subject to the approval of the RIM.

The requirements of SMS-06-GD-0268 *Working around Electrical Equipment* shall be observed.

No loads shall pass over any OHW or HV aerial lines located within the rail corridor without approval from TfNSW.

22.5. Track possessions and power outages

The developer shall be required to meet all associated costs incurred by TfNSW at any occasion where construction activity calls for train services to cease, or requires isolation of electrical supplies.

Arrangements for track possessions and electric traction power outage are scheduled in the long term through TfNSW consultation and require notice of up to twelve months.

Access to the rail corridor and working near rail infrastructure facilities is only permitted when TfNSW is satisfied that adequate safety precautions are in place.

22.6. Demolition and earthworks

Demolition and earthworks shall not adversely affect railway infrastructure facilities over the full life cycle.

Hydraulic rock breakers shall not be used within 5 m of any rail infrastructure facilities.

22.7. Drainage and pollution control

During construction, water shall not collect and pond on or near railway infrastructure facilities. Unless approved by TfNSW no increased runoff from the development shall discharge onto the rail corridor or into the track drainage system during construction.

22.8. Electrical restrictions

Minimum safe working clearances to electrical power lines and equipment located within the rail corridor shall be observed in accordance with SMS-06-GD-0268.

23. Maintenance and operation

23.1. General maintenance and operation

Maintenance activities include maintenance activities for all rail infrastructure facilities in addition to maintenance activities for the development.

Maintenance access shall be negotiated at the design development stage. Specific requirements include the following:

- ongoing maintenance of any element of the proposed development shall not rely upon access from the TfNSW side of the railway boundary
- the development shall not obstruct, or require the removal or relocation of, a railway maintenance access point or route

- future maintenance of the proposed development shall not adversely affect rail infrastructure facilities or railway operations
- the development shall not increase the maintenance requirements of a railway corridor
- components, materials and finishes shall be selected so as to minimise required maintenance during the life of the airspace development

23.2. Maintenance of airspace developments

The airspace development design shall include provision for ease of access to, and sufficient clearance around rail facilities and components for inspection and maintenance activities. Maintenance activities shall not infringe the transit space requirements in ESC 215 and shall not interrupt railway operations.

Responsibility for the maintenance of assets in spaces shared by both TfNSW and airspace infrastructure shall be agreed between TfNSW and the airspace developer.

Maintenance and replacement of waterproofing shall be carried out from above the transfer level of the ATW.

Maintenance requirements shall be specified, in the form of a technical maintenance plan, in the design documentation for the structure. The requirements shall include examination tasks and frequencies, damage limits and repair standards.

The requirements of MN A 00100 *Civil and Track Technical Maintenance* and MN C 10301 *Structures Examination* shall apply to TfNSW infrastructure affected by the airspace development. However, it may be necessary to document additional site-specific maintenance requirements.

The requirements and high-level processes for the development of technical maintenance plans are in T MU AM 01003 ST *Development of Technical Maintenance Plans*.

The following shall be used, as appropriate, on any part of the development that is vulnerable to graffiti or is visible from trains and railway platforms:

- unpainted, galvanised or stainless steel elements
- self-cleaning windows
- concrete fascia with no coatings that weather prematurely
- graffiti reduction coatings

24. Decommissioning and disposal

New airspace developments shall be designed so that the ABW can be demolished to the transfer level over the railway tracks, platforms and access ways, without interference to railway operations or TfNSW customers.

New external developments shall be designed to permit demolition without interference with rail infrastructure facilities and railway operations.

Existing external developments shall be demolished without interference with rail infrastructure facilities and railway operations.

Ground vibrations that can result during any demolition works shall be assessed to ensure that the rail infrastructure facilities are not adversely affected.