



Transit oriented development guide





Foreword

Over the last decade, Queensland has experienced a significant increase in population and economic growth. While this growth benefits Queenslanders in many ways, it also presents us with new challenges.

At the core of these challenges is the planning of our cities so they are sustainably and equitably managed to maintain our enviable quality of life.

To examine how this can be achieved the State Government convened the Queensland Growth Management Summit in March 2010.

Growth Management Queensland, as a key outcome of the Summit was established within my department to lead the way with a focused approach to growth management — helping shape tomorrow's Queensland.

The *Transit oriented development guide* demonstrates how Growth Management Queensland is delivering outcomes for Queenslanders by delivering sustainable, well-designed and connected communities.

The Queensland Government is also addressing these challenges through a program of regional planning, including the *South East Queensland Regional Plan 2009–2031* and the *Far North Queensland Regional Plan 2009–2031*, which create frameworks for managing growth and development in these regions.

The regional plans advocate 'transit oriented development' as an important strategy for achieving sustainability and building attractive, vibrant communities.

Well-planned transit oriented development in urban growth areas supports the State Government's *Toward Q2: Tomorrow's Queensland* (Green, Healthy) aspirations by addressing a number of challenges facing Queenslanders. These challenges include climate change, vulnerability to rising oil prices, traffic congestion, increasing levels of obesity, housing affordability and changing household types.

The concept of transit oriented development is relatively simple—it aims to provide opportunities for people to live, work and socialise in attractive urban environments that are accessible to all members of the community. It reduces the need for people to access their daily needs using private motorised transport. However, there are challenges to achieving good transit oriented development outcomes on the ground.

This *Transit oriented development guide* aims to encourage good practice in applying transit oriented development principles for implementation in Queensland. It contains a suite of guidelines and planning tools in three sections:

1. *Guide to practitioners*—which aims to encourage good practice in applying the principles of transit oriented development
2. *Guide to community diversity*—which provides guidance on how to achieve diverse and inclusive communities in transit oriented development precincts
3. *Guide for development in a railway environment*—a technical guide written for developers and practitioners involved with projects in or around a Queensland rail corridor.

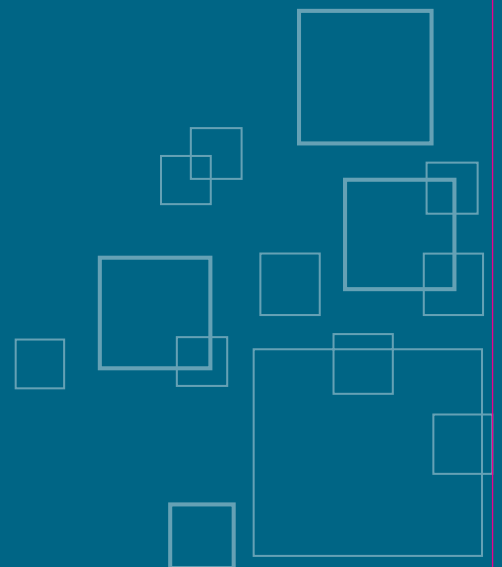
My department's website www.dip.qld.gov.au/TOD also provides more information about transit oriented development.

I hope you will find this *Transit oriented development guide* a useful resource. By working together with the community and industry, I believe we can create inspiring living and working environments and contribute to managing important issues such as population growth, traffic congestion and climate change.

The Honourable Stirling Hinchliffe MP
Minister for Infrastructure and Planning



Guide for practitioners in Queensland





Transit oriented development: guide for practitioners in Queensland



Transit oriented development: guide for practitioners in Queensland

Looking forward. Delivering now. The Department of Infrastructure and Planning leads a coordinated Queensland Government approach to planning, infrastructure and development across the state. The State Government, through Growth Management Queensland, is leading the way with a focused approach to growth management, to help shape tomorrow's Queensland.

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About this guide

Transit oriented development: Guide for practitioners in Queensland is designed to build understanding of the transit oriented development (TOD) concept and good practice in the Queensland context.

It has been written for practitioners, including urban planners, urban designers, transport professionals, local and state government officers and industry representatives and developers.

This guide is not a rigid rulebook. TOD is not a 'one size fits all' approach and a successful TOD will respond to local context and opportunities.

This guide is part of a suite of guidelines and planning tools that will influence TOD implementation in Queensland. These include guidance documents relating to urban density and community diversity, and various technical standards and specifications held by transport agencies and transport corridor managers, which provide advice and parameters for the planning, design and assessment of TOD projects.

This document has 10 parts:

- Section 1 – *Transit oriented development in Queensland* describes the Queensland Government's approach to TOD and explains why TOD is an important strategy for this state.
- Section 2 – *The origins of transit oriented development* briefly discusses the history of TOD.
- Section 3 – *Transit oriented development principles* identifies 21 principles for TOD.
- Section 4 – *Transit oriented development typology* describes the different types and scales of TOD precincts that will play a role in Queensland.
- Section 5 – *Location* provides guidance on good practice in planning for TOD precincts, corridors and networks at a regional level.
- Section 6 – *Land use* provides an overview of the main land use principles for achieving TOD outcomes and sets out good practice relating to density and mixed-use development.
- Section 7 – *Design* highlights the main design principles and good practice for achieving TOD outcomes.
- Section 8 – *Transport* provides guidance on principles for increasing mode share and intermodal connection, including good practice for transport providers.
- Section 9 – *Social* addresses principles aimed at achieving social diversity and inclusion and good practice guidelines for housing diversity and social infrastructure provision.
- Section 10 – *Process* addresses principles and good practice aimed at improved processes for TOD implementation, including coordination, community engagement and timeframes.



1 Transit oriented development in Queensland

1.1 What is transit oriented development?

Transit oriented development is a planning concept that promotes the creation of a network of well-designed, human-scale urban communities focused around transit stations.

While there are various definitions in use around the world, there is common agreement that transit oriented development is characterised by:

- a rapid and frequent transit service
- high accessibility to the transit station
- a mix of residential, retail, commercial and community uses
- high quality public spaces and streets, which are pedestrian and cyclist friendly
- medium- to high-density development within 800 metres of the transit station (i.e. the TOD precinct)
- reduced rates of private car parking.

The term ‘transit oriented development’ is often used incorrectly to describe a single development adjacent to or above a transit station. TOD refers to the set of principles applying to the broader precinct surrounding the station, rather than any individual development within it.

Development projects next to a station or in the airspace above the transport corridor are known as ‘joint development’ and may be important catalysts for TOD, if designed well. However, they can inadvertently reduce a location’s TOD potential if they block access to the station or contain uses that are not transit-supportive.

TOD precincts generally include the neighbourhood within a comfortable 10-minute walk of the transit station (a radius of about 800 metres).

The concept of TOD is in some ways a return to the traditional neighbourhoods and village communities of the pre-war years. Unlike dormitory suburbs and car-dominated developments, TOD provides a mix of different land uses and community services and facilities so people can live, work, shop and socialise within a short walk, cycle or transit trip of their homes.

1.2 Why is transit oriented development important for Queensland?

TOD has been a primary land-use planning strategy of regional plans, including the *South East Queensland Regional Plan 2009-2031* and the *Far North Queensland Regional Plan 2009-2031*. It supports the state government’s *Toward Q2 (Green, Healthy)* aspirations and assists in the delivery of congestion management and climate change initiatives.

Land-use planning is an important strategy for addressing urban congestion and transport-based CO₂ emissions.

As TOD supports the use of more sustainable modes of transport, including public transport, walking and cycling, and reduces the distances people must travel to access goods, services and employment opportunities, it will help address traffic congestion.

By reducing car dependence and transport-related greenhouse gas emissions, TOD plays an important role in energy conservation, mitigation of climate change and air-quality improvement.

Given the significant costs of servicing sprawled development, the effective integration of land use and transport infrastructure—which will maximise the efficient use of existing infrastructure—is increasingly critical.

TOD can contribute to better use of cities’ investments in rail and bus systems by promoting higher-density, mixed-use development, thereby increasing patronage. The Transit Cooperative Research Program (2004) found ‘residents living near stations are five to six times more likely to commute via transit than are any other residents in a region’.

At a broader scale, TOD can promote reverse-flow movement in the public transport system by encouraging commuting away from city centres out to major employment hubs located in activity centres in outer metropolitan areas.



TOD also presents major benefits by responding to population growth, changing demographics, oil scarcity, decreasing housing affordability, declining health and lower levels of physical activity—making it vital to the economic prosperity, livability and sustainability of Queensland cities.

TOD is a more economical urban form than traditional post-war suburbs and new greenfield development. Studies show substantial cost savings from inner city redevelopment compared with conventional residential subdivisions on the fringe (Trubka, Newman & Bilsborough 2008).

Newman and Jennings (2008) suggest car-dependent cities ‘spend 15 to 20 per cent of their wealth on transport whereas transit oriented cities spend 5 to 8 per cent. Roads and parking can also occupy over a third of the land in a car-dependent city’.

TOD also offers significant economic benefits to Queensland, including:

- more efficient use of existing public transport and other urban infrastructure
- more efficient community and emergency services
- lower costs associated with urban congestion due to reduced private motor vehicle use
- reduced incidence of crime and social isolation, and associated costs, through environmental design
- reduced healthcare costs associated with lack of physical activity and air quality issues
- revitalised local economies through increased pedestrian traffic and vibrant centres
- increased property values of neighbouring areas due to improved access to transport, facilities and quality public spaces.

Supporting Toward Q2

TOD will significantly contribute to achieving *Toward Q2: Tomorrow’s Queensland* vision and targets.

Green (Protecting our lifestyle and environment) 2020 Target: Cut by one-third Queenslanders’ carbon footprint with reduced car and electricity use

TOD can encourage a much smaller carbon footprint through reduced dependence on private motor vehicles by providing easy access to high-quality public transport services and reducing the need to travel for employment, everyday goods and services, and to public open space.

Studies show that TOD can achieve reductions in vehicle use of more than 15 per cent, while car ownership among people living within easy walking distance of transit nodes also falls. Bernick and Cervero (1996) found ‘increasing evidence to suggest that, if implemented at the regional level, transit oriented development leads to more sustainable outcomes and reduced car dependence’.

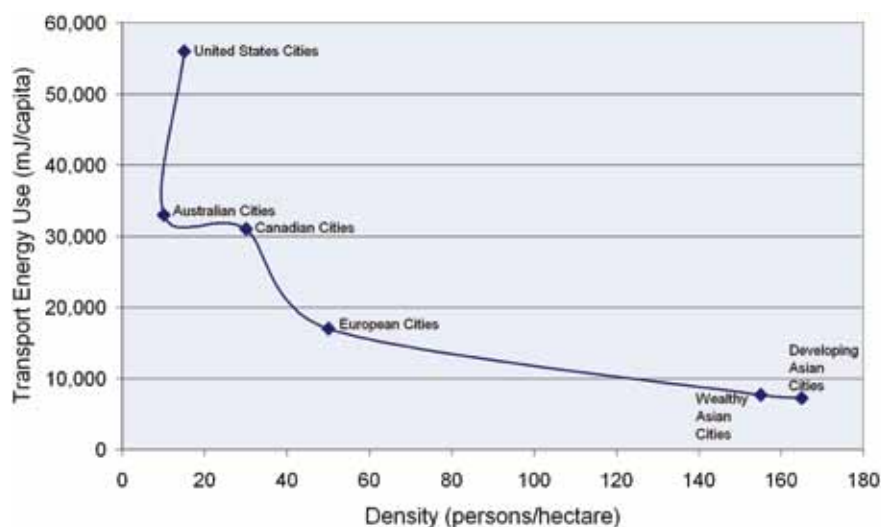
A Canadian study (Victorian Transport Policy Institute 2008) reported that (per capita) private vehicle travel tends to decline:

- where population and employment density is higher, particularly if it is concentrated in compact activity centres
- with increased land-use mix
- in areas with connected street networks, which encourage pedestrian and cycle movement
- in areas with attractive and safe streets that accommodate pedestrian and bicycle travel and where buildings are connected to footpaths rather than set back behind parking lots
- in areas with traffic calming and other measures that reduce vehicle traffic speeds
- when a strong, competitive transit system is present, particularly when it is integrated with high-density development within 500 metres of transit stations.

Decreasing private vehicle use is a critical measure for reducing transport-related greenhouse gas emissions. Reducing dependency on the private car contributes to improved air quality by decreasing emissions of key air pollutants such as particulates, ozone and volatile organic compounds such as benzene and toluene. By improving air quality, community health is also improved, leading to reduced costs associated with respiratory-related health issues.



Figure 1: Transport energy use per capita



(Arup, TOD Symposia, Brisbane, 23 June 2008)

Green (Protecting our lifestyle and environment) 2020 Target: Protect 50 per cent more land for nature conservation and public recreation

TOD will help preserve land on the urban fringe by promoting a more compact form of urban development, reducing pressure to clear native vegetation for urban purposes and preserving open space and biodiversity.

TOD can also promote a reduction in new expanses of paving compared with conventional subdivisions, which helps to:

- preserve areas that replenish groundwater supplies
- prevent polluted run-off to wetlands, river systems and the ocean
- reduce hard surfaces that radiate heat (a contributor to global warming).

Healthy (Making Queenslanders Australia's healthiest people) 2020 Target: Cut by one-third obesity, smoking, heavy drinking and unsafe sun exposure

By building communities that are designed to promote high levels of walking and cycling, TOD will contribute to reducing obesity levels within our community.

Research suggests that one-third of physical inactivity can be addressed through environmental design. A 2006 review (Heath et al. 2006) found that physical activity increases by:

- 161 per cent as a result of community-scale land-use planning that supports physical activity, such as proximity to commercial centres, green spaces and schools, and connectivity of streets
- 48 per cent due to access to suitable places (e.g. trails, facilities and parks) and by reducing barriers such as safety concerns and lack of affordability
- 35 per cent because of urban design that supports physical activity at a street level, such as improved lighting, ease of street crossings, pathway continuity, traffic-calming structures and aesthetic enhancements.



1.3 Implementing transit oriented development in Queensland

TOD is not intended to replace other forms of development. Implementing TOD means focusing employment, housing, community services and facilities in compact, vibrant and accessible settlements in identified regional activity centres and along high-frequency public transport corridors, including planned and future rail corridors.

TOD will be based around frequent and high-capacity public transport systems, primarily rail and busway. These systems will connect transit precincts of different scales and types in transit corridors. The goal is to create a network of vibrant, diverse communities and reduce reliance on private motor vehicles.

Given its many benefits, the Queensland Government is committed to implementing TOD, and will invest effort and resources to accelerate TOD delivery in a logical sequence of development.

In addition to shaping mixed-use neighbourhoods, TOD principles will also be applied to the planning and design of major community services and facilities and institutions (e.g. hospitals, government office accommodation and education campuses), to increase their accessibility.

Importantly, TOD is not a 'one size fits all' approach. While guided by a consistent set of principles, planning and design for individual TOD precincts in metropolitan areas across the state must respond to the distinctive local context and opportunities.

TOD is a relatively new approach for Queensland and much work needs to be done to ensure it is widely adopted as a viable alternative to car-dependent suburbs. While local advantages of this form of development may be realised in the short term, experience in Australia and overseas shows that it can take 15 years or more for the wider community benefits of TOD to be fully realised.

1.4 Regulatory framework for transit oriented development

TOD is the primary land-use strategy of the South East Queensland and the Far North Queensland regional plans.

The regional plans encourage local government planning to allow for a mix of land use that generates high demand for public transport (e.g. tertiary education, office, local retail, entertainment, high-density residential and professional services) within 400 to 800 metres of stops or stations in high-frequency transit corridors.

State agencies and local governments are required to consider the planning provisions of the regional plans in planning and development decision-making processes, including:

- state government plans and policies
- local government planning schemes and other plans and policies
- planning and development processes under the *Sustainable Planning Act 2009* (SPA)
- development applications made under the Integrated Development Assessment System (IDAS).

Forward planning instruments are vital to establish the conditions for effective and well-timed TOD.

These instruments cover different levels of planning—from state strategies to local detail—and include:

- regional plans
- local government planning schemes
- structure plans for declared master plan areas
- development schemes and interim development schemes for declared urban development areas
- local government planning strategies
- preliminary approvals.

Each plan type plays a different role in the delivery framework and they should be viewed in combination to ensure they are complementary and cover all important aspects of the overall vision.

In addition, the SEQ Regional Plan defines a set of agreed principles (see Section 3) to be applied in precincts within a comfortable 10-minute walk of a transit node (about 800 metres). These principles fit a range of different urban contexts (see the TOD typology in Section 4) and can be applied statewide.

Local governments should use these principles when preparing local planning strategies, planning schemes and amendments. They should determine the specific scale, intensity and land use mix for each precinct through the planning process.



2 The origins of transit oriented development

During the 1980s and 1990s, issues associated with car dependence and urban sprawl, such as environmental impacts and social dislocation, led to the emergence of new movements in planning theory such as 'Responsive Environments' in England and 'New Urbanism' in North America.

In 1993 Peter Calthorpe defined 'transit oriented development' in his publication *The Next American Metropolis* and practices that could be applied in greenfield, brownfield and infill situations. These drew on earlier 'garden city' planning concepts from the United Kingdom, such as the self-contained 'urban village' and 'traditional neighbourhood development', but were presented in a contemporary way.

This led to projects in locations such as Portland, Denver, San Francisco and Calgary, where significant investment in transit systems (often light rail) was linked to urban renewal projects in the downtown area.

Calthorpe's principles of transit oriented development:

- Organise growth at a regional level to be compact and transit supportive.
- Place commercial, housing, jobs, parks and civic uses within walking distance of transit stops.
- Create pedestrian-friendly street networks, which directly connect local destinations.
- Provide a mix of housing types, densities and costs.
- Preserve sensitive habitat, riparian zones and high-quality open space.
- Make public spaces the focus of building orientation and neighborhood activity.
- Encourage infill and redevelopment along transit corridors within existing neighbourhoods.

(Calthorpe 1993)

Cities in Australia have investigated the incorporation of TOD principles in a range of major metropolitan initiatives, including:

- **Greenhouse Neighbourhood Project—The Low Energy Suburb** (Loder & Bayly et al. 1993): An investigation into means of reducing energy requirements through changes to neighbourhood structure and street layout, public transport provision, residential density and land-use mix. It found that substantial energy savings (26 per cent in heating and cooling and 57 per cent in transport) could be achieved through changes in urban form.
- **Melbourne Urban Villages Project** (Energy Victoria et al. 1996): An investigation of options for improving the sustainability of urban areas through case studies.
- **Liveable Neighbourhoods Code** (Western Australian Department for Planning and Infrastructure 1999): A performance-based code that aims to achieve walkable neighbourhoods with reduced reliance on cars, convenient access to services and facilities and a choice of housing types.
- **Network City: Community Planning Strategy for Perth and Peel** (Western Australian Department for Planning and Infrastructure 2004): A strategy for the future of Perth that promotes compact urban growth patterns and efficient transport systems.
- **City of Cities: A plan for Sydney's future** (New South Wales Department of Planning 2005): A metropolitan strategy, which promotes major centres as job, service and residential locations, linked by improved communication and transport connections.
- **Melbourne 2030** (Victorian Department of Sustainability and Environment 2005): A 30-year plan to manage growth and change across metropolitan Melbourne and surrounding regions, which promotes TOD principles through initiatives such as 'a more compact city' and 'better transport links'.



3 Transit oriented development principles

Table 1 is a set of 21 agreed TOD principles drawn from the SEQ and FNQ regional plans. The principles and good practice guidelines that support them (see Sections 5–10) have broad applicability and relevance to urban areas throughout the state.

Table 1: Transit oriented development principles

Location	
Infrastructure and service levels	<ul style="list-style-type: none"> Locate development around nodes or corridors where infrastructure capacity exists, or can be created. Prioritise locations with high levels of transit service frequency.
Development levels	<ul style="list-style-type: none"> Ensure TOD occurs at a scale that is appropriate for the location.
New development	<ul style="list-style-type: none"> Apply TOD principles in new communities where transit nodes exist, or are proposed.
Land use	
Type	<ul style="list-style-type: none"> Ensure TOD precincts are dominated by land uses that support transit.
Extent	<ul style="list-style-type: none"> Focus on the area within 5 to 10 minutes walk of the transit node, considering the nature of the topography.
Density	<ul style="list-style-type: none"> Incorporate higher-density residential uses in TOD precincts to increase vitality and provide more convenient access to services and transport. Use the following baseline density guidelines: <ul style="list-style-type: none"> – activity centres: 40–120 dwellings per hectare (net) or greater – suburban and neighbourhood locations: 30–80 dwellings per hectare (net) or greater.
Intensity	<ul style="list-style-type: none"> Incorporate high employment intensities and a mix of employment opportunities.
Mix	<ul style="list-style-type: none"> Provide and integrate a mix of uses to create a greater variety of services catering for the diverse needs of a vibrant community. Provide timely and convenient access to services and facilities required to support people’s daily needs, including an appropriate mix of commercial and retail services, jobs, community infrastructure and open space relevant to the context of the surrounding area.
Continuity	<ul style="list-style-type: none"> Encourage continuous activity in TOD precincts to provide a sense of vitality and safety.
Design	
Adaptability	<ul style="list-style-type: none"> Ensure development delivers a built form that is robust and flexible, allowing development to be adapted or redeveloped over time to vary uses, increase densities or increase employment intensity.
Built form	<ul style="list-style-type: none"> Ensure development features high-quality subtropical design that maximises amenity, street activity and pedestrian connectivity.
Public realm	<ul style="list-style-type: none"> Provide for a high-quality public realm to meet the needs of the surrounding community, including open space, pedestrian areas and transit access. Deliver design that promotes social interaction and inclusion, physical activity and the development of a sense of place and identity.
Integration	<ul style="list-style-type: none"> Ensure design seamlessly integrates transit nodes and the community.
Safety and accessibility	<ul style="list-style-type: none"> Ensure development promotes a high sense of personal and community safety and equitable access to all public areas.
Parking	<ul style="list-style-type: none"> Locate, design, provide and manage car parking in TOD precincts to support walking, cycling and public transport accessibility.



Transport	
Mode share	<ul style="list-style-type: none">• Create an increased mode share for walking, cycling and public transport by providing high levels of accessibility and public amenity within precincts to stations and surrounding areas for cyclists and pedestrians, with priority for pedestrians.
Transport efficiency	<ul style="list-style-type: none">• Facilitate a high level of intermodal connection.
Social	
Social diversity and inclusion	<ul style="list-style-type: none">• Ensure development creates an environment that supports social inclusion and diversity, including different age, cultural, employment and income groups.• Provide a mix of housing types, tenures and affordability to support social diversity.• Promote physical and social connections between new and existing communities.• Ensure community development initiatives are carried out as an integral part of community building.
Process	
Coordination	<ul style="list-style-type: none">• Ensure a coordinated planning effort involving all stakeholders, including state agencies, local government and the development industry.
Community engagement	<ul style="list-style-type: none">• Engage early and throughout planning and development processes with the community likely to experience change to promote a sense of ownership and involvement.
Timeframes	<ul style="list-style-type: none">• Consider that TOD outcomes take time to deliver and precincts mature over time.

(Department of Infrastructure and Planning 2009)



4 Transit oriented development typology

TOD is not a ‘one size fits all’ approach.

TOD precincts can be categorised in terms of the role they play in the regional network, namely:

- city centre
- activity centre
- specialist activity centre
- urban
- suburban
- neighbourhood.

The broad precinct characteristics outlined in Table 2 provide a guide for planning and appropriate levels of development in each precinct type. Table 3 elaborates on the scale and density of development anticipated in each precinct type. Table 4 gives an indication of equivalent heights. Table 5 provides an indicative mix of uses by precinct type.

As development in each precinct will be influenced by local conditions, these guidelines are not intended to be restrictive or rigidly applied. Some TOD precincts may have characteristics of more than one type or may evolve over time, moving from a lower-order to a higher-order category. Some regions or local government areas in Queensland may not contain the full range of types.

Table 2: Transit oriented development precinct typology

Type	Applies to:
City centre	Metropolitan capital with excellent transit connections and established high-density and mixed-use built form.
Activity centre	Identified principal and major activity centres (SEQ Regional Plan) and regional activity centres elsewhere in the state, including: <ul style="list-style-type: none"> • traditional town centres undergoing renewal • major regional shopping centres adapting to become more mixed use and transit oriented • infill opportunities to expand existing centres • new activity centres in greenfield areas. <p>Activity centres provide a comprehensive range of retail, commercial, services, community services and facilities and other employment opportunities.</p> <p>While high to medium density is appropriate in these precincts, the scale of development will vary depending on the local context and quality of transit services.</p>
Specialist activity centre	Major public and institutional uses, such as hospitals and universities, which generate significant levels of activity and demand for transit from a wide range of destinations. Excludes major retail centres.
Urban	Inner urban areas supported by frequent transit services and well connected to employment hubs and key destinations.
Suburban	Locations with strong development potential, which are oriented to a transit station or corridor with reasonably frequent services.



Table 3: Predominant development scale

Type	Core (within 200 m of the station)	Primary walking catchment (within 400 m of the station and core)	Secondary walking catchment (within 800 m of the station and core)	Density range (dwellings per hectare)
City centre	High rise	High rise	High and medium rise	100+ / 300+
Activity centre	High and medium rise, depending on context	Medium rise, depending on context	Medium and low rise, depending on context	40+ / 140+
Specialist	Medium rise, depending on function	Medium rise, depending on function	Medium and low rise, depending on context	40+ / 120+
Urban	High and medium rise	Medium rise	Medium and low rise, depending on context	60+ / 180+
Suburban	Medium rise	Medium and low rise, depending on context	Low rise	30 – 80 / 100+
Neighbourhood	Medium and low rise	Low rise	Low rise	30 – 60 / 80+

Table 4: Development scales

	High rise	Medium rise	Low rise
	Over ten storeys	Between 4 and 10 storeys	Up to 3 storeys

Table 5: Indicative mix of uses

Type	Mix of uses	Indicative mix
City centre	<ul style="list-style-type: none"> Offices and other high-intensity commuter uses. Major retail and other high-intensity visitor destinations. Major cultural and entertainment destinations. High-density residential to provide a local community, after-hours activity, safety and custodianship of public spaces. Local shops and services to meet the needs of local residents, workforce and visitors. Promotion of a vertical mix of uses to ensure that ground-floor street frontages are active. 	Residential: 30% Commercial: 40% Retail: 20% Community: 10%
Activity centre	<ul style="list-style-type: none"> A good range of retail, commercial and employment opportunities to service the large catchment. A good range of community services and facilities to service the large catchment. A large residential catchment to provide a local community, after-hours activity, safety and custodianship of public spaces. Promotion of a vertical mix of uses to ensure that ground-floor street frontages are active. 	Residential: 50% Commercial: 25% Retail: 15% Community: 10%
Specialist activity centre	<ul style="list-style-type: none"> A dominant specialist land use (e.g. hospital or university). Clusters of complementary land uses. A significant residential population to provide activity and a local community. A basic range of shops and services to meet the needs of the local community and employees. 	At least 20% residential At least 10% retail, commercial or community



Type	Mix of uses	Indicative mix
Urban	<ul style="list-style-type: none"> • A substantial residential community involving high and medium-rise residential and mixed-use developments. • Intense commuter land uses such as offices that will benefit from the excellent transit connections. • A good range of retail, services and community services and facilities to meet the needs of the local residents and employees. • Promotion of a vertical mix of uses to ensure that ground-floor street frontages are active. 	Residential: 60% Commercial: 25% Retail: 10% Community: 5%
Suburban	<ul style="list-style-type: none"> • A large medium and low-rise residential catchment to provide activity and a local community. • A good range of shops, services and employment opportunities. • A good range of community services and facilities. • A mixed-use core with active frontages. 	Residential: 70% Commercial: 10% Retail: 15% Community: 5%
Neighbourhood	<ul style="list-style-type: none"> • Predominantly medium and low-rise residential. • A small collection of supporting shops and services. • No major attractors or destinations. 	Residential: 90% Commercial: 2.5% Retail: 5% Community: 2.5%



5 Location

5.1 Infrastructure and service levels

Principle: Locate development around nodes or corridors where infrastructure capacity exists or can be created. Prioritise locations with high levels of transit service frequency.

Good practice – infrastructure and service levels

- Focus TOD planning and implementation at locations where there are frequent, fast, reliable transit services to a range of destinations.*
- Rethink the location—is there limited development potential within 800 metres of the station?
- Apply TOD principles in the detailed planning of regional activity centres.
- Apply TOD principles in the detailed planning of specialist activity centres.
- Use secondary factors (e.g. capacity of existing infrastructure, local connectivity and amenity, level of community support, market interest) to determine the precinct type and to prioritise locations.
- Provide real-time service information or, better still, aim for timetable-free transit.
- Target 18 or 24-hour transit services in very-high-density areas or locations where there is a high proportion of shiftworkers.
- Give transit a high priority by enabling it to operate on dedicated or high-priority routes.**
- Consider converting traffic lanes to bus lanes to substantially increase public transport capacity.
- Consider introducing on-street transit (e.g. light rail) if travel demand and distances suit this type of mode.

*Frequency of transit services

A peak-period service frequency of at least 15 minutes and an off-peak service frequency of not more than 30 minutes are essential for TOD.

The frequency of transit will influence the scale and type of TOD that can be supported.

These locations are most likely to be found in designated major centres and adjacent to railway stations, busway stations or along high-frequency bus priority corridors.

Locations that have access to more than one public transport service or the potential for interchange between different services offer exceptional accessibility benefits and are prime locations for TOD.

**Dedicated routes

Bus services that operate in general traffic are usually not adequate to support genuine TOD. Building high-density, mixed-use environments around a bus service without dedicated lanes can further slow bus services.



5.2 Development levels

Principle: Ensure TOD occurs at a scale that is appropriate for the location.

Good practice – development levels

- Respond to local context—one size does not fit all.
- Perform a comprehensive site and context analysis for the area within 800 metres of the station before developing any plans.
- Consider functional aspects such as the location's role in the transport network and the activity centres network.*
- Use the TOD typology to determine precinct type and the scale and intensity of development.

*Functional aspects

For example: Is the location a point of interchange between different lines or modes of transport? What is the centre's role in the activity network? Is it a metropolitan or regional activity centre that can support medium to high levels of density, or is it more of a suburban or neighbourhood location? Is there an opportunity to create reverse-flow movement in the transport network?

Case study – Rosslyn-Ballston Metro Corridor, Arlington County, Virginia, USA

The Rosslyn-Ballston Metro Corridor is an example of where integrated precinct planning has played an important role in achieving a transit-supportive built form with a unique sense of place.

Roughly five square kilometres in area, the Rosslyn-Ballston Metro Corridor focuses mixed-use, infill development at five Metro stations.

Development within a 400 metre radius of each station is governed by detailed plans that specify land-use, urban-design, transportation and open-space guidelines.

The corridor accommodates 1.9 million square metres of office, retail and commercial space, more than 3000 hotel rooms and almost 25 000 residences resulting in vibrant 'urban villages' where people live, shop, work and play.

Nearly 50 per cent of corridor residents commute by transit.

The density and mix of uses tapers away from the station to integrate with surrounding residential neighbourhoods.



5.3 New development

Principle: Apply TOD principles in new communities where transit nodes exist, or are proposed.

Good practice – new development

- Comprehensively plan new areas to coordinate future development with infrastructure delivery.
- Design new development areas and growth centres according to TOD principles.
- Protect future transit corridors and nodes.
- Deliver sufficient densities to support TOD.
- Delay TOD implementation until necessary levels of transit service are available to avoid early residents becoming car-dependent.
- Protect TOD opportunities from inappropriate or premature development.



6 Land use

6.1 Type

Principle: Ensure TOD precincts are dominated by land uses that support transit.

Good practice – type

- Establish transit-supportive land uses and activities adjacent to the transit station and in the precinct core.*
- Exclude non-transit-supportive uses from the precinct core and primary walking catchment.**
- Ensure that retail uses have strong pedestrian orientation.

***Transit-supportive land uses and activities are those that:**

- generate high volumes of pedestrians and transit passengers
- generate high employment numbers or population density
- contribute to reverse-flow movement in the transit network
- encourage walking and cycling
- include activities that operate 18 or 24 hours per day throughout the week.

Uses that are transit-supportive include:

- employment-generating uses, such as commercial uses, offices and eating places
- compact housing
- street-fronting retail uses (excluding enclosed or parking lot-dominant retail forms)
- civic uses and government offices
- recreational and cultural facilities
- entertainment uses.

**** Land uses and activities that are non-transit-supportive include uses that:**

- occupy large parcels of land but are low intensity
- generate low employment numbers or low population density
- attract a high volume of traffic
- require a lot of parking or are car-dependent.

Examples of non-transit-supportive uses include enclosed or parking lot-dominant retail, industrial uses, warehousing and drive-through premises.



6.2 Extent

Principle: Focus on the area within 5 to 10 minutes walk of the transit node, considering the nature of the topography.

Good practice – extent

- Identify the precinct core (the area within approximately 200 metres of the station).*
- Connect the precinct core to the station.
- Locate the highest densities and mix of uses within the precinct core.
- Identify the precinct's walking catchments. The primary walking catchment is about 5 minutes walk (400 metres), the secondary catchment is about 10 minutes walk (800 metres).
- Apply TOD principles within the local walking catchment (800 metres).
- Make connections with surrounding areas and facilities.
- Create a place for people to live, not just a destination.

*Precinct core

In a transit corridor where the service operates on the street (e.g. priority bus lanes), the main street along which the service operates should be established as the precinct core.

Figure 2: Transit oriented development precinct showing the local walking catchments of a TOD precinct with high transit accessibility.





6.3 Density

Principle: Incorporate higher-density residential uses in TOD precincts to increase vitality and provide convenient access to services and transport. Use the following baseline density guidelines:

- activity centres: 40–120 dwellings per hectare (net) or greater
- suburban and neighbourhood locations: 30–80 dwellings per hectare (net) or greater.

Good practice – density

- Achieve medium to high density appropriate to the type of the precinct and its role.
- Match density to accessibility—the higher the accessibility, the higher the density.
- Intensify the core—consolidate density in the core of the precinct and taper off towards the outer areas of the precinct.
- Optimise the density potential of available developable land and balance the non-usable and open space components (e.g. use minimal setbacks, avoid surface car parking).
- Encourage land amalgamation where possible to enable development of appropriate scale and intensity to occur (e.g. by using development allowances or incentives for larger properties).
- Respond to local context and character—high density doesn't necessarily mean high rise.
- Ensure good design that reflects the climate and respects local character through design codes.
- Ensure public buildings establish a quality benchmark.
- Consider using an independent design review panel to ensure high-quality design.*

*Independent design review panels

In 2009 the Queensland Government established a non-statutory Board for Urban Places, chaired by the Queensland Government Architect, to champion high-quality urban design and provide general and project-specific advice on urban design, planning, architecture, landscape architecture, sustainability and built-environment issues throughout the state.

Brisbane City Council operates an Independent Design Advisory Panel, which provides the council with advice on the design quality of public and private development in Brisbane.

Case study – The Pearl District, Portland, Oregon, USA

The Pearl District—comprising 90 city blocks located north of the Portland CBD—is a successful transit oriented precinct with 2700 housing units and 93 000 square metres of commercial floor space.

A major catalyst for the transformation of the Pearl District was the construction of the Portland Streetcar. Investment in the streetcar has provided support for housing and transport initiatives with streetcar construction explicitly linked to high density development. Proposed housing densities were significantly higher than anything that was built previously in the area.

An innovative development agreement allowed increases in minimum densities, if certain public improvements were made. These included the removal of a viaduct that crossed the abandoned rail yards and the construction of the Pearl District's first park.





6.4 Intensity

Principle: Incorporate high employment intensities and a mix of employment opportunities.

Good practice – intensity

- Increase commercial densities (see Table 6).
- Ensure employment diversity by providing a range of employment opportunities and business premises of varying sizes.
- Avoid high demand for residential use in the early stages of the project compromising future employment diversity.
- Design ground floors of buildings in the precinct core to convert to commercial uses in response to demand.
- Where suitable incorporate light industrial uses, as long as they make efficient use of land, do not attract high volumes of cars and minimise external impacts.

Intensive commercial uses should be located in the core and achieve densities (measured by commercial plot ratio) above the average for the precinct. Table 6 provides indicative plot ratios anticipated in TOD precincts according to type.

Commercial developments in major TOD locations (e.g. activity centres) should aim to achieve plot ratios no less than 3:1, to make the best use of land in these locations. The ability to achieve this will depend on the context, mix of uses and type of TOD precinct.

Table 6: Indicative commercial densities

Type	Commercial plot ratio**
City centre	>5:1
Activity centre	>3:1
Specialist activity centre	>2:1
Urban	>3:1
Suburban	>2:1
Neighbourhood	>1:1

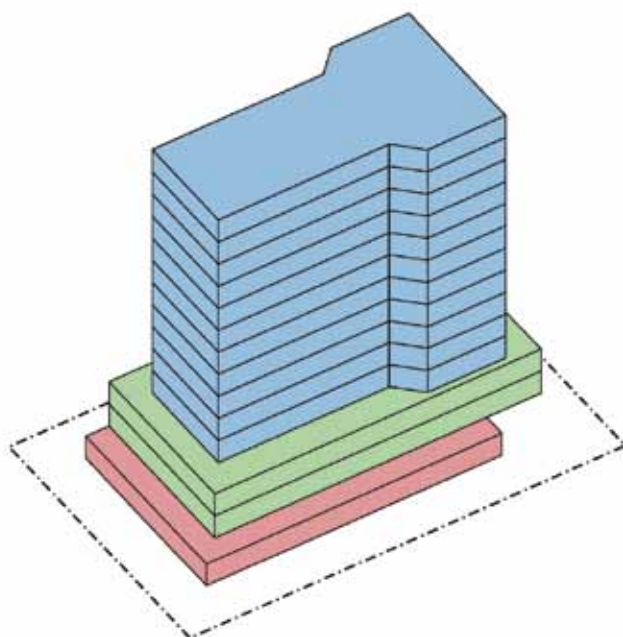
**Calculating commercial plot ratio

Plot ratio is the ratio of gross floor area to the area of the site. Applying different plot ratios to a site will result in different densities.

A plot ratio of 1:1 means a 1000-square-metre site should be developed with 1000 square metres of floor space. Similarly, a plot ratio of 3:1 means that a 1000-square-metre site should be developed with 3000 square metres of floor space.

Plot ratio is a useful measure of site density where development incorporates a mix of housing and non-residential uses—particularly where different uses are on different floors of a building. The higher the plot ratio is, the higher the urban density. Figure 3 demonstrates a mixed-use plot-ratio calculation.

Figure 3: Calculating plot ratio in a mixed-use development



<ul style="list-style-type: none"> RETAIL GROSS FLOOR AREA COMMERCIAL OFFICE GROSS FLOOR AREA RESIDENTIAL GROSS FLOOR AREA TOTAL GROSS FLOOR AREA PLOT RATIO 	<p>1500 sqm</p> <p>4 000 sqm</p> <p>11 000 sqm</p> <p>16 500 sqm</p> <p>Gross floor area 16 500 sqm divided by site area 4200 sqm = 1:3.93</p>
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Case study – Canary Wharf, Docklands, London, England

Canary Wharf is a large business and shopping development served by the Docklands Light Railway and a London Underground station. There are more than one million square metres of office and retail space and 90 000 employees in the precinct.

A key feature of Canary Wharf and the Docklands precinct is the inter-mixing of former wharf buildings with a variety of new building forms. Design at ground level relates to the pedestrian, reinforced by active uses, particularly along main pedestrian routes and plazas.





6.5 Mix

Principle: Provide and integrate a mix of uses to create a greater variety of services catering for the diverse needs of a vibrant community.

Provide timely and convenient access to services and facilities required to support people's daily needs, including an appropriate mix of commercial and retail services, jobs, community infrastructure and open space relevant to the context of the surrounding area.

Good practice – mix

- Co-locate a range of residential, commercial, retail and other uses.
- Allocate the split of residential, commercial and retail uses according to the precinct type (see Table 5, section 4).
- Emphasise uses that complement the precinct's role in the broader network or particular function.
- Include land uses that meet the daily needs of the local community.
- Integrate education, health care and social services within high-density, mixed-use environments.
- Perform a site and context analysis to reveal particular uses lacking in a precinct (e.g. affordable housing in an urban precinct or child care in a neighbourhood precinct).
- Ensure uses in the core offer active street frontages and are not overly car reliant.

6.6 Continuity

Principle: Encourage continuous activity in TOD precincts to provide a sense of vitality and safety.

Good practice – continuity

- Position different land uses to maximise the vitality of the precinct core.
- Arrange complementary uses for mutual support and to reinforce the convenience of walking.
- Aim for 18 hours a day activity in precinct core and mixed-use areas.
- Locate evening activities along key pedestrian routes and at intersections to maximise passive surveillance and vitality.
- Ensure buildings on key routes have active frontages to create a safe pedestrian environment.

Case study – South Bank, Brisbane, Queensland, Australia

The South Bank area in Brisbane has two rail stations and a busway station. TOD principles have been applied, enhancing transit use and creating a vibrant community.

Recent development around Grey and Little Stanley Streets features high-density residential and commercial premises with retail, entertainment and restaurants providing continuous activity at ground level. This approach has helped increase the mix of uses and provide an active pedestrian link between the stations and other facilities.

Evening uses such as restaurants and cafes are positioned to maximise passive surveillance and activity. Careful arrangement of different uses and the creation of quality pedestrian links have supported 18 hour operations, enhancing the area's vitality.





7 Design

7.1 Adaptability

Principle: Ensure development delivers a built form that is robust and flexible, allowing development to be adapted or redeveloped over time to vary uses, increase densities or increase employment intensity.

Good practice – adaptability

- Ensure buildings have a durable, adaptable design and are constructed to a high standard with robust materials.
- Design entrances, windows, ceilings and servicing to accommodate different uses over time.
- On the ground floor of mixed-use developments, ensure a ceiling height of at least 3.5 metres to allow a shop to be adapted to a restaurant or office.
- Construct car parking, including podium car parking, with sufficient height to enable adaptation to different uses in the future.

‘Areas with sensible zoning (integrating commercial, retail and residential), parks and street grids with sidewalks will age better than places oriented to disconnected subdivisions and shopping strips.’

(Price Waterhouse Coopers, Emerging Trends in Real Estate 2002)

7.2 Built form

Principle: Ensure development features high-quality subtropical design that maximises amenity, street activity and pedestrian connectivity.

Good practice – built form

- Ensure every building in a TOD precinct contributes to positive outcomes through appropriate design and functionality.
- Cluster taller buildings at central nodes and close to the transit station.
- Arrange buildings to preserve views and vistas.
- Respond to local context in building design, finding innovative ways to reflect but not duplicate traditional character.
- Design at a human scale with pedestrian-level detail.
- Avoid blank walls and long, single-purpose buildings.
- Activate street frontages with pedestrian entrances, active land uses (e.g. shops and cafes) and windows.
- Ensure entrances to buildings are well-defined and in the main facade of the building, with multiple entrances for multi-unit complexes.
- Activate upper-floor facades with windows, verandas and balconies.
- Use setbacks sparingly and avoid them in the core of precincts.
- Design for the climate.



- Design developments to improve natural ventilation and day-lighting, and minimise heat gain.
- Use landscaping to shade open spaces and buildings.
- Use insulation and energy-efficiency measures to reduce energy consumption.*
- Harvest rainwater and use water-efficient appliances to minimise water consumption.
- Facilitate waste recycling.
- Manage noise, odour and air quality.

Centre for Subtropical Design

The Centre for Subtropical Design is a partnership between the Brisbane City Council, Queensland University of Technology (QUT) and the Queensland Government Department of Infrastructure and Planning.

The centre aims to:

- stimulate design solutions that strengthen rather than weaken the city and region's subtropical identity
- develop and demonstrate comfortable and affordable subtropical design for neighbourhoods, homes and workplaces
- share knowledge and experiences of subtropical design.

www.subtropicaldesign.org.au

***Energy-efficiency measures**

Urban design measures can be used to maximise the comfort of residents and minimise energy use, for example:

- Design neighbourhoods to respond to the landscape, waterways and other natural features.
- Orient buildings and streets to minimise exposure to the summer sun and to maximise passive cooling and cross-ventilation.
- Shade walls, glass, balconies and entrances to minimise heat gain and facilitate cross-ventilation during wet weather.
- Provide sheltered balconies with appropriate shade and privacy.
- Increase ceiling heights to improve cross-ventilation and allow for ceiling-mounted fans.
- Include ventilation shafts, courtyards or breezeways to allow cross-ventilation of poorly oriented apartments.
- Provide the means to modify indoor climate through adjustable shading and operable windows and shelter these to allow use during wet weather.
- Design the landscaping of each development to maximise shade, capture breezes in summer, make the most of winter morning sun and to minimise exposure to winter winds and westerly afternoon sun.
- Establish vegetation on vertical surfaces to minimise the heat-sink effect and create green roof-tops to reduce energy demand and increase carbon dioxide absorption.
- Minimise the radiant heat impact of buildings through use of appropriate surfaces, colours and materials.
- Use insulation and double glazing to help prevent buildings heating up in summer and minimise interior heat loss in winter.
- Use natural daylight to minimise lighting bills without allowing the heating effect of direct sun.
- Shelter circulation spaces from sun and rain.
- Choose the most energy-efficient internal fixtures and fittings.
- Use ground-surface treatments that minimise heat reflection and site run-off.



Case study – Kogarah Town Centre, New South Wales, Australia

Kogarah Council has developed a model of sustainability that establishes a new benchmark for sustainable design principles in medium to high-density residential developments.

This model includes guidelines that require 91 per cent of living spaces to face a northerly direction, 85 per cent of apartments to be naturally cross-ventilated, and all buildings to incorporate passive design principles.

Reducing water use

Rainwater is collected from the roof surfaces and the upper level terraces. The water is filtered and used for toilet flushing, car washing and a water feature. Stormwater recycling is also important, with the collected water used for irrigation of the landscaped areas within the large courtyards.

The landscaped areas act as a filter for the water, removing the excess nutrients and fine particles. The filtered water is then collected and stored in a separate tank and used as a primary top-up supply for other tanks.

In conjunction with other conservation measures, such as AAA-rated toilets and showerheads, these measures reduce the development's demand on town water by 42 per cent.

Solar power

The Kogarah Town Square development also boasts Australia's largest building integrated photovoltaics installation in a medium-density development, incorporating a range of complementary energy-efficiency features.

The energy produced by the development offsets much of the electricity costs for the 194 apartments in the development, with initial estimates indicating that the 160 kW/h solar photovoltaic panels produce about 153 MWh of electricity a year.

An estimated 143 tonnes of carbon dioxide emissions will be saved each year through the use of solar power and the passive solar-design features of the development.





7.3 Public realm

Principle: Provide for a high-quality public realm to meet the needs of the surrounding community, including open space, pedestrian areas and transit access.

Deliver design that promotes social interaction and inclusion, physical activity and the development of a sense of place and identity.

Good practice – public realm

- Make places for people—when people have less access to private open space, the quality of the streets and public realm is important.
- Provide a range of open spaces and recreational opportunities, arranged to optimise efficient use of space in the precinct.
- Design streets and public spaces around stations at a human scale and with the pedestrian uppermost in mind.
- Ensure public realm improvement is an integral part of private sector developments—density on its own is not TOD.
- Reduce the width of road carriageways to enable street trees, landscaping, space for outdoor dining or street furniture.
- Introduce traffic-calming measures to disperse motor vehicles and reduce speeds.
- Allow for large shade trees in public and private spaces.*
- Plant native trees extensively throughout the built environment and preserve existing trees during new construction.*
- Develop shaded streets and median strips.
- Consider green walls and roof-top gardens where site cover constrains tree planting.
- Provide a continuous canopy of trees or awnings over footpaths along key pedestrian routes.
- Connect pocket parks with linear parks, landscaped streets and stormwater easements to create a network of public spaces.
- Provide at least 20 to 30 square metres combined of private and communal open space per dwelling.
- Use public art and streetscape features to promote a sense of place and local identity.
- Ensure the station is highly accessible from surrounding areas and visible from the local road network.
- Bear in mind when planning station access arrangements that pedestrians tend to take the shortest route to their destination and will only be deterred by major obstacles, particularly if the destination is in their sight.
- Ensure routes to the station through joint development are direct and convenient for pedestrians and cyclists, and not obstructed by internal roads, slip lanes, vehicular cross-overs or car parking.
- Ensure routes to the station through joint development are publicly accessible 24/7 and provide clear and legible access through the development to the station and to amenities such as bicycle storage.
- Arrange uses around stations to optimise activity and passive surveillance of through routes to the station.
- Create safe connections across the transit corridor in situations where the transit infrastructure acts as a barrier to pedestrian and cycle movement.
- Consider on-street bus lanes and/or light-rail corridors (where travel demand and distances warrant these modes) as these are more permeable, allowing interaction and movement across the transit corridor.
- Ensure station entrances are easy to identify and not secondary to other premises or fully embedded within a building—the station should have a presence in the public domain and ideally be supported by public space such as a forecourt.



'In trafficked streets the tendency is to follow the shortest route instead of the safest one. Only where automobile traffic is very heavy, where the streets are very wide, or where pedestrian crosswalks are very well placed is there effective use of crosswalks.'

(Gehl 2006)

Project for Public Spaces

'If you plan for cars and traffic, you get cars and traffic. If you plan for people and places, you get people and places.'

According to the Project for Public Spaces (PPS)—a New York-based non-profit organisation—streets account for up to a third of the land in a city. The PPS has undertaken a 'Streets as Places' initiative, which advocates a shift from transport planning that focuses almost exclusively on mobility to a process of designing streets for people.

PPS' 10 qualities of a great street

- **Attractions and destinations:** Consider a wide range of activities for people of different genders, ages, in groups or alone and at different times of the day, week or year. String these experiences together to create an appealing route.
- **Identity and image:** Create a positive image by keeping a place clean and well maintained and foster local identity by highlighting local assets.
- **Active edge uses:** Ensure building bases are human-scale and allow for interaction between inside and out. Create quality pedestrian experiences along a street by incorporating active ground-floor uses which are visual. Slow motorists down with visible footpath activity.
- **Amenities:** Provide street amenities to support a variety of activities (e.g. street furniture, street lighting, cycle storage).
- **Management:** Keep the street clean and safe, manage tenants and program use of the space to generate daily activity (e.g. schedule events such as small street performances, small street markets and celebrations).
- **Seasonal strategies:** Use seasonal strategies and events, markets and recreational activities to activate the street throughout the year.
- **Diverse user groups:** Provide activities for different groups, mixing people of different gender, age, ethnicity and socio-economic profile, to ensure no one feels unwelcome or out of place.
- **Traffic, transit and the pedestrian:** Ensure the street is easy to get to and through and is visible from a distance and up close. Provide convenient access to public transport and support walking and cycling access. Manage parking to achieve high turnover. Include access and links to surrounding destinations as part of the planning process. Slow down vehicles and share street space among a range of transport options so that private motor vehicle traffic does not dominate the space.
- **Blending of uses and modes:** Ensure ground-floor uses and retail activities spill out into the street to blur the distinction between public and private space. Ensure no single mode of transport dominates by sharing street space.
- **Neighbourhood protection:** Signal a change in surroundings by changing street character to ensure there are clear transitions from commercial streets to residential neighbourhoods.

(Project for Public Spaces)

To find out more about reinventing streets as places and other public-realm and place-making initiatives and tools, visit the Project for Public Spaces website at www.pps.org.



***Economic benefits of trees**

US research has shown a direct correlation between trees and local economic benefits.

Wolf reports that a survey undertaken in 2002 by the Center for Urban Horticulture measured consumers' response to trees in urban streetscapes according to visual preference, place perception, patronage behaviour and product pricing. The study found that consumers:

- rated pocket parks the highest, followed closely by a full canopy of trees. Enclosed sidewalks were the next preferred, with intermittent trees and no trees the least preferred
- perceived shopping districts with trees as more amenable, comfortable and better maintained than those without. They also enjoyed their interaction with merchants more and felt the quality of products was higher than in places without trees
- spent nearly four times longer on shopping or entertainment activities in streets with a tree canopy than in a street with no trees, and twice as long as in streets with small trees
- were willing to pay 9 to 12 per cent more for goods in shopping districts with trees.

A study of 85 office buildings and the effects of landscape variations (Laverne & Wilson 2003) found that rental rates for office buildings with quality landscaping received a 7 per cent boost. The rental rates of office buildings that used plants as a visual screen dropped by 7.5 per cent.

Case study – Kogarah Town Centre, New South Wales, Australia

In 1997 Kogarah Council started planning to revitalise Kogarah Town Centre and establish it as an effective TOD precinct.

A major symbolic decision was to redevelop a council car park into a new town square. This redevelopment has provided opportunities for employment and public facilities and has given the community a new heart and sense of place.

Changes in street hierarchy, streetscape improvements, new public spaces, traffic calming and widening of the existing laneways within the town centre have provided a more accessible environment for pedestrians through continuous paths of travel to all public areas.

Changes in land use have also improved the public experience by allowing activity at street level and increasing the village feel of the precinct.

An important element still to be addressed in this precinct is pedestrian access to the rail station from the town centre, which is hindered by traffic on Railway Parade. The Kogarah Council proposes to resolve this issue by diverting through-traffic from Railway Parade and introducing traffic calming on this street. The council also plans to make the town centre core surrounding the rail station more pedestrian friendly.





Case study – The Pearl District, Portland, Oregon, USA

Portland's Pearl District, which comprises 90 city blocks, is a successful transit oriented redevelopment precinct incorporating 2700 housing units and 93 000 square metres of commercial floorspace.

The aim of the redevelopment plan was to increase density, promote transit use, preserve historic buildings and support existing and new arts organisations.

The district features gentle walking blocks, which make it easy to get around, and inviting places to linger. Jamison Square is a notable public space that features a fountain, which simulates a shallow tidal pool, modernist totem poles that support the streetcar overhead wires, several small pocket parks, a community centre and space for a public market.



Case study – Subiaco Station, Perth, Western Australia

Subiaco is an inner-suburban centre located approximately three kilometres west of the Perth CBD. The focal point of the Subiaco central urban renewal area is the redeveloped railway station precinct.

The Subiaco Redevelopment Authority rebuilt the Subiaco Railway Station and lowered the Fremantle–Perth Railway Line into a cutting and tunnel for an 800-metre section near the station. This created space for a pedestrian precinct adjoining the station and enabled connections to be built between the existing town centre and for the residential and redevelopment areas on the northern side of the line.

The visually striking roof structure around the railway station platforms provides shelter for passengers and is a powerful landmark in the heart of Subiaco.

The below-ground but open-air station has a strongly pedestrian-focused core area, designed to create a sense of enclosure, comfort and intimacy. At surface level, the space around the railway station is designed to welcome pedestrians and cyclists.





7.4 Integration

Principle: Ensure design seamlessly integrates transit nodes and the community.

Good practice – integration

- Develop an integrated plan for TOD precincts.
- Manage place vs. node conflicts by putting the needs of the local community ahead of car-based commuters, visitors and through-traffic.
- Plan and manage access for commuters.
- Ensure there are clear transitions from higher-density TOD to residential neighbourhoods.

7.5 Safety and accessibility

Principle: Ensure development promotes a high sense of personal and community safety and equitable access to all public areas.

Good practice – safety and accessibility

- Incorporate Crime Prevention through Environmental Design (CPTED) principles in the planning for the precinct.*
- Ensure that public spaces can be safely used by children, the elderly and the mobility-impaired.

*Crime Prevention through Environmental Design (CPTED) principles

- **Casual surveillance and sightlines:** Ensure public spaces are overlooked by active street frontages, windows and balconies and sightlines extend beyond the immediate environs. Avoid blank or 'dead' frontages wherever possible.
- **Land-use mix and activity generators:** Ensure that a mix of land uses fronts public space and key thoroughfares and generates activity throughout the day and evening.
- **Definition of use and ownership:** Clearly demarcate boundaries between public and private space to limit trespassing and create distinct public domains.
- **Basic exterior building design:** Ensure active/permeable building frontages with clearly identified entry and exit points that are visible from public areas. Ensure building articulation does not create recesses capable of concealing potential assailants.
- **Lighting:** Ensure lighting is sufficient to see both the immediate surrounds and approaches to the chosen route. Elevated lighting allows approaching people or vehicles to be seen at distance.
- **Wayfinding:** Create legible routes that are well signed with clear pathways to important or frequently visited destinations.
- **Choice of routes:** Predictable pedestrian routes offer more potential for planned criminal activity than permeable street layouts with route choice. Similarly, dead-end streets can be potential danger zones.
- **Avoid 'entrapment' locations:** Consider the safety of all pedestrian and cycle routes. Avoid blank areas, concealed areas or unlit areas that could leave users exposed to danger.

(Queensland Police Service 2007)



7.6 Parking

Principle: Locate, design, provide and manage car parking in TOD precincts to support walking, cycling and public transport accessibility.

Good practice – traffic and parking

- Manage demand for traffic and parking to ensure it does not compromise pedestrian movement and local amenity.
- Design streets and intersections to slow traffic movements to safe speeds and allow increased pedestrian movement.
- Design streets to provide priority bus lanes and bike lanes where appropriate.
- Look for opportunities to create shared zones.
- Minimise the number and size of vehicle entrances.
- Use rear lanes for access where possible.
- Set maximum parking standards and encourage low-car developments.*
- Locate parking in basements, under decks and behind buildings. Surface parking adjacent to active street frontages is not appropriate in TOD precincts.
- Conceal podium parking with active frontages.
- Unbundle car parking from the sale of residential dwellings.
- Provide short-term on-street parking to improve activity and vitality.
- Carefully plan and place park-and-ride facilities where appropriate for accessing the transit network, preferably not in the core of the precinct.
- Consolidate and share parking between developments.
- Consider introducing car-share schemes and residential-parking permits.
- Price parking appropriately to promote sustainable travel behaviour.

*Maximum parking standards

TOD precinct types that offer high-frequency transit services and good pedestrian connections and have a high demand for quality public spaces, such as city centres or inner urban areas, should have the lowest maximum parking rates. Neighbourhood TOD precincts with moderate frequency transit services and transport facilities that serve surrounding suburbs may need to accommodate a comparatively higher maximum level of parking.

Table 7 provides indicative parking rates for TOD precincts according to their type. Parking rates in TOD precincts should be no more generous than the base maximum. However, planners are encouraged to adopt the preferred maximum where possible.

Table 7: Indicative parking rates

Precinct types	Residential (car spaces per unit)		Retail and office (square metres per car space)	
	Base maximum	Preferred maximum	Base maximum	Preferred maximum
City centre	0.75	0.5	400	600
Activity centre	1	0.75	100	200
Specialist activity centre	1.25	0.75	100	150
Urban	1	0.75	200	300
Suburban	1.25	1	75	100
Neighbourhood	1.25	1	50	100



Case study – Orenco Station, Portland, Oregon, USA

Orenco Station is an 80-hectare transit oriented community on the Westside light rail line in Portland, Oregon. The Orenco Station was designed as a complete community with opportunities to work, shop and engage in recreation within 400 metres of the homes.

The Orenco Station was developed under the regulations of the Portland Metro Region 2040 Plan, which mandates, among other things, pedestrian-oriented buildings, reduced parking and prohibitions on auto-oriented land uses. Design features that reinforce the pedestrian and community orientation of Orenco Station include rear-access parking, the elimination of front garages, curb cuts and driveways, and limited on-street parking facilities.





8 Transport

8.1 Mode share

Principle: Create an increased mode share for walking, cycling and public transport by providing high levels of accessibility and public amenity within precincts to stations and surrounding areas for cyclists and pedestrians, with priority for pedestrians.

Good practice – mode share

- Give priority to pedestrian movement in the transport hierarchy.
- Create a permeable and interconnected street network such as a traditional grid pattern or modified grid.
- Use street lengths between 80 and 200 metres and mid-block connections to improve pedestrian movement.
- Make direct and legible connections between key destinations.

‘People are more likely to walk or cycle in an attractive environment they feel comfortable and safe in.’
(*Goodwill & Hendricks 2002*)

Table 8: Walkable neighbourhoods

Attribute	Precinct core	Primary walking catchment	Secondary walking catchment	Outer catchment
Walking time	2–3 min	5 min	10 min	15 min
Distance to station/core	200 m	400 m	800 m	1200 m
Average block sizes	0.6 ha	0.8 ha	1 ha	1.4 ha
Street lengths	80–160 m	100–180 m	120–200 m	140–240 m

8.2 Transport efficiency

Principle: Facilitate a high level of intermodal connection.

Good practice – transport efficiency

- Place the station at the heart of the precinct with prominent and easily identifiable station entrances.
- Provide pleasant, safe, unobstructed pedestrian and cycle access to the station.
- Ensure safe, attractive and easy interchange between different transport modes.
- Position railway platforms and bus stops close together with pedestrian-friendly access between them.
- Provide bicycle storage and lockers.
- Locate ticket offices and vending machines conveniently for all modes.
- Install real-time service information.
- Ensure passive surveillance of all waiting areas and links between modes.
- Provide good pedestrian and cycle access as a higher priority than vehicle access.



9 Social

9.1 Social diversity and inclusion

Principle: Ensure development creates an environment that supports social inclusion and diversity, including different age, cultural, employment and income groups.

Good practice – social diversity and inclusion

- Provide a range of housing types, tenures and sizes to cater for different ages, household sizes and socio-economic groups.
- Set goals for the provision of non-market affordable housing.*
- Consider mechanisms to incorporate affordable housing into private development.
- Provide for employment diversity.
- Plan for retail diversity.
- Provide community services and facilities that respond to community needs and comply with precinct design and density principles.**
- Forecast population growth and work with human services and emergency agencies to plan for future community services and facilities.**
- Design compact community services and facilities for a range of uses.
- Encourage community and cultural development.
- Design community services and facilities to be inclusive and flexible in use.

***Housing affordability**

TOD is an important component of the Queensland Government's housing affordability agenda. The government will look for opportunities to provide housing affordability in TOD precincts, particularly when redeveloping state-owned land. This will be achieved in some areas by the Urban Land Development Authority acquiring suitable land in key locations and attaching conditions of sale that will include the development of a diverse range of housing products, including affordable housing. At the time of issue of this guide, Urban Development Areas had been declared in strategic sites in South East Queensland, regional centres and resource communities.



****Social Infrastructure**

- The planning and provision of social infrastructure in TOD precincts will play an important role in the development of new communities, and supporting the needs of residents and workers.
- Social infrastructure refers to the community facilities, services and networks that help individuals, families, groups and communities meet their social needs and maximise their potential for development, and enhance community wellbeing. They include:
 - universal facilities and services such as education, training, health, open space, recreation and sport, safety and emergency services, religious, arts and cultural facilities, and community meeting places
 - lifecycle-targeted facilities and services, such as those for children, young people and older people
 - targeted facilities and services for groups with special needs.

(South East Queensland Regional Plan, Implementation Guideline No. 5: Social Infrastructure Planning, 2007)

Case study – Fitzgibbon Urban Development Area, Brisbane, Queensland, Australia

In July 2008 the Queensland Government declared an Urban Development Area in Fitzgibbon, located 12 kilometres north of the Brisbane CBD. It enables planning for a large tract of government land to be coordinated with future transport planning around the Carseldine Railway Station.

One of the last remaining greenfield sites in the Brisbane local government area, the Fitzgibbon Urban Development Area is uniquely positioned for transformation into a TOD precinct.

The residential development at Fitzgibbon, including the residential components of mixed-use developments, will provide a range of housing choices to cater for the diverse needs of the northern Brisbane community through a mix of densities, types, designs, price points and home ownership and rental options.

The Urban Land Development Authority (ULDA), established in November 2007 in line with the Queensland Housing Affordability Strategy, will facilitate the availability of land, infrastructure provision and a greater range of housing options, including affordable housing, at Fitzgibbon.

Within Carseldine Urban Village Precincts 1, 2 and 3, a minimum of five per cent of dwellings will be available for purchase at or below the median house price in Brisbane, and a minimum of five per cent of dwellings will be available for purchase or rent by low- to moderate-income households.

Within the Fitzgibbon residential precinct, a minimum of two-thirds of dwellings will be available for purchase at or below the median house price in Brisbane, and one-fifth of dwellings will be available for purchase or rent by low- to moderate-income households.

For more information about the Fitzgibbon Urban Development Area or the ULDA, visit www.ulda.gov.au



Case study – Kelvin Grove Urban Village, Brisbane, Queensland, Australia

Kelvin Grove Urban Village is a 16-hectare master-planned community, demonstrating best practice in sustainable, mixed-use development. The village integrates with Queensland University of Technology's Kelvin Grove Campus and is within walking distance of the Inner Northern Busway.

Kelvin Grove Urban Village currently contains 125 units of affordable housing, accommodating 180 people. When the development is complete, there will be a good mix of affordable housing and market housing.

Kelvin Grove has integrated small blocks of affordable housing units around the village, achieving a mix of tenures within individual buildings and developments.

Case study – Fruitvale Village, Bay Area Rapid Transit (BART), Oakland, California, USA

Fruitvale Village is a 23 900-square-metre transit village with 47 mixed-income housing units, 10 600 square metres of community service and office space and 3700 square metres of retail.

The project was designed by and for the neighbourhood surrounding the BART station. As a result, there are several social service facilities including a health clinic, library, senior centre and child development centre. Ten of the 47 rental units in the village are designated affordable. In addition, a 68-unit senior housing project adjoins the village development.



**Transit oriented development: Guide to community diversity

The Queensland Government has prepared a guide for practitioners aimed at increasing government and industry understanding of the need to achieve community diversity in new TOD communities. It provides a range of strategies to support this goal. This guide is critical due to concerns that TOD development and its associated costs can result in gentrification, displacing lower socio-economic groups. Ensuring community diversity in TOD precincts will provide an alternative for many households who are forced to live on the urban fringe to access affordable housing.



10 Process

10.1 Coordination

Principle: Ensure a coordinated planning effort involving all stakeholders, including state agencies, local government and the development industry.

Good practice – coordination

- Identify suitable locations for TOD precincts in strategic plans, planning schemes and development schemes.
- Ensure planning schemes and local planning strategies (or equivalent) reflect TOD principles and allow the required mixed use, appropriate density and reduced parking rates in identified TOD locations.
- Support development with appropriate levels and sequencing of infrastructure as delivered through priority infrastructure plans and capital works programs.
- Incorporate TOD good practice in local planning strategies for TOD precincts.
- Engage with the local community in developing local planning strategies.
- Have regard to TOD policies when making decisions on planning scheme amendments and development applications.
- Develop complementary operational strategies to be incorporated into local laws (e.g. car parking management plans for TOD precincts).
- Consider partnerships for innovation in planning, funding, construction or management of different aspects of TOD.
- Locate new state government health, education, justice, arts, community and administrative facilities and employment activities within regional activity centres or on high-frequency transit corridors at identified TOD locations.

Key Queensland TOD stakeholders

Department of Infrastructure and Planning (DIP)

DIP is the lead agency for coordinating Queensland's TOD implementation activities. DIP's role includes developing whole-of-government TOD policy, determining TOD priorities, coordinating the state's interests and involvement in TOD delivery and identifying and determining the planning and delivery mechanisms for, and sequencing of, TOD projects. The department provides input to the assessment of development applications and may coordinate state and local government interests for high-priority or exemplary projects.

Department of Transport and Main Roads (TMR)

TMR is the owner of the rail corridor on behalf of the State of Queensland. The department is responsible for protecting the long-term integrity of the rail corridor.

TMR is a concurrence agency under the *Sustainable Planning Act 2009* and is responsible for ensuring the safety and operational integrity of railways and future railways and assessing the impacts of development on existing and future public passenger transport. TMR consults with its key stakeholders —QR, as the railway manager, and the TransLink Transit Authority—as required on specialist matters. The advice is then incorporated into TMR's IDAS response. Departmental staff also collaborate with DIP, local councils, developers and practitioners on the integrated transport and land use aspects of development.



TMR is also responsible for providing resource entitlements for development applications within the rail corridor, and facilitating and negotiating private sector purchase and development of corridor land. Examples of commercial arrangements include negotiating a commercial sale or lease of corridor land or airspace required for a development to proceed, or negotiating an infrastructure agreement to support transport infrastructure upgrades required because of development and ensuring that future requirements for the station are not compromised.

Queensland Rail (QR Ltd)

QR is a government-owned corporation with two subsidiary companies: QR Passenger Pty Ltd and QR Network Pty Ltd. QR Passenger Pty Ltd provides services under contract to TransLink Transit Authority and TMR. QR Network Pty Ltd is the railway manager for most of Queensland's rail corridor, and is responsible for the safe operation of the railway and for managing the rail infrastructure, passenger operations and the majority of freight operations. Representatives of both subsidiaries may be involved in discussions about proposed development.

The railway is critical infrastructure that can be endangered by development activities nearby. Under Section 255 of the *Transport Infrastructure Act 1994*, written approval from the railway manager (QR) is required for activities that could interfere with the railway or its operation. QR also oversees any activities that may affect rail operations.

TransLink Transit Authority (TTA)

TTA is the statutory body responsible for purchasing and scheduling government-funded services on the passenger network, administering the funding for Citytrain services, stations, station upgrades and rolling stock, and designing stations and station upgrades.

TTA advises TMR about the impact of development on stations and passenger services and the requirements for access to stations and intermodal facilities.

TTA manages the delivery of new and upgraded public transport station facilities within South East Queensland (SEQ) through the TTA Station Upgrade Program, funding for which is identified in the SEQ Infrastructure Plan and Program. TTA also manages the upgrade of stations on the rail network in SEQ as part of the Citytrain Station Upgrade Program, funded through the Transport Services Contract between the state government and QR, which TTA administers.

Department of Environment and Resource Management (DERM)

DERM maintains the state government's land policies and manages state land disposal processes through the Property Management Committee.

DERM also provides resource evidence for development applications involving private use of state government land (e.g. private uses of local roads, including permits to occupy or temporary or permanent closures).

Queensland Government Architect, Department of Public Works

The Queensland Government Architect advises the state government on contemporary design and heritage issues. From time to time, the Queensland Government Architect may advise on major TOD proposals and transport infrastructure proposals, particularly within station precincts.

Other state agencies

A range of agencies including Queensland Health, the Department of Education and Training, the Department of Communities and the Department of Public Works undertake asset delivery projects that may catalyse TOD opportunities.

Local governments

Local governments are responsible for the planning, delivery and maintenance of urban infrastructure, open spaces and some community services and facilities. Local governments plan for land use and control development, including the built form and streetscapes.



Urban Land Development Authority

The Urban Land Development Authority (ULDA) works with local and state governments, the community, local landholders and the development industry to help deliver commercially viable developments that include diverse, affordable, sustainable housing. The ULDA is responsible for preparing development schemes and assessing development applications in declared Urban Development Areas.

Private sector

The private sector has a key role in developing sites within TOD precincts through investment in buildings, public spaces, facilities and infrastructure. It is also involved in the design and construction of the development and in the marketing and sale of real estate.

The community

People in the community are the future neighbours, residents, business owners and employees of the TOD precinct. They will use the public spaces and transit, local shops and community services, creating the activity needed to bring vitality and economic success to the precinct.

10.2 Community engagement

Principle: Engage early and throughout planning and development processes with the community likely to experience change to promote a sense of ownership and involvement.

Good practice – community engagement

- Stimulate, encourage and facilitate dialogue within the community about TOD.
- Allow people opportunities to understand and discuss choices and trade-offs for their community's future.
- Allow informed decisions to be made which reflect the interests and concerns of the community.
- Tap into local and specialist knowledge.
- Ensure all stakeholders are empowered to participate.
- Capture views effectively and efficiently.
- Encourage the participation of Aboriginal and Torres Strait Islander people in all events and consultations.
- Use a combination of different levels of consultation (from one-way information sharing, to two-way consultation and active participation in decision-making processes) in different situations to achieve various objectives.
- Follow the principles of community engagement (see Table 9 in this section).
- Use techniques such as enquiry-by-design processes, charettes and citizen juries, where the community is actively involved in TOD planning from early in the planning process through all aspects of design and construction.

'Cities have the capability of providing something for everybody, only because, and only when, they are created by everybody.'

(Jane Jacobs, www.pps.org/info/placemakingtools/placemakers/jjacobs)



Table 9: Principles of community engagement

Inclusiveness: Connecting with those who are hardest to reach
<ul style="list-style-type: none">• Build new connections with people not usually heard on planning and development issues, including those who are not used to, or are uncomfortable, working with government.
Reaching out: Changing the ways government and community work together for the better
<ul style="list-style-type: none">• Make community engagement a fun and meaningful activity which creates opportunities for self-expression.• Find new ways to involve people in learning about the region.• Actively involve elected representatives and decision makers throughout the process.• Utilise new and emerging technologies in communicating with communities in the relevant region.• Be aware of a specific community's perceived benefits and costs of participating in community engagement and actively work to remove barriers.
Mutual respect: Listening, understanding and acting on experiences different from our own
<ul style="list-style-type: none">• Be open with the community about how their input has affected decisions by providing feedback on how the results of consultations have been used.• Respect diversity of opinions.
Integrity: Engagement as a means of promoting integrity in the democratic processes of government
<ul style="list-style-type: none">• Make information about the planning process accessible.• Be honest with the community about how decisions will be made and the level of influence they can expect to achieve through any given consultation effort.
Affirming diversity: Changing the processes of government to incorporate diverse values and interests
<ul style="list-style-type: none">• Adopt and implement activities and techniques that are respectful of community diversity and complement cultural traditions.• Engage diverse populations by using multiple engagement strategies.

10.3 Timeframes

Principle: Consider that TOD outcomes take time to deliver and precincts mature over time.

Good practice – timeframes

- Recognise that TOD precincts take time to plan, fund, build and mature (sometimes several years).
- Be prepared to make a long-term commitment.
- Ensure the community understands the long-term vision and the likely time scale for it to become a reality.
- Sites with high potential will be those where infrastructure investment and state government resources on sites with high TOD potential will be prioritised.
- Protect future TOD opportunities by preventing land uses that are non-transit-supportive from being introduced in identified TOD locations.
- Amend local government planning schemes to reduce delays in TOD implementation.
- Engage with the state government early if contemplating a project within a TOD precinct.
- Undertake a post-occupancy survey to evaluate the value and merits of TOD precincts to those that live there to inform new approaches and standards.



Glossary

Term	Definition
Active frontage	Building frontages that stimulate activity in the public spaces around the building. This is primarily achieved at ground level through the provision of doors and pedestrian entrances. Windows improve visual activity and balconies create activity on upper levels. Some land uses, particularly busy cafes and shops, create more activity than others do.
Activity centres	Centres within urban areas that provide shops, employment and services and attract activity from the surrounding areas. Activity centres include central business districts, major shopping centres, smaller neighbourhood centres as well as specialist centres like hospitals and universities.
Affordable housing	Housing that is appropriate to the needs of low-income households in terms of design, location and access to facilities and services; and where rent paid by households in the lowest 40 per cent of income units does not exceed 30 per cent of gross household income after any applicable Commonwealth Rent Assistance is deducted (this definition is applicable to the Australian context only). Affordable housing includes detached housing as well as boarding and emergency housing and other specialist forms of housing.
Brownfield land	Land that has been previously developed, including residential, industrial and commercial land. Brownfield development is similar to infill, renewal and regeneration developments.
Climate change	The change in the earth's climate as a result of increased levels of greenhouse gases and other pollutants in the atmosphere.
Community development	Initiatives that enhance community identity and cohesion through building the community's capacity to participate in problem solving, decision making and community life.
Community diversity	The presence and degree of representation of a diverse range of different demographic, socio-economic, cultural, employment and visitor characteristics within a transit oriented development community, with people living in an inclusive, interactive and harmonious manner.
Community services and facilities	The social infrastructure (buildings and the services they contain) that supports individuals, families and groups and enhances community development and wellbeing.
Cultural diversity	The understanding and sharing between different cultures and its positive value to society as a whole.
Demographics	Characteristics and statistics of human populations and behaviour, including age, occupation, housing and travel.
Density	In the context of urban planning, density refers to the amount of development or the number of dwellings in an area. Density is commonly measured as either dwellings per hectare (dph) for primarily residential developments, or plot ratios for predominantly commercial developments, or jobs per hectare.
Dwellings per hectare (dph)	This is the most common way of expressing and measuring development densities. Although this refers to residential dwellings, other uses can be considered through a conversion rate of non-residential floor space (e.g. one dwelling = 100 sqm).



Term	Definition
Floor space	The total floor area within a building, including the different levels.
Footprint	The area of land occupied by a building, development or urban settlement.
Garden city	An urban planning approach founded in the late 19th Century in the United Kingdom by Sir Ebenezer Howard and published in his widely recognised work - <i>Garden Cities of To-morrow</i> . Garden cities were intended to be planned, self-contained communities surrounded by greenbelts, containing carefully balanced areas of residences, industry, and agriculture.
Greenfield	Areas of undeveloped urban land suitable for urban development and not yet serviced with development infrastructure, e.g. water, sewerage and roads.
Gross density	Is the total number of dwellings divided by the total base land area, including non-residential uses (e.g. arterial roads, regional parks, industry, commercial and community infrastructure like schools, hospitals), internal local roads and half the area of adjoining roads.
Gross floor area	The total floor area of all storeys of a building (measured from the outside of the external walls or the centre of a common wall) other than areas used for: <ul style="list-style-type: none"> • building services, plant and equipment • access between levels • ground floor public lobby • a mall • parking, loading and manoeuvring motor vehicles • unenclosed private balconies whether roofed or not.
Infill development	New development or redevelopment within a built up area. Infill development often refers to the development of vacant land between or behind existing buildings, but can also refer to the demolition and redevelopment of a site. Infill development is similar to brownfield, renewal and regeneration developments.
Infrastructure	Can refer to a range of structures required to support human settlements, including roads, sewers, bridges and railways. The term can also be used in reference to green infrastructure (e.g. parks) and social infrastructure (e.g. schools).
Intermodal connections	Links between trains, buses, taxis and other transport forms, including cycling and walking.
Joint development	Development on land abutting a transit station or encroaching into the transit corridor.
Land use	The broad purpose that land is usually used for, including residential, retail, offices, industrial, education, agricultural, open space and environmental conservation.
Master plan	A comprehensive plan that describes and maps the overall development concept for an area or precinct, including present and future land use, detailed urban design and landscaping, built form, infrastructure and service provision.



Term	Definition
Mixed-use development	The presence of more than one type of land use in a building or a development area, including residential, commercial, retail or open space. A mix of uses can be achieved vertically within a single building or horizontally within a development or defined area.
Mode share	Describes the proportion (as a number of trips or as a percentage) of travellers using a particular form of transportation. It is also referred to as mode or modal split.
Mutual support	Arrange uses that complement and reinforce activity in the core and the convenience of walking.
Net density	Is the total number of dwellings divided by the combined area of residential lots, local parks and internal local roads, and half the area of adjoining local roads within a given land area.
New urbanism	An urban planning approach that promotes the creation of well designed compact, walkable, mixed use neighbourhoods, towns or cities. New urbanism promotes diversity in land use and population, mixed housing and density, scaled for pedestrians, have a highly-interconnected street network capable of accommodating motor vehicles, cyclists and public transport and are designed with a high quality public realm.
Open space	Land such as parks, foreshores and plazas available for recreation and outdoor enjoyment for all members of the public.
Park-and-ride	Car parks provided next to transit stations so that passengers can drive to the station, park their cars, and use the transit service.
Passive surveillance	The natural visual connections between public spaces and surrounding buildings and other spaces. Windows, balconies and open views between spaces allow them to be casually monitored by more people, thus increasing safety and the sense of security. Also referred to as 'casual surveillance'.
Plot ratio	The ratio of development floor space to the site area.
Podium car parking	Refers to parking spaces that are located in a prominent position on the first few floors of a medium or high-rise building.
Precinct core	The centre of a precinct, which has the best access to public transport and where the highest densities and mix of uses are achieved.
Public realm	Spaces that are used by the public, including streets, squares, parks and environmental reserves.
Redevelopment	The act of carrying out changes or works to existing land for alternatives uses. Renewal and regeneration are forms of redevelopment relating to rundown or derelict urban areas. Renewal and regeneration developments are similar to brownfield and infill developments.



Term	Definition
Responsive environments	A planning concept that advocates the design of a place affects the choices people can make. The responsive environments concept features seven key issues or qualities that are critical in making the design of buildings, places and spaces responsive to a given environment. These qualities include <i>permeability</i> or the number of ways through an environment, a <i>variety</i> of uses, <i>legibility</i> of the layout, <i>robustness</i> with the design enabling flexibility in uses, <i>visual appropriateness</i> , <i>richness</i> such as sense-experiences through detailed design and <i>personalisation</i> of the space.
Social diversity	Social diversity is generally the range of different community groups according to race, income and housing tenure within a given area.
Sustainability	Generally refers to the potential longevity of human ecological support systems, such as the planet's climate, systems of agriculture, minerals, forestry and fishery and the ecological systems on which they depend.
Sustainable development	In an urban planning context, this term refers to individual developments, movement systems and broader urban morphologies that consume fewer resources, produce less waste and have a lesser impact on the earth's ecological systems.
TOD community	The people that live and work within a TOD precinct.
TOD corridors	TOD that surrounds transit services that stop frequently and therefore facilitate a continuous corridor or TOD. The transit service is usually on-street (e.g. bus lane or light rail) and allows pedestrians to cross the transit corridor easily.
TOD precinct	Areas where TOD principles are applied.
Traditional neighborhood development	An approach to planning a neighbourhood or town that advocates a walkable community in a network of well-connected streets with a variety of residential densities and a mix of complimentary land uses including shops, schools and open space.
Traffic congestion	Congestion on streets and roads caused by an excessive number of cars and vehicles attempting to use the limited road space.
Traffic demand	The cumulative desire or demand for car-based travel from a particular population.
Transit	A term used to describe public transport, including bus, rail and ferry.
Transit adjacent development	Developments near transit stations that do not incorporate TOD principles and therefore do not encourage transit patronage and walking.
Transit corridor	An on-street transit lane or dedicated transit route that facilitates fast and frequent transit services along a corridor.



Term	Definition
Transit nodes	Stations and focal points for transit services. Transit nodes tend to be well separated or less frequent to facilitate fast travel, as opposed to transit corridors, which provide frequent stops along a corridor.
Transit oriented development (TOD)	Mixed-use residential and employment areas, designed to maximise access to public transport through higher-density development and pedestrian-friendly street environments.
Travel demand	The cumulative desire or demand for travel from a particular population.
Urban	Built-up human settlements, effectively broad areas of land that are occupied by buildings, etc. The word is also used to describe areas that are more densely occupied by buildings, compared with areas with dispersed buildings and more open spaces (e.g. suburban and rural residential areas).
Urban consolidation	The concentration of future urban development within established urban areas, achieved through infill and renewal developments that increase the overall density of existing urban areas.
Urban design	The holistic design of urban environments, including the overall townscape, individual buildings, street networks, streetscapes, parks and other public spaces.
Urban footprint	The statutory regional plans define the ‘urban footprint’ as the area of development and urban activity that will be permissible in the region during the life of the plan. Generally, the term urban footprint can be used to refer to the land occupied by an urban area or settlement.
Urban sprawl (or suburban sprawl)	The excessive spread of human settlements and the resulting development of greenfield land that is caused by low development densities.
Urban village	Describes a place in a city that has all the characteristics of a village including a mix of land uses, high quality public transport, good urban design and attractive public spaces.
Walking catchment	The area of land that is within walking distance of a particular location. The walking catchment is often referred to as being 800 metres or 10 minutes walk away from the location, depending on barriers to pedestrian movement (e.g. main roads).



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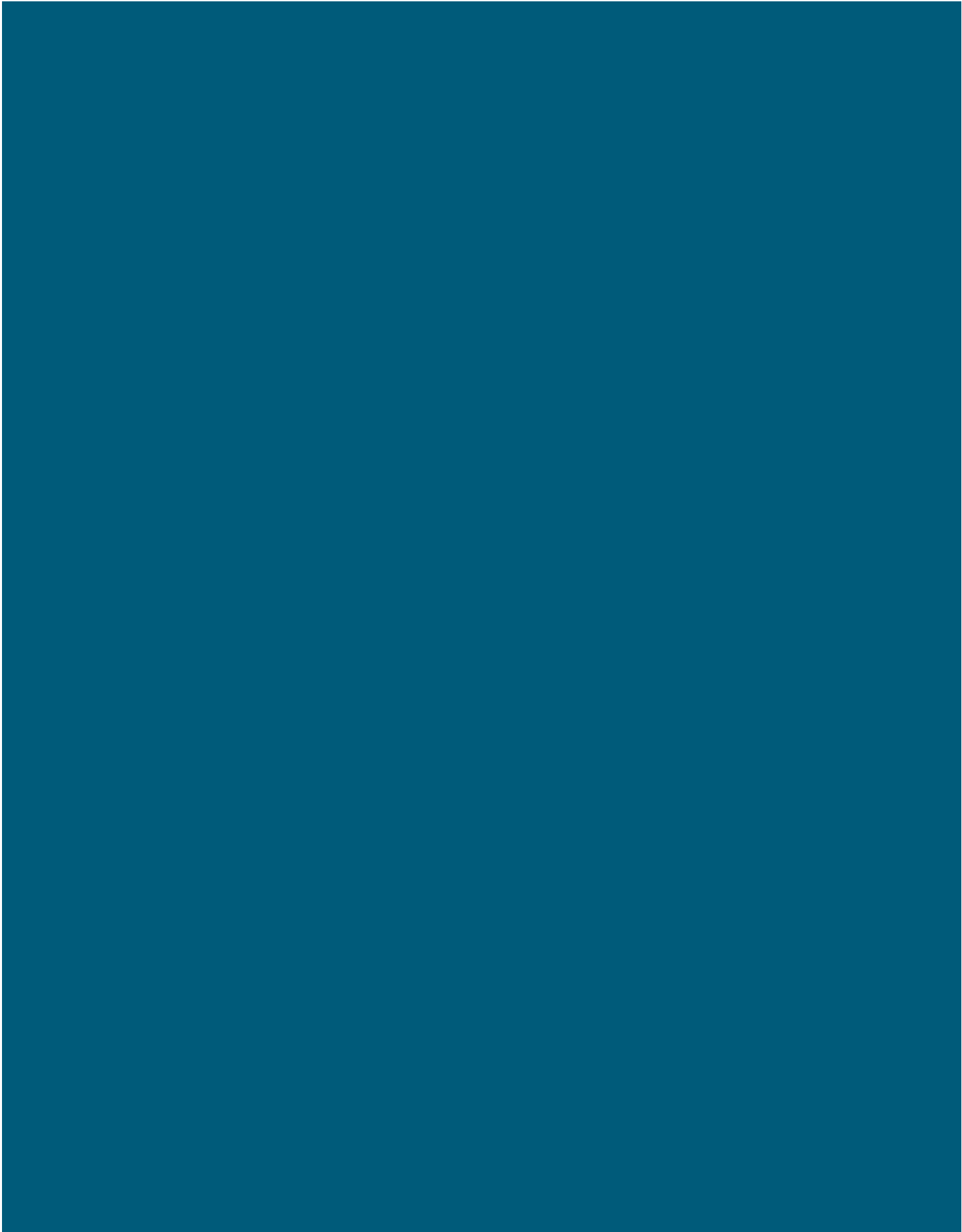
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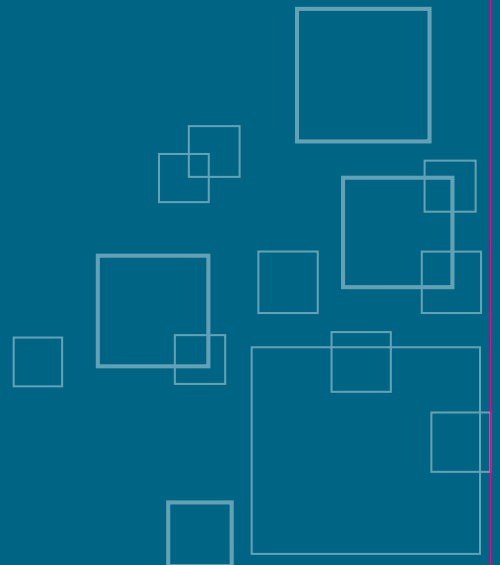
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Guide to Community diversity





Transit oriented development: guide to community diversity



Transit oriented development: guide to community diversity

Looking forward. Delivering now. The Department of Infrastructure and Planning leads a coordinated Queensland Government approach to planning, infrastructure and development across the state. The State Government, through Growth Management Queensland, is leading the way with a focused approach to growth management, to help shape tomorrow's Queensland.

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Executive summary

Creating built environments which allow for and facilitate community diversity is a key consideration in the delivery of successful transit oriented development (TOD) precincts. A key regional planning outcome in Queensland is to create 'cohesive, inclusive and healthy communities which have a strong sense of identity and place, and access to a full range of services and facilities that meet diverse community needs'.

Transit oriented development: guide to community diversity provides guidance on how to achieve diverse and inclusive communities in TOD precincts. It is informed by three background documents which draw on extensive evidence in national and international literature and research:

- *Transit oriented development: guide to community diversity—Research report*
- *Transit oriented development: guide to community diversity—Case studies*
- *Transit oriented development: guide to community diversity—Literature review*

Download these documents from the Department of Infrastructure and Planning website www.dip.qld.gov.au/TOD

The main findings are summarised as follows:

Transit oriented development

- Transit oriented development is a planning approach that promotes the creation of a network of well-designed urban communities focused around transit stations. Areas developed using this approach are called TOD precincts, and generally comprise a mixed-use community within a comfortable 10-minute walk of the transit station.

Community diversity

- Community diversity in TOD is seen to be achieved where people with different demographic, socio-economic, cultural, employment and visitor characteristics live in an inclusive, interactive and harmonious manner. To achieve diversity, the needs of different groups must be catered for in the urban environment.
- There is no one ideal mix or preferred community profile for TOD precincts. Community diversity will vary according to the area's unique characteristics and the changing dynamics that occur in an urban area over time.
- TOD precincts effectively create new communities embedded within existing ones, where redevelopment and infill occur, requiring careful attention to blend the two and build meaningful social and physical connections between them. Creating well-functioning, successful communities requires a long-term commitment to a combination of land use, investment and community development strategies.
- There is a strong contention that there are social and economic benefits in achieving community diversity. A fundamental principle of urban planning is that communities function best when quality of life and access to the community's resources are enjoyed by all. It also makes good planning sense to integrate different social groups rather than isolate them, with the collective urban experience being that concentrated social disadvantage is problematic.
- Community diversity will not occur through housing diversification alone—the most common approach adopted. Evidence indicates that the establishment and maintenance of community diversity requires initiatives which address a wide range of factors.
- The principle of community diversity forms part of a set of interlinked social and urban planning principles for TOD precincts, and is achieved through a number of factors including urban form, housing mix and design, economic development, the provision of community facilities and services, public domain planning, community development and community engagement.



Strategies

- Planning and developing TOD precincts requires deliberate strategies to overcome the possible displacement impacts of urban revitalisation. The case studies indicate that in the long-term revitalisation projects often erode diversity, with small businesses and community organisations commonly displaced as affordability of rental office premises declines. Displacement of low-income residents also occurs as lower-cost housing is lost.
- Statutory measures guiding how development should occur in TOD precincts are not sufficient on their own to deliver diversity. Long-term investment is also needed in social housing, community infrastructure, programs to retain existing local businesses, and programs to create a fusion between existing and new communities.
- Both big-picture or macro issues, such as governance, collaboration and community engagement, urban form and land use, along with fine-grained or micro issues such as housing design, public domain, retail, diversity and accessibility ultimately influence how well community diversity is achieved.
- The facilitation of community diversity is influenced by the broad urban form and land use management actions that take place as the master plan is implemented.
- Nine key factors have been identified as most influential in promoting community diversity:
 - urban form and land use
 - housing
 - access to diverse jobs
 - retail diversity
 - social infrastructure
 - access and movement
 - open space, recreation and the public domain
 - community engagement and collaboration
 - community and cultural development.
- These factors are supported by a comprehensive set of strategies providing guidance on how to establish and maintain community diversity. The strategies include a combination of statutory and non-statutory measures that, when coordinated, will help to achieve stronger, more diverse communities in TOD precincts.

Evaluation

- The establishment and maintenance of community diversity is an ongoing effort. For this reason it is important to evaluate outcomes over time.
- The evaluation framework outlined in Section 5 provides a guide. Evaluation frameworks must be individualised to ensure their relevance to local needs and circumstances. Evaluators will need to develop a framework that fits the circumstances and conditions that apply to the TOD precinct being evaluated.

The concept of community diversity and the measures required to achieve diversity have previously been relatively undocumented. This guide has concluded that community diversity in TOD precincts can be achieved, but will require concerted efforts from all relevant stakeholders, including the planning authority, developer and the community.



1 Introduction

The growth of Queensland as a whole, and South East Queensland (SEQ) in particular, presents a diverse range of challenges to our lifestyle, our social structures and our environment. The South East Queensland and Far North Queensland regional plans are examples of how the state government is addressing these challenges. These plans create a framework for managing growth and development. One of the key strategies to help manage growth and build sustainable and vibrant communities, is the application of transit oriented development (TOD) principles in appropriate locations.

A key objective of these regional plans is to create cohesive, inclusive and healthy communities which have a strong sense of identity and place, and access to a full range of services and facilities that meet diverse community needs. *Transit oriented development: Guide to community diversity* is intended to provide guidance on how to achieve inclusive communities in TOD precincts, and is based on the findings of research commissioned by the Queensland Department of Infrastructure and Planning.



Cleveland EcoVillage, Ohio, United States - a ceramic mural, 'Strive for harmony', hanging in the community room of the EcoCity's rapid transit station.



2 What is transit oriented development?

Transit oriented development is a planning concept that promotes the creation of a network of well-designed, human-scale urban communities focused around transit stations. The term refers to communities which comprise high-quality, medium to high-density mixed-use residential and employment areas, with high levels of access to public transport and pedestrian and cyclist friendly street environments.

TOD is not intended to replace all other forms of development. However, in locations where it is possible and appropriate, it offers choice, significant economic benefits and potential community benefits. In urban infill areas TOD precincts effectively create new communities embedded within existing ones, and in greenfield areas the development of TOD precincts may be the catalyst for further centre development. Creating well-functioning, successful communities in this context requires a long-term commitment to a combination of land use, investment and community development strategies.

While there are various definitions of TOD in use around the world, there is general agreement on the main characteristics of a TOD precinct, namely:

- a rapid and frequent transit service
- high accessibility to the transit station
- a mix of residential, retail, commercial and community uses
- high-quality public spaces and streets which are pedestrian- and cyclist-friendly
- medium to high-density development within 800 metres of the transit station (i.e. the TOD precinct)
- reduced rates of private car parking.

The term transit oriented development is often used incorrectly to describe a single development adjacent to, or above, a transit station. TOD refers to the set of principles applying to the broader precinct surrounding the station, rather than any individual development within it.

Development projects next to a station or in the airspace above the transport corridor are known as 'joint development' and may be important catalysts for TOD, if designed well. However, they can inadvertently reduce a location's TOD potential if they block access to the station or contain uses that are not transit-supportive.

TOD precincts generally include the neighbourhood within a comfortable 10-minute walk of the transit station (a radius of approximately 800 metres).



Kelvin Grove Urban Village, Brisbane – demonstrates the application of a number of transit oriented development principles. The village comprises a mix of uses, provides a high-quality public domain and access to public transport.



3 Why community diversity?

Increasingly, with the rising cost of fuel and traffic congestion, people of all types of backgrounds, income levels and occupations want and need to live near public transport or within walking or cycling distance of most of their everyday needs. The concept of TOD has some parallels with the traditional neighbourhoods and village communities of the pre-war years. This form of urban village is a reinterpretation for 21st century needs, but like the neighbourhoods of the past, it includes mixed uses and transport connections that celebrate the station area as a high quality community focal point.



Albion, Brisbane – urban villages of the past were centred around transit.

People and communities of diverse types will have different requirements of the high-density urban environment, including housing, movement systems, services, facilities, jobs and open space. They also have different ways of participating in the community. To be attracted to live in a TOD precinct, the needs of different groups in the urban environment must be catered for.

The SEQ and FNQ regional plans outline TOD principles for these regions. These principles support the creation of built environments which facilitate community diversity in TOD precincts. They also promote a diversity of employment opportunities, and precincts that are vibrant and safe. These principles must be applied in the detailed planning of all regional activity centres and in precincts surrounding high-capacity public transport nodes and corridors.

3.1 Why does it matter?

A fundamental principle of urban planning is that communities function best when quality of life and access to the community's resources are enjoyed by all its members. It makes good planning sense to integrate rather than exclude. The collective urban experience is that concentrated social disadvantage is problematic. The social and economic costs associated with spatial segregation and concentrated disadvantage are well recognised. Less well documented are the advantages to individuals, governments and the development industry of achieving community diversity. These include:

- Achievement of the cultural shift to higher-density living will be assisted by ensuring that TOD communities offer a lifestyle and housing options that appeal to a broad range of people.



- Families will be attracted if housing supports family lifestyles, the needs of children and teenagers are attended to, safety is addressed, and there is convenient access to shops, schools and public spaces. This will create higher population thresholds for businesses and services.
- A diverse and well-planned TOD precinct caters to the needs of different households at different stages of life, enabling households to form and reform in the same local area if they choose, and providing a market niche of repeat business.
- Where different households live together in a socially connected and well-designed community, the risk of social isolation is reduced and ageing in place can be supported, resulting in a community attractive and desirable for older people.
- Design which promotes accessibility for all people regardless of age or physical ability promotes an environment that is welcoming to all market segments.
- Convenient and timely access to community infrastructure (e.g. schools, child care and community centres) and the ability to walk to local shops to purchase food, drinks and other regular items promotes quality of life and is an important factor influencing choices of where to live.
- Community development and engagement can facilitate greater social cohesion, reducing the risk of costly opposition and nurturing a strong sense of belonging whereby people feel valued. Community vitality and harmony are strong attractors for prospective investors and residents.
- Diversity in employment, business and cultural activities contribute to a more resilient local economy. Working near home avoids long commute times and costs.
- Community diversity adds to vitality. Vibrant places attract people, are great places to live and are economically successful.
- Cultural diversity is a recognised factor contributing to creative and innovative economies where people mix social, business and cultural activities.
- Planning for pets broadens the market appeal of high-density areas. It supports mental and physical wellbeing, and provides a valuable way for people to get to know each other (e.g. local dog parks are a significant community meeting place). By deliberately planning for pets, the risk of incompatibility between pet owners and non-owners can also be reduced.
- Housing will attract a wider market when it is designed to accommodate a diversity of needs (e.g. families, home based workers, group households, ageing people and different cultural groups).
- Housing diversity allows people to live near one another in a neighbourhood as children grow up and leave home, or elderly parents require more appropriate housing. The housing market is therefore more likely to be sustainable over time.
- Affordable housing increases the diversity of the local workforce, and avoids problems where key workers cannot be found due to high housing and travel costs. Student and casual labour can also be found more easily.
- Where housing design promotes neighbourliness and the opportunity for people to know one another, its appeal is strengthened and the area becomes known as a good place to live.
- Ready access to interesting, well-designed and diverse open spaces supporting a range of different activities adds to the overall lifestyle appeal, bringing with it significant health benefits, and increased social contact and sense of community. This will increase the appeal of the precinct and help it retain this appeal over time.
- Urban design that supports spontaneous contact between residents and increases access to services, infrastructure and shops within walking distance will reduce the number of car trips over short distances within a neighbourhood. It will also increase convenience and the desirability of the locality as a place to live, work and visit.

While there is an acceptance that community diversity is beneficial, it is also clear that social inclusion and acceptance of difference are not an automatic effect or result of social-mix policies. There is research to support the contention that community development is a key to achieving good social outcomes for residents of a TOD precinct (see *Research report*).



3.2 What is community diversity?

In TOD, community diversity refers to:

The presence and degree of representation of a diverse range of different demographic, socio-economic, cultural, employment and visitor characteristics within a transit oriented development community, with people living in an inclusive, interactive and harmonious manner.

Community diversity is a broad term widely used in planning, but not widely defined in planning literature. In the context of TOD, the word diversity is usually used in relation to land use mix or diversity of housing tenure types. While there is certainly a relationship between the built form of a TOD precinct and the characteristics of the people who live and work there, this relationship is complex.

The literature suggests there can be many types of diversity in an urban environment, for example:

- social diversity (different social groups such as the elderly and low income people)
- land use diversity
- housing diversity
- employment diversity
- retail diversity
- diversity in the public domain (e.g. streets, plazas and open space).

While the goal is to achieve social diversity, all of these factors of diversity contribute to achieving a mix of different groups of people in a TOD precinct. While important, providing a mix of houses and land uses in the built environment will not lead to social diversity on its own. Effort is needed to foster social relationships between different groups to nurture acceptance of difference and generate a real sense of belonging. Experience shows that revitalisation and urban renewal processes can erode diversity, by displacing existing small businesses and affordable commercial and residential properties, and attracting new residents who are more similar (or homogenous) than they are different. Deliberate strategies are required to retain existing diversity in TOD precincts.

3.3 Who are we planning for?

Social mix in TOD precincts applies to the mix of residents and workers and, to a lesser extent, visitors. There is no one ideal demographic profile for TOD precincts; rather they vary according to their setting, and change over time. However, the typical characteristics of TOD communities in Australia suggest only limited diversity is being achieved. The findings in the Literature review and Case studies background documents indicate that TOD communities to date have been largely characterised by: renters who are fairly transient; a relatively high proportion of first home buyers; people who are wealthier and better-educated than residents in neighbouring areas; small households with few children and older people; some variation in income level depending on the location and availability of social housing; and, in some cases, a high proportion of people from multicultural backgrounds.

To attract greater diversity, the needs of particular groups and how they experience life in higher-density neighbourhoods must be catered to. These groups include residents who are: demographically diverse in age group, household type and size, disability and gender; socio-economically diverse, with varying income and tenure; and culturally and linguistically diverse. Workforce groups can be diverse in terms of occupations and employment status. Visitors should be taken into account in planning TOD precincts only where the attributes of the area itself are likely to attract significant numbers of visitors.



Table 1: Who we need to plan for in TOD precincts

Demographically diverse groups	
Age	Children (preschool (0–4 years) middle childhood (5–9) early teens (10–14)
	Young people (15–19)
	Young adults (20–29)
	Mature adults (30–54)
	Empty nesters (typically 55–64)
	Older people (65+)
Household/ family composition	Nuclear families (2 parents with child/children)
	Single-parent families
	Couples
	Large (including extended) families
	Single people (of all ages)
	Group households (unrelated individuals sharing a dwelling)
Other demographic characteristics	Disability
	Gender
	Alternative lifestyle (e.g. eco-villagers)
Socio-economically diverse groups	
	Middle- and high-income groups
	Low-income groups
	Renters
	Homeowners
	Homeless people
	Pensioners and self-funded retirees
Culturally and linguistically diverse groups	
	Established and recent immigrants
	Refugees
	Indigenous (i.e. Aboriginal and Torres Strait Islander) people
	Religious groups
Workforce groups	
	Students
	Key workers
	Temporary workers (seasonal and holiday workers)
	Home workers
	Other workforce groups
	Unemployed workers



3.4 Social planning principles

The goal of achieving community diversity should be viewed within the context of a range of social planning principles which can be applied to the development of TOD precincts. The following principles were developed following a review of the literature and previous studies, and provide a framework within which the purpose of achieving community diversity in TOD precincts can be understood and pursued. These principles are interlinked and should be read collectively, rather than in isolation, as the creation of a TOD precinct is always an holistic exercise.

Principle 1: Diversity and inclusion

TOD communities strive for a social mix and create an environment which is inclusive and sociable, where all members feel a strong sense of belonging and cultural relevance. Physical and social connectivity is achieved with adjoining communities.

Principle 2: Housing choice and equity

TOD communities offer high-amenity, affordable housing across the spectrum of households and housing that is well designed to meet the diverse and changing needs of residents.

Principle 3: Accessibility

TOD communities are supported with convenient access to the employment, services and facilities required to support their daily needs, including commercial and retail services, jobs, social services and facilities and open space.

Principle 4: Vibrancy and a healthy lifestyle

TOD communities enjoy a high level of amenity that supports a healthy, vibrant and active lifestyle, and an appreciation for sustainable living. The public domain is a major lifestyle feature that connects people with the place, each other and nature.

Principle 5: Participatory and collaborative processes

To achieve multiple beneficial outcomes, TOD precincts are developed with a long-term commitment to collaboration with key stakeholders, consultation with affected communities and empowerment of residents. This commitment extends to the planning, design, implementation, monitoring and review phases of development.

4 Strategies for achieving community diversity

4.1 How to achieve community diversity

TOD communities that strive for community diversity create environments that are inclusive and friendly, where people feel welcome. Community diversity in its broadest sense means groups from different cultures and ethnic backgrounds, traditions, attitudes, demographic characteristics such as age, and people with different socio-economic status. It also refers to people who work in different occupations and circumstances, and visitors from all walks of life. Implicit in community diversity is that difference is respected and accepted; diverse communities are interesting and intrinsically appealing.

Community diversity is influenced by a wide variety of factors which need to be considered at both the macro and the micro level, through the broad urban form and land use strategies in master planning, as well as through the detailed design, community development and management actions that take place as the master plan is implemented.

At the macro level, the physical and social seams that connect a TOD precinct to the surrounding community can help to build cohesion and harmony between new and old communities. Housing and neighbourhood design can offer choice, to support the range of housing needs through the life cycle of a community. It can also facilitate interaction between residents. The availability of community and recreation facilities and services to meet the needs of different groups can provide the support required by all members of the community. A diversity of employment and access to convenience shopping that is affordable means that all members of the community are able to live well and feel included.

Together, urban form and community and cultural development can facilitate the emergence of new communities within old, bridging the range of cultures and respecting existing communities as the new ones emerge.

Playing a crucial role, the public domain promotes health, and helps to connect people with spaces, the environment and each other. Its quality is influenced by its availability, diversity, utility and relevance to users. However, quality is also influenced by the care taken in the detail of its design (e.g. seating arrangements which encourage people to linger and talk) and the management of its use (e.g. maintaining accessibility for all groups and programming local activities).



Rouse Hill, New South Wales – a high-quality public domain that provides an opportunity for people to linger and interact.



Attention to detail is critical as it is the detail that influences how people experience their home and neighbourhood. The quality of housing design (e.g. noise abatement, room layout, storage capacity and privacy), or the perceived safety in getting about the neighbourhood (influenced by design, lighting and landscaping details), can have a powerful impact on people's levels of satisfaction. Similarly, open space has little value if local teenagers and children can't play there, or if it is inadequately maintained or poorly managed.

This guide addresses the factors that are most influential in promoting community diversity, including:

- urban form and land use
- housing diversity (e.g. design, form, tenure and affordability)
- access to diversified local employment (job diversity)
- retail diversity (mix of shops offering different levels of affordability)
- availability of an appropriate range of community facilities and services
- access to transit stations and public transport (in lieu of access to private vehicles)
- an inclusive, safe and multifunctional public domain and a wide range of recreational and leisure opportunities
- community engagement and collaboration
- community and cultural development.

The following sections discuss each of these factors and identify strategies to establish and maintain community diversity. The strategies include a combination of statutory planning measures (e.g. land use controls) and non-statutory measures (e.g. funding and community development initiatives) that, when coordinated, will help achieve stronger, more diverse communities in TOD precincts.

Statutory and non-statutory strategies need to be developed as an integral part of master planning processes. Implementation of the strategies is the responsibility of all key stakeholders involved in the design, planning and development of TOD precincts. They could include state agencies, local governments, planning and design professionals, developers and the community.

The master planning process is key to incorporating many of the strategies below at the outset.

4.2 Urban form and land use

Why urban form and land use?

The form, shape and pattern of land use in TOD precincts provide the setting for human behaviour for many years to come, and so it is important that this foundation supports community diversity from the outset. People are strongly influenced by their physical environment. The scale, intensity, legibility and aesthetics of a TOD precinct will influence how well people connect to the place, who is attracted to be there and the sociability, health and wellbeing of residents and workers. How well the precinct is woven into the physical and social fabric of the existing surrounding neighbourhoods will impact on how cohesive the overall community will be, generating either a sense of 'us' or 'them and us'.

The distribution and mix of land uses and their amenity influences how people perceive their relative worth in a community (e.g. locating affordable housing in areas with the poorest amenity signals a divisive social hierarchy).

How can community diversity be supported?

Strategies based on urban form and land use distribution that support community diversity include:

- **Develop identifiable community hubs** as a focal point for the community, associated with transit nodes, community facilities and open space.
- **Ensure strong physical links** with existing neighbourhoods through road network design, layout of the public domain (including open space), pedestrian and cycle routes, and the location of the nodes of community activity (e.g. retail hubs, town plaza and community centre).



New Farm, Brisbane – residential buildings located adjacent to green spaces provide residents with access to open space, pedestrian and cycle paths.

- **Create clusters of residential buildings** associated with open space, strengthening localised identity, providing relief to the dense urban form, maximising access to open space and creating views from dwellings over greenery.
- **Develop a strong association** between housing clusters and local open spaces to differentiate identity between sub-precincts, offer visual and actual relief, and provide ready access to open space for families and people with restricted mobility.
- **Make use of existing** iconic buildings or landmarks to help reflect an appreciation of the past, merging the existing communities and the new.
- **Locate community services and facilities** (e.g. schools, youth centres and libraries) in areas with a high profile to promote the value of community, stimulate community spirit and promote the visibility and legitimacy of the different user groups.
- **Share access to the TOD precinct's intrinsic amenities** for the benefit of all, rather than the benefit of a few, so that, for instance, residents living in affordable housing have the same access to community services and facilities and open space as other residents.
- **Manage compatibility between different uses** in TOD precincts (e.g. retail, commercial, entertainment and residential activities), promoting residential amenity, after-hours safety and access to appropriate services (e.g. policing and health support services if the area supports a late-night economy).
- **Accommodate diversity in employment, retailing and a range of complementary uses** (e.g. homes, shops, offices, services, education, dining, entertainment, community and health facilities) which will allow people to satisfy many of their daily needs in one place.
- **Accommodate diversity in housing types, densities and affordability**, paying attention to the spatial distribution and locational attributes of housing (e.g. accessibility to open space and schools) and the choice of neighbourhood type (e.g. offer high and low-rise options).
- **Implement contemporary approaches to crime prevention** that address design and social development principles, including social inclusion, legibility and territoriality of space and community activation as articulated in Crime Prevention Through Environmental Design principles.
- **Use eco-revelatory design principles** to reveal and interpret ecological processes and relationships to help raise community awareness of, and responsibility for, sustainability (e.g. demonstrating water sensitive urban design practices).



4.3 Housing

Why housing diversity?

Providing a diverse range of housing at the outset does not in itself generate community diversity. However, it does help lay the foundation on which diversity can develop over time. A TOD precinct that offers different housing types and tenure, over a range of prices, can cater for people from a variety of demographic backgrounds and allow residents to move from one stage of life to another without having to leave the neighbourhood. It can also reinforce the local economy by ensuring housing for key workers (e.g. cleaners, security staff and retail sales staff), whose low to moderate salaries may preclude them from accessing housing near their city workplace, as well as housing for higher paid professional and managerial staff.

Experience overseas suggests that where cultural diversity already exists and where deliberate strategies to attract families have been used, more diverse communities establish early in the formation of TOD precincts (e.g. in Vancouver, Canada, and Portland, USA). Experience in Australia suggests that, at least initially, single and couple households with financial means are attracted to live in TOD precincts. However, as the community ages and evolves, more community diversity emerges as younger residents start a family, older residents age and require more support, and the attraction of living in a TOD precinct widens.

By providing the following kinds of diversity in housing, TOD precincts can cater to the needs of a wide range of people over time:

- **a range of dwelling sizes** including one, two and three plus bedroom dwellings suitable for singles, couples, families and group households
- **affordable housing** including social housing (meaning public and community housing), as well as housing that is affordable to people on low to moderate incomes, including first home buyers and renters in the private market
- **different types of tenure** including private rental, public rental, shared equity, cooperative and community housing, and home ownership
- **a range of housing types** including apartments, terrace housing with courtyard gardens (for children), attached housing (duplex, triplex and quadplex housing) independent-living and residential-care accommodation for older people, group housing for people with disabilities, shared housing and student housing, and boarding housing
- **attention to detail and flexibility in design** to support the different and changing needs of households.



How can community diversity be supported?

Dwelling mix

The market in higher-density settings tends to deliver mainly one and two bedroom rental dwellings, which does not serve community diversity well. Life cycle changes (e.g. starting a family or ageing) will stimulate the need to relocate if housing needs are not adequately met. High turnover of residents erodes social networks, making it difficult for meaningful communities to form. Homogeneity also fosters intolerance and isolation of those who do not fit the dominant group (as can be experienced by teenagers and elderly people).

There are various strategies available to diversify dwelling mix:

- **Require the inclusion of larger and smaller dwellings** (in Vancouver City there is a requirement for a percentage of housing to include two bedroom family housing to cater for families with small children).
- **Diversify funding mechanisms** to increase the mix of affordable home ownership through shared equity schemes (Western Australia Government), subsidised non-commercial home loans (South Australia Government) and other means.
- **Establish targets for affordable housing** applicable to a specific project, precinct or category of development. Targets can be achieved through mechanisms designed to capture planning gain (achievable under the *Urban Land Development Authority Act 2007*, but not the *Sustainable Planning Act 2009* (SPA) or through the use of planning incentives (less effective, but achievable under SPA), by requiring or negotiating a share of gross floor area or a cash contribution. Within this target, additional targets to provide dwellings suitable for families and group households can also be established (Vancouver City and Queensland Urban Land Development Authority).
- **Avoid or offset the loss of existing community diversity** through protective or compensatory measures for affordable and special-needs housing (e.g. demolition controls, housing replacement and other impact mitigation measures).
- **Designate specific sites at the master-planning stage** for special forms of housing (such as residential-aged-care or boarding-house accommodation).



Earnshaw Haven, Nudgee, Brisbane (Brisbane Housing Company) – provides a variety of tenure options, including affordable rental housing as well as market housing (developed as a master-planned community).



Dwelling design

Dwelling design is a key feature in how successful TOD precincts will be in attracting different types of households. Strategies to influence design features include:

- **Create a residential and humanised street interface** particularly in areas with higher-density housing, through design that promotes a human scale at street level, passive surveillance on the street and connected communities.
- **Plan for ageing and disability** by applying universal design principles so that dwellings can be adapted to the changing needs of ageing households and other households affected by disability (some 20 per cent of all households). The housing mix should support ageing in the same home or at least the same community, supporting independent-living needs and extending through to supported (residential care) accommodation.
- **Design affordable housing to integrate into the community** so that it is not distinguishable from market housing, to promote social mix. Affordable housing can be developed in separate buildings within a development, or spread throughout in mixed-tenure developments. Case studies suggest that buildings with more than 35 units should provide a mixture of affordable rental, home purchase and private rental housing (see *Case studies* background documents). Housing intended for people with higher social needs should be supported with appropriate on-site support services.
- **Design to support well-connected 'vertical' communities** in apartment buildings by encouraging spontaneous and organised social contact through the provision of social spaces for incidental encounters (e.g. foyers, seating areas in lift wells, and mail boxes), communal spaces and facilities (e.g. meeting rooms, shared gardens, function and games rooms) and social activities run by corporate bodies (e.g. resident barbeques and fitness groups).
- **Incorporate flexible multi-use spaces** that can serve as a home office or business, storage space, children's play space or guest area.
- **Provide access to outdoor areas** suitable for children's play and social use such as rooftop gardens, common gardens and public space that are easy to get to and which offer good visual surveillance (preferably from family dwellings).
- **Design for pets** by providing convenient access to dedicated dog parks and managing the impact of pets on common use areas, particularly areas used by children.



Rouse Hill, New South Wales – provides a mix of uses (including residential, commercial and retail) with active frontages at street level, a high-quality public domain and pedestrian priority.



Hartopp Lane Communal Area, Kelvin Grove, Brisbane (Brisbane Housing Company Ltd) – this shared space for residents provides opportunities for formal and informal interactions between residents.

- **Promote a high quality of residential amenity** with attention to visual and noise privacy, accessibility to private and common outdoor space, visual outlook, unit layout, design and storage, and sociability within apartments (consistent with best practice urban design).
- **Pay attention to the detail** by ensuring sufficient storage space (e.g. for clothing, toys, camping gear, fans and heaters), a functional kitchen layout, a high standard of noise attenuation and privacy, and allowing for the versatile use of spaces. Developing guidelines for family-friendly housing is one way of paying attention to detail.
- **Ensure efficient internal mobility in apartment buildings** allowing for movement between floors via stairwells, and an adequate supply of lifts (which are regularly used for moving furniture where rental levels are high).
- **Design for a comfortable micro-climate in indoor and outdoor areas** by capturing natural light and breezes, while avoiding creating wind tunnels and dark areas. Consideration should be given to the orientation of units, window glazing, eaves, sunhoods over windows, screening, etc., to create comfortable living environments.
- **Design outdoor living areas large enough** to entertain in, provide for children's play, and other outdoor activities, and receive natural light, capture breezes and provide sufficient privacy. Design should maintain a sense of openness (e.g. partial enclosure of balcony using privacy screening, opaque glass).
- **Buildings should be oriented and designed to minimise noise impacts** within the precinct as well as within residential buildings. Insulation and acoustic shielding along with the use of acoustic windows, doors, facade materials and ventilation should be utilised to minimise noise impacts.
- **Internal and external spaces should be considered in the acoustic design** of a TOD precinct and individual buildings. The layout and configuration of a development should also respond to the local environment, including road/rail infrastructure, noise levels, topography and nearby buildings. Careful consideration in the design and materials selection can greatly minimise acoustic impacts.



Melbourne Street, South Brisbane – open balconies capture sunlight and breezes, enhancing the micro-climate for both indoor and outdoor living.

Planning approach

Given the complexities involved in delivering a diverse range of housing, a robust planning approach is required including:

- **Collaboration between stakeholders** can create the opportunity for greater innovation in housing, bringing together developers, housing providers, designers, financiers and planning agencies. This can also contribute to community appreciation of community diversity and its benefits.
- **Statutory planning measures** can establish requirements for: the mix of density, size or dwelling type; design requirements to support the needs of families, households with pets, and people with disabilities; floor area bonuses or other measures to achieve affordable housing targets; and the removal of statutory barriers to community diversity.
- **Complementary measures** can facilitate the development of affordable or specialised housing (e.g. housing for older people). These include: financial assistance; the provision of land; facilitating partnerships between housing providers (private, public and community sector); building the capacity of the local community housing sector (via financial assistance, professional advice and support, or providing photocopying and other office support); promotional activities; and monitoring housing needs and outcomes.



4.4 Access to diverse jobs

Why diversity in jobs?

Employment diversity enables people to live and work in the same neighbourhood, while also attracting a diversity of workers into the area. A TOD precinct with a diversity of jobs expands local employment opportunities and contributes to the mix of people, adding to its overall vitality and identity. Jobs, business and cultural diversity are interdependent, helping to foster a more resilient and creative local economy.

However, the establishment of TOD precincts in low-rent areas can also lead to the displacement of existing small businesses that are reliant on low rents, reducing employment diversity and opportunities for small and starter businesses. Specific strategies are needed to reduce this effect.

How can community diversity be supported?

Diversity in jobs is dependent on the range of businesses and organisations operating in and around the TOD precinct. There are a number of ways that job diversity can be stimulated:

- **Develop a local economic development strategy** in collaboration with key stakeholders to diversify the local economy and employment opportunities.
- **Adopt a business retention strategy** for existing businesses that add to diversity, but are at risk of displacement (as part of the local economic development strategy).
- **Establish a range of mechanisms to stimulate business and jobs diversity** including business development advisory services, affordable finance and other incentives to stimulate investment in small business, job creation and property improvements, and training programs to support locally relevant skill development.
- **Ensure that land use measures support the creation of diversity** by enabling a range of land uses and building footprint sizes to support operations of varying scales.
- **Negotiate strategic office relocations** with government agencies and other organisations to attract employment opportunity.
- **Establish social enterprises** operating on a commercial, not-for-profit basis that provide employment pathways (such as experience in landscape and property maintenance services) for people who are disadvantaged in the workforce due to disability, illness or other circumstances. These enterprises play an important role in overcoming social exclusion and providing sustainable jobs to marginalised people.
- **Design housing to support the operation of home-based businesses** incorporating features such as flexibility in the use of rooms, internet wiring and the location of office space near the front door and away from living spaces.



4.5 Retail diversity

Why retail diversity?

A risk associated with TOD precincts is the tilting of retailing towards the higher income market. When this occurs, retail services tend to be oriented towards gourmet foods, dining out and household interior wares. The absence of locally available convenience shopping will lead to the need to travel out of the area, which is frustrating and costly to residents, particularly those reliant on public transport.

Being able to readily access affordable convenience shopping (e.g. a chemist, bakery or grocery shop) means that no matter how wealthy, all members of the community feel included and are able to live well.

How can community diversity be supported?

- **Include a retail strategy within your economic development strategy** and seek retailers that are a good cultural fit (if in an economically or ethnically diverse neighbourhood).
- **Support and attract a diversity of retailing opportunities** by ensuring buildings allow for a range of retail floor area sizes, and financial and other incentives to attract targeted stores.
- **Take advantage of existing convenience shopping areas** when deciding where to locate TOD precincts.
- **Adopt a retail retention strategy** for existing businesses that add to cultural diversity, but are at risk of displacement (as part of the local economic development strategy).
- **Negotiate a range in retail floor space rental** to provide opportunity for a mix in retail affordability.



Kelvin Grove Urban Village, Brisbane – the village provides residents with access to a local supermarket and other daily convenience shopping.



4.6 Social infrastructure

Why provide community services and facilities?

Social infrastructure, community services and facilities and the social networks they help foster, is fundamental to the wellbeing of communities. Social infrastructure encourages people to take part in community life, builds belonging, reduces social isolation and meets basic individual and family needs. It includes infrastructure that is available to all (e.g. education, health, arts, culture and community facilities), infrastructure targeted at people in different stages of life (e.g. children, young people and older people), and infrastructure targeted at groups with special needs (e.g. families, people with a disability and Indigenous and culturally and linguistically diverse people). In a high-density setting, community facilities can also supplement the role of the private home by providing places for celebrations and gatherings (e.g. affordable venues for children's birthday parties).

Social infrastructure needs to be available to communities early in their formation to support the practical needs of residents and workers including access to child care or venues for fitness, craft and other recreational activities.

How can community diversity be supported?

- **Prepare a social infrastructure plan** as part of the master planning process, identifying for both the existing and new communities:
 - the type of built infrastructure required, its size and location, preferred timing, and the agency responsible for its development
 - the community services which need to be established in built facilities, and cultural and community development strategies required to support the emerging community
 - a funding plan addressing both establishment and operational costs, and including priority infrastructure plan and infrastructure charges schedule contributions. As appropriate, relevant costs should be integrated into an infrastructure charges schedule developed in accordance with the *Sustainable Planning Act 2009*
 - performance criteria or standards of provision to ensure appropriateness for the intended purpose, including design, land use compatibility and function.
- **Provide a base level of community infrastructure** at the outset to support the early stages of the development (e.g. childcare centres, schools, community centre, information and welcoming program), complemented by the staged provision of infrastructure as the population grows.
- **Provide cultural facilities** appropriate to the population, including cafes, live music, galleries, youth spaces, performance spaces and libraries.
- **Locate facilities for convenient access** to pedestrian and cycle networks, public transport stations, and to help contribute to the creation of a sense of community (e.g. a community focal point or hub).
- **Develop flexible, multi-purpose facilities** capable of supporting a range of functions which may change over time, including recreation (e.g. play groups, fitness classes and hobby groups), arts and cultural activities (e.g. rehearsal spaces, local performance spaces and display spaces), social functions (e.g. family gatherings) and support services (e.g. community information, health clinics, counselling services).
- **Secure sites required for community infrastructure** through site designation or other means, and by negotiating their development as part of the development assessment process.
- **Develop retention strategies for existing and valued community infrastructure** where it exists, prior to the development of the TOD precinct.
- **Design community facilities to be inclusive and flexible in use** to help foster a strong sense of local identity and to ensure that both management and design is inclusive (across different ages, cultures and incomes). Community halls and centres must also attract a variety of income groups to be an effective community resource and point of contact.



4.7 Access and movement

Why diversity in travel?

A TOD precinct should be easy to move around in, and be well connected to other destinations by a range of different travel modes, including public transport, walking and cycling, and private vehicles. It should also cater well to the needs of people with restricted mobility, providing a fully accessible environment.

TOD precincts that offer a fine-grained street network support accessibility and achieve a scale that is interesting to be in and promotes walking and street activity.

How can community diversity be supported?

- **Incorporate direct, attractive and safe pedestrian links** to transit stations, and between neighbourhoods and employment centres, transit interchanges and community facilities.
- **Provide high-quality intermodal connections** with links between trains, buses, taxis and other forms of transport.
- **Develop a coherent and legible streetscape** that is oriented to pedestrian and cyclist movement that offers safety, connectivity, legibility and permeability. The network should be supported by clear directional signage.
- **Allow for increasing levels of pedestrian movement and use of public transport** as fuel costs rise. Provide sufficient public space at transit stops, activated with civic, retail and commercial functions for growth.
- **Protect and enhance pedestrian and cycle connectivity** in the construction of new transit infrastructure.
- **Emphasise public safety** in the design of all transit modes and routes so that all groups feel confident in using the mode of transport of their choice.
- **Provide equitable access for people with disabilities or restricted mobility** along continuous paths of travel in the public domain and to all parts of premises to which the public is entitled access.



Rouse Hill, New South Wales – provision of high-quality signage at a transit station, directing people to facilities within the precinct.

4.8 Open space, recreation and the public domain

Why diversity in the public domain?

The public domain includes public open space, public plazas and other pedestrianised areas, including publicly accessible but privately owned civic spaces (e.g. shopping malls and building setbacks). The quality of the public domain is influenced by its availability, diversity, utility and meaning to users, and the contact it offers with nature.

Vitality in the public domain is a key to creating successful TOD precincts, attracting people to live, work and visit. Vital places also confer a sense of safety and are socially inclusive. The public domain connects people with the place, each other, and nature. It must offer a series of diverse spaces that accommodate a range of different uses, users, and needs, and allow for different activities at different times of the day and in different seasons. To attract people to TOD precincts, it is critical for pedestrians and cyclists to have priority, with vehicles limited.

In planning higher-density neighbourhoods, the public domain takes on a more significant role as the outdoor living room of the neighbourhood than in a suburban setting. Access to basic environmental amenities is important to the wellbeing of both residents and workers, providing places for recreation and sport, social interaction, physical activity, getting around, and leisure. Safe and convenient access to parks and other green spaces also has significant health benefits, by encouraging greater physical activity and reducing stress levels just looking at greenery has been found to have physiological benefits.

Privatised space (e.g. outdoor cafes, private malls and plazas) is often associated with social exclusion. As the dominance of outdoor cafes can exclude those without the financial means to participate, care is needed to ensure that the management of other private spaces does not make any social groups (e.g. elderly people, teenagers or Indigenous people) feel unwelcome. Nor should these spaces replace the traditional role of publicly owned space.



Vienna, Austria – this high-quality public domain provides diverse, vital spaces that accommodate a range of different uses, users and needs.



Brisbane Square, Brisbane – provides increased priority to pedestrians and cyclists in the public domain.

How can community diversity be supported?

- **Achieve an improved balance between vehicular, cyclist and pedestrian** use of the public domain by reducing car dominance and increasing pedestrian and cyclist use.
- **Provide a network of flexible and versatile spaces** offering a diversity of activities and experiences, including social activities (e.g. meeting, talking, markets, community events), recreation activities (e.g. pleasure, exercise, play, sport), connection with nature (e.g. stimulation of the senses), as well as pedestrian and cycle paths. A network of spaces will expand their utility and accessibility, and encourage more physical activity.
- **Investigate opportunities to provide access to indoor sports and active recreational pursuits.**
- **Provide open space** and adopt a benchmark for the provision of open space appropriate for the TOD typology and residential density. Make innovative use of available space, including road closures, spaces between buildings and on roof tops, and shared use spaces (e.g. schools) to maximise accessibility to open space. Open space planning must also include provision for outdoor sporting and recreational activities, spaces which may exist in adjoining areas. Adequate links should be provided to these adjoining areas.
- **Include a design specification in the master plan for each public space** describing its purpose and main functions, the groups for whom it should cater (including older people, teenagers and children), and the types of activities it should support.
- **Providing convenient access to fenced dog parks** promoting pet health and reducing incompatibility with other park users.
- **Provide physical and visual access to nature** both natural and re-created natural environments to promote healthy lifestyles.
- **Adopt consultative open space design processes** to facilitate an authentic local identity and culture in the public spaces created.
- **Ensure that the ownership, ongoing maintenance and management of the public domain** secures access and enjoyment for the general public by requiring a dominance of publicly owned space. The main communal areas must be retained in public ownership so that no-one can be precluded from accessing these vital areas (e.g. transit stations, public plazas, parks and pedestrianised laneways). This way long-term maintenance is assured and equity of access is secured in perpetuity for the benefit of all. Shopping malls and other privately owned but publicly used spaces should be designed to be inclusive and adopt a management protocol endorsing the inclusion of all social groups (particularly young people).



Portside Park, Hamilton, Brisbane – access to parks and green spaces provides a range of benefits for residents of higher-density neighbourhoods.

4.9 Community engagement and collaboration

Why community engagement?

Engaging the community in the process of developing a TOD precinct is fundamental to achieving successful community change. Through engagement, the needs, fears and aspirations of both new and existing communities can be identified and addressed. This builds ownership and support for the planned changes, and contributes to a shared sense of identity. Community engagement processes that target a diversity of groups and blend the views of disparate groups will flow through to better informed approaches to achieving community diversity within the precinct. Ongoing engagement will allow the emerging TOD community to shape its own unique culture and identity as it develops. If well managed, community engagement can build capacity and awareness of the complexities associated with development, and allow planning agencies and developers to adapt to the lessons learned along the way.

Multiple and mutually beneficial outcomes can be achieved where there is a shared commitment to a common goal. Leadership combined with collaborative processes that harness a wide pool of knowledge, skills and other resources, will help achieve innovation and creativity.

How can community diversity be supported?

- **Adopt governance arrangements** that support collaborative and integrated approaches to project planning and implementation, and encourage joined up thinking rather than a silo approach. Collaborative partnerships should involve state agencies, community organisations, financiers, developers, local businesses and other key stakeholders.
- **Adopt a flexible planning framework informed by post-occupancy evaluation** to allow modifications in response to changing circumstances and benefit from the lessons learned.
- **Make a commitment to long-term community engagement** to inform project planning, implementation and evaluation for the duration of development of the TOD precinct.



- **Make a clear distinction between the role of public relations and community engagement** maintaining the integrity of community engagement at all times as an open and honest exchange of ideas and information.
- **Design processes that are open and accountable** indicating when and how community information and opinions will be taken into account, and establishing feedback loops so that the community can see how their views are being taken into account.
- **Develop approaches that seek a broad representation of the community** (not limited to public meetings, focus groups and exhibitions), targeting hard-to-reach and diverse groups (e.g. older people, people with a disability, Indigenous people, young people and culturally and linguistically diverse people). Monitor and evaluate the effectiveness of those approaches.
- **Find ways to maintain community interest and involvement** over a long period, perhaps by tying processes to established community events and activities and avoid processes that could be perceived as tokenism.
- **Develop the capacity of community members and organisations** to participate effectively in planning processes, helping them to understand the complex technical and environmental issues associated with the TOD precinct development, and where necessary helping to resource their participation.

4.10 Community and cultural development

Why community and cultural development?

Health and wellbeing research consistently highlights the importance of social relationships and community connectivity for people's health and wellbeing. Communities with fewer social connections have little capacity to bridge differences and build cohesion. While the built environment provides the physical setting for social relationships to occur and a sense of place to grow, investment in community and cultural development is essential. Evaluations of urban renewal in the United Kingdom found community development to be a key factor in achieving successful outcomes, noting that initiatives focused solely on the built environment failed to form flourishing businesses and communities.

The process of community development promotes participation in public affairs by bringing people together to meet and jointly address issues important to them. It focuses on building a capacity for self-help, moving from individual concerns towards a collective responsibility, with an ultimate goal of achieving social inclusion and community cohesion. Cultural development focuses on how cultural values can contribute to the experience of living in a community through artistic expression, celebrations and the practice of cultural customs, and the meaning reflected through urban design, programs and spaces.

In a TOD precinct, community and cultural development play a critical role in fostering community spirit, building capacity and nurturing a sense of belonging for all its members. Strong and culturally diverse communities with skilled workers are successful in attracting business and other investment.

How can community diversity be supported?

- **Prepare a community and cultural development strategy** designed to support the establishment of social relationships and the needs of existing and incoming residents, and foster local cultural values, activity and interest.
- **Establish strategic partnerships** with community organisations, local businesses, property and public space managers and other relevant stakeholders to strengthen integration, ownership and capacity for the strategy to take effect.
- **Adopt a range of land use and urban design strategies to foster local cultural identity**, including:
 - **Design public spaces to support community activities** such as markets, festivals and parades, complemented by events programming
 - **Activate and integrate public spaces and street frontages** through a mixture of land uses to create a vibrant street culture and a sustainable mass of people throughout the day and evening



Powerhouse Markets, New Farm, Brisbane – public spaces can be adapted to accommodate diverse community activities.

- **Design TOD precincts with respect for existing character**, community diversity and local heritage at the macro and micro level, adopting design themes and symbols that reflect community traditions and cultures (including young and older people, local Indigenous people and people from different cultural groups)
- **Provide a finely grained street network** capable of supporting a complexity of interesting buildings, spaces and human activity at a human scale.
- **Support the programming of community events** through grant programs or other means, to help encourage the community to come together in large or small groups, seeding the formation of relationships and local identity (e.g. through welcoming information packs and programs, neighbourhood parties, walking groups, playgroups, teenager recreation).
- **Identify opportunities for local expression** enabling communities to place their own cultural imprint on public spaces and communal facilities, the programming of community activities, and the ongoing development of the community.
- **Develop strategies to manage anti-social behaviours and prejudices** between residents including engaging residents to improve awareness and problem-solving skills, tenant participation groups, concierge or other tenancy support roles within individual establishments, and neighbourhood agreements on relevant issues (e.g. safety, behaviour, open space management).
- **Address community opposition to development** by bringing disparate groups together to work through issues and fears. Developing understanding of differences can facilitate an acceptance of community diversity so that it becomes a local social and cultural norm.
- **Develop a local leadership program** to identify, train and support potential and existing leaders who can reach into the community and speak out on local issues and support community building initiatives. Leaders should reflect the diversity of existing and new residents.
- **Ensure community involvement in monitoring and evaluating** outcomes as the TOD precinct develops, adopting processes that help to extend community capacity, social cohesion and leadership capability.



5 Evaluating outcomes

5.1 Why evaluate outcomes?

The establishment and maintenance of community diversity is ongoing, not a one-off effort. For this reason it is important to evaluate outcomes over time. Experience so far in establishing TOD precincts around the world has indicated that they become homogenous. Older neighbourhoods occupied by a demographic mix often slowly transform as wealthier, more similar groups move in. This can lead to the displacement of the traditionally diverse population and businesses. Even in communities where significant public policy initiatives and investment have been made to retain this mix, an on-going effort is required to address potential homogenising effects. On the other hand, there is considerable evidence that these communities may become more settled and mature in their profile over time.

It is therefore important to assess the effectiveness of strategies aimed at reducing homogenisation and increasing community diversity. This will help strategies to be better tailored to the changing circumstances of the TOD precinct, and new strategies to be developed where the desired social outcomes are not being achieved.

The findings will help planners and others make choices about future implementation of community diversity policies in TOD precincts. The aim should be to inform and guide future practical action.

5.2 How and when to evaluate

Evaluation should assess the value, merit and worth of attempts to achieve community diversity in specific, designated TOD precincts. A multi-faceted approach will be necessary to evaluate the achievement of community diversity in TOD precincts, both because of the of evaluating social processes and qualities, and also the wide range of factors necessary to support the establishment and maintenance of community diversity.

A quantitative approach alone, based exclusively on measurements of various indicators, will not be sufficient to evaluate community diversity. Qualitative and attitudinal techniques will also be required to assess the achievement of desired social outcomes.

The sorts of evaluations envisaged are more far-reaching than simple audits or monitoring of data. Evaluating a complex subject such as community diversity in TOD precincts is much more ambitious. It needs to ask, for example, whether or not a certain strategy for achieving community diversity has worked, and which observed changes can be seen as resulting from specific interventions (e.g. tenure mix, rent subsidies, mix of dwelling sizes). It may also need to examine the impacts of regulations or incentives from a number of different perspectives, and explore causal links between activities and outcomes.

Some of these evaluation techniques are likely to require a specific post-occupancy evaluation to be undertaken. With the exception of the major post-occupancy evaluation undertaken at False Creek, Vancouver, remarkably little evaluation of TOD precincts has occurred, particularly of the social aspects of development. A post-occupancy evaluation suggests that a baseline evaluation needs to be conducted prior to TOD principles being instituted. A useful baseline to maximise the availability of recent data could be data taken from a Census.

The timing of ongoing evaluations is critical to ensure that changes can be made. A post-occupancy evaluation is only appropriate when a sufficient threshold of residents has been established to contribute to this process. An effective evaluation framework will need to be highly participatory and involve a range of stakeholders, in addition to residents, workers and users of community spaces and facilities and services. This framework will need to be flexible and modified over time as the understanding of the factors associated with community diversity in TOD precincts becomes more sophisticated. The evaluation must be purposeful and action-oriented, with a view to making recommendations for change.



Staged evaluations can yield valuable results. There is value in conducting a pre-evaluation before the full formal evaluation. Even a limited, diagnostic evaluation, such as those frequently used in post-occupancy evaluations, can help with the early estimation of the technical difficulties and practical and financial implications associated with various planning, design and tenure models. Census periods suggest a five-yearly major evaluation including a post-occupancy evaluation is appropriate. However, annual data is also available on a variety of aspects (see Appendix: Evaluation criteria), which can provide interim information.

Where evaluation is ongoing, it can explore many aspects, including:

- how the specific aims were to be achieved and have been achieved
- how the various elements have or have not produced the desired effects
- how the intervention/s might be improved.

5.3 A monitoring and evaluation framework

Principles for how to evaluate

A framework for monitoring the establishment and maintenance of community diversity over time should include the following key principles:

- Conduct evaluation throughout the project development process, not only when the TOD precinct is completed.
- Use criteria related closely to both project objectives and stakeholder objectives. Systematically refine those criteria with stakeholders.
- Use a mix of methods:
 - regular, ongoing data collection on a range of performance criteria
 - post-occupancy evaluation of environments in use
 - interviews with residents and other users
 - focus groups
 - more participatory processes such as a SpeakOut or a World Café.
- Refine evaluation criteria for further evaluations based on the findings of earlier studies.
- Ensure the evaluation processes reflect the social outcomes sought in the project and are designed to incorporate the views of a diverse range of users of the precinct, not only residents.
- Tailor processes and methods to the questions that need to be asked.
- Ensure that cultural diversity and age issues are taken into consideration in the design of processes and survey instruments. Provide separate evaluation processes for children and young people.
- Fully involve stakeholder groups in the design and pilot testing of the evaluation criteria, methods and survey instruments.
- Report back to stakeholders and others on results while still in draft form, so they can assist with the interpretation of the findings.
- Publish and disseminate evaluation findings widely to help build a knowledge base about community diversity in TOD precincts.



Options for undertaking evaluation

Evaluation of community diversity in TOD precincts can be:

- part of a wider, ongoing data collection and monitoring process relating to TOD precincts
- part of a post-occupancy evaluation on various aspects of a specific TOD precinct using a range of evaluation techniques
- an evaluation of a social environment in a specific TOD precinct.

The table in the Appendix illustrates the range of indicators which could be evaluated to assess community diversity in a TOD precinct. Key indicators have been listed from the strategies identified in Section 4. The indicators are considered integral to achieving positive community diversity and healthy and vibrant social environments.

Possible performance criteria have been identified which can be used to evaluate each indicator. Also described is the data source, and the possible timing of the evaluations which is influenced by desirability and the availability of data. The selection of indicators and performance criteria should be based on the circumstances of each individual TOD precinct. Where appropriate and possible, a baseline of the social conditions (e.g. population profile, housing mix and social infrastructure provision) that existed prior to the development of a TOD precinct should be prepared so that change can be effectively monitored.



Appendix: Evaluation criteria for community diversity

Evaluation frameworks must be individualised to ensure their relevance to the needs and circumstances of the TOD precinct being evaluated. The table below provides a guide only to developing an evaluation framework for monitoring and evaluating the achievement of community diversity in TOD precincts. It is not intended to be exhaustive or used in a standardised way.

Note: POE refers to post-occupancy evaluation.

Table 2: Suggested criteria for evaluating community diversity in TOD precincts

Indicator	Performance criteria	Data source	Timing		
			Baseline	Annually	Five-yearly
Urban form and land use					
Integration between new and existing communities	Physical connections to adjoining areas: – transit linkages	• Observation survey	✓		✓
	– intermodal connections – number of pedestrian and cycle links – pedestrian numbers	• Pedestrian counts	✓	✓	✓
	Functional: – cross-participation at meetings, events – resident perceptions of integration	• POE survey			✓
Access for all to area's intrinsic amenities	Resident satisfaction	• POE survey			✓
	Spatial distribution	• Observation survey			✓
Community safety	Perceptions of safety	• POE survey			✓
	Reported incidences of crime against the person and property	• Queensland Police Service crime statistics			
Housing diversity					
Dwelling mix	Tenure: – owner occupied – private rental – public rental Dwellings by number of bedrooms Specialised housing: – affordable housing – community housing – public housing – aged people's housing – supported accommodation – serviced apartment (short-term accommodation)	• Planning approvals data • ABS Census • Rates database	✓	✓	✓



Indicator	Performance criteria	Data source	Timing		
			Baseline	Annually	Five-yearly
Employment diversity					
Job availability, diversity and accessibility	Number of jobs created Available jobs by industry category Match between the occupational structure of jobs and the occupations of residents	<ul style="list-style-type: none"> economic development strategy monitoring data ABS Census by industry category ABS Census by occupational category 	✓	✓	✓
Local economic development	Existence of: <ul style="list-style-type: none"> economic development strategy funding programs or other initiatives Retention of existing businesses New business/investment attracted through enterprise development initiatives	<ul style="list-style-type: none"> Observation survey Incentives/ other program monitoring 	✓		✓
Retail diversity					
Accessible and affordable convenience shopping	Walkable access to convenience shops	<ul style="list-style-type: none"> Observation survey 	✓		✓
	Mix in retail floor area Mix in retail floor space affordability	<ul style="list-style-type: none"> POE survey 			✓
Social infrastructure					
Available and suitable social infrastructure	Inventory and capacity of available infrastructure	<ul style="list-style-type: none"> Audit of social infrastructure 	✓		
	Social infrastructure gained (since commencement)	<ul style="list-style-type: none"> Planning approvals data 	✓		✓
	Resident satisfaction (with type, location, function, relevance to perceived needs)	<ul style="list-style-type: none"> POE survey Infrastructure providers' data records 			✓ ✓
	Social infrastructure lost (since commencement)	<ul style="list-style-type: none"> Comparison with baseline audit 			✓



Indicator	Performance criteria	Data source	Timing		
			Baseline	Annually	Five-yearly
Access and movement					
Public transport	Transit (before and after) Modal change	• Travel data	✓	✓	✓
		• POE survey • ABS Census data			✓ ✓
Pedestrian- and cycle-friendly networks	Connectivity of network to local destinations	• Site observations	✓	✓	✓
	Users' perceived safety	• Safety audit • POE survey			✓ ✓
Open space, recreation and the public domain					
Diversity of open space, recreation and public domain	Area of useable open space Provision of active recreational and leisure spaces and facilities Diversity in type/function of spaces available Provision for children, teenagers, elderly, pets and other needs groups	• Site survey	✓	✓	✓
	Users' perceived safety User satisfaction	• Safety audit • POE survey			✓ ✓
Community engagement and collaboration					
Collaboration	Existence of governance arrangements that support collaboration and the formation of strategic partnerships	• Process review	✓		✓
Opportunity for engagement	Existence of governance arrangements that support community engagement in precinct planning, implementation and evaluation Existence of community engagement in: – public-domain/open-space planning – social-infrastructure planning – evaluation-data gathering	• Process review	✓	✓	✓
Extent of community participation	The extent to which neighbours know each other Community pride and association with place	• Site observations • Community organisations • Community information		✓	✓



Indicator	Performance criteria	Data source	Timing		
			Baseline	Annually	Five-yearly
Community and cultural development					
Community and cultural development	Existence of: <ul style="list-style-type: none"> – community and cultural development strategy – community development workers – programs/activities – strategic partnerships – funding programs 	<ul style="list-style-type: none"> • Program review 	✓		✓
Sense of community and belonging	<p>The extent to which neighbours know each other</p> <p>Community pride and association with place</p> <p>Resident satisfaction</p> <p>Evidence of:</p> <ul style="list-style-type: none"> – sociability/friendliness – local cultural expression – design and symbols that reflect cultural belonging for different groups – connectivity between TOD and adjoining communities <p>Existence of formal social networks/groups</p> <p>Existence of community/cultural events</p>	<ul style="list-style-type: none"> • Site observations • Community organisations • Community information data bases • POE survey 		✓	✓
Other factors					
Resident diversity	Demographic profile: <ul style="list-style-type: none"> – age group – culturally and linguistically diverse (CALD) and Indigenous status – length of residency 	<ul style="list-style-type: none"> • ABS Census 	✓		✓
Accessibility for people with disabilities	Existence of continuous paths of travel in public domain and areas intended for use by general public	<ul style="list-style-type: none"> • Site survey 	✓	✓	✓
		<ul style="list-style-type: none"> • POE survey 			✓
Needs of particular groups	Satisfaction with providing for the needs of: <ul style="list-style-type: none"> – families – Indigenous and CALD groups – children – teenagers – older people – pet owners 	<ul style="list-style-type: none"> • Surveys by service providers • POE survey 		✓	✓



Glossary

Term	Definition
Affordable housing	Housing that is appropriate to the needs of low-income households in terms of design, location and access to facilities and services; and where rent paid by households in the lowest 40 per cent of income units does not exceed 30 per cent of gross household income after any applicable Commonwealth Rent Assistance is deducted (this definition is applicable to the Australian context only). Affordable housing includes detached housing as well as boarding and emergency housing and other specialist forms of housing.
Collaboration	Cooperative action, often between the three tiers of government and with the community and private sector.
Community development	Initiatives that enhance community identity and cohesion by building the community's capacity to participate in problem solving, decision making and community life.
Community diversity	The presence and degree of representation of a diverse range of different demographic, socio-economic, cultural, employment and visitor characteristics within a transit oriented development community, with people living in an inclusive, interactive and harmonious manner.
Community housing	Housing that is usually publicly owned and managed by the community housing sector. It includes housing provided under the Supported Accommodation Assistance Program, such as boarding house and crisis accommodation.
Community services and facilities	The social infrastructure (buildings and the services they contain) that supports individuals, families and groups and enhances community development and wellbeing.
Continuous path of travel	A slip-resistant, hard-surfaced and continuous pathway that does not incorporate any step, stairway or other impediment which would prevent it from being safely negotiated by people with disabilities, and is provided in accordance with Australian Standard AS 1428.2.
Cultural diversity	The understanding and sharing between different cultures and its positive value to society as a whole.
Culturally and linguistically diverse (CALD)	A term used to refer to people of different cultural background and/or people who speak a different language.
Culture	The systems of beliefs, assumptions, sentiments and perspectives—many of them unconscious and taken for granted—which members of a group have in common, and the embodiment of such beliefs, assumptions, sentiments and perspectives in customs, routines, roles and rituals.
Density	In the context of urban planning, density refers to the amount of development or the number of dwellings in an area. Density is commonly measured as either dwellings per hectare (dph) for primarily residential developments, or plot ratios for predominantly commercial developments, or jobs per hectare.
Disadvantage	A condition in which individuals, households or communities are in a less favourable position than other members of the community. Disadvantage is often associated with educational attainment, income, employment, and access to public transport, community services and facilities.



Term	Definition
Displacement	The act of being forcibly removed or relocated. The term is often used to refer to communities that may be displaced as a result of physical development (e.g. gentrification and urban renewal).
Diversity	A broad term that, in the context of transit oriented development, usually refers to the mix of societal characteristics, land uses, retailing, employment and housing types in an area.
Eco-revelatory design	Building design that is underpinned by ecological principles, where those principles are easily discerned in the design itself.
Fine grained street network	Streets arranged around small urban development blocks that encourage walkability and accessibility.
Floor area bonus	An additional benefit provided to enable buildings to be developed to an intensity that would otherwise not be permitted.
Gentrification	Changes in a neighbourhood or city that reflect the inflow of money and affluence. The effect of this inflow of affluence is a rise in rental and property values making them difficult to afford for long-term residents.
Greenfield land	Areas of undeveloped urban land suitable for urban development and not yet serviced with development infrastructure, e.g. water, sewerage, roads.
Group or shared household	A household consisting of two or more people without immediate relationships. Examples include students or workers living in a house or a unit with shared amenities.
Healthy communities	Environments that foster opportunities for incidental physical activity in the neighbourhood.
High density	High density refers to areas with an intense concentration of residential dwellings, often in multi-storey buildings. High-density areas are usually located near activity centres and public transport. High density for a TOD precinct may be over 100 dwellings per hectare (indicative only).
Homogeneous/homogeneity	A sociological term referring to a grouping of people of similar social background.
Independent living	Self-contained accommodation that is purpose-built for older people who are able to live independently and care for themselves. They have one or more bedrooms and may be provided within a low- to medium- or high-rise complex, or as stand-alone or detached housing.
Infrastructure charges schedule	That part of the priority infrastructure plan which enables the trunk infrastructure costs identified in the priority infrastructure plan to be recovered through the fair apportionment of these costs among network users.
Intermodal connections	Links between trains, buses, taxis and other transport forms, including cycling and walking.
Key worker	Is a public sector employee who is considered to provide an essential service. Typically, these people include teachers, nurses, health services support staff, police officers, emergency service staff and the like.
Low density	Low density refers to areas with a low concentration of residential dwellings, often separate dwelling houses. Low density may be under 30 dwellings per hectare (indicative only).
Low income households	Usually a reference to the bottom 40 per cent of households in the income distribution.



Term	Definition
Master planning	A planning process whereby a comprehensive master plan is developed that describes and maps the overall development concept for an area or precinct, including present and future land use, detailed urban design and landscaping, built form, supporting infrastructure and service provision.
Medium density	Medium density refers to areas with an intermediate concentration of residential dwellings and usually a mix of building heights. Medium density for a TOD precinct may be 30–100 dwellings per hectare (indicative only).
Mixed-use development	The presence of more than one type of land use in a building or a development area, including residential, commercial, retail or open space. A mix of uses can be achieved vertically within a single building or horizontally within a development or defined area.
Networks	Patterns of interaction that enable social contact to be developed and maintained between people in the community (e.g. friendships, groups, clubs).
Open space	Land such as parks, foreshores and plazas available for recreation and outdoor enjoyment for all members of the public.
Participatory processes	A continuum along which people in the community can engage in planning processes—from advisory, one-way information exchanges (e.g. seeking a community’s view on an issue) at one end, to partnership approaches between a government authority and the community at the other end, with a range of variations in between.
Partnership approaches	Sharing responsibility for program development, implementation and maintenance between a government authority, other agencies and/or the community as a way of sharing ownership, ensuring relevance, gaining commitment and building community capacity.
Place management	A system of public governance that focuses on identifying a set of outcomes for a defined area, and developing policy, coordinating agency activities and investing resources to achieve those outcomes. This system contrasts with the current system, which focuses on the priorities of individual agencies to do things according to their own authority (e.g. build roads, hospitals, schools).
Post-occupancy evaluation (POE)	Evaluates the building or site from the users’ perspective, including how user needs are met, and identifies potential improvements.
Priority infrastructure plan	That part of the planning scheme identifying future urban development areas prioritised to be supplied with trunk development infrastructure. The purpose of the priority infrastructure plan is to integrate and coordinate land use and infrastructure planning; ensure trunk infrastructure is provided in an efficient and orderly manner; and provide equitable and accountable funding for trunk infrastructure.
Public housing	Affordable rental housing for low to moderate income families and individuals, in particular those who have difficulties accessing accommodation in the private market.
Redevelopment	The act of carrying out changes or works to existing land for alternative uses.



Term	Definition
Residential care accommodation	Accommodation and care services provided in residential care homes to older people who can no longer remain in their own home, in premises with subsidised low- and high-care places funded and licensed by the Commonwealth Government under the <i>Aged Care Act 1997</i> .
Shared equity	The sharing of ownership in a property with a partner or, in some schemes, with a housing authority.
Social exclusion	The act of excluding, by overt or covert means or signals, some individuals from full participation in the community; or situations in which some people do not have access to the goods and services enjoyed by the majority, or considered the norm, in society.
Social diversity	Social diversity is generally the range of different community groups according to race, income and housing tenure within a given area.
Social housing	Not-for-profit rental housing provided for people receiving low incomes. It includes public housing, community housing and Indigenous people's housing.
Social inclusion	Being socially included means that people have the resources (skills and assets, including good health), opportunities and capabilities they need to: learn-participate in education and training; work-participate in employment, unpaid or voluntary work including family and carer responsibilities; engage-connect with people, use local services and participate in local, cultural, civic and recreational activities; and have a voice-influence decisions that affect them.
Social infrastructure	The community services and facilities that support the creation and functioning of communities, helping to form friendship and support networks, and which support family, health and education and other social development needs. These may include services and facilities relating to: community development, health, education, information, children, young people, women, aged people, families, Indigenous people, culturally and linguistically diverse people, arts and culture, open space and recreation. These include, but are not limited to, development infrastructure as defined by the <i>Sustainable Planning Act 2009</i> , under which land for community benefit can be partly funded through infrastructure charges levied on developers.
Social mix	A term commonly used in planning and social policy to refer to the proportion and proximity of people with different racial backgrounds, income levels or housing tenure within a neighbourhood or area.
<i>South East Queensland Regional Plan 2009–2031</i> <i>Far North Queensland Regional Plan 2009–2031</i>	The regional plans developed in accordance with Section 2.5A of Chapter 4, Planning Partnerships of the <i>Sustainable Planning Act 2009</i> that provides a framework for a coordinated and sustainable approach to planning, development and infrastructure provision and recognise the importance of developing sustainable and inclusive communities.
SpeakOut	An informal consultation technique which incorporates the features of a lively, innovative, colourful and interactive staffed exhibition and a workshop—a hybrid event combining some of the characteristics of a meeting and some of an exhibition or 'open house'.
TOD community	The people who live and/or work in a TOD precinct.



Term	Definition
TOD precinct	Areas where transit oriented development principles are applied. These precincts generally include communities within a comfortable 10-minute walk of an established or planned transit station (a radius of approximately 800 metres).
Transit	A term used to describe public transport, including bus, rail and ferry.
Transit oriented development (TOD)	Mixed-use residential and employment areas, designed to maximise access to public transport through higher- density development and pedestrian-friendly street environments.
Trunk infrastructure	Is the ‘higher order’ or ‘shared’ development infrastructure required to ensure the healthy and safe functioning of the uses it is servicing. Trunk infrastructure’s primary purpose is to service ‘catchment’ areas with a number of users or developments, rather than servicing individual developments or users.
Universally designed housing	Housing that is designed in such a way that it can be modified easily in the future to become accessible to both occupants and visitors with disabilities or progressive frailties. Reference should be made to Australian Standard AS 4299-1995 Adaptable housing.
Urban renewal (or urban regeneration)	The term refers to land redevelopment policies to improve housing and business conditions in a particular urban area. Contemporary urban renewal policies focus on revitalisation and investment, and neighbourhood participation.
World Cafe	A consultation activity where every participant has a shared conversation with a broad cross-section of other participants, by moving from table to table.



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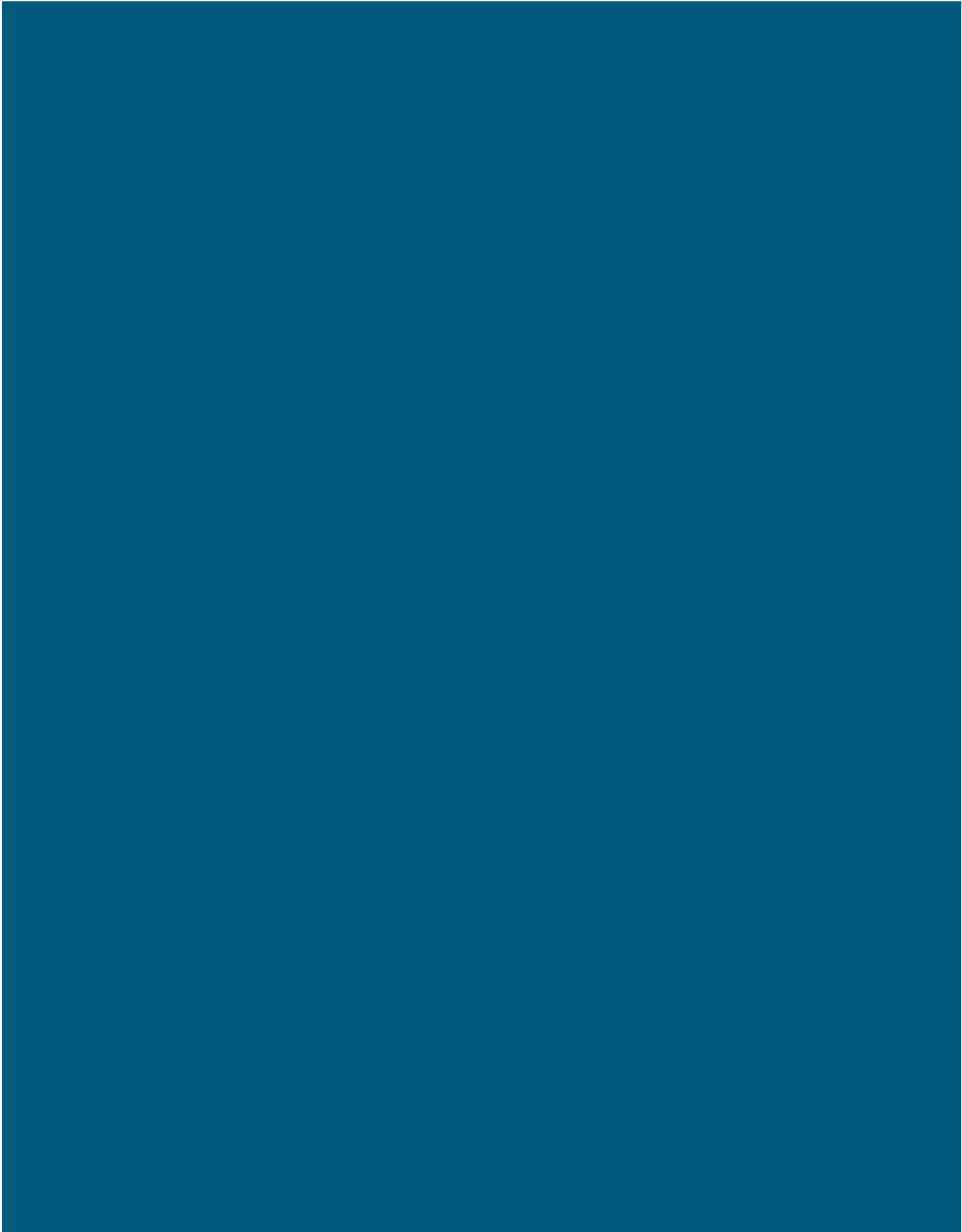
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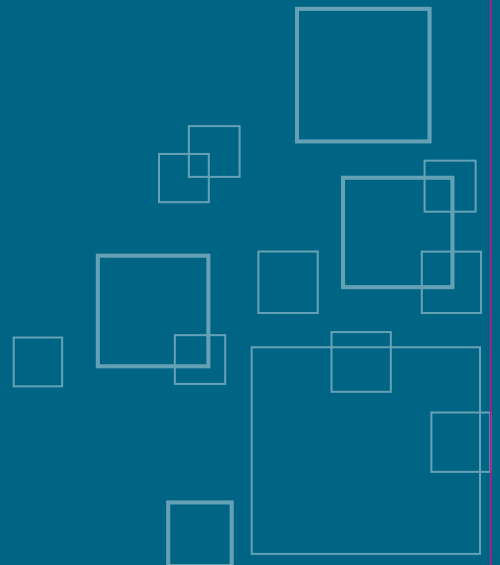
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Guide for development in a railway environment





Guide for development in a railway environment



Transit oriented development: guide for development in a railway environment

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Preamble

This guide provides important information for those involved in the planning, design or delivery of a development in or near to a railway corridor in Queensland.

The guide is essential reading for those who are proposing to:

- develop in or near to a railway corridor, for example near a railway station, over a railway tunnel, or near a railway bridge
- provide, alter or upgrade any railway infrastructure
- excavate in or near a railway corridor
- develop in a location that is likely to experience noise and vibration from a passing train
- develop near to a railway corridor used by freight trains
- carry out a construction activity that has the potential to affect railway services.

Early consultation with the Department of Transport and Main Roads is strongly recommended to confirm how the information contained in this guide applies to a proposed development.

The list of Queensland Rail and Department of Transport and Main Roads technical requirements and standard drawings and the Queensland Rail Station design guide are current at the time of publication (Appendix 1). Future editions or amendments to the list will be available and remain current on the Queensland Rail website www.qr.com.au and the Department of Transport and Main Roads website www.tmr.qld.gov.au.

A link is also available from the Department of Infrastructure and Planning website www.dip.qld.gov.au/TOD



1 Introduction

Urban areas are comprised basically of two elements:

- the places in which people live, work and play
- the movement systems that enable people and goods to travel between these places.

By their very nature, places and movement systems are interrelated and interdependent. For places to be liveable, productive and enjoyable they need, among other things, to be easily accessed by people and vehicles. For movement systems to be functional, safe and efficient in enabling travel between places they need, among other things, to enable the convenient and unobstructed passage of people and goods.

As urban areas grow and intensify, the ability for places and movement systems to perform properly is tested. There is greater demand for the available space and more care has to be exercised in maintaining the quality of places and safeguarding the effective operation of movement systems.

The preparation of regional and metropolitan plans by the state and local governments is a reflection of the need to deal with the demands and consequences of Queensland's continuing growth to better plan for the development of places and secure the appropriate operating environments for movement networks.

In the busiest parts of the state, these plans promote a progressive move to a more compact urban form with higher density development located in the places of greatest accessibility.

Delivering transit oriented development is one of the most effective ways of achieving a desirable urban form. Transit oriented development is characterised by high quality people-focused places in which a lively mix of intensive activities is located in close proximity to a frequent and reliable public transport service.

Much has to be done well to ensure the successful delivery of a more compact urban form and transit oriented development outcomes. The choice of location has to fit with the strategic role of the place. The mix of activities has to be right. The form of development has to make for a good living environment and a favourable business setting. Using the public realm has to be welcoming and enjoyable experience. And the movement networks, especially public transport services, have to assure the accessibility of the place.

Providing this assurance of accessibility and the certainty of service is a challenge for public transport in places that are subject to increasingly intensive use and development. A particularly demanding set of circumstances arises in and around railways as the development that seeks to take advantage of the accessibility provided by the service has to be carefully planned, designed and delivered to ensure the service can continue to operate efficiently and with the expected level of reliability and safety.

A range of parameters therefore applies to the planning, design and delivery of a development near to a railway that are aimed at ensuring the operations of the railway service are maintained in an efficient, reliable and safe manner.

Queensland's urban railway network is also one of the few anywhere in the world that transports both passengers and freight on most of its lines. This introduces considerations for nearby development such as the risks associated with the transport of dangerous goods and hazardous materials and the amenity impacts associated with the transport of heavy loads and livestock.

For development to satisfactorily coexist with an operating railway the parameters associated with railway operations and the risk and amenity considerations associated with freight transport have to be appropriately addressed during the planning, design and delivery of the development. This guide will assist those involved in this process to be informed of what has to be addressed when dealing with a development in a railway environment.

1.1 What is the purpose of this guide?

This guide provides information about the matters that should be taken into account in undertaking development in a railway environment. It explains why this is necessary, who and where it applies to, which government agencies are involved, what processes have effect, how parameters are to be used and when to seek advice.

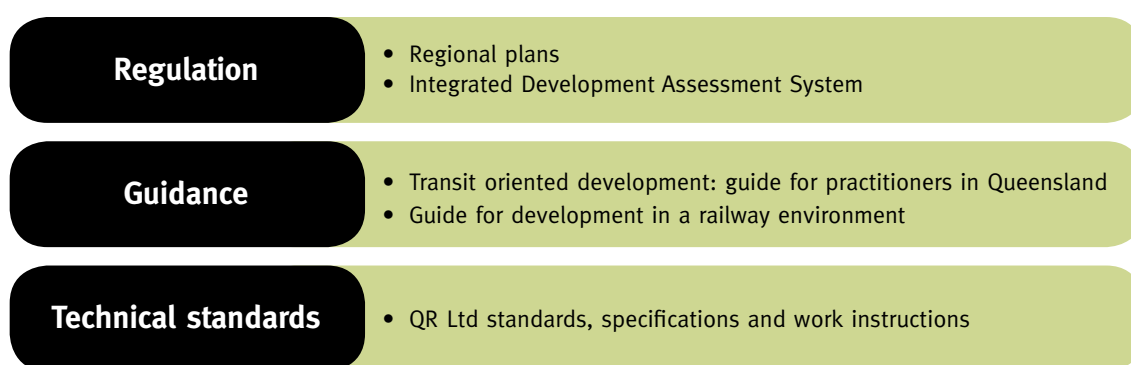
The guide provides a checklist approach to determining whether the appropriate steps have been taken to address the matters that affect development in a railway environment. It also sets out what is involved in gaining access to railway land, how to deal with a number of operational constraints and what must be done to ensure that the construction of a development proceeds safely and smoothly. A risk assessment process is appended to assist with the evaluation and refinement of development proposals in a railway environment.

1.2 Who is this guide for?

This guide is for those involved in the planning, design or delivery of a development in a railway environment in Queensland, including developers, development managers, project managers, urban planners, architects, engineers, landscape architects and construction managers. It is also for those who are responsible for assessing and responding to development applications made under the *Sustainable Planning Act 2009*.

All of those involved in a development in a railway environment, either as a proponent, applicant or assessor, should be familiar with the contents of this guide. They should understand the framework for dealing with development in a railway environment as illustrated in Figure 1. They should also be aware of the importance of early consultation in relation to a proposed development to ensure that all the information needed to successfully progress the development is sought and provided in advance, to minimize the potential for wasted effort, rework and delay.

Figure 1: The framework for development in a railway environment



1.3 What is the railway environment?

The railway environment comprises the combination of the following:

- the area located in, below and above a railway corridor
- the area located on, below and above the 25 metre wide strip of land running along each side of a railway corridor.

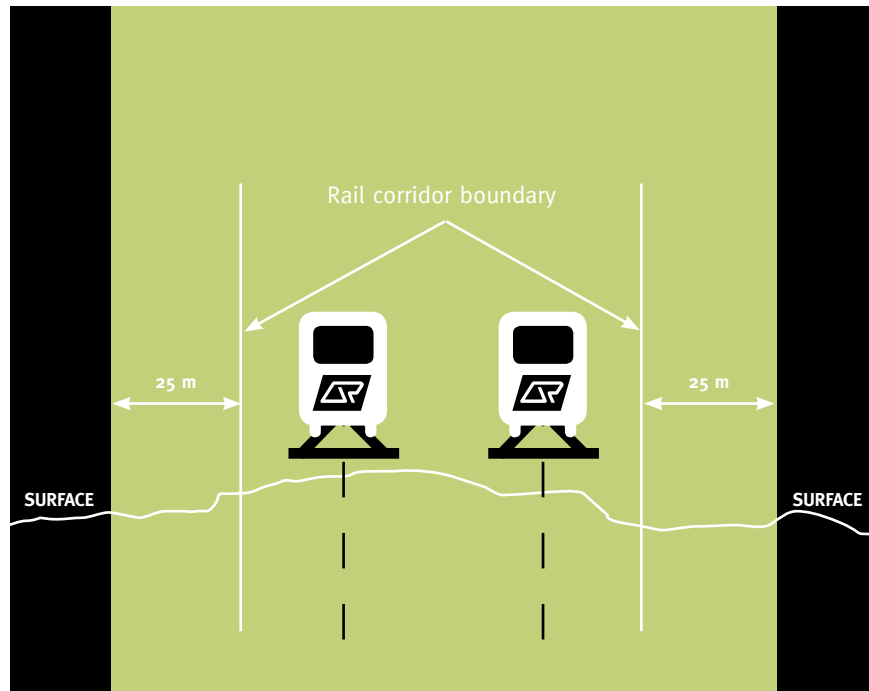
The extent of the railway environment is illustrated in Figure 2.

Maps of existing railway corridors are available on the Department of Transport and Main Roads' website. These maps typically depict the corridors as 'railway corridor land'. Railway corridor land includes the area containing the railway tracks as well as railway stations, park 'n' ride facilities and other sundry land holdings.

Where a railway is located in a tunnel and any part of that tunnel is less than 25 metres below natural ground level, the width of the strip of land included in the railway environment increases to 50 metres along each side of the tunnel.



Figure 2: The extent of the railway environment



The area represented in this colour comprises the extent of the railway environment at any given point along the length of a railway corridor. The area extends indefinitely above and below a railway corridor. A development located in this area is the subject of the information contained in this guide.

1.4 What regulatory provisions apply?

Those involved in the planning, design or delivery of a development in a railway environment should be familiar with all of the regulatory provisions that have the potential to affect such development. The following is a list of the legislation and regulatory documents applicable to developing in a railway environment.

- *Building Act 1975*
- *Electrical Safety Act 2002*
- *Environmental Protection Act 1994*
- *Disability Discrimination Act 1992* (Australian Government)
- *Land Act 1994*
- *Sustainable Planning Act 2009*
- *Transport Infrastructure Act 1994*
- *Transport Operations (TransLink Transit Authority) Act 2008*
- *Transport Planning and Coordination Act 1994*
- *Workplace Health and Safety Act 1995*
- *Disability Standards for Accessible Public Transport 2002* (Australian Government)
- *Environmental Protection (Noise) Policy 2008*
- *Sustainable Planning Regulation 2009*
- *South East Queensland Regional Plan 2009–2031*
- *Far North Queensland Regional Plan 2009–2031*
- *Transport Infrastructure (Dangerous Goods by Rail) Regulation 2008*



2 State agency roles and responsibilities

Whenever development is proposed in a railway environment in Queensland, various state agencies become involved including several government departments and certain state owned entities.

Some of these are involved in a decision making capacity; others provide advice on the development proposal. Each has particular objectives and responsibilities that shape their input to the process.

This section provides an overview of the agencies that may be involved in a development, including the roles and responsibilities of those agencies. It should be noted that the extent of involvement of each agency will depend on the nature and scale of the development, and on factors such as whether the development is proposed to:

- use or encroach on the railway environment
- affect transport infrastructure
- trigger a referral under the IDAS process.

2.1 Department of Transport and Main Roads

The Department of Transport and Main Roads (TMR) is the owner of the railway corridor on behalf of the State of Queensland. In this regard, TMR's role is to protect the long-term integrity of the railway corridor. A number of divisions of TMR are involved, each performing a different, but related role.

TMR is a concurrence agency under the *Sustainable Planning Act 2009*. TMR is responsible for ensuring the safety and operational integrity of railways and for assessing the affect of proposed development on existing and future public passenger transport. Through the IDAS process (refer to Section 3 of this guide), TMR has the authority to direct the outcome of a development application.

TMR staff will typically be involved in pre-lodgment discussions about a development proposal in a railway environment, either with or without the relevant local government. TMR does not charge a fee for participating in pre-lodgement discussions or conducting its assessment processes.

TMR consults with stakeholders such as Queensland Rail (the railway manager) and the TransLink Transit Authority (an adviser on specialist matters). The advice of these stakeholders is incorporated in TMR's IDAS response. TMR staff also collaborate with the Department of Infrastructure and Planning, local councils and development proponents about the delivery of land use transport integration in appropriate locations.

TMR is also responsible for:

- providing resource entitlements for development applications in a railway environment
- negotiating and facilitating private sector purchase and development of railway corridor land.

The latter responsibility entails:

- identifying and assessing the risks associated with a proposed development and determining the opportunities to upgrade railway station infrastructure
- working with Queensland Rail to facilitate development in a railway environment, including resolving the applicable commercial arrangements.

These commercial arrangements may include, for example:

- the sale or lease of railway corridor land or the volumetric title needed for a proposed development
- an infrastructure agreement in relation to the provision of new or upgraded transport infrastructure needed to support a development.



2.2 Queensland Rail

Queensland Rail (QR) is a government-owned corporation with two subsidiary companies - QR Passenger Pty Ltd and QR Network Pty Ltd.

QR Passenger Pty Ltd provides services under contract to TransLink Transit Authority and TMR. QR Network Pty Ltd is the railway manager for most of Queensland's railway corridors. QR Network Pty Ltd is responsible for railway operations involving passengers and the majority of freight transport and for managing the railway infrastructure. Both subsidiary companies may be involved in discussions about a proposed development in a railway environment.

2.2.1 Section 255 of the *Transport Infrastructure Act 1994*

QR regulates activities that may affect the operations of a railway in accordance with the provisions of Section 255 of the *Transport Infrastructure Act 1994* (Section 255). Under Section 255 the approval of the railway manager (QR) is required for activities that could “interfere with a railway”. QR is therefore required to assess proposals for development in a railway environment to ensure that railway services will not be interrupted, safety risks are minimised, maintenance arrangements are not compromised and development activities such as building construction in, over or under the railway environment proceed in an orderly manner.

An applicant lodging an IDAS application is advised in the concurrence agency approval from TMR whether an application will need to be lodged under Section 255. QR requires detailed construction plans and a description of the construction process to be lodged with a Section 255 application. The Section 255 application is therefore typically lodged after the local government's decision notice has been issued and following the execution of a development agreement.

An approval under Section 255 is required notwithstanding the existence of access rights or rights to develop conferred by a development agreement, development lease or access licence.

QR will typically impose a condition on a Section 255 approval that enables QR to oversee the construction of the aspects of a development that QR considers have the potential to affect railway operations.

A Section 255 approval for proposed development activities may also be necessary apply in the following circumstances:

- where work is proceeding in a railway environment that does not need a development approval from a local government or TMR (for example, tree lopping or fence construction)
- where QR identifies work in a railway environment that has the potential to interfere with railway operations (for example, an unauthorised excavation).

QR charges a fee to make an application under Section 255. QR will advise the applicable fee at the time of lodgment.

2.3 TransLink Transit Authority

TransLink Transit Authority (TTA) is the statutory body responsible for:

- purchasing and scheduling government-funded services on the passenger network
- administering the funding for Citytrain services, new stations, station upgrades and rolling stock
- designing new stations and station upgrades.

TTA advises TMR about the affect of development on railway stations and passenger services and the requirements for access to stations and intermodal facilities.

TTA manages the delivery of new and upgraded public transport station facilities in South East Queensland (SEQ) through the TTA Station Upgrade Program, which is funded through the SEQ Infrastructure Plan and Program. TTA also manages the upgrade of stations on the railway network in SEQ as part of the Citytrain Station Upgrade Program, funded through the transport services contract between the state government and QR. This contract is administered by TTA.



2.4 Department of Infrastructure and Planning

The Department of Infrastructure and Planning (DIP) is the lead agency for coordinating the state's transit oriented development (TOD) implementation activities, including:

- developing whole-of-government TOD policy
- determining TOD priorities
- coordinating the state government's interests and involvement in TOD delivery
- identifying and determining the planning and delivery mechanisms for, and sequencing of, TOD projects.

DIP works with other state government agencies and local government and industry stakeholders to facilitate TOD outcomes. DIP also provides input to the assessment of development applications in TOD locations and may coordinate state and local government interests in these locations.

2.5 Department of Environment and Resource Management

The Department of Environment and Resource Management (DERM) maintains the state government's land policies and manages state land disposal processes through the Property Management Committee. If a development is proposed on state land, the PMC will consider the case for allowing access to state land via private treaty or tender.

In addition, if a project involves the private use of a public road, necessitating, for example, the issuing of a permit to occupy or a temporary or permanent road closure, the development application for the project will need to be referred to the local DERM office for resource evidence required under the *Sustainable Planning Act 2009* and the *Sustainable Planning Regulation 2009*.

2.6 Queensland Government Architect, Department of Public Works

The Queensland Government Architect advises the state government on design and heritage matters. From time to time, the Queensland Government Architect may seek or be requested to provide advice in relation to a TOD proposal or a transport infrastructure proposal, for example, the design of a railway station precinct. This advice may have an influence on, among other things, the TTA design of a station or a station upgrade.

2.7 Queensland Fire and Rescue

The Queensland Fire and Rescue Service (QFRS) provides specialist advice regarding the handling of emergency events and the protection of community safety. The input of QFRS is sought by TMR when a development is proposed in a railway environment on the basis that such a development may be subject to an increased risk associated with a serious accident, particularly where the railway is known to carry dangerous goods. A concurrence referral received by TMR involving development in a railway environment will therefore be referred to QFRS, State Community Safety Unit, Major Infrastructure Developments for third party advice under section 256 of the *Sustainable Planning Act 2009*.



3 Integrated Development Assessment System

The Integrated Development Assessment System (IDAS) is the process under the *Sustainable Planning Act 2009* for assessing and determining development applications in Queensland. This section describes the IDAS process, TMR's concurrence agency powers and the matters that TMR takes into account in dealing with an application.

3.1 IDAS process

TMR is a concurrence agency under the Sustainable Planning Act, which means that, in addition to providing advice to the assessment manager (typically the local government), TMR may:

- impose conditions on the approval of a development application
- approve only part of an application
- request more information about an application.

Schedule 7 of the *Sustainable Planning Regulation 2009* specifies the types of applications for which TMR is a referral agency. In addition, the *Guide to referrals in relation to public transport, rail and airports* (IDAS guide 2) assists applicants and local governments to determine if TMR needs to assess a development application as a concurrence agency under IDAS.

TMR's website provides checklists to assist with the preparation of information for a development application.

3.2 Stages of IDAS

The following sets out the stages involved in the IDA process.

Stage 1 – Lodgement of development application

The applicant lodges the development application with the assessment manager (typically the local government).

Stage 2 – Referral and information request

The assessment manager reviews the development application. The applicant refers the application to the relevant IDAS referral agencies (usually state government agencies) which assess the application. Concurrence agencies (for example, TMR), may request more information about the proposed development.

Stage 3 – Notification

If the development application requires public notification, the applicant advertises the application. Public notification is required for impact assessable development and applications for preliminary approval under Section 242 of the *Sustainable Planning Act 2009*.

Stage 4 – Decision

The assessment manager determines the application by way of either an approval or a refusal. In approving the application, the assessment manager may make the approval subject to conditions, including any conditions provided by concurrence agencies. The applicant and any submitters are advised of the decision.



Where development is proposed in a railway environment TMR should be contacted as soon as possible (and preferably well before an application is lodged). Following this initial contact a request for a pre-lodgment meeting should be made in writing to TMR. The request should specify the location of the proposed development (by way of lot and plan numbers and the street address) and include indicative concept plans. TMR will endeavour to provide a written response to the concept plans within 10 working days of the pre-lodgement meeting. The response will incorporate the advice of all TMR stakeholders, including QR and TTA.

A pre-lodgment meeting can assist in the early determination of:

- the state government's level of support for the development proposal
- whether a resource entitlement needs to be obtained in the form of either the railway owner's consent to lodge a development application that affects a railway corridor, or DERM's consent to occupy state land
- whether a commercial agreement needs to be entered into with TMR or QR
- the level of information TMR or QR will require to assess the development application (for example, a geotechnical report and a risk assessment if structures are proposed to be located over a railway line).

Where a proposed development involves multiple processes (such as an IDAS referral, a Section 255 application and the resolution of commercial dealings with TMR or QR), the processes associated with each of these can be run in parallel under the coordination of TMR.

3.3 Assessment of minor development

Applications for minor development in a railway environment are typically assessed by TMR within five days of lodgement and are subject to few or no conditions. Examples of minor development include:

- the subdivision of an existing house block or the extension of an existing house
- an extension to the gross floor area of an established business by less than 10 percent or an increase in the number of dwellings in an apartment building of less than ten percent
- the addition of a new use in an existing building that does not involve the modification of the building
- the volumetric subdivision of an existing or approved building where no modification of the structure is proposed
- a development in compliance with an approval already issued by TMR, for example, for the implementation of part of an approved master plan or preliminary approval.
- a proposal for a building on a site that is partially within the railway environment, but the building's footprint is located entirely outside the railway environment.

3.4 Checklist for development in a railway environment

Introduction

This checklist covers the matters that will need to be addressed in an application for a proposed development that will be referred to TMR on the basis of its potential to have an affect on a railway environment.

Using the checklist

The checklist is presented in two parts:

- **Part A: For development in, below or above a railway corridor.**
- **Part B: For development on a site abutting a railway corridor.**

Each part of the checklist sets out the matters that will need to be addressed in a development application. Each matter is described to prompt consideration of the matter's relevance to a proposed development. With the desired development outcome in mind, the checklist should be used to ensure the application responds appropriately to all of the relevant matters.

It is recommended that an applicant review the checklist prior to the pre-lodgement meeting to help frame any questions or raise any concerns.



Australian standards, QR and TMR technical requirements and standard drawings

Where reference is made to an Australian Standard, a QR and TMR technical requirement, or standard drawing, all referenced requirements and standards are taken to mean the version current at the time of lodgement of a development application.

A proposed development is to comply, where relevant, with the QR and TMR technical requirements and standard drawings outlined below.

Note – The following list of QR and TMR technical requirements and standard drawings is current at the time of publication (Appendix 1). Future editions or amendments to this list will be available and remain current on QR and TMR's websites.

- *MCE-SR-001 - Design of road overbridges (Revision F dated 30-09-2010)*
- *MCE-SR-002 - Work in or about QR property (Revision F dated 27-09-2010)*
- *MCE-SR-003 - Work adjacent to overhead line equipment (Revision E dated 30-09-2010)*
- *MCE-SR-005 - Design of buildings over or near railways (Revision C dated 30-09-2010)*
- *MCE-SR-006 - Design of footbridges (Revision G dated 30-09-2010)*
- *MCE-SR-007 – Design and selection criteria for road/rail interface barriers (Revision A dated 30-09-2010)*
- *MCE-SR-008 – Protection screens (Revision A dated 30-09-2010)*
- *MCE-SR-012 – Collision protection of supporting elements adjacent to railways (Revision B dated 30-09-2010)*
- *MCE-SR-014– Design of noise barriers adjacent to railways (Revision A dated 30-09-2010)*
- *MCE-SR-016 - Requirements for services under the railway corridor (non-QR services) (Revision A dated 30-09-2010)*
- *Standard Drawing 1474 - Steel beam guardrail installation and set out*
- *Standard Drawing 2544 - Standard security fence (50 mm chain link fabric)*
- *Standard Drawing 2545 - Standard timber fence (1800 mm high timber paling fence)*
- *Standard Drawing 2550 - Standard rural fences (miscellaneous site layout details)*
- *Standard Drawing 2754 - Standard clearances for new structures*
- *Standard Drawing 2614 - Standard rural fences (fencing with rail posts)*

Compliance with QR's standards is generally deemed to satisfy the railway manager's requirements. Development proposals that deviate from these standards will need to be supported by sound argument and proof that the railway manager's core requirements and objectives are not compromised.

To avoid frustrations or delays, it is strongly recommended that any proposal to modify or waive requirements contained in the standards be discussed with TMR and QR at the earliest opportunity. It may be necessary to undertake a risk assessment in conjunction with QR, to validate the proposal.

Notes

1. The Queensland Fire and Rescue Service plays a significant role in ensuring the safety of development. Therefore, safety considerations should be discussed with the Queensland Fire and Rescue Service prior to the lodgement of a development application.
2. Where a proposed development necessitates the crossing of a railway corridor by utility services or other infrastructure, resource evidence is required under Section 264 of the *Sustainable Planning Act 2009*. This should be obtained from TMR prior to the lodgement of a development application.



Part A – Development in, below or above a railway corridor

Matters identified in Part A:

The following matters are likely to apply to all development proposals.

Generic matter

Part A.1 Dangerous goods and fire safety

Part A.2 Future railway corridors and upgrades

Part A.3 Stormwater and drainage

Part A.4 Services and utilities

Part A.5 Design and construction

Part A.6 Maintenance

Part A.7 Amenity

Part A.8 Protection of the railway corridor from unauthorised access

The extent to which the following matters are relevant to a proposed development will depend on the nature of the development, the attributes of the railway corridor and the characteristics of the site.

Specific matters:

Part A.9 Collision protection

Part A.10 Clearances

Part A.11 Integrating with stations and park 'n' ride facilities

Part A.12 Ventilation and lighting

Part A.13 Tunnels

Part A.14 Viaducts

Part A.15 Excavation, retaining and ground disturbance

Part A.16 Rock anchors and soil nails



Generic matters

Part A.1 Dangerous goods and fire safety

Description

The cost of developing in, below or above a railway corridor may be prohibitive because of the need to ensure the impacts of an incident involving dangerous goods and fire can be appropriately mitigated.

Is this relevant?

Will the proposed development be located in, below or above a railway corridor in which dangerous goods will be transported?

- Yes – consider the desired development outcome and checklist below
- No – go to Part A.2

Desired development outcome

Development located in, below or above a railway corridor is designed and constructed to ensure the impacts of a fire, explosion, spill, gas emission or dangerous goods incident that occurs in the railway corridor can be appropriately mitigated.

Checklist

- a. A pre-lodgement meeting has been held with TMR to enable the early assessment of risk and TMR has sought the input of the Railway Manager and the Queensland Fire and Rescue Service.
- b. A risk assessment has been undertaken to evaluate all relevant considerations relating to fire safety and the transport of dangerous goods in the railway corridor. (A risk assessment guide is provided in Appendix 1).
- c. The proposed development has been designed to minimise the impacts of fire, explosion, chemical spill, liquid fuel spill or gas emission. Measures have been incorporated in the design to:
- i. minimise or control the outbreak of fire
 - ii. control smoke and/or gas release and dispersion
 - iii. minimise heat build-up in structures
 - iv. limit the possibility of structural components being blast damaged
 - v. provide stability or contingency measures in the proposed development
 - vi. provide safe emergency access and egress to and from the railway corridor and the development
 - vii. ensure effective containment and cleanup of dangerous goods incidents.



- d. The proposed development has been designed to withstand a minimum heat load of 60 MW. Consideration has been given, in discussion with TMR, to the prospect that the proposed development, its location in the railway corridor and the risk profile of the dangerous goods transported in the corridor may mean the development will have to withstand a greater heat load.
- The design for the appropriate heat load has considered the following:
- i. the appropriate thickness of the enclosure soffit
 - ii. the coating of the enclosure soffit with passive fire protection material
 - iii. the provision of sprinklers on the enclosure soffit above the tracks to reduce the heat generation rate and suppress fire by preventing air flow to the fuel.
- e. Appropriate fire protection and alarm systems are proposed to be provided in the enclosed parts of the railway corridor.

Other advice

TMR may refer a development application to the Queensland Fire and Rescue Service for advice to ensure the relevant safety requirements have been incorporated in the design of the proposed development.

Part A.2 Future railway corridors

Description

Railway corridors are continuously being upgraded to increase the capacity of the network, minimise maintenance and respond to legislative changes aimed at improving safety, sustainability and amenity. TMR's website contains plans of future railway corridors and shows the extent of these corridors as 'future railway land'. If development is proposed in, below or above a future railway corridor, a pre-lodgement meeting should be held with TMR to determine the applicable development requirements.

Is this relevant?

Will the proposed development be located in, below or above a future railway corridor?

- Yes – consider the desired development outcome and checklist below
- No – go to Part A.3

Desired development outcome

Development accommodates proposed railway corridor upgrades and future railway corridor plans.

Checklist

- a. A pre-lodgement meeting has been held with TMR to discuss the potential impact that any upgraded or future railway corridor may have on the proposed development.
- b. The proposed development is designed to accommodate a proposed upgrade to the railway corridor and/or future railway corridors.



Part A.3 Stormwater and drainage

Description

Railway corridors should have a high level of flood immunity. Development should generally not discharge or direct stormwater, roof water or floodwater onto a railway corridor. Where circumstances necessitate the crossing of a railway corridor by stormwater and drainage infrastructure associated with a development, TMR may require resource evidence prior to the lodgement of a development application.

Is this relevant?

Will the proposed development be located in, below or above a railway corridor?

- Yes – consider the desired development outcome and checklist below
- No – go to Part A.4

Desired development outcome

The stormwater and drainage infrastructure associated with a development does not adversely impact on the function, operation or maintenance of a railway corridor.

Checklist

- a.** The development will not cause the following to be directed to or increased or concentrated in a railway corridor:
 - i. stormwater
 - ii. roof water
 - iii. ponding
 - iv. floodwater
 - v. any other drainage.
- b.** The development will not impede any drainage, stormwater or floodwater flows from a railway corridor.
- c.** Stormwater or floodwater flows have been designed to:
 - i. maintain the structural integrity of the railway corridor infrastructure
 - ii. avoid scour or deposition
 - iii. prevent obstruction of the railway corridor as a result of stormwater or flood debris.
- d.** Drainage has been design to be directed to approved legal points of discharge.
- e.** Drains have been designed to be lined with concrete and clear of railway infrastructure.
- f.** Drainage systems have been designed to prevent leakage onto the railway corridor.
- g.** Additional railway formation drainage necessitated by the development has been designed to be accommodated in the development site.
- h.** Piers and foundations have been designed to allow free drainage along the formation and not cause ponding.
- i.** Deck drainage for all road overbridges and footbridges has been designed to discharge in a manner that will not adversely affect railway tracks or associated railway facilities.



- j. Road overbridge and footbridge deck drainage has not been designed to discharge via scuppers from spans over a railway corridor or railway land. Deck drainage pipes have been designed to comply with the requirements for services in QR Technical Requirement Section 9 of *MCE-SR-001 Design of road overbridges*, or *MCE-SR-006 Design of footbridges*, whichever applies.
- k. Bridge decks have been designed to be waterproof to prevent leaking through to the railway corridor and infrastructure.
- l. Drainage and stormwater systems, including pipes for deck drainage, have not been designed to attach to the sides or undersides of structures unless the risks to the railway corridor from failure of the systems have been addressed and the systems approved by TMR.

Part A.4 Services and utilities

Description

Services and utilities associated with a development have the potential to affect railway corridor infrastructure and operations. Where a service or utility has been poorly designed or installed, there is likely to be a need for more frequent maintenance and repair. This increases the potential for interference with railway infrastructure such as electrical and signal systems.

Is this relevant?

Will the proposed development be located in, below or above a railway corridor?

- Yes – consider the desired development outcome and checklist below
- No – go to Part A.5

Desired development outcome

Railway operations are protected from the adverse effects of locating services or utilities associated with a development in a railway corridor.

Checklist

- a. Services or utilities associated with the development are not proposed to be located in the railway corridor.
or
 Where circumstances necessitate the location of a service or utility in the railway corridor, the design of the service or utility complies with QR Technical Requirement *MCE-SR-16 Requirements for services under the rail corridor (non-QR services)* and any other QR Standards relevant to the design.
- b. Pipe work (for example, water or sewer pipes) has been designed to not penetrate through any soffit or side of a proposed structure.
- c. Services and their attachment to structures have been designed to be easily repaired or replaced and result in minimal interference to railway services.
- d. The design of the development allows for easy access to railway services and utilities for example, signals, telecommunications and overhead line equipment.
- e. Existing services and utilities under a railway corridor will be protected from increased loads during the construction and operation of the development.

Other advice

All railway corridor land is considered to be contaminated and construction activity that entails disturbance of the land should therefore be managed according to the requirements of the relevant agency.



Part A.5 Design and construction

Description

The delivery of a development in, below or above a railway corridor will necessitate the resolution of a range of structural design and construction management challenges that are far in excess of those experienced on a similar development elsewhere.

A proposed development needs to take account of the practicalities of accessing the railway corridor and of seeking to interrupt railway services. Approval to interrupt services will usually not be granted and access to the railway corridor is permitted only on a very limited basis.

Is this relevant?

Will the proposed development be located in, below or above a railway corridor?

- Yes – consider the desired development outcome and checklist below
- No – go to Part A.6

Desired development outcome

The design and construction of a development located in, below or above a railway corridor has ensured the efficient operation of railway services is maintained and there are no adverse impacts on the corridor or railway operations.

Checklist

- a. A risk assessment has been undertaken that shows all potential risks associated with the construction and operation of the development will be appropriately mitigated. (A risk assessment guide is provided in Appendix 1.)
- b. An engineering report has been prepared by a Registered Professional Engineer Queensland confirming that development can be classified as an ‘importance level 2 structure’ for the purposes of *AS 1170.4 Structural design actions: Part 4 Earthquake actions in Australia* and in accordance with *AS 5100* (noting that the lateral restraint force in *AS 5100.2 Cl. 9* is not applicable to footbridges).
- c. Structures have been designed to minimise the risk of collapse during earthquakes.
- d. The proposed development has been designed to ensure construction can be carried out without interfering with railway operations.
- or
- A superstructure of a development to be erected above a railway corridor is proposed to be assembled from precast or prefabricated elements to minimise the construction timeframe and disruption to railway operations.
- e. Existing services and utilities under a railway corridor will be protected from increased loads during the construction and operation of the development.
- f. The development will not obstruct emergency access to the railway corridor.
- g. The design of the proposed development does not direct emergency exits to the railway corridor.
- h. The proposed development does not prejudice the efficient construction of future railway infrastructure.



- i. The design of the proposed development complies with, as relevant, *AS 5100 – Bridge design* and the following QR Technical Requirements:
 - i. *MCE-SR-001 Design of road overbridges*
 - ii. *MCE-SR-005 Design of buildings over or near railways*
 - iii. *MCE-SR-006 Design of footbridges.*

Other advice

1. Compliance with the *Disability Discrimination Act 1992* (DDA) may be required where a proposed development is to be adjoining or over a station or park 'n' ride facility. Information about the DDA can be found at: www.comlaw.gov.au/ComLaw/Legislation/Act1.nsf/asmade/bytitle/53071E1E3AC70505CA256F720017DABE?OpenDocument
2. Crime prevention through environmental design (CPTED) principles should be incorporated in the proposed development. Further information about CPTED can be located at: www.police.qld.gov.au/programs/crimePrevention/cpted.htm
3. A requirement for a geotechnical survey of the development site may be imposed by TMR as a condition of development approval or may form part of an Infrastructure Agreement entered into with TMR.
4. TMR may require a Construction Management Plan to be submitted for the proposed development, either as a condition of development approval or as part of an Infrastructure Agreement.
5. TMR may require a dilapidation survey to be submitted, either as a condition of development approval or as part of an Infrastructure Agreement.
6. Condition monitoring may be required by TMR, either as a condition of development approval or as part of an Infrastructure Agreement.

Part A.6 Maintenance

Description

As the railway line, overhead wires and signals need to be maintained in good working order, the development should not obstruct access to maintenance tracks in the railway corridor.

A development in, above or below a railway corridor will also have maintenance requirements that should be considered during the design phase to ensure access to the development to undertake maintenance does not necessitate access to the railway corridor.

Is this relevant?

Will the proposed development be located in, below or above a railway corridor?

- Yes – consider the desired development outcome and checklist below
- No – go Part A.7



Desired development outcome

The development has been designed so that:

1. access to the railway corridor is not required to conduct maintenance of the development
2. the Railway Manager's access to the railway corridor for maintenance purposes is maintained.

Checklist

- a. The maintenance of the development will not necessitate access from the railway corridor.
- b. The development will not obstruct, or require the removal or relocation of, a railway maintenance access point or route.
- c. The development will not increase the maintenance requirements of a railway corridor.
- d. The maintenance access arrangements for the development will be separate from the maintenance access arrangements for the railway corridor.
- e. The following will be used, as appropriate, on any part of the development that is vulnerable to graffiti and/or is visible from trains and railway platforms:
 - i. unpainted, galvanised or stainless steel elements
 - ii. self-cleaning windows
 - iii. concrete fascias with no coatings that weather prematurely
 - iv. graffiti reduction coatings.

Part A.7 Amenity

Description

Railway corridors have the potential to generate noise and vibration from the operation of passenger services, freight train movements and railway corridor maintenance. Development needs to minimise the effect of noise and vibration on nearby activities.

Is this relevant?

Will the proposed development be located in, below or above a railway corridor?

- Yes – consider the desired development outcome and checklist below
- No – go to Part A.8



Desired development outcome

Development incorporates measures to minimise the emission of noise and vibration from the railway corridor.

Checklist

- a. An acoustic and vibration report has been prepared by a Registered Professional Engineer Queensland to determine how the proposed development can minimise noise and vibration from the railway corridor. The development has been designed in accordance with the Queensland Development Code (QDC) Mandatory Part (MP) 4.4 – Buildings in Transport Noise Corridors (as identified in Chapter 8b of the *Building and Other Legislation Amendment Act 2009*). Noise sensitive uses have been designed to ensure a maximum sound level (between 10.00pm and 6.00am) of not greater than 45 decibels dB(A) and noise sensitive development of two storeys or less meets the external design level noise criteria of:
 - i. 65 dB(A) assessed as a 24-hour average equivalent continuous A-weighted sound pressure level
 - ii. 87 dB(A) assessed as a single maximum sound pressure level when measured one metre from the most exposed part of the noise sensitive place.The acoustic and vibration modeling has taken account of :
 - i. the running of long freight trains hauled by diesel locomotives as well as electric multiple units
 - ii. diesel powered track maintenance machinery, including equipment with audible reversing alarms and significant vibration generation
 - iii. projected increases in railway traffic, including future tracks and platforms.
- b. Consideration has been given to:
 - i. incorporating noise mitigation measures in buildings rather than noise walls or mounding on the corridor boundary
 - ii. building layouts that shield residential balconies and habitable rooms from noise generating activities in the railway corridor
 - iii. shielding noise sensitive uses by utilising buildings that accommodate activities not sensitive to noise as noise barriers.
- c. Balustrades on balconies exposed to railway noise of greater than 87 dB(A) single event maximum and 65 dB(A) Leq will be solid, gap-free and continuous for their complete length other than gaps required for drainage purposes. The total width of any gaps will not exceed 10 mm. The total area of the underside of the roof above these balconies requiring solid balustrades will be treated with an appropriate highly acoustically absorbent material.
- d. Where an acoustic report identifies that a noise barrier may be required, the barrier:
 - i. will be constructed of materials having a serviceable life of more than 40 years
 - ii. will require minimum maintenance over its serviceable life
 - iii. will be constructed from materials that:
 - a. are fire resistant
 - b. do not produce toxic fumes when burnt
 - c. do not cause flames to spread easily when ignited
 - d. do not result in toxic or environmentally harmful ash from burnt material
 - iv. will be vandal resistant and not easily disfigured by scratching with sharp implements
 - v. will be designed in accordance with QR Technical Requirement *MCE-SR-014 Design of noise barriers adjacent to railways*, in particular, section 7.



Part A.8 Protection of the railway corridor from unauthorised access

Description

The railway corridor needs to be protected from unauthorised access to prevent disruption of railway services, damage to railway infrastructure and harm to railway staff or passengers. The main risks associated with a railway corridor and its infrastructure include:

- **Electrocution** - this can be caused by contact with the electrical infrastructure including the overhead line equipment (OHLE).
- **Hazard from thrown objects** - damage can be caused to the OHLE and other railway infrastructure and railway staff and passengers if objects are unintentionally or maliciously thrown onto a railway corridor.
- **Unlawful access** - accidental access to and intentional trespass on a railway corridor have the potential to disrupt services, result in damage and vandalism to railway infrastructure and put trespassers at risk of being hit by a train.

Is this relevant?

Will the proposed development be located in, below or above a railway corridor?

- Yes – consider the desired development outcome and checklist below
- No – go to Part A.9

Desired development outcome

Development is designed to prevent unauthorised access to the railway corridor or contact with electrical infrastructure by people, vehicles and projectiles.

Checklist

Windows and openings

- a. Opening windows, doors, balconies and other areas that afford the opportunity for objects to be thrown onto the railway corridor or access to the OHLE, and located less than 20 metres from the centreline of the closest railway track or less than 10 metres from a railway corridor boundary, will have protection screens for anti-throw purposes and/or protection from electrification.

Protection screens - generally

- b. Protection screens have been designed in accordance with QR Technical Requirement *MCE-SR-008 Protection screens*.
- c. Protection screens within three metres of the OHLE will be electrically bonded to prevent any risk of electrocution.
- d. Protection screens will be constructed from materials that are not easily marked by scratching with a sharp implement.
- e. Protection screens will be provided where construction and maintenance works occur on or close to a railway corridor. These screens will be erected no closer than three metres (in a horizontal direction) from the nearest component of the OHLE.

Anti-throw screens

- f. Anti-throw screens will extend 2.4 metres vertically above the highest toe-hold if see-through, or two metres if non see-through, noting that expanded metal is considered to be see-through.
- g. See-through anti-throw screens will not have openings greater than 25 mm x 25 mm.



- h. Anti-throw screens will be returned a minimum of two metres at each end accessible to the public, to prevent climbing onto the back of the screen.
- i. Anti-throw screens will be provided on all bridges. The length of anti-throw screens will inhibit throwing of objects onto tracks/platforms.

Electrification screens

- j. Electrification screens will be positioned abutting live components of the OHLE to protect railway staff and members of the public from electrocution. Electrification screens will be attached to any accessible part of a development that is within three metres of the OHLE.
- k. The opportunity has been taken, where appropriate, to extend the electrification screens for dual purpose use in locations requiring the fitting of both electrification and anti-throw screens.
- l. Any perforations in electrification screens will be less than 8 mm wide. Where expanded metal panels are to be used, they will be oriented to cause objects pushed through them to protrude upwards.
- m. Where electrification screen perforations are larger than 3.5 mm wide and the bridge clearance above conductors is less than two metres, extra protection will be provided by way of either:
 - i. ensuring the lowest one metre of the screen is solid
 - ii. installing a hood above the overhead wires, extending at least one metre away from the bridge (measured perpendicular to the bridge).
- n. If an electrification screen is within 1.5 metres horizontally of the conductor, it will not have perforations larger than 3.5 mm wide.
- o. Electrification screens will extend at least three metres horizontally past the electrical equipment they are shielding.
- p. Electrification screens will be provided on all footbridges over an electrified railway. Screens will extend at least three metres horizontally both sides of conductors measured perpendicular to the track.
- q. Electrification screens will be provided on stairs and ramps within three metres horizontally of any part of the OHLE.
- r. Electrification screens will extend vertically 1.8 metres above the highest foothold.
- s. Electrification screens will extend from the point where conductors are level with the top of the screen to the top of the stairway or ramp. Below this point, screens will extend one metre towards the bottom, measured horizontally.
- t. Where retaining walls, wing walls and other significant embankments are located within three metres horizontally of the OHLE, electrification screens will be provided.

Road barriers

- u. Road barriers will be installed along roads abutting a railway corridor in accordance with QR Technical Requirement *MCE-SR-007 Design and selection criteria for road/rail interface barriers*.
- v. Road traffic barriers will be provided across road overbridges and on approaches to prevent vehicles leaving the roadway and accessing the railway corridor. Road traffic barriers on road overbridges will be designed in accordance with:
 - i. *AS 5100 Bridge design*
 - ii. QR Technical Requirement *MCE-SR-007 Design and selection criteria for road/rail interface barriers*.



- w. Where car parking structures are provided within or over a railway corridor, traffic barriers, designed in accordance with *AS 5100 Bridge design*, and QR Technical Requirement *MCE-SR-007 Design and selection criteria for road/rail interface barriers* will be provided along any floor with a boundary to the railway corridor to prevent vehicles from accessing the corridor.

Fencing

- x. Fencing will be installed along the property boundary with the railway corridor in accordance with QR Standard Drawings for fencing.

Specific matters

The following matters may or may not apply to development within or over a railway corridor, depending on the nature of the proposed development, the site and the railway corridor.

Part A.9 Collision protection

Description

Any structure located in the railway corridor should be designed and constructed to withstand damage from a derailed train. Deflection walls and structural redundancy may need to be provided in a proposed development. Such measures should also be considered in situations where a development is located at the base of a railway embankment or has a basement that could be impacted by a derailed train.

Is this relevant?

Will the proposed development be located in, below or above a railway corridor?

- Yes – consider the desired development outcome and checklist below
- No – go to Part A.10

Desired development outcome

A development in a railway corridor is designed to ensure the structural integrity of the development is maintained in the event of an impact from a derailed train.

Checklist

- a. A risk assessment has been undertaken considering all matters relating to the standard of collision protection required for the proposed development, such as the alignment of the railway tracks, the nature and frequency of trains using the track and the proximity of the supporting structure of the proposed development to the railway tracks and other railway infrastructure.
- b. All new structures have been designed for collision loads in accordance with *AS 5100 Bridge design*.
- Where the proposed development involves existing piers and columns that do not meet the collision protection and collision load requirements specified in *AS 5100 Bridge design*, deflection walls have been provided. Where space permits, independent deflection walls have been provided.



- c. Given that the collision loads in *AS 5100 Bridge design* do not cover the impact of explosions in the enclosed spaces underneath a development, additional design measures have been incorporated as relevant, to protect against explosions beneath the development, including:
 - i. the selective location of supporting elements to avoid domino effects
 - ii. the spacing of supporting elements of sufficient number to provide strength, while still providing ventilation
 - iii. the use of structural walls instead of columns where appropriate
- d. A structural redundancy analysis has been carried out to verify the capacity to support the deck load at the ultimate limit state with one or more of the supporting columns removed.
- e. Supporting elements for the proposed development have been designed to comply with QR Technical Requirement *MCE-SR-012 Collision protection of supporting elements adjacent to railways*.
- f. All new development over the railway corridor will utilise clear spans with no piers or supporting elements located in the corridor.

Part A.10 Clearances

Description

It is extremely important to maintain the safety and integrity of the overhead line equipment (OHLE). Development in or above a railway corridor therefore needs to maintain an appropriate clearance above the OHLE.

Is this relevant?

Will the proposed development be located above a railway corridor?

- Yes – consider the desired development outcome and checklist below
- No – go to Part A.11

Desired development outcome

A development in or above a railway corridor should be designed and constructed to maintain sufficient clearance above railway infrastructure and to have no effect on the OHLE.

Checklist

- a. The proposed development will not impact on existing or planned OHLE or other railway infrastructure.
- b. The proposed development has been designed in accordance with QR Standard Drawing 2754 *Standard clearances for new structures* and complies with the following vertical clearances:
 - i. the lowest part of the proposed development is a minimum of 7.9 metres above the railway track where the proposed development is intended to extend along the railway corridor for a distance of less than 40 metres
 - ii. the lowest part of the proposed development is a minimum of 9.0 metres above the railway track where the proposed development is intended to extend along the railway corridor for a distance of between 40 metres and 80 metres.

(Refer to Figure 3 – Clearances).

A development that is proposed to extend along a corridor for more than 80 metres is considered to form a tunnel and is subject to other requirements as specified by TMR.



- c. Structures have been designed to be set back horizontally a minimum of three metres from the OHLE (Refer Figure 4 – Setbacks).
- d. Any footbridges and road overbridges proposed as part of the development have been designed to comply with the following as relevant:
 - i. AS 5100 – Bridge design
 - ii. QR Technical Requirement *MCE–SR-006 Design of footbridges*
 - iii. QR Technical Requirement *MCE–SR-001 Design of road overbridges*.

Other advice

The plans for the proposed development should show the centre lines of all railway tracks located in the vicinity of the proposed development and include the railway kilometrage at the intersection of railway and bridge centre lines. The plans should also locate all railway infrastructure in the vicinity of the proposed development.

Figure 3 – Clearances

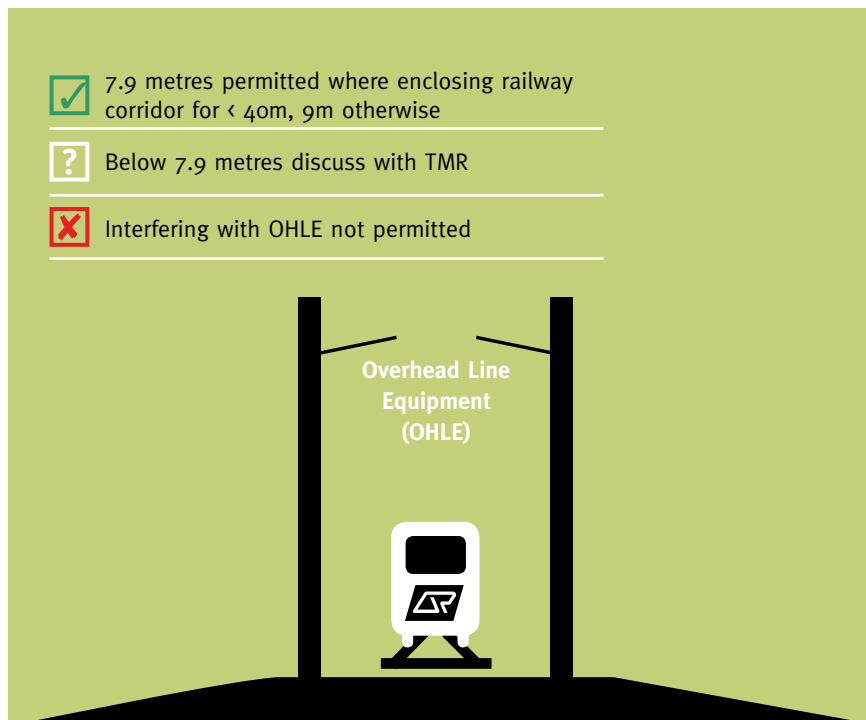
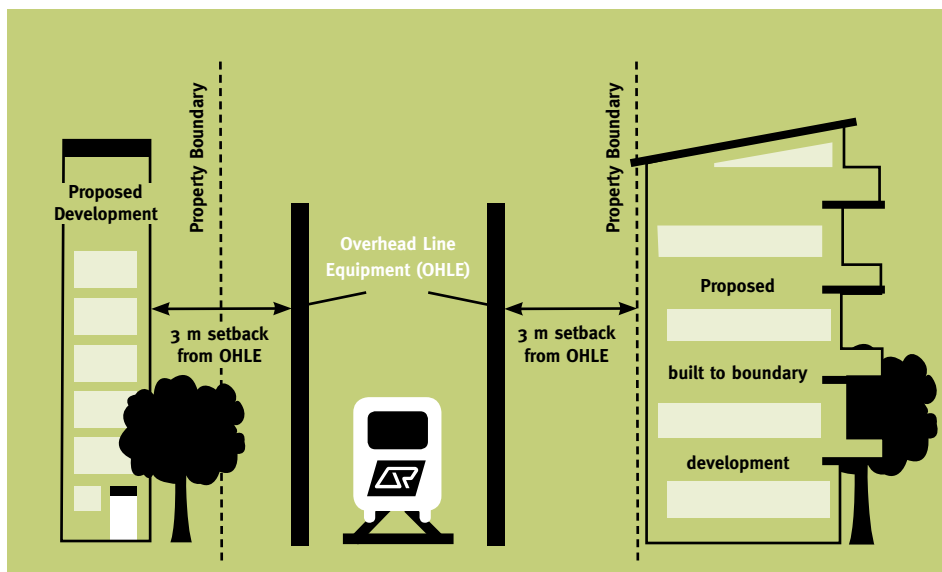


Figure 4 – Setbacks



Part A.11 Integrating with stations and park ‘n’ ride facilities

Description

A development proposed above a railway station should be designed to ensure the station remains functional and accessible. In some situations, the upgrading of a station or a park ‘n’ ride facility may be undertaken in conjunction with the construction of a development subject to station upgrade priorities and the availability of funding. Where appropriate, TMR may enter into an Infrastructure Agreement that contains a cost sharing arrangement for the provision of railway infrastructure.

The Queensland Government does not generally support development proposals that necessitate the total enclosure of station platforms on the basis that the absence of natural light and ventilation increases the operating costs of a station. The Queensland Government also will not generally support a development proposal that involves complex grade separated pedestrian movement arrangements for a station as this would disperse pedestrian flows onto multiple levels, decrease surface level activity around the station and reduce legibility of station entrances.

Is this relevant?

Will the proposed development involve works within or over a railway station or park ‘n’ ride facility?

- Yes – consider the desired development outcome and checklist below
- No – go to Part A.12



Desired development outcome

A development above a railway station or park 'n' ride facility is well integrated with the station and enables efficient pedestrian and cyclist movement to and from the station, allowing the convenient and safe use and operation of the railway service.

Checklist

- a. A pre-lodgement meeting has been held with TMR enabling the early assessment of risk.
- b. The proposed development will provide the following, where appropriate:
 - i. maintained or improved access to railway station entrances
 - ii. new, improved or maintained facilities including the following where necessary:
 - taxi access and loading zones
 - park 'n' ride facilities
 - kiss 'n' ride facilities
 - bus stops
 - pedestrian and cycle network connections
 - bike storage and/or end of trip facilities
 - maintenance and emergency access to station facilities.
 - iii. safe and efficient pedestrian access routes between station entrances and associated facilities such as park 'n' ride and kiss 'n' ride facilities, public transport interchanges and any nearby thoroughfares
 - iv. promotion of railway station legibility and incorporation of way finding signs and electronic timetables
 - v. separate emergency access and exit points for the proposed development that do not direct an evacuation onto the railway corridor or toward a railway emergency exit.
- c. Where there is an existing park 'n' ride facility, the proposed development will:
 - i. maintain the required number of park 'n' ride car parking spaces in accordance with TTA's Park 'n' Ride Strategy
 - ii. locate transit supportive uses (extended hours convenience retailing and the like) along the pedestrian link between the station entrance and the park 'n' ride facility.
- d. Pedestrian footpaths connecting to and within 100 metres of a station entrance have been designed to be a minimum of 2.4 metres in width.
- e. Where public access to the railway station is required through the proposed development, a public access easement will be provided for in favour of TMR.
- f. The proposed development will not interrupt efficient pedestrian movement to and from a railway station.
- g. The proposed development, will not locate waste receptacles, waste storage areas, vents or plant equipment in areas adjacent to or in plain sight of railway station platforms.
- h. The proposed development will not have blank, unarticulated or graffiti-vulnerable walls in areas visible from a railway station platform.
- i. The proposed development will provide casual surveillance and activation along pedestrian thoroughfares to stations and park 'n' ride facilities.
- j. The proposed development will provide shade and shelter over pedestrian paths located in or next to the development.



Other advice

1. TMR may agree to coordinate the design of a railway station or park 'n' ride upgrade with the design a development proposal and approve a resource evidence under section 264 of the *Sustainable Planning Act 2009*
2. Crime Prevention Through Environmental Design (CPTED) principles should be addressed where a proposed development is to be in or above a station or park 'n' ride facility.

Part A.12 Ventilation and lighting

Description

Where a development encloses a railway corridor, it should be designed to allow access to natural light and ventilation in the corridor. This is especially important where a development is located above a railway station.

Is this relevant?

Will the proposed development be located above a railway corridor?

- Yes – consider the desired development outcome and checklist below
- No – go to Part A.13.

Desired development outcome

A development above a railway corridor is designed to facilitate natural ventilation and lighting of the railway corridor, particularly a station environment.

Checklist

- a. Where a proposed development is planned to extend above a railway corridor for a length of up to 80 metres, sufficient gaps have been designed in the development to ensure adequate natural ventilation. The size of the gaps is in accordance with the recommendations of a ventilation study of the proposed development.
- or
- Where a proposed development is planned to extend above a railway corridor for a length of more than 80 metres, ventilation shafts have been designed at appropriate intervals.
- b. Where a development is proposed above a railway corridor for a length of more than 80 metres, modeling of smoke dispersion has been undertaken by a Registered Professional Engineer Queensland to predict ventilation patterns and inform ventilation design.
- c. Where a proposed development is located above a railway corridor, the ventilation design has resolved how to maintain railway operations during a fire emergency. The ventilation systems have been designed to control smoke and allow emergency response teams to enter safely with appropriate fire fighting and protective equipment.
- d. Where ventilation shafts are provided as part of a proposed development, discharge points for the vents have been designed to be located in a position where escaping toxic plumes will not enter air-conditioning intake ducts or affect nearby sensitive uses such as residential, education and medical uses.

The design of the ventilation system for the proposed development has been prepared in accordance with a dispersion modeling analysis prepared by a Registered Professional Engineer Queensland. The analysis utilised meteorological data applicable to the building location for various combinations of wind speeds and Pasquil stability conditions.



- e. Air-conditioning intakes, when located above or in the vicinity of ventilation vents, are proposed to be fitted with smoke detectors which automatically shut down air-conditioning fans and dampers.
- f. Where a proposed development is located above a railway station, the lighting of the station has been designed to have an uninterrupted power supply and be able to operate in the event of a fire or other emergency situation.

Part A.13 Tunnels

Description

Where a proposed development involves construction, excavation or filling above a railway tunnel, groundwater and geotechnical investigations should be undertaken to ensure the tunnel will not be affected.

Is this relevant?

Will the proposed development be located above a railway tunnel?

- Yes – consider the desired development outcome and checklist below
- No – go to Part A.14

Desired development outcome

A development in the vicinity of a railway tunnel should not cause the tunnel to be overloaded vertically or affected by the addition or removal of lateral pressures. The groundwater regime should not be altered in a way that would adversely affect the tunnel.

Checklist

- a. A comprehensive geotechnical assessment, encompassing groundwater assessment, has been prepared by a Registered Professional Engineer Queensland. The assessment demonstrates that the proposed development will not cause the tunnel to be vertically overloaded or affected by the addition or removal of lateral pressures and it will not adversely affect the integrity of the tunnel as a result of directly or indirectly disturbing groundwater.

Other advice

1. Reporting by a Registered Professional Engineer Queensland may not be required depending on the scope and extent of the works and their distance from the railway corridor. This should be confirmed with TMR.
2. Where excavation, drilling or other similar ground disturbing works are to be carried out abutting a railway tunnel, monitoring of tunnel linings throughout construction by a Registered Professional Engineer Queensland may be required. This will depend on the extent of works and their distance from a railway tunnel.

Part A.14 Viaducts

Description

Emergency access to a railway viaduct may be required from time to time, in addition to regular maintenance access. Accordingly, any development located below a railway viaduct is to be limited to temporary structures and minor uses such as car parking and outdoor storage.

Is this relevant?

Will the proposed development be located in or above a railway corridor containing a viaduct?

- Yes – consider the desired development outcome and checklist below
- No – go to Part A.15

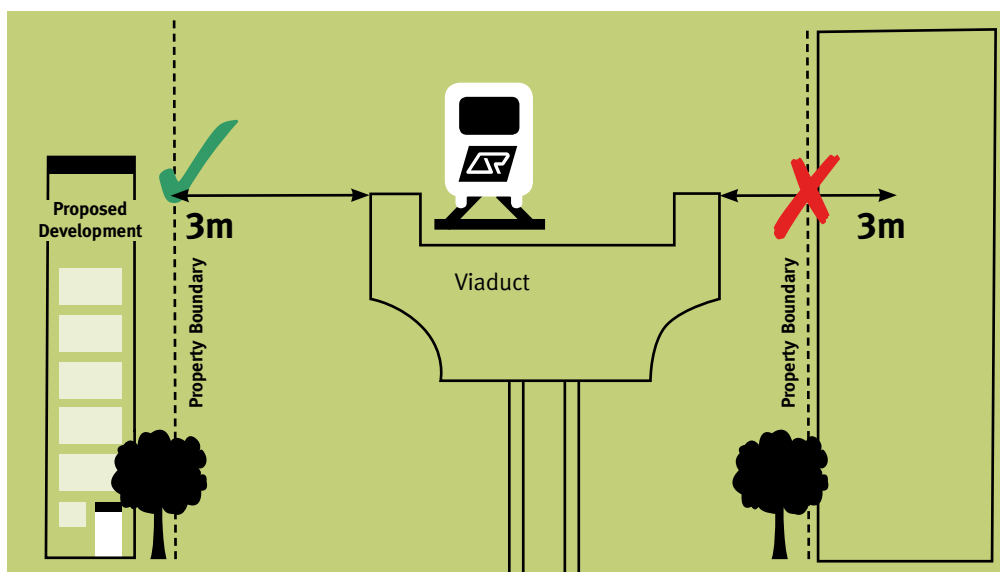
Desired development outcome

A development should be designed to avoid risks to operations and infrastructure associated with a railway viaduct.

Checklist

- a. The part of a proposed development located below a railway viaduct is intended to be used only for temporary activities and will be limited in use to ancillary activities such as car parking or outdoor storage.
- b. Land underneath a railway viaduct is proposed to be clear of permanent structures or any other activity that may impede construction and maintenance of railway infrastructure or emergency access.
- c. The proposed development abutting a railway viaduct will be set back a minimum of 3 metres from the viaduct structure (refer to Figure 5 – Viaducts).
- d. The development will not restrict emergency access to a railway viaduct.

Figure 5 – Viaducts





Part A.15 Excavation, retaining and other ground disturbance

Description

Excavation, retaining works and other works involving ground disturbance can significantly affect the safety and operational integrity of railway corridors and accordingly are generally not permitted. Where such works are unavoidable, it may be necessary to undertake surveying, groundwater and geotechnical investigations to ensure the works will not adversely affect the corridor.

Is this relevant?

Will the proposed development necessitate excavation, retaining or other ground disturbance in or below a railway corridor?

- Yes – consider the desired development outcome and checklist below
- No – go to Part A.16

Desired development outcome

Excavation, retaining works and other ground disturbance works associated with a proposed development should not impact on the safety and operational integrity of the railway or cause the de-stabilisation of railway transport infrastructure.

Checklist

- a. The design of proposed excavation works, retaining works and other works involving ground disturbance abutting a railway corridor is supported by a report prepared by a Registered Professional Engineer Queensland which confirms that the works will not de-stabilise railway transport infrastructure.
- b. Temporary structures and batters are not planned to encroach into a railway corridor. Where approved, temporary structures or batters in the railway corridor are able to be easily removed and the corridor returned to its former state.
- c. The development will not necessitate the storage of fill, spoil or any other material on a railway corridor at any stage of construction.
- d. Retaining structures necessary to stabilise any excavations for a development will be located outside the railway corridor boundary.

Other advice

Provision should be made to monitor the position of potentially affected track and other railway infrastructure in real time.



Part A.16 Rock anchors and soil nails

Description

The use of rock anchors and soil nails in a railway corridor has the potential to disrupt the safety and operational integrity of the corridor and may constrain future corridor upgrading.

Accordingly, rock anchors and soil nails are generally not permitted in a railway corridor. However, in exceptional circumstances temporary anchors and/or soil nails may be permitted. These anchors or soil nails should be temporary in the sense that they are not required to support a development beyond the period of its construction. The use of temporary anchors and/or soil nails in a corridor should be discussed with TMR prior to lodgement of a development application.

Is this relevant?

Will the proposed development involve the use of rock anchors and/or soil nails in or below a railway corridor?

- Yes – consider the desired development outcome and checklist below
- No – assessment against Part 1 completed

Desired development outcome

Railway corridors are not affected by rock anchors and/or soil nails and therefore are not subject to such associated impacts as ground disturbance and constraints on the maintenance or future upgrading of railway infrastructure.

Checklist

- a. Temporary soil nails and/or rock anchors located within a railway corridor have been designed so that they do not interfere with railway infrastructure.
- b. Temporary soil nails and/or rock anchors that are intended to remain in place, are proposed to be de-stressed following construction to avoid unnecessary disturbance to the railway corridor.
- c. The design and installation of temporary soil nails and/or rock anchors within a railway corridor is supported by a report prepared by a Registered Professional Engineer Queensland that confirms the works will not de-stabilise railway transport infrastructure or place any unnecessary risk on the railway corridor.

Other advice

Provision should be made for continuous monitoring of the railway corridor throughout construction including independent geotechnical advice from a Registered Professional Engineer Queensland.



Part B – Development abutting a railway corridor

Matters identified in Part B:

The following matters are likely to apply to all development proposals.

Generic matters:

- Part B.1 Setbacks**
- Part B.2 Future railway corridors and upgrades**
- Part B.3 Stormwater and drainage**
- Part B.4 Services and utilities**
- Part B.5 Design and construction**
- Part B.6 Maintenance**
- Part B.7 Amenity**
- Part B.8 Protection from unauthorised access to a railway corridor**

The extent to which the following matters are relevant to a proposed development will depend on the nature of the development, the attributes of the railway corridor and the characteristics of the site.

Specific matters:

- Part B.9 Integrating with stations**
- Part B.10 Tunnels**
- Part B.11 Viaducts**
- Part B.12 Excavation, retaining and ground disturbance**



Generic matters

Part B.1 Setbacks

Description

It is extremely important to maintain the safety and integrity of the overhead line equipment (OHLE). Development abutting a railway corridor therefore needs to maintain appropriate setbacks from OHLE.

Is this relevant?

Will the proposed development abut a railway corridor?

- Yes – consider the desired development outcome and checklist below
- No – go to Part B.2

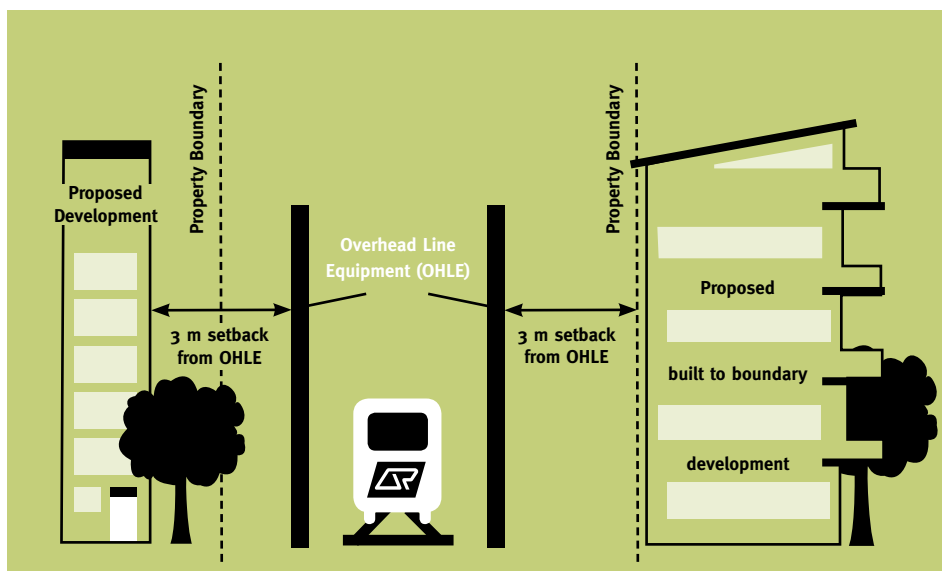
Desired development outcome

A development abutting a railway corridor should be designed and constructed to maintain sufficient clearance to railway infrastructure and to have no effect on the OHLE.

Checklist

- a. The proposed development has been designed to be set back horizontally a minimum of 3 metres from the OHLE (refer to Figure 6 – Setbacks).
- b. The proposed development has been designed with setbacks that provide for an access way abutting the railway corridor to facilitate building maintenance.

Figure 6 – Setbacks





Part B.2 Future railway corridors

Description

Railway corridors are continuously being upgraded to increase the capacity of the network, minimise maintenance and respond to legislative changes aimed at improving safety, sustainability and amenity. TMR's website contains plans of future railway corridors and shows the extent of these corridors as 'future railway land'. If development is proposed abutting a future railway corridor, a pre-lodgement meeting should be held with TMR to determine the applicable development requirements.

Is this relevant?

Will the proposed development abut a railway corridor that is to be upgraded or a future railway corridor?

- Yes – consider the desired development outcome and checklist below
- No – go to Part B.3

Desired development outcome

Development accommodates proposed railway corridor upgrades and future railway corridor plans.

Checklist

- a. A pre-lodgement meeting has been held with TMR to discuss the potential impact that any upgraded or future railway corridor may have on the proposed development.
- b. The proposed development has been designed to accommodate a proposed upgrade to the railway corridor and/or future railway corridors.

Part B.3 Stormwater and drainage

Description

Railway corridors should have a high level of flood immunity. Development should generally not discharge or direct stormwater, roof water or floodwater onto a railway corridor. Where circumstances necessitate the crossing of a railway corridor by stormwater and drainage infrastructure associated with a development, TMR may require a resource evidence prior to the lodgement of a development application.

Is this relevant?

Will the proposed development abut a railway corridor?

- Yes – consider the desired development outcome and checklist below
- No – go to Part B.4



Desired development outcome

The stormwater and drainage infrastructure associated with a development does not adversely impact on the function, operation or maintenance of a railway corridor.

Proposed development and its associated drainage and stormwater should not adversely impact on the function, operation or maintenance of a railway corridor.

Checklist

- a. The development will not cause the following to be directed to or increased or concentrated in a railway corridor:
 - i. stormwater
 - ii. roof water
 - iii. ponding
 - iv. floodwater
 - v. any other drainage.
- b. The development will not impede any drainage, stormwater or floodwater flows from a railway corridor.
- c. Stormwater or floodwater flows have been designed to:
 - i. maintain the structural integrity of the railway corridor infrastructure
 - ii. avoid scour or deposition
 - iii. prevent obstruction of the railway corridor as a result of stormwater or flood debris.
- d. Drainage has been design to be directed to approved legal points of discharge.
- e. Drains have been designed to be lined with concrete and clear of railway infrastructure.
- f. Drainage systems have been designed to prevent leakage onto the railway corridor.
- g. Additional railway formation drainage necessitated by the development has been designed to be accommodated in the development site.
- h. Piers and foundations have been designed to allow free drainage along the formation and not cause ponding.
- i. Retaining structures for excavations abutting the railway corridor have been designed to include provision for drainage.
- j. Drainage and stormwater systems have not been designed to attach to the sides of structures unless the risks to the railway corridor from failure of the systems have been addressed and the systems approved by TMR.

Part B.4 Services and utilities

Description

Services and utilities associated with a development have the potential to affect railway corridor infrastructure and operations. Where a service or utility has been poorly designed or installed, there is likely to be a need for more frequent maintenance and repair. This increases the potential for interference with railway infrastructure such as electrical and signal systems.

Is this relevant?

Will the proposed development about a railway corridor?

- Yes – consider the desired development outcome and checklist below
- No – go to Part B.5



Desired development outcome

Railway operations are protected from the adverse effects of locating services or utilities associated with a development in a railway corridor.

Checklist

- a. Pipe work (for example, water or sewer pipes) has been designed to not penetrate through the side of a built-to-boundary wall abutting the railway corridor.
- b. Services have been designed to be easily repaired or replaced and result in minimal interference to railway services.

Part B.5 Design and construction

Description

The safety and operational integrity of the railway corridor is a high priority. The construction of a development should therefore not involve access to the railway corridor or cause any interruption to services.

Is this relevant?

Will the proposed development abut a railway corridor?

- Yes – consider the desired development outcome and checklist below
- No – go to Part B.6

Desired development outcome

The design and construction of a development abutting a railway corridor has ensured the efficient operation of railway services is maintained and there are no adverse impacts on the corridor or railway operations.

Checklist

- a. The proposed development has been designed to ensure construction can be carried out without interfering with railway operations.
- b. The proposed development has been designed to enable the development to be demolished with minimal interference to the railway corridor and its operations.
- c. The development will not obstruct emergency access to the railway corridor.
- d. The design of the proposed development does not direct emergency exits to the railway corridor.

Other advice

1. A proposed development abutting a railway corridor may need to incorporate some degree of collision protection depending on the type of development, the railway track alignment and the proximity of the proposed development to track centreline.
2. Compliance with the *Disability Discrimination Act 1992* (DDA) may be required where a proposed development abuts a railway corridor. Information about the DDA can be found at: www.comlaw.gov.au/ComLaw/Legislation/Act1.nsf/asmade/bytitle/53071E1E3AC70505CA256F720017DABE?OpenDocument
3. Crime prevention through environmental design (CPTED) principles should be incorporated in the proposed development. Further information about CPTED can be located at: www.police.qld.gov.au/programs/crimePrevention/cpted.htm



Part B.6 Maintenance

Description

As the railway line, overhead wires and signals need to be maintained in good working order, the development should not obstruct access to maintenance tracks in the railway corridor.

A development abutting a railway corridor will also have maintenance requirements that should be considered during the design phase to ensure access to the development to undertake maintenance does not necessitate access to the railway corridor.

Is this relevant?

Will the proposed development abut a railway corridor?

- Yes – consider the desired development outcome and checklist below
- No – go to Part B.7

Desired development outcome

The development has been designed so that:

1. access to the railway corridor is not required to conduct maintenance of the development
2. the Railway Manager's access to the railway corridor for maintenance purposes is maintained.

Checklist

- a. The maintenance of the development will not necessitate access from the railway corridor.
- b. The development will not increase the maintenance requirements of a railway corridor.
- c. The development will not obstruct, or require the removal or relocation of, a railway maintenance access point or route.
- d. The maintenance access arrangements for the development will be separate from the maintenance access arrangements for the railway corridor.
- e. The following will be used, as appropriate, on any part of the development that is vulnerable to graffiti and/or is visible from trains and railway platforms:
 - i. unpainted, galvanised or stainless steel elements
 - ii. self-cleaning windows
 - iii. concrete fascias with no coatings that weather prematurely
 - iv. graffiti reduction coatings.



Part B.7 Amenity

Description

Railway corridors have the potential to generate noise and vibration from the operation of passenger services, freight train movements and railway corridor maintenance. Development needs to minimise the effect of noise and vibration on nearby activities.

Is this relevant?

Will the proposed development abut a railway corridor?

- Yes – consider the desired development outcome and checklist below
- No – go to Part B.8

Desired development outcome

Development incorporates measures to minimise the emission of noise and vibration from the railway corridor.

Checklist

- a. An acoustic and vibration report has been prepared by a Registered Professional Engineer Queensland to determine how the proposed development can minimise noise and vibration from the railway corridor. The development has been designed in accordance with the Queensland Development Code (QDC) Mandatory Part (MP) 4.4 – Buildings in Transport Noise Corridors (as identified in Chapter 8b of the *Building and Other Legislation Amendment Act 2009*). Noise sensitive uses have been designed to ensure a maximum sound level (between 10.00pm and 6.00am) of not greater than 45 decibels dB(A) and noise sensitive development of two storeys or less meets the external design level noise criteria of:
- i. 65 dB(A) assessed as a 24-hour average equivalent continuous A-weighted sound pressure level
 - ii. 87 dB(A) assessed as a single maximum sound pressure level when measured one metre from the most exposed part of the noise sensitive place.
- The acoustic and vibration modelling has taken account of :
- i. the running of long freight trains hauled by diesel locomotives as well as electric multiple units
 - ii. diesel powered track maintenance machinery, including equipment with audible reversing alarms and significant vibration generation
 - iii. projected increases in railway traffic, including future tracks and platforms.
- b. Consideration has been given to:
- i. incorporating noise mitigation measures in buildings rather than noise walls or mounding on the corridor boundary
 - ii. building layouts that shield residential balconies and habitable rooms from noise generating activities in the railway corridor
 - iii. shielding noise sensitive uses by utilising buildings that accommodate activities not sensitive to noise as noise barriers.



- c. Balustrades on balconies exposed to railway noise of greater than 87 dB(A) single event maximum and 65 dB(A) Leq will be solid, gap-free and continuous for their complete length other than gaps required for drainage purposes. The total width of any gaps will not exceed 10 mm. The total area of the underside of the roof above these balconies requiring solid balustrades will be treated with an appropriate highly acoustically absorbent material.

- d. Where an acoustic report identifies that a noise barrier may be required, the barrier:
 - i. will be constructed of materials having a serviceable life of more than 40 years
 - ii. will require minimum maintenance over its serviceable life
 - iii. will be constructed from materials that:
 - a. are fire resistant
 - b. do not produce toxic fumes when burnt
 - c. do not cause flames to spread easily when ignited
 - d. do not result in toxic or environmentally harmful ash from burnt material
 - iv. will be vandal resistant and not easily disfigured by scratching with sharp implements
 - v. will be designed in accordance with QR Technical Requirement *MCE-SR-014 Design of noise barriers adjacent to railways*, in particular, section 7.

Part B.8 Protection of the railway corridor from unauthorised access

Description

The railway corridor needs to be protected from unauthorised access to prevent disruption of railway services, damage to railway infrastructure and harm to railway staff or passengers. The main risks associated with a railway corridor and its infrastructure include:

- **Electrocution** - this can be caused by contact with the electrical infrastructure including the overhead line equipment (OHLE).
- **Hazard from thrown objects** - damage can be caused to the OHLE and other railway infrastructure and railway staff and passengers if objects are unintentionally or maliciously thrown onto a railway corridor.
- **Unlawful access** - accidental access to and intentional trespass on a railway corridor have the potential to disrupt services, result in damage and vandalism to railway infrastructure and put trespassers at risk of being hit by a train.

Is this relevant?

Will the proposed development abut a railway corridor?

- Yes – consider the desired development outcome and checklist below
- No – go to Part B.9



Desired development outcome

Development is designed to prevent unauthorised access to the railway corridor or contact with electrical infrastructure by people, vehicles and projectiles.

Checklist

Windows and openings

- a. Opening windows, doors, balconies and other areas that afford the opportunity for objects to be thrown onto the railway corridor or access to the OHLE, and located less than 20 metres from the centreline of the closest railway track or less than 10 metres from a railway corridor boundary, will have protection screens for anti-throw purposes and/or protection from electrification.

Protection screens - generally

- b. Protection screens have been designed in accordance with QR Technical Requirement *MCE-SR-008 Protection screens*.
- c. Protection screens within three metres of the OHLE will be electrically bonded to prevent any risk of electrocution.
- d. Protection screens will be constructed from materials that are not easily marked by scratching with a sharp implement.
- e. Protection screens will be provided where construction and maintenance works occur on or close to a railway corridor. These screens will be erected no closer than three metres (in a horizontal direction) from the nearest component of the OHLE.

Anti-throw screens

- f. Anti-throw screens will extend 2.4 metres vertically above the highest toe-hold if see-through, or two metres if non see-through, noting that expanded metal is considered to be see-through.
- g. See-through anti-throw screens will not have openings greater than 25 mm x 25 mm.
- h. Anti-throw screens will be returned a minimum of two metres at each end accessible to the public, to prevent climbing onto the back of the screen.

Electrification screens

- i. Electrification screens will be positioned abutting live components of the OHLE to protect railway staff and members of the public from electrocution. Electrification screens will be attached to any part of a development that is within 3 metres of the OHLE.
- j. The opportunity has been taken, where appropriate, to extend the electrification screens for dual purpose use in locations requiring the fitting of both electrification and anti-throw screens.
- k. Any perforations in electrification screens will be less than 8 mm wide. Where expanded metal panels are to be used, they will be oriented to cause objects pushed through them to protrude upwards.
- l. Where electrification screen perforations are larger than 3.5 mm wide and the clearance from the screens to the conductors is less than 2 metres, extra protection will be provided by way of either:
 - i. ensuring the lowest one metre of the screen is solid
 - ii. installing a hood above the overhead wires, extending at least 1 metre away from the nearest surface (measured perpendicular to that surface).
- m. If an electrification screen is within 1.5 metres horizontally of the conductor, it will not have perforations larger than 3.5 mm wide.
- n. Electrification screens will extend at least 3 metres horizontally past the electrical equipment that they are shielding.



- o. Electrification screens will be provided on stairs and ramps within 3 metres horizontally of any part of the OHLE.
- p. Electrification screens will extend vertically 1.8 metres above the highest foothold.
- q. Electrification screens will extend from the point where conductors are level with the top of the screen to the top of the stairway or ramp. Below this point, screens will extend 1 metre towards the bottom, measured horizontally.
- r. Where retaining walls, wing walls and other significant embankments are located within 3 metres horizontally of the OHLE, electrification screens will be provided.

Road barriers

- s. Road barriers will be installed along roads abutting a railway corridor in accordance with QR Technical Requirement *MCE-SR-007 Design and selection criteria for road/rail interface barriers*.
- t. Where car parking structures are proposed abutting a railway corridor, traffic barriers, designed in accordance with *AS 5100 Bridge Design*, and QR Technical Requirement *MCE-SR-007 Design and selection criteria for road/rail interface barriers* will be provided along any floor with a boundary to the railway corridor to prevent vehicles from accessing the corridor.

Fencing

- u. Fencing will be installed along the property boundary with the railway corridor in accordance with QR Standard Drawings for fencing.

Specific matters

The following matters may or may not apply to development within or over a railway corridor, depending on the nature of the proposal, the site and the railway corridor.

Part B.9 Integrating with stations

Description

A development abutting a railway station should be designed to ensure the station remains functional and accessible. Maximising the visibility of the railway station and the legibility of access to the station is of greatest importance in the design process.

Is this relevant?

Will the proposed development abut a railway station?

- Yes – consider the desired development outcome and checklist below
- No – go to Part B.10



Desired development outcome

A development abutting a railway station should enable efficient pedestrian and cyclist movement to and from the station, allowing the convenient and safe use and operation of the railway service.

Checklist

- a. A pre-lodgement meeting has been held with TMR enabling the matters that will need to be resolved prior to lodgement of a development application to be identified.
- b. The proposed development will provide the following, where appropriate:
 - i. maintained or improved access to railway station entrances
 - ii. new, improved or maintained facilities including the following where necessary:
 - taxi access and loading zones
 - park 'n' ride facilities
 - kiss 'n' ride facilities
 - bus stops
 - pedestrian and cycle network connections
 - bike storage and/or end of trip facilities
 - maintenance and emergency access to station facilities.
 - iii. safe and efficient pedestrian access routes between station entrances and associated facilities such as park 'n' ride and kiss 'n' ride facilities, public transport interchanges and any nearby thoroughfares
 - iv. promotion of railway station legibility and incorporation of way finding signs and electronic timetables
 - v. separate emergency access and exit points for the proposed development that do not direct an evacuation onto the railway corridor or toward a railway emergency exit.
- c. Where a proposed development abuts a railway station access and the length of the development is more than 200 metres, safe and direct pedestrian and cyclist connections will be provided through the development.
- d. Where public access to the railway station is required through the proposed development, a public access easement will be provided for in favour of TMR.
- e. Pedestrian footpaths connecting to and within 100 metres of a station entrance have been designed to be a minimum of 2.4 metres in width.
- f. The proposed development will not locate waste receptacles, waste storage areas, vents or plant equipment adjacent to or in plain sight of the railway station platforms.
- g. The proposed development will not have blank, unarticulated or graffiti-vulnerable walls in areas visible from a railway station platform.
- h. The proposed development will provide casual surveillance and activation along pedestrian thoroughfares to the railway station.
- i. The proposed development will provide shade and shelter over pedestrian paths located in or next to the development.



Part B.10 Tunnels

Description

Where a proposed development involves construction, excavation or filling abutting a railway tunnel, groundwater and geotechnical investigations should be undertaken to ensure that the tunnel will not be affected.

Is this relevant?

Will the proposed development about the railway environment associated with a railway tunnel?

- Yes – consider the desired development outcome and checklist below
- No – go to Part B.11

Desired development outcome

A development in the vicinity of a railway tunnel should not cause the tunnel to be overloaded vertically or affected by the addition or removal of lateral pressures. The groundwater regime should not be altered in a way that would adversely affect the tunnel.

Checklist

- a. A comprehensive geotechnical assessment, encompassing groundwater assessment, has been prepared by a Registered Professional Engineer Queensland. The assessment demonstrates that the proposed development will not cause the tunnel to be vertically overloaded or affected by the addition or removal of lateral pressures and it will not adversely affect the integrity of the tunnel as a result of directly or indirectly disturbing groundwater.

Other advice

1. Reporting by a Registered Professional Engineer Queensland may not be required depending on the scope and extent of the works and their distance from the railway corridor. This should be confirmed with TMR.
2. Where excavation, drilling or other similar ground disturbing works are to be carried out abutting a railway tunnel, monitoring of tunnel linings throughout construction by a Registered Professional Engineer Queensland may be required. This will depend on the extent of works and their distance from a railway tunnel.



Part B.11 Viaducts

Description

Emergency access to a railway viaduct may be required from time to time, in addition to regular maintenance access. Accordingly, any proposed development abutting a railway viaduct is to be limited to temporary structures and minor uses such as car parking and outdoor storage.

Is this relevant?

Will the proposed development abut a railway corridor containing a viaduct?

- Yes – consider the desired development outcome and checklist below
- No – go to Part B.12

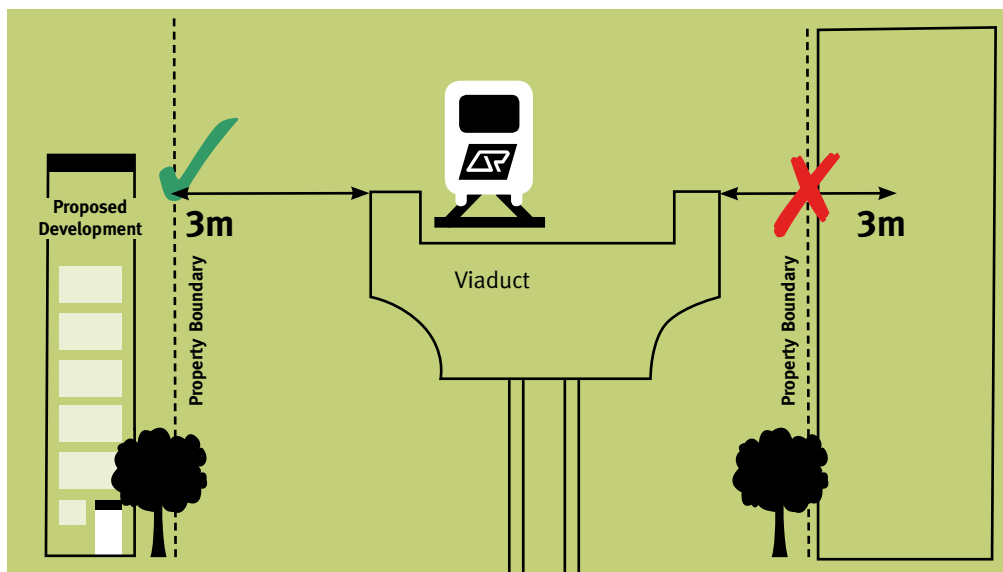
Desired development outcome

A development should be designed to avoid risks to operations and infrastructure associated with a railway viaduct.

Checklist

- a. The part of a proposed development abutting a railway viaduct is intended to be used only for temporary activities and will be limited in use to ancillary activities such as car parking or outdoor storage.
- b. Land underneath a railway viaduct is proposed to be clear of permanent structures or any other activity that may impede construction and maintenance of railway infrastructure or emergency access.
- c. The proposed development abutting a railway viaduct will be set back a minimum of 3 metres from the viaduct structure (refer to Figure 7 – Viaducts).
- d. The development will not restrict emergency access to a railway viaduct.

Figure 7 – Viaducts



Part B.12 Excavation, retaining and other ground disturbance

Description

Excavation, retaining works and other works involving ground disturbance can significantly affect the safety and operational integrity of a railway corridor and accordingly are generally not permitted. Where such works are unavoidable, it may be necessary to undertake surveying, groundwater and geotechnical investigations to ensure the works will not adversely affect the railway corridor.

Is this relevant?

Will the proposed development necessitate excavation, retaining or ground disturbance abutting a railway corridor?

- Yes – consider the desired development outcome and checklist below
- No – Checklist complete



Desired development outcome

Excavation, retaining works and other ground disturbance works associated with a proposed development should not impact on the safety and operational integrity of the railway or cause the de-stabilisation of railway infrastructure.

Checklist

- a. The design of proposed excavation works, retaining works and other works involving ground disturbance abutting a railway corridor is supported by a report prepared by a Registered Professional Engineer Queensland which confirms that the works will not de-stabilise railway transport infrastructure.
- b. The development will not necessitate the storage of fill, spoil or any other material on a railway corridor at any stage of construction.
- c. Retaining structures necessary to stabilise any excavations or a will be located outside the railway corridor.
- d. The development will not necessitate a track formation to be supported by a reinforced earth retaining structure.

Other advice

1. Provision should be made to monitor the position of potentially affected track and other railway infrastructure throughout the period of the ground disturbance.
2. For additional requirements where a development abutting a railway corridor involves the use of soil nails and/or rock anchors in the railway corridor, refer to the checklist at Part A.16.



4 Access to railway land

As part of a development proposal, access may be sought to railway land, including airspace.

This section explains the parties, processes and requirements involved in obtaining temporary or permanent access to railway land.

4.1 Railway land ownership

As the holder of the perpetual lease over railway land on behalf of the Queensland Government, TMR is the 'owner' of the land. QR and other railway managers sublease railway land from TMR.

A number of sites in various railway corridors have not been included in the perpetual lease due to the complexity of dealing with intervening rights held by private third parties. These sites are defined in legislation as 'commercial corridor land'. Although QR holds the freehold title to these sites, TMR is regarded as the owner. Central Station is an example of such a site.

4.2 Sale of corridor land, including airspace

TMR can arrange freehold title for parts of the corridor, including the airspace, for the purposes of facilitating development. However, given the complexity of undertaking airspace development in an operating railway environment, airspace sales only occur where all design requirements have been met and the appropriate agreements are in place to protect the railway corridor.

The development of corridor airspace may involve a development agreement, a contract of sale, a development lease and either a building management statement or a suite of easements. In some cases, short-term occupation of the corridor can be dealt with by way of a licence.

Transfer of title does not usually take place until the development is completed and the envelope of the building is accurately defined by survey. A long term leasehold arrangement may be more appropriate than a freehold arrangement, particularly where a plan for a future corridor may affect the site.

4.3 Private treaty dealings

Private treaty dealings are rare and the disposal sale of most government owned sites will be by way of a tender process. Owning or having an option to purchase land adjacent to a railway corridor will not necessarily be regarded as sufficient basis for a private treaty disposal.

Private treaty dealings may only occur where it is practically necessary or commercially advantageous to the Queensland Government and not contrary to the best interests of the community. Private treaty dealings require the endorsement of the Property Management Committee in accordance with Government Land Policy Disposal Policy 5: Private Treaty Disposal (DERM 2005). The policy sets out the criteria for approval of a private treaty.

4.4 Approval for works on or near the railway corridor

Certain works in the railway corridor are deemed to be exempt under the *Sustainable Planning Act 2009* (SPA). These works generally involve railway infrastructure, including stations.

QR assesses and approves proposals for railway-related infrastructure. The Department of Public Works (Project Services) is involved in certifying compliance with various building regulations.

Where railway infrastructure works are proposed as part of a development, TMR will advise the works that are exempt under SPA and which therefore will not form part of the development application.



4.5 Owner's consent and resource entitlement

If a development application involves railway corridor land held in perpetual lease, owner's consent is required from both TMR and QR. If a development application involves QR freehold land, owner's consent is required from QR.

If a development application involves TMR freehold land, a resource evidence is required from TMR. A request for resource evidence is to be made in writing to TMR. A copy of the development application (in the form that it will be lodged with the local government) is to be provided to TMR to enable the evidence to be issued. TMR will endeavour to provide the resource evidence within five business days of receipt of the request and development application.

As outlined in Section 2 of this guide, if it is proposed to occupy or temporarily or permanently close a local road, DERM will also need to provide the applicant with evidence of resource entitlement.

4.6 Building management statement

If the proposed development involves both private land and railway land in an integrated development, and involves shared access and services a building management statement (BMS) may be required. The Queensland Government and QR will both be a party to the BMS.

In accordance with Section 294D of the *Land Act 1994*, the BMS will contain provisions about:

- the provision of services
- rights of access
- rights of support and shelter
- insurance arrangements.

The BMS may also restrict the development of some part or parts of the land to maintain natural light and ventilation to the railway corridor.

The BMS will generally require the owner or lessee (as applicable) to agree to not take any action against the State of Queensland, QR or its subsidiary companies in relation to the operations of the railway or any disturbance arising from those operations.

4.7 Encroachment into the railway corridor

QR may approve a temporary encroachment into the railway corridor by way of a licence. The licence will cover such matters as the conditions of use, security of the corridor, supervision (for railway safety purposes) and insurances or indemnities.

A permanent encroachment into the railway corridor will be subject to a negotiated commercial agreement between the proponent, QR and the state government. This may involve a volumetric lease.



4.8 Easements

A permanent easement will generally not be granted over the railway corridor because of the need to preserve the ability to upgrade or relocate infrastructure in the corridor at any time.

Where provision needs to be made for a utility service, the preferred means of granting a right of occupation is by way of a licence or 'wayleave'. A wayleave will usually allow the service to be altered or removed, at the grantee's expense, in the event that this is necessary to enable the railway infrastructure to be maintained or upgraded.

The state government may require an easement through a development to protect and preserve public access to a railway station.

4.9 Indemnities, insurances and securities

If a proposed development integrates with the railway corridor, the current and subsequent owners will be required to:

- have adequate insurance cover
- indemnify QR and TMR against any claims arising from events occurring during the life of the development.

Security may also need to be provided to cover such costs as the expense of rectification works required to maintain the operational efficiency of railway operations in light of the development.

4.10 Native title

Before entering into negotiations with a private party, TMR will undertake an assessment to determine if there is a need to address native title matters in relation to the railway corridor land.

4.11 Commercial dealings process

The process for obtaining access to railway corridor land can occur in parallel with the consideration of the related IDAS application. The processes by which access is secured to the railway corridor land will be coordinated by TMR, including negotiation of access arrangements, the necessary approvals and any associated development or infrastructure agreements.

A plan will need to be provided to TMR showing the nature and extent of the proposed encroachment onto or over the railway corridor. If a proposed development necessitates a station upgrade, TMR will establish an agreement to concurrently undertake concept design for the development and the station upgrade.



5 Operational constraints

This section provides high-level advice regarding operational constraints that may affect development in or around the railway corridor.

The way that development in or around the railway corridor is designed may have an ongoing effect on the operations of the railway in addition to short-term effects during construction. It can also affect future expansion of the railway or fetter opportunities for future development in the railway corridor.

Accordingly, the design of the proposed development must take a long-term view and address issues such as construction, operations, maintenance (both of the railway and the development) refurbishment and demolition, and future track and platform requirements. Proper consideration of design and construction issues (such as designing for a dangerous goods incident) will help in determining the financial viability of the proposed development, and is best undertaken early in the design process.

5.1 Contaminated soils in the railway corridor

All soils in the railway corridor are deemed to be contaminated unless proven otherwise by sample testing. If excavation is being undertaken in or below the corridor, the development proponent is responsible for testing the soils and treating or disposing of them using a method acceptable to DERM, at the proponent's cost.

Water running off the surface or percolating from the subsoils of the railway corridor into drainage systems incorporated into the development's retaining structures may be contaminated and should be treated as such.

5.2 New or altered assets

On completion, any new or altered assets must be transferred with full documentation to the state government or railway manager. This includes 'as built' drawings, specifications, manuals, quality assurance documentation and warranties.

5.3 Access to stations

The TransLink Transit Authority (TTA) designs stations as public places with a user-friendly layout that facilitates patronage on and off the train.

Stations may include ancillary uses such as a ticket office, communication rooms, amenities and, in some cases, retail uses.

A well-designed station is an asset to the state and the local community as it contributes to achieving high levels of customer satisfaction, increased public transport patronage and higher land values for properties near the station.

While station design may relate or be sympathetic to the adjoining development, the station's identity must be separate from the development.

Good practice urban design principles must be applied in the layout of the proposed development to promote seamless connectivity from the street to the station, from the proposed development to the station and between various transport modes.

Directional signage from the street to the station must meet TTA and railway manager requirements, with travel paths avoiding narrow choke points and complex or convoluted routes. Consideration must be given to egress in the event of emergencies or power failures.

New stations and station upgrades must be designed to ensure that mobility-impaired passengers can move between the street and station via step-free routes between levels. This generally requires a combination of lifts, ramps and level access between platform and trains.



A number of railway standards, including a station design guide, are available on QR's website, www.qr.com.au

Station design must comply with Australian Government legislation and standards, namely the *Disability Discrimination Act 1992* and the *Disability Standards for Accessible Public Transport*.

Station environments should:

- enable the station to provide a high standard of service
- be easily accessible by all
- be cost-effective to maintain
- be safe and secure by applying Crime Prevention through Environmental Design principles
- provide a pleasant and safe work environment
- provide protection from weather while maintaining natural light and ventilation
- include a station plaza
- generate high levels of community satisfaction
- generate community pride and a sense of ownership in Queensland's public transport system (e.g., involving local community groups and schools in selecting or preparing the finishes).



6 Construction requirements

The safety of railway operations and workplace health and safety in the railway corridor are paramount. QR has a Zero Harm Policy, which extends to all works undertaken by third parties in or around the railway corridor.

It is particularly difficult undertaking construction in a railway corridor. In the electrified South East Queensland railway system in particular, windows of opportunity to cease railway traffic, shut down the railway and occupy track areas to permit construction activity are limited.

This section outlines the requirements of QR (as the railway manager) when construction is being undertaken in the railway corridor.

6.1 QR standards

QR's standards, *'Requirements for work on or about QR property'* and *'Requirements for work adjacent to overhead line equipment'*, are of critical importance to any construction work. Any building contract must ensure compliance with these standards, which are available from QR on request.

6.2 Safety

The railway is potentially a very dangerous environment, which is made safe by strict observance of established safety measures and QR's Safety Management System.

QR has a legal duty of care to advise on, and approve, specific safety issues. Any breaches of QR's safety requirements may result in severe penalties, including large fines and custodial sentences. For this reason, no access to the railway corridor is permitted at any time without the express permission in writing of QR.

All access to the railway corridor must be under QR's supervision and will be at the applicant's expense.

Work within the railway corridor may require:

- submission of a safety management plan
- submission of work method statements as part of the Section 255 application
- supervision as agreed with QR, including the use of specialist QR safety personnel, such as protection officers, lookouts and electrical supervisory staff
- appropriate insurances and indemnities in favour of QR
- the developer agreeing to meet all reasonable costs incurred by QR in managing safety issues, payable monthly
- maintenance of the security of the railway corridor to the required standard
- a quality assurance system and a quality plan approved by QR
- a dilapidation survey of any QR infrastructure before construction commences.

The safety of the public is to be maintained at all times during construction. Any temporary arrangements, such as temporary access, must meet QR's safety and operational requirements. QR requires all personnel intending to work within the railway corridor to complete the QR Trackside Awareness Course. Completion of this course is evidenced by a 'pink card', which must be provided upon demand when inside the railway corridor.

A construction methodology will need to be devised that is appropriate to the available construction windows as part of the design process. Sufficient equipment and labour must be available to respond effectively to contingencies. QR strongly recommends that the construction methodology is planned collaboratively to avoid rework due to safety issues.

The 25 kilovolt overhead line equipment (OHLE) is a particular source of danger. QR must approve in writing any work in proximity to the OHLE. The safety requirements dictated by the OHLE will affect the design, construction, maintenance and ultimately the demolition of the development (refer to QR standard *'Requirements for work adjacent to overhead line equipment'*).



6.3 Environmental management plan

During the construction phase, the applicant is to submit an environmental management plan and comply with all statutory requirements, including:

- preservation and rehabilitation of the environment
- control of noise and vibration
- control of air pollution
- waste disposal
- waterways
- vegetation removal
- contaminated land.

A safe and user-friendly environment must also be maintained for QR staff and customers.

6.4 Principal contractor

The contractor for the development construction must be the principal contractor for the development site. While QR's workforce may be engaged on associated works on the site, the responsibility for workplace health and safety issues will remain with the principal contractor.

QR may appoint the same building contractor or another building contractor or principal contractor in relation to any works being carried out on the railway corridor that is not part of the site.

6.5 Working in the railway corridor

Prior to entering the railway corridor (including working over or under the railway corridor), all workers are required to attend a 'Track Safety Awareness' training course and an 'Electrification Safety Basic Awareness' training course conducted by QR. On request, workers must produce a current safety training course completion card (a 'pink card') endorsed and issued by QR.

Movements of trains and individual items of rolling stock through a development site are a source of danger. QR does not permit any work that impinges within three metres of any track centreline or OHLE without strict QR control and supervision.

Unless otherwise agreed with QR, all construction operations must be carried out so that no labour, plant, equipment, buildings, shelter framework or material is located within three metres of any operating track.

QR may permit reduced clearances to trains and OHLE if special barrier screens are used during construction, for limited periods, under a regime of strict QR control and supervision.

6.6 Appointment of protection officers and site protection supervisor

Where work is being carried out over, under or adjacent to the operating railway, QR will appoint protection officers to ensure the safety of the operating railway. Protection officers will be entitled to stop or direct the movement of construction workers and the location of plant and equipment in accordance with the safe working procedures.

Where QR considers it necessary to coordinate the activities of several protection officers appointed in connection with the work, QR may appoint a site protection supervisor.

A requirement for protection officers should be raised with QR as early as possible. The costs of the protection officers and supervisor should be factored into construction costs.



6.7 Contractor's safety liaison representative

A safety liaison representative is to be appointed with responsibility for:

- safety of the contractor's employees, plant and equipment during the execution of work in the railway corridor
- coordinating and programming the contractor's work in the corridor
- receiving directions from the QR superintendent, the site protection supervisor or protection officers on matters relating to the safety of the operating railway
- ensuring that all plant and equipment is operated and all employees of the contractor act in accordance with such directions.

The safety liaison representative is present on site at all times while works are being undertaken on railway property.

If the safety liaison representative leaves the site at any time while works are being undertaken, a competent relief representative must be appointed.

6.8 Twenty-five kilovolt environment

Electrified railway infrastructure has overhead power systems and related cabling and cable support structures. Poles, masts, signals and substations all have power cabling associated with them. Safety issues associated with these electrical systems include risks of electrical arcing and electrocution.

Although the equipment is nominally energised to 25 kilovolts, some items of equipment—such as transformers and feeder wires—may operate at much higher voltages.

Where construction is able to proceed without the OHLE being de-energised, metal items near the railway may have induced voltages that could give rise to electric shocks. Temporary or permanent earthing and bonding of elements may be necessary for safety both during construction and when in service.

QR's standard '*Requirements for work adjacent to overhead line equipment*' is to be complied with.

An applicant is responsible for seeking advice from QR or another competent electrical engineer. Early consultation with QR's electrical engineers, arranged through the QR Project Manager for the proposed development, is essential.

6.9 Work adjacent to overhead line equipment (OHLE)

Works associated with the proposed development may require construction activity within three metres of the 25 kilovolt alternating current OHLE.

QR is an electrical entity under the *Electrical Safety Act 2002* and must be contacted before any work around the OHLE commences. Any instructions given by QR on how to perform the work around the OHLE must be complied with in full.

QR will undertake all work on the OHLE required to facilitate the development, and will charge the costs to the applicant.

As none of the components of the OHLE have protective covering, they are potentially dangerous, and people must not approach them either directly or indirectly with any item of material or equipment.

All OHLE must always be regarded as energised with 25 kilovolts of electricity unless an isolation has been carried out and a permit to work has been issued. If, in the opinion of a protection officer or the site protection supervisor, any activity of the contractor is dangerous or contravenes any of these requirements, the protection officer or the site protection supervisor will direct that such activity cease immediately.



6.10 Closures and isolations

If QR is not satisfied that work near the OHLE can be safely performed, arrangements will be made to isolate the OHLE. Isolations take time to put in place and remove due to the need to ensure the equipment is earthed properly at each end of the work site. This reduces the time available for actual construction work and must therefore be allowed for in programming of activities to be carried out during isolations.

QR does not permit anyone to walk or work within three metres of any operational track without special approval and controls and procedures being in place, to ensure safety and avoid disruption of railway operations. Where work is required within the three metres, a track possession or line closure will be required.

As closures and isolations interfere with normal railway operations, they must be kept to a minimum. At least six months (preferably 12 months) notice is required. QR maintains a rolling program of isolations and closures and the requirements of the proposed development will need to be incorporated into this program. The risk of cancellation due to inclement weather means that contingency periods for closures and isolations should also be booked.

The applicant will incur the costs of closures, isolations and cancellations. There may be additional associated costs for bussing passengers, arranging for diesel haulage of freight trains or sending freight by road.

Detailed planning and efficient use of construction windows is vital, as a late finish to work will cause closures and isolations to over-run and may attract penalties.

6.11 Emergency provisions

As part of the development agreement or other agreement, in the event of an emergency QR may need to resume services, regardless of any pre-arrangements. If this occurs, the applicant will be required to take all necessary steps to facilitate the restoration of services without any cost to QR.

6.12 Delays to trains

Various railway operators on the network have contractual obligations to meet in the transport of passengers, freight, livestock and minerals. Consequently, any unscheduled delays to trains, which are attributed to the proposed development, will result in penalties.

6.13 Lifting over railway lines

QR will not permit lifting operations over operational tracks or live OHLE without closures or the erection of protective structures in the corridor that will withstand the impact of a failure in lifting operations, without affecting the railway corridor.

6.14 Temporary access

Temporary access during construction will generally be subject to the same design requirements as permanent access (apart from durability), where these are designed for use by QR staff and the public. Temporary access for the construction of the development may encroach on the railway corridor, subject to conditions. Co-use of QR access roads may be acceptable. QR may permit temporary crossings of the railway tracks under QR's control and supervision, if the safety, risk and operational impacts are acceptable.



6.15 Construction management plan and work method statements

For construction over railway tracks, the contractor must provide a construction management plan detailing the construction procedure and interfaces with railway operations. For each package of work within the railway corridor, a detailed work method statement must be prepared and submitted to QR for review. These will include detailed methodologies for excavations, installation of retaining systems, erection of supporting elements near the track, construction over the tracks and overhead line equipment, and construction access around the railway, including hoardings, gantries and barriers to ensure public safety.

A program for construction of the development, with details of major track possessions and any required OHLE isolations, must be submitted with the construction management plan.

Construction must not commence until QR has approved the construction management plan and individual work method statements.

6.16 Track monitoring

In circumstances where works for a development might affect track alignment, QR may require monitoring of the track alignment to ensure that movement is detected and rectification action taken before the alignment becomes unsafe. The monitoring may be required to be 'real time' remote telemetric monitoring, with independent access for QR staff.

6.17 Railway operational issues

The construction process must also consider railway operational issues such as signal sighting requirements. Train drivers' sighting of signals depends on factors such as train speed and track curvatures. Permanent structures (for example, columns) and temporary structures (for example, fences and scaffolding) must not obstruct the sighting of signals.

6.18 Practical completion

During construction and on practical completion of the proposed development, QR will inspect any works that interface with the railway and issue a list of defects that affect QR assets or may affect the operation of the transport facilities. Rectification should be immediate if the defect has the potential to affect the management, operation, maintenance or safety of the transport facilities. Otherwise, the normal period for rectification is one month or as agreed by all parties. Depending on the urgency, the railway manager may elect to carry out the rectification and charge the costs to the applicant.



Attachment 1: Risk assessment guide

1. Introduction to risk assessment

The railway environment is a challenging setting for development. The railway corridor can impose risks on development such as impacts from a train derailment, potential amenity impacts, including noise, as well as risks associated with the transport of dangerous goods along the railway. Conversely, development can pose risks to the railway corridor by interfering with the railway corridor and overhead line equipment. It can also create the potential for vandalism of railway infrastructure and cause disruption to the operational safety and integrity of the railway corridor.

At all times, the operational safety and integrity of the railway corridor must be protected and maintained when developing abutting or over a railway corridor. Development will not be permitted to proceed unless the risks to both the railway corridor and the development itself are appropriately managed and mitigated.

A risk assessment is the fundamental tool to assist developers in better designing development to address the potential impacts associated with building near a railway corridor. The risk assessment exercise must:

- i. identify all potential hazards to the operational railway, its staff, customers and the users of the development
- ii. take into account the operational requirements of the railway corridor and the whole life cycle of the development
- iii. identify design and construction issues that may impact on the feasibility of development
- iv. identify the potential risks and necessary safety controls and design measures required to reduce the risks to the safety and operational integrity of the railway corridor and avoid long term disruptions to railway operations that would arise from a defect or failure of structure elements
- v. identify how an incident could be managed if it were to occur.

The Department of Transport and Main Roads (TMR) strongly recommends that developers liaise when preparing a risk assessment to ensure that all relevant matters are addressed.

This document sets out the minimum generic requirements to be addressed as part of a risk assessment accompanying a development application for land within or abutting a railway corridor. By no means does this document represent the ultimate content solution and as such, additional topics may need to be addressed in a risk assessment depending on the unique nature of the site and the proposed development. Pre-lodgement meetings with TMR will assist developers in understanding the information requirements for a risk assessment unique to their development.

1.1 Risk assessments for preliminary approvals

Further, it is acknowledged that many developers may seek a preliminary approval in accordance with section 241 of the *Sustainable Planning Act 2009* for development which limits the amount of detailed information relating to design and construction at the development application stage. This affects the amount of information that can be reasonably included in a risk assessment. As such, risk assessments for preliminary approvals need only address the following matters as detailed in this document:

- i. site details
- ii. railway details
- iii. development details (specifically items ii, iv, v and ix in Section 4 of this document)
- iv. construction details (specifically items i and iv in Section 5)
- v. identify hazards and risks
- vi. control measures to mitigate risks

The following sections set out the basic content to be addressed in a risk assessment.



2. Site Details

The risk assessment will need to include a detailed understanding of the subject site in order to create a strong understanding of the context through which risks may arise. Matters to be considered include, as a minimum:

- i. site condition, cutting, embankment, etc.
- ii. soil type, geology
- iii. topography
- iv. prevailing drainage patterns over the site
- v. proximity to railway corridor and railway infrastructure/utilities
- vi. noise levels at the development site.

3. Railway details

The nature and details of the railway corridor itself will also be important in determining the potential risks associated with development abutting or over a railway corridor. Key points of interest in this section of the risk assessment should include, as a minimum:

- i. track geometry and alignment (for example, straight or curved section of track)
- ii. track speed
- iii. type of rolling stock using the corridor (for example, electric passenger vs. diesel freight locomotives)
- iv. derailment history
- v. current and future estimated usage and growth in patronage (10-year horizon)
- vi. details of any future/planned corridor upgrades/works
- vii. formation of the track (for example, in cut, on an embankment or at grade)
- viii. potential for the carrying of freight and dangerous goods
- ix. operational requirements of the railway corridor.



4. Development details

Details of the development itself, its design and operational components, are important in understanding whether the building has been designed to withstand potential risks as a result of the railway corridor, as well as ensuring that the development will not pose any adverse risks upon the railway corridor. The risk assessment is to include the following information, as a minimum:

- i. structural integrity/collision protection in the event of a train derailment, dangerous goods incident and/or explosion, other significant incident and/or explosions (for example, terrorist attack within, under or in close proximity to the development), or earthquake
- ii. proximity of proposed development to railway corridor, railway infrastructure and railway station access points
- iii. potential traffic generation which may impact on the railway corridor (i.e. increased traffic using a level crossing, or development may require a new crossing)
- iv. clearances and setbacks from railway infrastructure
- v. demolition design of any existing buildings on site
- vi. ventilation system design for development that encloses the railway corridor in the event of normal operation and an emergency event within the railway corridor (involving smoke/gas emissions). Details to be provided must include:
 - a. the ability of the system to operate in an emergency situation to allow emergency crews to safely enter the enclosed area for fire fighting or restorative purposes
 - b. details of the location of air intakes and external vents for the ventilation system
 - c. smoke modelling to demonstrate that the most appropriate ventilation system for the site and building has been designed.
- vii. emergency management details are crucial and information should include:
 - a. details of fire detection and alarm systems that can operate independently of the buildings main power supply in the event of a power outage
 - b. fire sprinklers and liquids to be used with the sprinklers (water may not be appropriate on dangerous goods railway lines that are known to carry materials/chemicals that combust when in contact with water)
 - c. evacuation plans for the development in the event of an incident (fire and/or explosion) within the development or the railway corridor
 - d. details of emergency exits for the railway corridor (where development encloses the railway corridor creating a tunnel) suitable for the mass evacuation of passenger trains in the event of an incident (fire and/or explosion) caused by a train derailment or dangerous goods emergency
 - e. details and location of emergency access points into the corridor when emergency services may be required to attend to a situation within the railway corridor either under or abutting the development.
- viii. planned maintenance program for the development including whether access within the railway corridor will be required. This program should include trimming and management of landscaping as well as maintenance of the building itself.
- ix. details of the development's potential impacts on nearby (within 50 metres measured horizontally) railway tunnels. This must include design loads, geological implications of development, impacts on ground water etc.



5. Construction details

TMR understands that construction details will not yet be finalised at the development application stage, as it is unknown exactly what will be approved. However, given the complexities involved with developing in the vicinity of a railway corridor, there are a number of impacts associated with construction that need to be considered prior to development approval. Some impacts associated with construction are not acceptable to TMR and it is generally best to identify these prior to decision of a development application to determine whether viable alternatives are available.

Construction impacts involving the railway corridor need to be considered as part of the risk assessment. TMR will require a risk assessment to ensure that the railway corridor, infrastructure, staff and general public railway users can be adequately protected from activities associated with the construction of development.

The information to be considered in a risk assessment includes:

- i. method of construction—for example, the use of pre-fabricated or pre-cast materials where building along the property boundary with the corridor to prevent track closures associated with construction
- ii. timing of construction—specify staging and timing of proposed construction works to determine the impact of any disruption to services and make the state government aware of the timing of potential incidents impacting on the railway corridor
- iii. details of the use and storage of hazardous and dangerous goods on site during construction which have the potential to impact on the railway corridor and operations
- iv. describe the anticipated impact of construction on access:
 - a. for pedestrians using railway stations and associated interchange facilities such as bus stops, taxis, park ‘n’ ride and kiss ‘n’ ride
 - b. for public transport routes and the flow of traffic for people accessing railway stations
 - c. detail how the general public and surrounding residents will be informed of changes in access arrangements.
- v. corridor encroachment—provide details with regard to:
 - a. whether access to the railway corridor will be required
 - b. whether any materials will be lifted over the railway corridor
 - c. whether any temporary vehicle-crossing points are required
 - d. whether there will be any disruption to services or other railway operations as a result of construction
 - e. whether there will be any requirement for de-energising of a section of the overhead line equipment to accommodate construction within or adjacent to the railway corridor.

Generally encroachment within a railway corridor for construction is not permitted and alternative construction options will need to be identified.

- i. provide details of how the security of the railway corridor will be maintained during construction, (e.g. providing details about the type and height of security fencing to be used).
- ii. provide details of any planned demolition, excavation and retaining works within 25 metres of the railway corridor and specify the type and quantity of works to be undertaken.
- iii. services and utilities—provide details of:
 - a. whether any services or utilities will be required to cross the railway corridor
 - b. whether any existing railway services/utilities be interfered with.
- iv. stormwater, drainage, sediment and erosion control—provide details of how any temporary stormwater and drainage will operate during construction, and how sediment and erosion control will be managed.



6. Identify hazards and risks

Once details unique to the site, railway corridor, development design and construction have been determined, the individual risks must be identified and evaluated with control measures planned for each. Such risks may include injury or loss of life and damage to public and private infrastructure and considerations should include, but not be limited to:

- i. safety of people occupying the development
- ii. safety of people on platforms or in trains under or near the building
- iii. structural damage to the building and/or adjacent structures
- iv. potential explosion or fire associated with loss of containment of dangerous goods, whether or not involving a train derailment
- v. increasing risks as a result of transporting dangerous goods by train through areas of increasing population and infrastructure density
- vi. collision from a derailed train
- vii. act of terrorism along the railway corridor or within the development
- viii. trespass by members of the public into the railway corridor
- ix. vandalism of railway corridor and/or development
- x. interference with railway corridor infrastructure, especially overhead line equipment
- xi. impingement on railway corridor operations and/or damage to the railway corridor itself
- xii. business interruptions and financial loss to building occupants in the event of railway incidents affecting the building
- xiii. commercial risks in the potential loss of freight and passenger business in the event of incidents
- xiv. adverse public perceptions of the dangers of transporting dangerous goods through enclosed platforms, especially security related issues.

A recommended process for the identification of hazards and risks has been provided below to guide developers.

Step one

Identify all potential hazards to the operational railway and its staff and customers as well as the development and its users. This exercise is to link the risks with the source of the risk and identify potential outcomes. Unique risks associated with the construction of development must also be addressed as construction can impose significant risks to the operational safety and integrity of the railway corridor (i.e. lifting of building materials over the railway corridor, excavation and retaining works along the railway corridor boundary etc). Table 1 provides examples of this process.

Table 1: Identification of risks as a result of development

Risk	Risk source	Potential outcome
Collision of rolling stock with proposed development.	Derailed freight train due to broken wheel axle.	Derailed train collides with building. Potential for destabilisation of building's supporting elements and subsequent collapse resulting in injury, loss of life and damage to public and private property.
Throwing of objects onto overhead line equipment.	Locating non-screened private balconies too close to the railway corridor boundary.	Damage to overhead line equipment and potential for disruption to railway services/ operations.



Step two

Once the risks, their sources and potential outcomes have been identified, the severity of these events must be determined. The severity of the risk is to be rated from 1 to 5 as indicated in Table 2.

Table 2: Severity of Risk

Severity (S)	Extent of consequences	Examples
1	Minor	No harm to railway corridor staff, customers, passengers, users of the development and external public. No damage to railway corridor infrastructure. No damage to development or structural elements. No fire or blast.
2	Medium	No harm to railway corridor staff, customers, passengers, users of the development and external public. No damage to railway corridor infrastructure. No damage to development or structural elements. Minor fire.
3	Major	Minor injuries/harm to railway corridor staff, customers, passengers, users of the development and external public. Some damage to railway corridor infrastructure. Some damage to development or structural elements. Fire or blast.
4	Catastrophic	Injuries/harm to railway corridor staff, customers, passengers, users of the development and external public. Death. Major damage to railway corridor infrastructure. Major damage to development or structural elements. Major fire or blast. Impact largely contained to development/railway corridor.
5	Catastrophic external	Impacts of a catastrophic event. Significant impact beyond the boundaries of the premises.



Step three

Once the risks and their severity have been identified, the likelihood of their occurrence must be determined in order to prioritise the risk. Table 3 indicates what values are to be assigned to risks.

Table 3: Likelihood values

Likelihood (L)	Likelihood of occurrence
0	totally eliminated
1	rare
2	unlikely
3	likely
4	certain
5	imminent

Step four

The identified risks must then be prioritised. Calculate the 'Relative level of risk' (R), by multiplying the value obtained for the 'Likelihood' (L) by the value obtained for the 'Severity' (S):

$$R = S \times L$$

Step five

Once the Relative level of risk has been obtained, assess the risks according to priority and identify the appropriate implications to development based on the criteria in Table 4.

Table 4: Risks and implications to development

Relative risk (R)	Assessment of risk	Implications to development
1 – 2	Low	Appropriate control measures must be in place to allow development to proceed.
3 – 4	Medium	Significant control measures must be in place to allow development to proceed. Such control measures may require design changes to components of the development.
5 – 9	High	It is unlikely that suitable control measures can be put in place. Development is unlikely to be approved by TMR.
10 or more	Totally unacceptable	Development cannot proceed.

7. Control measures to mitigate risks

Once the risks of development over or abutting a railway corridor have been identified, appropriate control measures must be designed to mitigate the risk and any associated impacts on the railway corridor and the development. The necessary safety parameters required to reduce the risk of long term disruptions to railway operations that would arise from a defect or failure of structure elements must also be clearly identified.

Each risk may require multiple control measures and the developer is strongly encouraged to provide as much information as possible when detailing the design and construction measures proposed to mitigate each risk.

To assist in documenting the control measures proposed, Table 5 is provided as an example.



Table 5: Identification of control measures (worked example of steps 1 – 5)

Risk	Assessment of risk	Control measures proposed	Supporting report/evidence
Risk of collapse in the event of impact with a derailed train-existing supporting piers of a building to be extended over the railway corridor do not meet the requirements of AS 5100 for collision protection	3	Independent deflection walls to be constructed in front of existing supporting elements.	Civil engineering report and proposal plans.



Notes

1. Risk assessments will be assessed on an individual basis and according to their merits. The amount of information required will be dependent on the proposed development, the location and logistics of the site, the nature and extent of works being undertaken and the level of impact on the railway corridor and its operation. The information provided above is intended as a guide only and **additional details may be required** in some cases.
2. A site plan may need to be submitted with a risk assessment for TMR to assess the suitability of proposed mitigation measures. For instance, how access to the railway station and corridor and any other associated interchange function and park 'n' ride facility will be maintained during construction.
3. Please note that in rare instances where approval is given to access a railway corridor for construction purposes, there may be a requirement for the applicant to indemnify the state government against all claims, damages or otherwise arising out of the use of railway corridor land to facilitate construction.



Glossary

Term	Definition
Abutting	To be adjacent to or have a common boundary with and, for the purposes of Part 2, applies to development located in the 25 metre wide strip of land running along each side of a surface railway corridor or the 50 metre wide strip of land running along each side of a tunnel.
Airspace development	Any development that encroaches into or passes through the airspace of a railway corridor. This term includes buildings, footbridges, road-over-railway bridges and any other structures.
Assessment manager	Is responsible for receiving and assessing development applications under the Integrated Development Assessment System (IDAS). The assessment manager is usually the local government but may be a state government agency.
Building Management Statement (BMS)	Is a document that is registered in the Titles Office. It is an encumbrance on the title of each of the lots to which the statement applies. The document contains terms and conditions that benefit and burden the land to which the statement applies. The owners of the lots must sign the BMS agreeing to its terms before the statement can be registered.
Cess drain	A drain that conveys waste from the railway corridor.
Concurrence agency	For a development application, means an entity prescribed under a regulation as a concurrence agency for the application, or if the functions of the entity in relation to the application have been devolved or delegated to another entity, the other entity. A concurrence agency has the power to direct the outcome of an application. It can require that: <ul style="list-style-type: none"> • certain conditions be imposed on an approval • an approval be for part only of the development or for a preliminary approval only • that an application be refused. A concurrence agency can also ask an applicant for further information about an application. A concurrence agency may only exercise its powers within its defined jurisdiction.
Development	All structures including buildings, footbridges, road-over-railway bridges, and any supporting elements (for example, piers, columns etc), unless otherwise specified.
Dilapidation survey	Is usually undertaken immediately before a contractor commences site work. The purpose of the survey is to record the pre-construction condition of properties adjoining the contractor's site and/or which may be influenced by the contractor's work. The survey encompasses the external elements of these properties and may extend to the internal condition if deemed appropriate.
Gantry	Is a structure that carries signaling equipment above the railway tracks.
Grade separation	Is the process of aligning a junction of two or more transport axes at different heights (grades) so that they will not disrupt the traffic flow on other transit routes when they cross each other. This usually takes the form of an underpass/overpass.
Hoardings	Are barriers to deny access to certain areas, or to provide construction noise barriers; often with a secondary role as advertising devices.
Overhead Line Equipment (OHLE)	Refers to overhead lines, cabling and associated structures used to provide power to electric trains.



Term	Definition
QR	Queensland Rail Ltd and all its corporate divisions, branches, departments, and so on.
Railway corridor	All existing and future railway infrastructure and land and is taken to incorporate the definitions 'existing or future Public Passenger Transport' under the <i>Transport Planning and Coordination Act 1994</i> and 'railways and future railways' under the <i>Transport Infrastructure Act 1994</i> .
Railway Manager	Has the meaning given to that term in the <i>Transport Infrastructure Act 1994</i> and refers to the person accredited for managing the railway under Chapter 7, Part 3 of that Act.
Referral trigger	Is activated if there is a requirement under the <i>Sustainable Planning Regulation 2009</i> (IP Reg) for an entity other than the assessment manager to have input in the assessment of a development application. In these cases the development application may be referred to an IDAS referral agency to: <ul style="list-style-type: none"> • seek advice on an application • determine any requirements an agency may impose on an application.
Remote telemetric monitoring	Is the automatic transmission and measurement of data from remote sources by wire or radio or other means.
Resource entitlement	Means the permission of the state to occupy or otherwise interfere with a state resource. The provision of resource entitlement for the use of state land for the purpose of a development application means that the state as owner of the land has no objection to the lodgement of the development application to the assessment manager. It does not: <ul style="list-style-type: none"> • imply approval of the development application • affect the functions exercised as the assessment manager or a referral agency of the agency who provides the resource entitlement, or • authorise a right to use and occupy land.
Resource evidence	Is documentation from the state confirming a resource entitlement.
Rock anchor	Is a steel rod or cable placed in a hole drilled in rock, held in position by grout, mechanical means, or both.
Soffit	The underside of a structural component, such as a beam, arch, staircase, or cornice.
Structural redundancy	Is the replication of critical components of a building or structure with the intention of increasing its reliability, usually in the case of a backup or fail-safe in the case of an unlikely event.
Structure	Buildings, road/railway bridges, footbridges, retaining walls, drainage etc.
Track possession	Means the temporary closure of a section of the railway corridor for the purposes of carrying out construction or maintenance work.
Viaduct	A railway raised on a freestanding structure but does not include a railway bridge which is designed to cross a specific point (for example, a water body).
Volumetric subdivisions	Are three-dimensional subdivisions in the space above or below the railway corridor that can accommodate a development such as a building or carpark. A volumetric parcel must be bounded in all dimensions.



References

Australian Government, *Disability Discrimination Act 1992* and the *Disability Standards for Accessible Public Transport 2002*, accessible via www.austlii.edu.au

Department of Environment and Resource Management 2005, *Government Land Policy Disposal Policy 5: Private Treaty Disposal*, can be viewed at www.nrw.qld.gov.au/about/policy

Department of Infrastructure and Planning 2006, *IDAS Guide 23 Referrals in relation to public passenger transport, and rail safety and efficiency*, can be viewed at www.dip.qld.gov.au/docs/ipa/forms/IDAS

Department of Transport and Main Roads, www.transport.qld.gov.au

Office of the Queensland Parliament Council, www.legislation.qld.gov.au

Queensland Police Service 2007, *Crime Prevention through Environmental Design – Guidelines for Queensland*, State of Queensland, Brisbane, Australia.

Acknowledgements:

Parts of this guide have been prepared utilising information from the following report:

- *GSM Information Paper No. 6: Carry out a risk assessment for dangerous goods under the Dangerous Goods Safety Management Act 2001*—Department of Community Safety, October 2003.

Contact Details

This guide for developers and practitioners highlights important elements that TMR, QR (as the railway manager) and other state agencies will consider when development is proposed in or around the railway corridor in Queensland.

While this document provides high-level advice on what can be expected when embarking on such a project, it should be borne in mind that specific issues will need to be discussed in detail once a concept design for a proposed development is available.

Applicants are strongly encouraged to contact TMR at the earliest opportunity to ensure the necessary information is available prior to the commencement of design.

The department will also assist in determining what other specifications, standards or guidelines are applicable to a proposed development, the approvals that should be sought and how to obtain them.

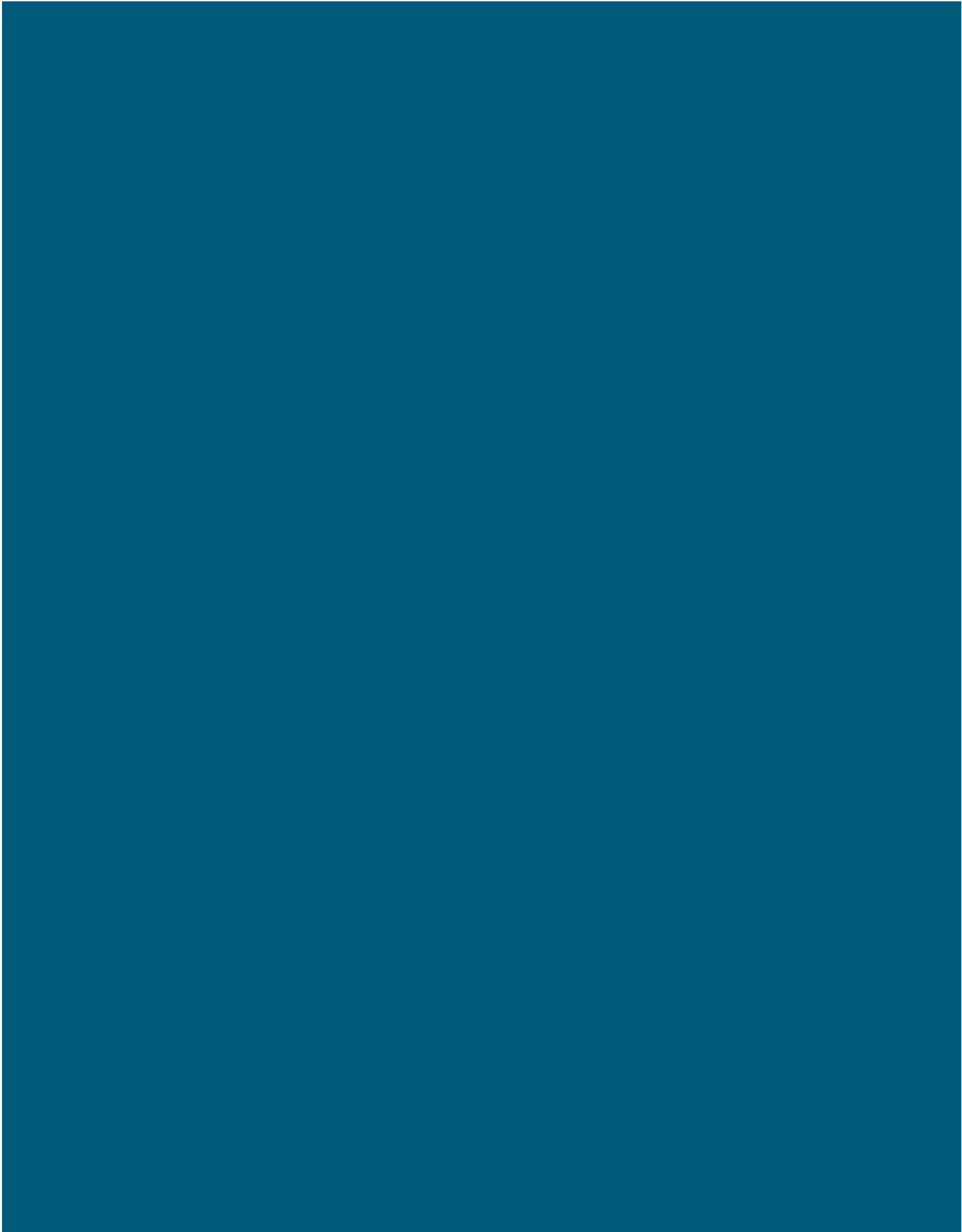
As described in the previous sections, a range of stakeholders may be involved in assessing and approving a development application for building in and around the railway corridor, particularly transport agencies and the railway manager, QR. TMR is the first point of contact for those seeking to undertake development in a railway environment.

The TMR contact is:

The Director
Development Leadership
Integrated Transport Planning Division
Department of Transport and Main Roads
Ph: 07 3146 1427

For those seeking advice about transit oriented development or with enquiries about the content of the *Transit oriented development: Guide for practitioners in Queensland*, contact:

Department of Infrastructure and Planning
Ph: 07 3238 3000
or visit www.dip.qld.gov.au/TOD.



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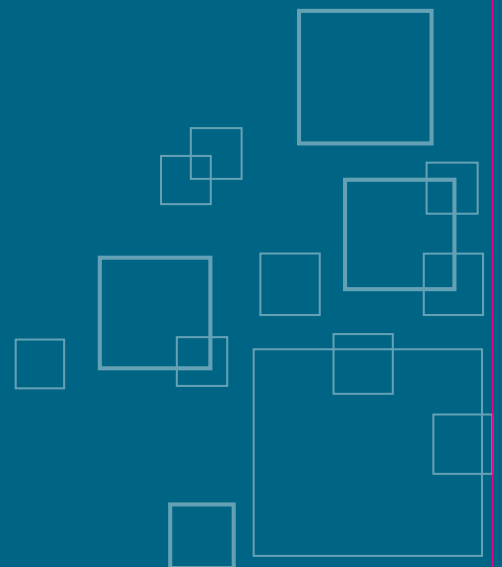
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Appendix 1 – Queensland Rail and Department of Transport and Main Roads technical requirements and standard drawings

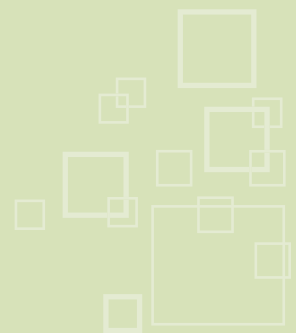
Queensland Rail Station design guide





Appendix 1 – Queensland Rail and Department of Transport and Main Roads technical requirements and standard drawings Queensland Rail Station design guide

The list of Queensland Rail and Department of Transport and Main Roads technical requirements and standard drawings and the Queensland Rail Station design guide are current at the time of publication. Future editions or amendments will remain current and will be available on the Queensland Rail website www.qr.com.au and the Department of Transport and Main Roads website www.tmr.qld.gov.au



Appendix 1 –

Queensland Rail and Department of Transport and Main Roads technical requirements and standard drawings

Queensland Rail Station design guide

Looking forward. Delivering now. The Department of Infrastructure and Planning leads a coordinated Queensland Government approach to planning, infrastructure and development across the state. The State Government, through Growth Management Queensland, is leading the way with a focused approach to growth management, to help shape tomorrow's Queensland.

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A link is also available from the Department of Infrastructure and Planning website www.dip.qld.gov.au/TOD


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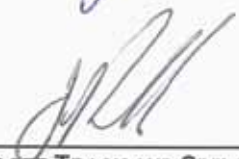
Systems and Capability Technical Requirement

DESIGN OF ROAD OVERBRIDGES

No: MCE-SR-001
Issue: Revision F
Date: 30 September 2010

ISSUE	DATE	DESCRIPTION / REASON
Initial	18.9.1996	
Revision A	7.11.1996	Load factor added to Cl. 3.2.3(c) to comply with Australian Bridge Design Code Railway Supplement.
Revision B	21.11.1997	Parapet measurement amended in Cl. 6.
Revision C	18.8.1999	Cl. 1.1, loads in Cl. 3.2.3 & 3.2.4, and parapet requirements in Cl. 6 altered. Cl.1.3 for earthquake protection added.
Revision D	22.7.2005	New Cl. 1 added and successive clauses renumbered. Cl. 2 - additional information and amendments, drawing no changed. Cl. 4 - design to be in accordance with AS 5100. Cl. 6 - reference to AS 5100 and new requirements added. Cl. 7 - Protection Screens added and amended to meet requirements. Cl. 12 – Certification - change to information.
Revision E	22.12.2009	Complete Revision
Revision F	30.09.2010	Rebranded with new disclaimer.

APPROVED BY:  DATE: 23-12-2009
 PRINCIPAL SYSTEMS ENGINEER (CIVIL)

AUTHORISED BY:  DATE: 23-12-2009
 MANAGER TRACK AND CIVIL SYSTEMS

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1.0 INTRODUCTION

This Technical Requirement details the criteria which must be met by external party designs for road overbridges over railway property.

Definition: **Road overbridge** is a road bridge crossing a railway.

Reference is made to the following additional QR Technical Requirements which must also be satisfied:

- MCE-SR-002 *Work in or about QR property,*
- MCE-SR-003 *Work adjacent to overhead line equipment,*
- MCE-SR-007 *Design and selection criteria for road / rail interface barriers,*
- MCE-SR-008 *Protection screens, and*
- MCE-SR-012 *Collision protection of supporting elements adjacent to railways.*

Copies of these documents may be obtained from QR.

2.0 SCOPE

This Technical Requirement applies to the

- design of new overbridges, and
- upgrading of existing overbridges.

It covers the design criteria for road overbridges which pass over QR property. Only those matters which will affect or are affected by the presence of the railway are covered. For example, the aesthetics of the bridge are not considered.

3.0 DESIGN AND DOCUMENTATION

3.1 General

The design of road overbridges is to comply with:

- relevant Australian Standards,
- AS 5100 *Bridge Design* for collision protection and collision loads, and
- this Technical Requirement and associated Technical Requirements.

Designers are to liaise with QR to minimise the effect of construction on train services and to determine whether QR will accommodate any speed restrictions, track closures and/or isolations of the overhead line equipment (OHLE) anticipated during construction.

The design of the overbridge is to take into account the available access to the site and the need to minimise interference with train operations, passengers and railway activities during construction.

QR reserves the right to restrict construction methods to those that minimise interference to train operations, passengers and railway activities.

Existing access to QR property for maintenance and emergency is to be maintained at all times during construction work.

All documentation for the construction of overbridges is to allow for and include:

- MCE-SR-002 *Work in or about QR property,* and
- MCE-SR-003 *Work adjacent to overhead line equipment (where applicable).*

The drawings are to show:

- design loads, including the heavy load platform used,
- any special provisions, e.g. structural redundancy and use of precast or prefabricated elements
- railway centrelines in the vicinity of the proposed overbridge,
- distances from overbridge to track and OHLE,
- railway kilometrage at the intersection of railway and road centrelines, and
- details of all existing railway infrastructure, including maintenance and emergency access, under and in the vicinity of the proposed overbridge.

All structural drawings, including temporary works such as falsework and formwork shall be certified as having been designed in compliance with the Professional Engineers Act.

Prior to construction, copies of the drawings and documentation consisting of:

- overall scope of construction works,
- demolition scheme,
- collision protection measures, and
- details of work within / over / adjacent to QR property

are to be submitted to QR for review and a compliance check against QR's Technical Requirements and Standards.

Construction is not to commence until permission has been received from QR.

3.2 Clearances

Clearances to railway tracks are to satisfy the minimum requirements of the following, unless otherwise approved by QR:

- QR Standard Drawing No 2754,
- trackside access roads,
- formation drainage,
- sighting requirements for railway signals and level crossings,
- special items of overhead traction wiring equipment, e.g. switches, transformers, wiring at turnouts,
- passenger platform requirements, and
- access to clean and maintain the overbridge.

For overbridges across existing and future electrified lines, the overbridge's support structure is to be located clear of the overhead wiring system and to have protection screens installed in accordance with QR Technical Requirement MCE-SR-008 *Protection screens*.

Overbridge abutments adjacent to existing tracks are to be located sufficiently clear of the tracks to avoid any delays to train services from speed restrictions, track closures and / or isolations of the OHLE. This may require clearances greater than the minimum clearances shown on Standard Drawing No. 2754. QR will advise of clearances required in excess of the minimum.

The drawings of the proposed overbridge are to show the railway clearance outline

superimposed on an elevation of the overbridge at 90° to the track alignment.

3.3 Earthquake Protection

Road overbridges are to be classified as "importance level 2 structures" for the purposes of AS 1170.4 *Structural design actions: Part 4 Earthquake actions in Australia* and in accordance with AS 5100.

Overbridges are to be designed to minimise the risk of collapse during earthquakes, with particular attention being given to:

- bearing arrangements,
- widths of bearing shelves, and
- reinforcing steel in columns.

3.4 Durability

The design life of road overbridges needs to be a minimum of 100 years.

Road overbridges are to be designed to minimise maintenance (such as maintenance painting of steelwork) and when required, will have no effect on QR's operations. No access from the railway corridor is allowed.

3.5 Demolition

A road overbridge is to be designed so that it can be demolished progressively without causing interference to train operations, passengers and any railway activities. A demolition scheme is to be included in the drawings and documentation to be submitted to QR as required by Section 3.1.

4.0 SUBSTRUCTURE - FOUNDATIONS

Foundations are to be designed to be installed with minimum interference to railway operations.

The design of shoring systems for excavations adjacent to operating railway tracks is to be submitted to QR for review before construction commences.

Provision is to be made for railway formation drainage. Drains are to be lined where appropriate and are to be clear of the track. Overbridge piers and foundations are to be designed to allow free drainage along the formation and are not to cause ponding.

5.0 PIERS - COLLISION PROTECTION

5.1 General

Road overbridges are to have a single clear span between abutments over existing and future railway tracks, unless agreed otherwise by QR.

Collision protection and collision loads are to be in accordance with AS 5100 *Bridge Design* and QR Technical Requirement MCE-SR-012.

5.2 Upgrading of Existing Road Overbridges

Existing piers and columns which do not satisfy the requirements of Section 5.1 are to have deflection walls provided. Independent deflection walls are to be provided where space permits. For details refer to QR Technical Requirement MCE-SR-012.

5.3 Design Report

A design report on the measures adopted for collision protection is to be included in the drawings and documentation to be submitted to QR as required by Section 3.1.

6.0 SUPERSTRUCTURE

6.1 General

Overbridge superstructures over existing tracks are to be designed to minimise the time needed for erection, e.g. precast / prefabricated components. The aim is to minimise any delays to train services during construction from speed restrictions, track closures and / or isolations of the overhead traction wiring equipment.

The connections between the deck and piers are to be designed to minimise the risk

collapse in the event of an earthquake or collision from railway traffic.

6.2 Deck Drainage

Overbridge deck drainage shall discharge in a manner which does not adversely affect railway tracks, associated railway facilities or property occupied by QR. Deck drainage discharge via scuppers is not permitted from spans over existing and future railway tracks. Deck drainage pipes are to comply with the requirements for services in Section 9.

7.0 TRAFFIC BARRIERS

Traffic barriers are to be provided across the overbridge and on the approaches to prevent vehicles from leaving the roadway and accessing QR tracks and property.

Traffic barriers on overbridges are to be designed in accordance with AS 5100 *Bridge Design* and QR Technical Requirement MCE-SR-007. Designers are to reach agreement with QR on the barrier performance level.

8.0 PROTECTION SCREENS

Protection screens are to be designed to protect the railway by preventing:

- public access to overhead traction wiring equipment and the track, and / or
- the throwing of objects at trains, stations and staff / public on the railway corridor.

The minimum requirements for protection screens are provided in QR Technical Requirement MCE-SR-008.

9.0 SERVICES

Overbridges are not to disturb QR services (signal, telecommunications and OHLE) and other externally-owned services. Existing underground services that are to remain in place are to be protected from loads during construction and operation of the building. Design details are to be submitted to QR for review.

Services, including pipes for deck drainage, are not to be attached to the sides or undersides of overbridges over or adjacent to the railway.

Services and their attachment to the overbridge are to have a 100 year design life and are to be designed for replacement without effecting railway operations. Design and material selection is to be subject to review by QR. Drainage systems are to be designed to prevent leakage onto the railway corridor.

10.0 WATERPROOFING

Overbridge decks are to be waterproofed to prevent water leaking through to the railway. Details of the material and extent of application are to be shown on the construction drawings.

11.0 ANTI-GRAFFITI COATING

Except in remote areas, piers, parapets and any other parts of overbridges vulnerable to graffiti are to be protected by an approved non-sacrificial coating.

12.0 ADVERTISING SIGNS

Advertising signs and other hoardings are not to be placed on overbridges, unless approved by QR.

If existing advertising signs on QR property will require removal or relocation because of the proposed works, QR must be advised as early as possible. Failure to do so, may cause delays in the start of work. All costs associated with the removal and relocation of these signs are to be borne by the owner of the building.

13.0 CERTIFICATION OF DESIGN AND CONSTRUCTION

The overbridge design is to be carried out in compliance with the Professional Engineers Act. The designer is to specify the

functional requirements and the standards used for the design.

Design is to include verification by competent professional engineers, not directly involved in the design, that the design complies with the specified functional requirements and related standards.

The designer is to provide formal certification to QR that the overbridge design and verification requirements have been met. The certification is to include a summary of the specified functional requirements and related standards.

The completed overbridge must be certified by a Registered Professional Engineer of Qld as having been constructed in accordance with the drawings and any approved variations.

14.0 AS CONSTRUCTED DRAWINGS

Within six (6) weeks of practical completion of construction, the constructing authority is to provide QR with:

- as constructed drawings (plan and section) for the overbridge, showing the relationship to the railway tracks and all adjacent railway infrastructure, and
- collision protection elements for the overbridge.

Drawings are to be in electronic pdf format.

15.0 ASSOCIATED COSTS INCURRED BY QUEENSLAND RAIL


All of QR's costs associated with the review, design and construction of the overbridge and the implementation of QR's Technical Requirements will be charged to the overbridge owner or its agent. This includes any remedial work necessary to QR property as the result of this work and any accidental damage, as well as costs associated with train delays. Rates will be set by QR.


Systems and Capability Technical Requirement

WORK IN OR ABOUT QUEENSLAND RAIL PROPERTY

No: *MCE-SR-002*
 Issue: *Revision F*
 Date: *27 September 2010*

ISSUE	DATE	DESCRIPTION / REASON
Initial	05.03.1997	
Revision A	14.05.1997	Minor editing prior to authorisation
Revision B	16.01.2001	QUEENSLAND RAIL costs updated Definition of terms altered
Revision C	04.02.2002	Safety Induction course costs updated
Revision D	30.06.2005	Definition of Terms altered
Revision E	22.12.2009	Complete Revision
Revision F	27.09.2010	New disclaimer. Rebranded.

APPROVED BY:  DATE: 23-12-2009
 PRINCIPAL SYSTEMS ENGINEER (CIVIL)

AUTHORISED BY:  DATE: 23-12-2009
 MANAGER TRACK AND CIVIL SYSTEMS

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1.0 INTRODUCTION

This Technical Requirement details the criteria which must be met by an external party working in or about Queensland Rail property.

Reference is made to the following additional Queensland Rail Technical Requirements which must also be satisfied:

- *MCE-SR-003 Work adjacent to overhead line equipment,*

A copy of this document may be obtained from Queensland Rail.

All reference documents, e.g. Australian Standards, codes and Queensland Rail Technical Requirements, are to be the latest version.

1.1 Scope

This Technical Requirement specifies the requirements that a Contractor, not working for Queensland Rail, must comply with when working on:-

- Queensland Rail Property.
- In the vicinity of Queensland Rail property.
- Over or under Queensland Rail property.

When working on or adjacent to electrified tracks these requirements need to be read in conjunction with the Technical Requirement *MCE-SR-003 "Work Adjacent to Overhead Line Equipment"*.

1.2 Definition of Terms

- I. "Queensland Rail ". Queensland Rail having its offices at 305 Edward Street, Brisbane, Queensland.
- II. "Track Protection Officer (TPO)". The person appointed by Queensland Rail to protect the safe operation of the Operating Railway and has the responsibility for liaising with Train Control (except where a TPC has been appointed) and arranging for the necessary track protection;
- III. "Track Protection Co-ordinator (TPC)". The person appointed by Queensland Rail who has the overall responsibility for liaising with Train Control and arranging for the necessary track protection and safe working requirements. The TPC is to oversee and advise the Contractor on all railway safety requirements associated with the Works.

- IV. "Contractor". The persons, firm, partnership, company or corporation carrying out work adjacent to or over electrified railway tracks, whether as a contract or as day labour. The word "Contractor" shall mean the Contractor, subcontractors of the Contractor, and suppliers and invitees of the Contractor.
- V. "Queensland Rail Property". Property owned, leased or occupied by Queensland Rail.
- VI. "Operating Railway". The existing railway, which is in operation and includes but is not limited to fixed structures, installations, buildings and the like, as well as rollingstock and other equipment operating on the track.
- VII. "Project Manager". Queensland Rail appointed representative to oversee and coordinate the works during planning, design, construction and post construction. This role may be carried out by the Contracts Engineer during the construction and post construction.
- VIII. "Operating Track". A railway track over which trains and other track-mounted equipment may be operating.
- IX. "Track Closure". The closure of a section of the Operating Track to all rail traffic other than construction related rail traffic.
- X. "Track Possession". The period within a Track Closure when the Contractor is authorised to carry out work over, under or adjacent to the closed operating track.
- XI. "Work". Work which could directly or indirectly affect Queensland Rail property and/or operations.
- XII. "Work Site". Each separate location where work is to be carried out over, under or adjacent to the Operating Railway.

1.3 QUEENSLAND RAIL Corridor Safety

Queensland Rail corridor safety must be in accordance with Queensland Rail Multi Business Instruction NET-MUL-BI-6001 – "Access to the Queensland Rail network rail corridor". These requirements must apply to all persons entering the rail corridor, including all visitors, vendors and suppliers to the worksite.

No one can enter the rail corridor without being supervised by a Queensland Rail qualified Track Protection Officer or being accredited as a Queensland Rail qualified Track Protection Officer.

All planned work within the rail corridor requires a written and approved Corridor Access Safety Plan (SW61), developed prior to entering the corridor, by the worksite Queensland Rail Track Protection Officer and the Worksite Supervisor. The Contractor/Worksite Supervisor must contact Queensland Rail prior to planning to enter the rail corridor, to arrange for a worksite assessment of the Queensland Rail corridor safety requirements, by a Queensland Rail Track Protection Officer.

The Contractor shall be responsible for ensuring that all staff, employees and all other persons for whom the Contractor is responsible are fully informed of the dangers and procedures while working near existing railway tracks and overhead traction wiring equipment.

1.4 Safety Clothing

The Contractor shall ensure that all employees, visitors and other personnel employed or present on railway property in areas generally excluded from the public, shall at all times wear high viz orange shirts or safety vests, in accordance with QUEENSLAND RAIL safety standard SAF/STD/0032/SWK/NET. Where work is to be carried out at night or in reduced visibility, all shall wear reflectorised orange safety shirts or vests, in accordance with QUEENSLAND RAIL's requirements.

The Contractor shall ensure that no red or green clothing, including hats and safety helmets, shall be permitted to be worn by any employee, visitor or other personnel of the Contractor while on railway property, in areas generally excluded from the public.

1.5 Work Authorisation

Work shall be carried out to the satisfaction of Queensland Rail or a Queensland Rail appointed Project Manager.

All work performed on Queensland Rail property or when directed by Queensland Rail shall be under the supervision of a TPC or TPO and shall be carried out only at times authorised by Queensland Rail or the Queensland Rail appointed Project Manager.

When the Works are located adjacent to a railway track with overhead traction wiring equipment, these requirements shall be read in conjunction with MCE-SR-003 - "Work Adjacent to Overhead Line Equipment".

2.0 CONSTRUCTION METHODS

2.1 General

The Contractor shall execute the Works in such manner as not to impede, obstruct, interfere with, or endanger in any way the operations and/or property of Queensland Rail.

The safe operation of the railway is to take precedence over all work. No work is to be performed which will jeopardise the safe operation of railway traffic.

The Contractor shall be responsible during the progress of the works to avoid damage to any existing structures or services either owned by Queensland Rail or other Authorities. Before the commencement of any Works the Contractor shall arrange to check the location of services shown on drawings and for the presence of any other services not shown, by contacting "Dial Before You Dig".

Any damage to such services or/and structures shall be repaired at the Contractors cost, either by the Contractor or by the relevant Authority and to the satisfaction of the Authority concerned. The Contractor shall also be responsible for all costs incurred by the Service Authority due to interruptions to the service caused by any damage done by the Contractor.

In electrified railway areas, any damage to overhead line equipment is a serious safety hazard. Any damage to grading rings (copper wires buried around existing mast foundations) or traction bonds (cables attached to the railway rails) must be immediately reported to the TPO or TPC.

2.2 Interfering with a Railway

In accordance with section 255 of the Transport Infrastructure Act 1994, the Contractor must not interfere with a railway, unless he or she has the Rail Manager's written approval.

Should a Contractor interfere with a railway, the Rail Manager for the railway may, by written

notice, require the Contractor to rectify the interference within a stated reasonable time.

Should the Contractor not comply with the requirement, the Rail Manager may rectify the interference at cost to the Contractor.

2.3 Environmental Management Plan

The Contractor's Construction Environmental Management Plan (EMP) shall ensure that all Works undertaken by the Contractor on Queensland Rail property shall have minimal impact on the environment and shall be in accordance with all relevant State Government legislation and Local Authority regulations. In doing so, the Contractor shall comply with the Environmental Protection Act 1994 and its Environmental Protection Policies and Regulations.

Specific account shall be taken of the Environmental Guidelines for Construction and Building Sites and Environmental Guidelines for Noise from Blasting.

No construction work on Queensland Rail land will be permitted until written approval of the relevant sections of the EMP is received from the Project Manager.

2.4 Track Protection Coordinator / Officer (TPC/TPO)

No operation which, in the opinion of the TPC or TPO, could affect in any way whatsoever QUEENSLAND RAIL operations and/or property shall be performed unless a TPC or TPO is in attendance. The Contractor shall advise the TPC or TPO through the Project Manager at least 48 hours (in addition to non-working days) in advance, stating the period or periods for which TPOs are required.

The TPC will arrange with the Project Manager for the services of TPOs for the period or periods required.

The number of TPOs employed at any time shall be at the discretion of the TPC.

2.5 Project Manager

All enquires and correspondence to Queensland Rail, which are associated with the Works, is to be directed through the Project Manager.

2.6 Construction Procedure

The Contractor shall prepare Work Method Statements as required by the Workplace Health and Safety Act and the Queensland Rail Project Manager and submit them to the Queensland Rail Project Manager for review. Work Method Statements shall include details of construction procedures, together with details of all falsework and formwork to be used over or adjacent to the railway tracks. Work shall not commence until such Work Method Statements have been reviewed by the Project Manager.

2.7 Track Clearances

All track has a danger zone of 3.0 metres from the track centre line. For electrified track, a further 3.0 metre exclusion zone is required, from overhead live equipment (all components considered live). For clearance details to electrified lines reference must be made to MCE-SR-003 - "Work Adjacent to Overhead Line Equipment".

All types of plant, fixed or mobile, used about or in connection with any work shall be so operated that no portion of the plant is at any time closer than the 3.0 metre danger zone to the centreline of any railway track (measured horizontally).

Where a worker, piece of plant or equipment has the potential to be struck by rail traffic on an adjacent live track, a barrier must be in place between the worksite and live track, or, where a barrier is not possible an alternative form of protection must be provided.

Where barriers are used as track protection, authorisation for such barriers will be made by the TPO/TPC.

All temporary buildings, shelters, barriers, falsework, formwork and the like shall only be erected at locations assessed by the TPO/TPC and approved by the Project Manager. No portion of any such building, shelter, barrier, falsework, formwork and the like shall be closer than 3.0 metres to the centreline of railway track (measured horizontally).

If it is necessary at any time to operate plant or erect falsework or formwork or other temporary structure closer to the centreline of the railway track than 3.0 metres (inside the danger zone), such closer operation or erection will only be

permitted under track protection approved by the TPC/TPO.

All work inside Queensland Rail property shall be supervised by a TPC or TPO, unless otherwise approved by the Project Manager. Work further than 3.0 metres horizontally from the track centreline, but at a higher level where objects could fall within 3.0 metres horizontally of the track centreline, will only be permitted under track protection approved by the TPC/TPO.

The Contractor shall erect and maintain throughout the Contract period, a Queensland Rail approved high visibility tape or other Queensland Rail approved barrier 3.0 metres horizontally from the track centreline to indicate the limits of the safe work area. Where a high visibility tape is used as a barrier, a TPO must supervise.

For minimum clearances for falsework and formwork erected over non-electrified railway track refer to Queensland Rail standard drawing 2754 "Standard clearances for new structures". When working on or adjacent to electrified lines reference must be made to MCE-SR-003 - "Requirements for Work Adjacent to Overhead Line Equipment".

For work being carried out below rail level, all personnel must be at least 3.0 metres horizontally clear of the track centreline during the passage of any train through the worksite unless approved overhead protection barriers are provided.

2.8 Track Possession

Work which could involve undermining the track, damaging the track, blocking the track with rock or spoil, blasting and other operations which could prevent the safe operation of trains shall only be carried out during approved track possessions.

The Contractor shall schedule such work for the track possession periods available and shall ensure adequate manpower and equipment is on hand to complete the work and make the track available for train operations within the total track possession period.

The minimum period for notification of the Contractor's requirements for possessions shall

be **six (6) months** for minor possession times unless approved by the Project Manager.

For major possession times extra period for notification may be required. External Contractors are to submit requests on the appropriate form (via relevant Project Manager) to Queensland Rail, a minimum of 12 months, where practicable, or at least 6 months, from the day of operation.

The Track Possessions shall be in sufficient detail, including dates and durations desired for each Track Possession, to provide all necessary information on work at Work Sites, which affects or may affect the Operating Railway.

The Contractor shall be responsible for the accuracy of all information stated on the application and for delivery of the application to the Project Manager.

The Project Manager will not give the Contractor approval to commence work for which the track possession has been arranged until the Contractor has satisfied the TPC or TPO that the proposed procedures are suitable and that adequate plant and labour are on hand to complete the work within the allotted period.

The Contractor may not have available the whole of the period of any track closure as an exclusive use for the carrying out of work. Prior, concurrent or concluding activities by Queensland Rail may restrict the time available to the Contractor.

All costs associated with the provision of track possessions as well as any costs associated with the withholding of approval or the provision of additional or backup plant or labour shall be borne by the Contractor.

After a Track Possession has been granted by Queensland Rail for a nominated date, the contractor shall advise the Project Manager of any changes to the required date of the Track Possession by no later than 10 days prior to the Track Possession date. Should the Contractor fail to advise within the required minimum notification times, appropriate cancellation cost will apply. The Project Manager will endeavour to give the contractor as much notice as possible of any Track Possession that cannot be granted, but will not be obliged to compensate the contractor for any loss.

The Contractor shall, to the extent stated by Queensland Rail, pay all costs incurred by

Queensland Rail in connection with track possession.

The Contractor shall pay without deduction all moneys due and owing to Queensland Rail pursuant to this clause not later than 30 days from the date of Queensland Rail's invoice.

Queensland Rail reserves the right at any time to cancel any Track Possession at short notice by notice in writing to the Contractor.

2.9 Delays to Trains

Where the operations of Queensland Rail trains are delayed by **over 5 minutes** by the Contractor, or its servants or workmen or agents, and Queensland Rail determines that such delays are attributable to the default or neglect of the Contractor or its servants or workmen or agents, the cost of such delays shall be recovered by Queensland Rail from the Contractor.

The cost of delay shall be calculated by Queensland Rail for the train standing at the point of obstruction and for each train delayed further along the line in either direction.

If the delay is such that alternative transport arrangements are necessary for passengers or freight, the full cost of providing the alternative transport will be recoverable from the Contractor in addition to the cost of the delayed trains.

2.10 Stopping Work

If the Contractor is executing any work in a manner which, in the opinion of the TPC, TPO or Project Manager, could endanger Queensland Rail operations and/or property, the TPC, TPO or Project Manager shall have the right to instruct the Contractor to stop such work. If such instructions are not carried out, the TPC, TPO or Project Manager shall have the power to stop immediately all work, which could endanger Queensland Rail operations and/or property until adequate safety measures are implemented.

2.11 Removal of Contractor's Employee

The TPC and the TPO shall have the power to instruct the Project Manager, in writing, to order the Contractor to remove any employee of the Contractor from the Works, should that employee disobey an instruction given by the Protection Officer.

If a person breaches Queensland Rail's safety requirements associated with the safe operation of the operating corridor, by more than twice on the Work Site, then that person will be immediately removed from the Work Site, by the TPO. The matter will be referred

to the TPC/Project Manager, who will determine whether that person shall be permanently removed from the Work Site.

2.12 Temporary Level Crossings

If access across railway tracks is required by the Contractor and is considered necessary by the Project Manager, Queensland Rail will provide, maintain and remove at the expense of the Contractor temporary level crossings to enable the Contractor to gain access to the Works Site.

Queensland Rail must assess any proposed temporary level crossings, in accordance with the Australian Standard 1742.7 for level crossings. The Contractor shall apply the controls as recommended by the Queensland Rail assessment. All costs of the assessment and crossing construction shall be at the Contractor's cost.

The location of any access across railway tracks shall be authorised in writing by the Project Manager.

Approach earthworks to such crossings shall be constructed by the Contractor at the Contractor's expense to details provided by Queensland Rail.

The Contractor shall advise the Project Manager at least four (4) weeks in advance of the date when such access will be required, but Queensland Rail will not be responsible for any delay in the construction of the crossing and the Contractor shall have no claim on Queensland Rail in respect of any such delay.

2.13 Excavation near a Railway Track

The Contractor is to give Queensland Rail or the Queensland Rail Project Manager at least four (4) weeks notice of any intention to excavate within 25 metres of an existing or future rail corridor boundary, adjacent to or under railway tracks and over or under a railway tunnel. Excavations in these areas are to be carried out by methods described in Queensland Rail's conditions of approval for the Works and/or methods authorised by the Project Manager.

The Contractor shall be responsible for the costs of any track supports.

Where required by the Contractor and/or considered necessary by the Project Manager, the construction and installation of track supports will be carried out, at the Contractor's cost, by Queensland Rail. The Contractor shall be responsible for the construction and installation of any shoring required.

The Contractor shall be responsible for the safety of excavations within Queensland Rail property and shall cover and/or protect any such excavations with barriers and lights as necessary.

Excavations on Queensland Rail property shall not be backfilled until the methods and material proposed have been submitted to and reviewed by the Project Manager.

2.14 Blasting

The Contractor must give the Project Manager at least two (2) weeks notice of any intention to excavate by blasting and shall furnish full details of the location thereof and the proposed methods as well as the name and permit number of the licensed shotfirer.

Such blasting may only be carried at locations authorised by the Project Manager and at times authorised by the TPC or TPO. The TPO shall be in attendance.

Because of the extensive use of radio communications in the Queensland Rail system, the Contractor shall only use a non electric initiation system for explosives unless otherwise approved by the Project Manager. Explosive holes may be filled and stemmed prior to the passage of the last train past the Work Site but the interconnection of the initiation system between blast holes shall not occur until the track is clear of trains and permission given to the contractor to proceed by the TPO.

Blasting will not be permitted near any structures, fixtures, foundations and the like, the stability or integrity of which, in the opinion of the Project Manager, TPC or TPO may be endangered by blasting.

The Contractor will provide screens, barriers, mats and the like to limit the effects of blasting.

The Contractor will be held responsible for any loss, damage or injury sustained by the public or by workmen (whether employees of the Contractor, Queensland Rail or other Authority) and for any damage to property of any description whatsoever caused directly or indirectly by such blasting.

2.15 Construction Plan

For construction over railway tracks, the Contractor shall detail, in a construction plan, the construction procedure and interfaces with the railway. Construction shall not commence until the construction plan has been submitted to and approved by the Queensland Rail Project Manager.

3.0 RELOCATION OR ALTERATION OF RAILWAY SERVICES

The Contractor must advise the Project Manager in writing at least six (6) weeks before the date that any alterations to Queensland Rail services such as signalling, telecommunications or power supply systems will be required.

The cost of any such work shall be borne by the Contractor.

4.0 WORKS AREAS ON RAILWAY LAND

The Contractor must advise the Project Manager in writing of any areas of railway land required by the Contractor for carrying out the Works at least six (6) weeks before the land is required. The Contractor must not be given possession of any railway land until the extent and limits of all work areas on railway land have been authorised by the Project Manager.

The Contractor must erect safety fences and any other necessary protective measures to ensure that the Contractor's possession of such areas does not interfere with or endanger in any way whatsoever members of the public, Queensland Rail agents or servants, or Queensland Rail operations or property.

The Contractor must ensure that existing public access is maintained throughout the construction to a standard at least equal to that existing prior to the start of construction.

5.0 DEMOLITION OF EXISTING STRUCTURE

Demolition work must not commence until full details of proposed demolition methods and of the types of plant and equipment to be used have been submitted to and authorised by the Project Manager.

The demolition work is to be carried out in such a manner that no material shall fall on Queensland Rail tracks or other Queensland Rail installations.

If there is a possibility of material falling on Queensland Rail tracks or other Queensland Rail installations, the Contractor is to provide protection to such tracks and/or installations as approved by the TPC or TPO and the Project Manager.

Demolition must only be carried out at times authorised by the Project Manager, and the TPO shall be in attendance.

6.0 REMOVAL AND RE-ERECTING OF FENCING

If it is necessary to remove any fences along the railway boundary as part of the Works, or where other fences are removed temporarily or disturbed, all such fences shall be replaced or repaired by the Contractor, and left, at the time of the completion of the Works, in the same order and condition as they were at the commencement of the Works.

Contractor must maintain operating corridor security at all times or provide a TPO to supervise. A temporary fence shall be erected to protect corridor security before fences are removed.

Following removal of any fence along the railway boundary, the Contractor shall erect suitable barricades along the boundary at all times when work at that location is not in progress and until the fence is re-erected or replaced.

The Contractor is to keep the fence stockproof at all times when access is not required.

7.0 REMOVAL OF BUILDINGS AND CLEANING UP

Upon completion of work on Queensland Rail land, the Contractor is to remove all buildings, offices, workshops, temporary structures, plant, materials, surplus earth, rubbish and other construction items and shall restore the site to its original condition.

Any unfinished restoration works, which are not to Queensland Rail satisfaction, will be completed by Queensland Rail at the expense of the Contractor.

8.0 LIABILITIES OF CONTRACTOR

The cost of the TPC and TPO is to be borne by the Principal. Any other Queensland Rail employees necessary for the protection of Queensland Rail operations and/or property, the provision of rail corridor induction training, or for the isolation of Overhead Line Equipment, together with all other expenses incurred by Queensland Rail in safeguarding its operations and property during the course of the Works, shall be borne by the Contractor.

Queensland Rail will advise the Contractor of the estimated cost of the above requirements and the Contractor is to provide an order for this amount at least two (2) weeks before such work is required. Actual costs, whether more or less will be subsequently charged to the Contractor.

The Contractor is to be responsible for the cost of any damage to the rollingstock and other property of Queensland Rail and for any injury or damage to any person or property caused by or arising from the operations of the Contractor in carrying out the Works, or in any way associated with the Works, including any damage to underground services. The contractor is responsible for calling "Dial Before You Dig" prior to any excavation. In addition, the Contractor is responsible for the costs of any and all alternative arrangements and/or additional expenses which Queensland Rail may find necessary arising out of such damage by the Contractor in the carrying out of the Works, or in any way whatsoever associated with the Works.

9.0 INDEMNITY

The Contractor is to INDEMNIFY AND SAVE HARMLESS Queensland Rail, its agents and servants from and against all actions, proceedings, claims, demands, costs, losses, damages and expenses (including consequential loss) which may be brought against or made upon Queensland Rail, its agents and servants, or which Queensland Rail, its agents and servants may pay, sustain or be put to by reason of, in consequence of or in connection with the Works AND the Contractor shall RELEASE AND DISCHARGE QUEENSLAND RAIL, its agents and servants from any such action, proceeding, claim, demand, cost, loss, damage or expense including consequential loss arising out of the provisions hereto which but for the provisions hereof might be brought against or made upon Queensland Rail, its agents and servants either by the Contractor or any other persons, firm, partnership, company or corporation, save and except any action brought due to an act or omission of Queensland Rail.

10.0 INSURANCE

The Contractor must, on or before entering into and/or upon the construction and execution of the Works, at its expense effect and maintain current at all times during the life of the Contract in the joint names of Queensland Rail and the Contractor, a Public Risk Insurance Policy with a company licensed to carry on business in the State of Queensland for a sum of not less than twenty-five million dollars (\$25,000,000.00) to cover the legal liability of the insured or either of them, arising out of or in connection with either directly or indirectly the performance of this Contract for:

- (i) injury to or death of any person whatsoever including any agent or servant of Queensland Rail or the Contractor. Other than liability which the law requires to be covered in accordance with a statutory act;
- (ii) loss of or damage to any property whatsoever including the property of Queensland Rail or the Contractor;
- (iii) any accident caused including any accident arising out of or in consequence of the running of Queensland Rail trains through, under and during the construction of the Works.

The Contractor is to ensure that policies of insurance affected under this clause shall include provisions that will:


- (a) require the insurer, wherever the insurer gives an insured party other than Queensland Rail a notice of cancellation or other notice concerning the policy, at the same time to inform Queensland Rail in writing that the notice has been given;
- (b) provide that any cancellation of the policy by the insurer shall not take effect until 30 days after the notice under sub-clause (a) of this clause was given to Queensland Rail;
- (c) provide that a notice of claim given to the insurer by one insured party shall be accepted by the insurer as a notice of claim given by each of the insured parties;
- (d) provide that a breach of or failure to observe and fulfil the terms of the policy by any party comprising the insured shall not prejudice the rights of the remaining parties comprising the insured;
- (e) require the insurer, wherever there is a failure to pay a premium, to give notice in writing thereof forthwith to Queensland Rail;
- (f) include a cross of liability clause.


Systems and Capability Technical Requirement

WORK ADJACENT TO OVERHEAD LINE EQUIPMENT

No: *MCE-SR-003*
 Issue: *Revision E*
 Date: *30 September 2010*

ISSUE	DATE	DESCRIPTION / REASON
Initial	07.08.1997	
Revision A	16.01.2001	Reference made to Electrification Manual (STD/0039/SWK) QUEENSLAND RAIL costs updated
Revision B	04.02.2002	Safety Induction Course cost updated
Revision C	30.06.2005	Cl. 3.2.2 revised in respect of loads. Cl. 3.2.4 revised to exclude protection by a platform. Cl. 3.2.5 revised in respect of loads.
Revision D	22.12.2009	Complete Revision
Revision E	30.09.2010	Rebranded with new disclaimer.

APPROVED BY:  DATE: 23-12-2009
 PRINCIPAL SYSTEMS ENGINEER (CIVIL)

AUTHORISED BY:  DATE: 23-12-2009
 MANAGER TRACK AND CIVIL SYSTEMS

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1.0 INTRODUCTION

This Technical Requirement details the criteria which must be met by an external party working adjacent to Overhead Traction Wiring Equipment, in or about Queensland Rail property.

Definition:

Electrified Area is any section of track equipped with overhead traction wiring equipment, or any substation or supply substation used to provide power for electric trains.

Overhead Traction Power Equipment is the structures and overhead equipment necessary for the traction power supply for electric trains.

Traction Power Engineer or delegated representative is the registered professional electrical engineer responsible for the electric traction infrastructure in a defined geographic area in respect of 1. System operation, maintenance and integrity; and 2. Electrical safety advice.

Isolation is the action or arrangement whereby an electrical section of the overhead traction power equipment is isolated from all possible sources of electrical supply and earthed so that the equipment is no longer energised with electricity at the work site.

Permit to Work (Form C) is a permit that is issued subsequent to the equipment being isolated and earthed.

Safety Clarification Advice (SCA) is a written advice provided by QUEENSLAND RAIL on how to safely carry out work that has the potential to come within the 3 m exclusion zone of the live overhead traction power equipment. It is site specific written advice, concerning work restrictions in the vicinity of live overhead traction power equipment. This advice is supplied by the Senior Traction Power Engineer or their representative in response to a request from a Person in Charge of Work.

Person in Charge of Work (PICOW) is a worker who has the competence to supervise the electrical safety aspects of the work and has been appointed by line management to take charge of a specific worksite in the electrified area. If this worker is not the worker supervising

the technical aspects of the work or is not the work group leader, then the PICOW must be given an overriding safety responsibility.

Reference is made to the following additional Queensland Rail Technical Requirements which must also be satisfied:

MCE-SR-001 *Design of road overbridges;*
 MCE-SR-002 *Work in or about Queensland Rail property,*
 MCE-SR-005 *Design of buildings over or near railways,*
 MCE-SR-006 *Design of footbridges;*
 MCE-SR-008 *Protection screens, and*
 MCE-SR-012 *Protection of supporting elements adjacent to railways.*

Copies of these documents may be obtained from Queensland Rail.

All reference documents, e.g. Australian Standards, codes and Queensland Rail Technical Requirements, are to be the latest version.

2.0 SCOPE

This Technical Requirement specifies the requirements that a Contractor, not working for Queensland Rail, must comply with when working:

- On Queensland Rail Property,
- In the vicinity of Queensland Rail property, or
- Over or under Queensland Rail property.

3.0 WORK ADJACENT TO OVERHEAD TRACTION WIRING EQUIPMENT

3.1 Warning

WARNING: None of the components of the Overhead Line Equipment have any protective covering and are potentially dangerous and shall not be approached by persons either directly or indirectly with any item of material or equipment.

A 3 m exclusion zone from Overhead Electrics must be maintained.

All overhead line equipment shall always be regarded as energised with 25,000 volts of electricity unless an isolation has been carried out and a Permit to Work has been issued.

If, in the opinion of a Track Protection Officer (TPO) or the Track Protection Coordinator (TPC), any activity of the Contractor is considered dangerous or contravenes any of these Requirements, then the TPO or TPC has the authority to direct that such activity is to cease immediately.

3.2 General Requirements

For any work adjacent to Overhead Traction Wiring Equipment that encroaches or has the potential to encroach within 3 m of the Overhead Traction Wiring Equipment from a position below, along side or for any work at any distance above, **no work shall commence on site** until the Contractor has contacted the Senior Traction Power Engineer's office and received one of the following :

An isolation of the Overhead Traction Wiring and receipt of a Permit to Work (Form C) issued from a nominated person.

A Safety Clarification Advice (SCA) issued by the Senior Traction Power Engineer or his designated representative.

Isolation and Permit to Work :

When the Senior Traction Power Engineer (STPE) determines that work cannot be carried out safely under a Safety Clarification Advice (SCA) process, an isolation must be sought and planned so that the work can be conducted safely. A Permit to Work (Form C) will allow suitably trained workers under the supervision of a Person In Charge of Work (PICOW), to work "NEAR" isolated overhead line equipment.

Safety Clarification Advice (SCA) :

A Safety Clarification Advice (SCA) is a written advice provided by the Senior Traction Power Engineer or his designated representative on how to safely carry out work that has the potential to come within the 3 m exclusion zone of the live overhead line equipment.

The advice contained on the Safety Clarification Advice (SCA) form indicates the restrictions on work and work methods when work could come within 3 m of the live overhead line equipment. It is not a Permit to Work (Form C). The Person In Charge of Work (PICOW) remains responsible for the safety of the work group.

3.3 Application Procedure

The Contractor shall contact the Senior Traction Power Engineer and then apply in writing for one of the above using appropriate Queensland Rail forms/paperwork. The timing for the start of work by the Contractor on site is to allow for a Queensland Rail /Contractor site inspection and Queensland Rail's analysis/amendment/approval of the Contractor's application and Queensland Rail planning/resourcing.

The Contractor's application is to include but not be limited to such aspects as the provision of a Safe Work Method statement. The Safe Work Method Statement (WMS) must contain the minimum control measures required to ensure that an unsafe electrical situation is not created at any stage of the works. The submission is to nominate the Contractor's person who will be in charge of the work (PICOW). This worker must have appropriate knowledge of electrical safety and working within 3 m of the live overhead line equipment and also knowledge of working in a railway corridor which is to be obtained from appropriate Queensland Rail training courses.

There will be a requirement that all of the contractor's staff carrying out the works undergo Queensland Rail safety training.

4.0 FURTHER INFORMATION


More in depth information can be obtained from Queensland Rail Network Safety Management System SAF/STD/0141/ELE/NET - "Electrical Traction Systems Standards Manual".


Systems and Capability Technical Requirement

DESIGN OF BUILDINGS OVER OR NEAR RAILWAYS

No: *MCE-SR-005*
 Issue: *Revision C*
 Date: *30 September 2010*

ISSUE	DATE	DESCRIPTION / REASON
Initial	27.03.1997	
Revision A	09.05.2005	Complete Revision
Revision B	22.12.2009	Complete Revision
Revision C	30.09.2010	Rebranded with new disclaimer

APPROVED BY:  DATE: 23-12-2009
 PRINCIPAL SYSTEMS ENGINEER (CIVIL)

AUTHORISED BY:  DATE: 23-12-2009
 MANAGER TRACK AND CIVIL SYSTEMS

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1.0 INTRODUCTION

This Technical Requirement details the criteria which must be met by external party designs for buildings over or within 25 m of railway property. Reference is made to the following additional Queensland Rail Technical Requirements which must also be satisfied:

- MCE-SR-002 *Work in or about Queensland Rail property,*
- MCE-SR-003 *Work adjacent to overhead line equipment,*
- MCE-SR-007 *Design and selection criteria for road / rail interface barriers,*
- MCE-SR-008 *Protection screens,*
- MCE-SR-012 *Collision protection of supporting elements adjacent to railways, and*
- MCE-SR-014 *Design of noise barriers adjacent to railways.*

Copies of these documents may be obtained from Queensland Rail.

All reference documents, e.g. Australian Standards, codes and Queensland Rail Technical Requirements, are to be the latest version.

2.0 SCOPE

This Technical Requirement applies to the:

- design of new buildings, and
- upgrading of existing buildings.

It covers the design criteria for buildings which are neighbouring Queensland Rail property (with a common boundary), as well

as buildings which are above and enclose the railway tracks. Only those matters which will affect or are affected by the presence of the railway are covered. For example, the aesthetics or internal use and features of the building are not considered.

The presence of buildings over or near high speed or heavy haul railway lines is highly undesirable on safety grounds associated with increased consequence from derailment and will be limited by Queensland Rail.

3.0 DESIGN AND DOCUMENTATION

3.1 General

The design of buildings over or near the railway is to comply with:

- Building Code of Australia,
- relevant Australian Standards,
- AS 5100 *Bridge Design* for collision protection and collision loads, and
- this Technical Requirement and associated Technical Requirements.

Designers are to liaise with Queensland Rail to minimise the effect of construction on train services and to determine whether Queensland Rail will accommodate any speed restrictions, track closures and/or isolations of the overhead line equipment (OHLE) anticipated during construction.

The design of the building is to take into account the available access to the building site and the need to minimise interference with train operations, passengers and railway activities during construction.

Queensland Rail reserves the right to restrict construction methods to those that minimise interference to train operations, passengers and railway activities.

Existing access to Queensland Rail property for maintenance and emergency is to be maintained at all times during construction work.

All documentation for the construction of buildings is to allow for and include:

- MCE-SR-002 *Work in or about Queensland Rail property*, and
- MCE-SR-003 *Work adjacent to overhead line equipment (where applicable)*.

The drawings are to show:

- design loads,
- any special provisions, e.g. structural redundancy and use of precast or prefabricated elements
- railway centrelines in the vicinity of the proposed building,
- clearances from building to track and OHLE,
- railway kilometrage linked to the set out, and
- details of all existing railway infrastructure, including maintenance and emergency access under and in the vicinity of the proposed building.

All structural drawings, including temporary works such as falsework and formwork shall be certified as having been designed in compliance with the Professional Engineers Act.

Prior to construction, copies of the drawings and documentation consisting of:

- overall scope of construction works,
- demolition scheme,
- collision protection measures,
- assessment of risks from dangerous goods transport with appropriate control measures in the design, and
- details of work within / over / adjacent to Queensland Rail property,

are to be submitted to Queensland Rail for review and a compliance check against Queensland Rail's Technical Requirements and Standards.

Construction is not to commence until permission has been received from Queensland Rail.

3.2 Clearances

Clearances to railway tracks are to satisfy the minimum requirements of the following, unless otherwise approved by Queensland Rail:

- Queensland Rail Standard Drawing No 2754
- trackside access roads,
- formation drainage,
- sighting requirements for railway signals and level crossings,
- special items of overhead traction wiring equipment, e.g. switches, transformers, wiring at turnouts,
- passenger platform requirements, and
- access to clean and maintain the building.

For buildings across existing and future electrified lines, the building's support structure is to be located clear of the overhead wiring system and to have protection screens installed in accordance with Queensland Rail Technical Requirement MCE-SR-008 *Protection screens*.

The drawings of the proposed building are to show the railway clearance outline superimposed on an elevation of the building at 90° to the track alignment.

3.3 Earthquake Protection

Buildings over or near railways are to be classified as "importance level 2 structures" for the purposes of AS 1170.4 *Structural design actions: Part 4 Earthquake actions in Australia*.

Buildings are to be designed to minimise the risk of collapse during earthquakes, with particular attention being given to:

- bearing arrangements,
- widths of bearing shelves, and
- reinforcing steel in columns.

3.4 Durability

The design life of the building over or adjacent to the railway tracks needs to be a minimum of 100 years.

Buildings are to be designed so that maintenance will have no effect on Queensland Rail's operations. No access from the railway corridor is allowed.

3.5 Lighting and Ventilation

A building enclosing the railway is to be designed to maximise natural air flow and lighting within the railway corridor. Where a building abuts the railway corridor, it is not to produce lighting or ventilation shafts within or opening onto the railway corridor. Where it is determined that artificial light and mechanical ventilation of the railway corridor is required, the building owner or its agent is to provide and maintain:

- independent power supply for these services, and
- back-up plant and power supply to ensure continuous light and ventilation in case of failures and emergencies.

3.6 Demolition

A building is to be designed so that it can be demolished progressively without causing interference to train operations, passengers and any railway activities. A demolition scheme is to be included in the drawings and documentation to be submitted to Queensland Rail as required by Section 3.1.

4.0 SUBSTRUCTURE - FOUNDATIONS

Foundations are to be designed to be installed with minimum interference to railway operations.

No excavation within or under the railway corridor is permitted, unless agreed to by Queensland Rail. Permanent soil nails / rock anchors are not permitted to extend into the railway corridor. Temporary soil nails / rock anchors may be permitted during

construction of the substructure. They must be designed not to interfere with railway infrastructure. On completion of each level of the substructure, the temporary soil nails / rock anchors for that level are to be de-stressed, as agreed by Queensland Rail.

The period from commencement of excavation until completion of the substructure to at least rail level adjacent to the railway must not be more than 6 months.

The design of shoring systems for excavations adjacent to operating railway tracks is to be submitted to Queensland Rail for review before construction commences.

Foundations are not to interfere with corridor drainage. Provision is to be made for railway formation drainage. Drains are to be lined where appropriate and are to be clear of the track. Piers and foundations are to be designed to allow free drainage along the formation and are not to cause ponding. For deep excavations next to the corridor, the design of the retaining structures is to include provision for drainage.

5.0 PIERS – COLLISION PROTECTION

5.1 General

Buildings are to be a single clear span over existing and future railway tracks, unless agreed otherwise by Queensland Rail.

Collision protection and collision loads are to be in accordance with AS 5100 *Bridge Design* and Queensland Rail Technical Requirement MCE-SR-012.

5.2 Upgrading of Existing Buildings

Existing piers and columns which do not satisfy the requirements in Section 5.1 are to have deflection walls provided. Independent deflection walls are to be provided where space permits. For details refer to Queensland Rail Technical Requirement MCE-SR-012.

5.3 Design Report

A design report on the measures adopted for collision protection is to be included in the drawings and documentation to be submitted to Queensland Rail as required by Section 3.1.

6.0 SUPERSTRUCTURE

6.1 General

Building superstructures over existing tracks are to be designed to minimise the time needed for erection, e.g. precast / prefabricated components. The aim is to minimise any delays to train services during construction from speed restrictions, track closures and / or isolations of the overhead traction wiring equipment.

The connection between the deck and piers is to be designed to minimise the risk of collapse in the event of an earthquake or collision from railway traffic.

6.2 Building Drainage

Building drainage is to discharge in a manner which does not adversely affect railway tracks, associated railway facilities or property occupied by Queensland Rail. Building drainage discharge via scuppers is not permitted from spans over existing and future railway tracks. Building drainage pipes are to comply with the requirements for services in Section 9.

7.0 TRAFFIC BARRIERS

In areas of the building accessible by vehicles, traffic barriers are to be provided across the railway corridors to prevent vehicles from accessing Queensland Rail tracks and property.

Traffic barriers are to be designed in accordance with AS 5100 *Bridge Design* and Queensland Rail Technical Requirement MCE-SR-007. Building designers are to reach agreement with

Queensland Rail on the barrier performance level.

8.0 PROTECTION SCREENS

Protection screens are to be designed to protect the railway by preventing:

- public access to overhead traction wiring equipment and the track, and / or
- the throwing of objects at trains, stations and staff / public on the railway corridor.

The minimum requirements for protection screens are provided in Queensland Rail Technical Requirement MCE-SR-008.

9.0 SERVICES

Buildings are not to disturb existing Queensland Rail services (signal, telecommunications and OHLE) and other externally-owned services. Existing underground services that are to remain in

place are to be protected from loads during construction and operation of the building. Design details are to be submitted to Queensland Rail for review.

The building's services, including pipes for deck drainage, are not to be attached to the sides or undersides of buildings over or adjacent to the railway.

Services and their attachment to the building are to have a 100 year design life and are to be designed for replacement without effecting Queensland Rail operations. Design and material selection is to be subject to review by Queensland Rail. Drainage systems are to be designed to prevent leakage onto the railway corridor.

10.0 WATERPROOFING

Building enclosures over railways are to be waterproofed to prevent water leaking through to the railway.

11.0 ANTI-GRAFFITI COATING

Any parts of the building vulnerable to graffiti and visible from trains and railway platforms are to be protected by an approved non-sacrificial coating.

12.0 ADVERTISING SIGNS

Advertising signs and other hoardings are not to be placed on buildings over or having a common boundary with the railway, unless approved by Queensland Rail.

If existing advertising signs on Queensland Rail property will require removal or relocation because of the proposed works, Queensland Rail must be advised as early as possible. Failure to do so, may cause delays to the start of work. All costs associated with the removal and relocation of these signs are to be borne by the owner of the building.

13.0 TRANSPORT OF DANGEROUS GOODS

13.1 Background

The railway tracks under or beside the building may be used for transporting various dangerous goods (DG) and the effects of this are to be considered in the design of the building.

The feasibility of the development of buildings over the railway could be influenced by the cost of the risk control measures.

This section provides information about some of the hazards and some control measures that may be adopted for a building.

It is the responsibility of the building's owner or its agent to:

- assess the information,
- consider all aspects relating to the consequences of a dangerous goods accident,
- determine the appropriate control measures to be used in each particular case, and
- incorporate control features into the building to minimise negative impacts on the railway.

The potential risks from the escape of DG from their containment as the result of a railway accident, are fires, explosions and toxic emissions, either directly from chemical spills or as products of combustion / reactions.

The designer of the building is to consider the following aspects of the risks posed by transporting DG:

- safety of people occupying the building,
- safety of people on platforms or in trains under or near the building,
- structural damage to the building and / or adjacent structures,
- business interruptions and financial loss to building occupants in the event of incidents affecting the building,
- commercial risks to Queensland Rail in the potential loss of freight and passenger business in the event of incidents,
- increasing risks as a result of transporting DG by train through areas of increasing population and infrastructure density, and
- adverse public perceptions of the dangers of transporting DG through enclosed platforms, especially security related issues.

The following control measures have been identified by quantitative risk assessment and are to be considered in the design of the building:

- minimise or control the outbreak of fire,
- control the smoke / gas release from a fire,

- minimise the heat build-up in structures,
 - limit the blast damage to structural components,
 - provide stability or contingency measures to the design of the building, and
 - provide safe emergency access and egress from the railway track area and the building.
- emergency services to control the fire before significant structural damage can occur.

Any building over or beside the railway must be able to withstand a fire, explosion, chemical spill, liquid fuel spill, gas emission, etc. resulting from a derailment or other incident and still provide protection for users of the building.

The control measures identified are generic and all of them may not apply to all buildings. The extent of their applicability will need to be determined for each building, depending on its location and type.

In all cases where a building encloses the railway, provision is to be made in the design for access to the railway corridor so that cleaning of the railway infrastructure (station facilities, track, ballast, cess drains, etc.) can be performed after a DG incident.

For the purposes of a building which encloses railway tracks on both sides and above for a greater length than 80 m, the situation regarding limited ventilation is to be considered as similar to a tunnel.

Documentation is to be submitted to Queensland Rail for review, in accordance with Clause 3.1, and is to include a specialist design report on the assessment of DG risks and the control measures adopted in the design. Buildings that have a sufficiently wide enclosure over the tracks may or may not behave like a tunnel depending on the length to width ratio of the enclosure. Such cases have to be considered by computational modelling of smoke generation by fires to determine an effective ventilation strategy.

13.2 Design Intent

The aim of the design of buildings is to maintain structural integrity and so enable:

- people to escape from the building to a safe area,
- people to be rescued from stations beneath the building and evacuated to a safe area, and

13.3 Design Measures for the Control of Fire

This information is provided for the consideration of the building's designer for inclusion in the design.

One way to reduce the rate of temperature rise in a fire within an enclosure is to provide adequate ventilation. Ventilation reduces the build up of smoke and toxic gases in the enclosure, and heat affecting the structure above. Ventilation can be fed in a direction that creates a clear air entry for emergency response personnel. Alternatively, smoke and gases can be drawn into a ventilation duct and taken away from the enclosure space, so keeping the air in the enclosure free of smoke and gas, and achieving the design intent in Section 13.2. Mechanical ventilation for fire and life safety is mandatory when the enclosure contains platforms or station facilities.

Some design measures are outlined below:

1. Keep the length of the enclosure above and around the tracks to less than 80 m wherever possible, so that the onerous provisions of a tunnel may not be required. It also minimises hot gas layer build-up and heating of the building.
2. Provide sufficient gaps between buildings to ensure ventilation can occur between enclosures. Provide off-takes at the portals for ventilation. The optimum length for gaps (between buildings) is best determined by a generic ventilation study of an enclosed track section, using various lengths of enclosed track.

3. If the enclosure is longer than 80 m, making it a tunnel, consider providing a natural ventilation shaft at appropriate intervals. Where the enclosed section is also wide, the requirements shall be determined by smoke modeling.
4. The discharge point of the vent requires careful consideration as there is potential for dispersion of toxic plume (from the discharge point) to enter the air-conditioning air intake duct of the building. Dispersion modelling needs to be carried out using the meteorological data applicable to the building location, for various combinations of wind speeds and Pasquill stability conditions.
5. Construction of ventilation shafts to the “surface” may require consideration of formal permissions or tenure rights for a ventilation outlet to exist if outside Queensland Rail property. Consideration needs to be given to Queensland Rail’s long-term rights for the vent structure to remain and operate unrestricted while the railway operates.
6. Undertake modelling of smoke dispersion at the concept design stage to predict ventilation patterns. Computational models provide a useful tool in this area.
7. The enclosure structure itself shall be designed for a fire load of 60 MW. This may be achieved by one or more of the following:
 - (a) selecting an appropriate thickness for the enclosure soffit,
 - (b) coating the enclosure soffit with passive fire protection material, and
 - (c) providing sprinklers on the enclosure soffit above the tracks to reduce the heat generation rate and suppress fire by preventing air flow to the fuel.
 Option (c) will not be permitted if it interferes with the overhead traction equipment. Further, the situation would be aggravated if water is sprayed on Class 4.3 goods or burning
 - xanthates. The frequency of transport of xanthates and Class 4.3 goods may be significantly lower than that for flammable liquids such as gasoline.
8. The effect of more fuel will not increase the temperature of a hydrocarbon fire, but will only extend the duration of the fire. Therefore, the temperatures attained will be similar to those used in the design of road tunnels and the international code developed by PIARC will be appropriate.
9. Smoke dispersion modeling is to be used to predict the location of the smoke plume relative to the building. The building’s air-conditioning air intakes are to be located clear of these areas. However, the air intakes are to be fitted with smoke detectors which will automatically shut down the air-conditioning fan and damper.
10. Ventilation design needs to cater for operation during a fire emergency. The ventilation system must be able to control smoke and allow emergency response teams to enter the enclosed space safely with appropriate fire fighting and protective equipment.
11. Provision for the capture of large spills of flammable liquid.
12. The provision of fire detection and alarms in the enclosure.
13. Protection of fire detection equipment from the fire itself. Separate circuits with feeds from both ends of the enclosure and closed loops are essential to ensure that these communications remain open during a fire.
14. Provide adequate water drainage from the enclosed section of track, to avoid causing a hazard to fire fighters from burning fuel floating on the water.
15. Including emergency exit doors leading to escape passages to enable a mass evacuation of a passenger train, should a freight train carrying DG be stopped in the enclosure because of a fire or explosion.

13.4 Design Measures for Passive Fire Protection

This information is provided for the consideration of the building's designer for inclusion in the design.

Spalling of concrete can be limited and structural integrity can be maintained by the use of passive fire protection (PFP) materials. These coatings reduce the build-up of heat on the concrete surface and therefore limit the potential for spalling.

A PFP material is defined as, "a coating, cladding or free-standing system which, in the event of a fire, will provide thermal protection to restrict the rate at which heat is transmitted to the object or area being protected". These materials are used to:

- prevent escalation of the fire due to progressive releases of inventory, by separating the different fire risk areas, and hence protect personnel until safe evacuation can take place,
- protect essential safety items and critical components such as separators, risers and topside emergency shutdown valves, and
- minimise damage to the building by protecting the critical structural members.

The use of passive fire coatings has been shown to maintain concrete surface temperatures in hydrocarbon fires below 400 °C for up to 2 hours.

The use of polyfibres in concrete and minimising moisture content has also been shown to limit spalling. The polyfibres melt, providing space for moisture to expand.

Some design measures are outlined below:

1. Consider use of Passive Fire Protection materials to coat the soffit of the enclosure, as an alternative to structural design alone for a significant hydrocarbon fire.
2. Ensure that all materials to be used in the construction of the enclosure are evaluated with regard to their

flammability and combustion characteristics.

3. Develop a building evacuation plan in the event of a fire in the enclosure.
4. Nominate a safe assembly area for the building occupants in the building evacuation plan.

13.5 Design Measures for the Control of Blast Damage

This information is provided for the consideration of the building's designer for inclusion in the design.

The collision loads in AS 5100 do not cover the impact of explosions in enclosed spaces underneath a building.

Some design measures are outlined below:

1. In addition to looking at the actual structural design of specific support elements, limiting the effects of blast damage in a building may include:
 - (a) selective location of support pillars to avoid domino effects,
 - (b) spacing of pillars of sufficient number to provide strength, but at the same time providing adequate ventilation,
 - (c) use of structural walls instead of pillars only in cases where pillars are insufficient to support the load, and
 - (d) provision of additional support elements
2. A structural redundancy analysis shall be carried out to verify the capacity to support the deck load at the ultimate limit state with one or more of the supporting columns removed.
3. Consider providing alternative support structures for the building independent of the enclosure, additional fire rating etc, so that the integrity of these structures can be maintained. The need for this has to be determined on a case by case basis.
4. Configuration of a ventilation system which allows rapid ventilation transition

to zero air movement may be useful in a range of scenarios.

14.0 CERTIFICATION OF DESIGN AND CONSTRUCTION

The building design is to be carried out in compliance with the Professional Engineers Act. The designer is to specify the functional requirements and the standards used for the design.

Design is to include verification by competent engineers not directly involved in the design that the design complies with the specified functional requirements and related standards.

The designer is to provide formal certification to Queensland Rail that the building design and verification requirements have been met. The certification is to include a summary of the specified functional requirements and related standards.

The completed building must be certified by a Registered Professional Engineer of Queensland as having been constructed in accordance with the drawings and any approved variations.

15.0 AS CONSTRUCTED DRAWINGS

Within six (6) weeks of practical completion of construction, the constructing authority is to provide Queensland Rail with:

- as constructed drawings (plan and section) for the building, showing the relationship to the railway tracks and all adjacent railway infrastructure,
- collision protection elements for the building, and
- DG risk mitigation measures.

Drawings are to be in electronic pdf format.

16.0 ASSOCIATED COSTS INCURRED BY QUEENSLAND RAIL

All of Queensland Rail's costs associated with the review, design and construction of the building and the implementation of Queensland Rail's Technical Requirements will be charged to the building owner or its agent. This includes any remedial work necessary to Queensland Rail property as the result of this work and any accidental damage, as well as costs associated with train delays. Rates will be set by Queensland Rail.

Systems and Capability Technical Requirement

DESIGN OF FOOTBRIDGES

No: MCE-SR-006
Issue: Revision G
Date: 30 September 2010

ISSUE	DATE	DESCRIPTION / REASON
Initial	11.5.1998	Initial
Revision A	16.11.1999	Project Manager added to Clause 1.2 and 1.3. Cl. 1.4 on Earthquake Protection added. Cl. 3.2.3 on Support Loads added. Platform offset increased to a maximum of 3 m in Cl. 3.2.4. Cl. 3.3 revised. Cl. 5 on Parapets revised.
Revision B	30.11.1999	Cl. 3.2.3 corrected.
Revision C	3.5.2000	Cl. 3.2.2 revised in respect of loads. Cl. 3.2.4 revised to exclude protection by a platform. Cl. 3.2.5 revised in respect of loads.
Revision D	25.11.2005	Changes to all clauses to reflect AS 5100. Cl. 1 revised Introduction and Scope. Cl. 2.4 revised Earthquake Protection. Cl. 2.5 Durability added Cl. 4.0 revised text and added information and clauses for Collision From Rail Traffic Cl. 7.0 additional information for Services Cl. 11.0 Certification clause added
Revision E	14.2.2006	Cl. 4.1.2 revised and amended text
Revision F	22.12.2009	Complete revision
Revision G	30.09.2010	Rebranded with new disclaimer.

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1.0 INTRODUCTION

This Technical Requirement details the criteria which must be met by external party designs for footbridges over railway property.

Definition: **Footbridge** is a bridge solely for pedestrian traffic.

Reference is made to the following additional Queensland Rail Technical Requirements which must also be satisfied:

- MCE-SR-002 *Work in or about Queensland Rail property,*
- MCE-SR-003 *Work adjacent to overhead line equipment,*
- MCE-SR-008 *Protection screens, and*
- MCE-SR-012 *Collision protection of supporting elements adjacent to railways.*

Copies of these documents may be obtained from Queensland Rail.

2.0 SCOPE

This Technical Requirement applies to the

- design of new footbridges, and
- upgrading of existing footbridges.

It covers the design criteria for footbridges which pass over Queensland Rail property. Only those matters which will affect or are affected by the presence of the railway are covered. For example, the aesthetics of the footbridge are not considered.

•

3.0 DESIGN AND DOCUMENTATION

3.1 General

The design of footbridges is to comply with:

- relevant Australian Standards,
- AS 5100 *Bridge Design* for collision protection and collision loads, and
- this Technical Requirement and associated Technical Requirements.

Designers are to liaise with Queensland Rail to minimise the effect of construction on train services and to determine whether

Queensland Rail will accommodate any speed restrictions, track closures and/or isolations of the overhead line equipment (OHLE) anticipated during construction.

The design of the footbridge is to take into account the available access to the site and the need to minimise interference with train operations, passengers and railway activities during construction.

Queensland Rail reserves the right to restrict construction methods to those that minimise interference to train operations, passengers and railway activities.

Existing access to Queensland Rail property for maintenance and emergency is to be maintained at all times during construction work.

All documentation for the construction of footbridges is to allow for and include:

- MCE-SR-002 *Work in or about Queensland Rail property,* and
- MCE-SR-003 *Work adjacent to overhead line equipment (where applicable).*

The drawings are to show:

- design loads,
- any special provisions, e.g. structural redundancy and use of precast or prefabricated elements
- railway centrelines in the vicinity of the proposed overbridge,
- distances from footbridge to track and OHLE,
- railway kilometrage at the intersection of railway and footbridge centrelines, and
- details of all existing railway infrastructure, including maintenance and emergency access, under and in the vicinity of the proposed footbridge.

All structural drawings, including temporary works such as falsework and formwork shall be certified as having been designed in compliance with the Professional Engineers Act.

Prior to construction, copies of the drawings and documentation consisting of:

- overall scope of construction works,

- demolition scheme,
 - collision protection measures, and
 - details of work within / over / adjacent to Queensland Rail property
- are to be submitted to Queensland Rail for review and a compliance check against Queensland Rail's Technical Requirements and Standards.

Construction is not to commence until permission has been received from Queensland Rail.

3.2 Clearances

Clearances to railway tracks are to satisfy the minimum requirements of the following, unless otherwise approved by Queensland Rail:

- Queensland Rail Standard Drawing No 2754,
- trackside access roads,
- formation drainage,
- sighting requirements for railway signals and level crossings,
- special items of overhead traction wiring equipment, e.g. switches, transformers, wiring at turnouts,
- passenger platform requirements, and
- access to clean and maintain the footbridge.

For footbridges across existing and future electrified lines, the footbridge's support structure is to be located clear of the overhead wiring system and to have protection screens installed in accordance with Queensland Rail Technical Requirement MCE-SR-008 *Protection screens*.

Footbridge abutments adjacent to existing tracks are to be located sufficiently clear of the tracks to avoid any delays to train services from speed restrictions, track closures and / or isolations of the OHLE. This may require clearances greater than the minimum clearances shown on Standard Drawing No. 2754. Queensland Rail will advise of clearances required in excess of the minimum.

The drawings of the proposed footbridge are to show the railway clearance outline and at platforms, the structure outline superimposed on an elevation of the footbridge at 90° to the track alignment.

3.3 Earthquake Protection

Footbridges are to be classified as "importance level 2 structures" for the purposes of AS 1170.4 *Structural design actions: Part 4 Earthquake actions in Australia* and in accordance with AS 5100, although the lateral restraint force in AS 5100.2 Cl. 9 is not required.

Footbridges are to be designed to minimise the risk of collapse during earthquakes, with particular attention being given to:

- bearing arrangements,
- widths of bearing shelves, and
- reinforcing steel in columns.

3.4 Durability

The design life of footbridges needs to be a minimum of 100 years.

Footbridges are to be designed to minimise maintenance (such as maintenance painting of steelwork) and when required, will have no effect on Queensland Rail's operations. No access from the railway corridor is allowed.

3.5 Demolition

A footbridge is to be designed so that it can be demolished progressively without causing interference to train operations, passengers and any railway activities. A demolition scheme is to be included in the drawings and documentation to be submitted to Queensland Rail as required by Section 3.1.

4.0 SUBSTRUCTURE - FOUNDATIONS

Foundations are to be designed to be installed with minimum interference to railway operations.

The design of shoring systems for excavations adjacent to operating railway tracks is to be submitted to Queensland Rail for review before construction commences.

Provision is to be made for railway formation drainage. Drains are to be lined where appropriate and are to be clear of the track. Footbridge piers and foundations are to be designed to allow free drainage along the formation and are not to cause ponding.

5.0 PIERS - COLLISION PROTECTION

5.1 General

Footbridges are to have a single clear span between abutments over existing and future railway tracks, unless agreed otherwise by Queensland Rail.

Collision protection and collision loads are to be in accordance with AS 5100 *Bridge Design* and Queensland Rail Technical Requirement MCE-SR-012.

5.2 Upgrading of Existing Footbridges

Existing piers and columns which do not satisfy the requirements of Section 5.1 are to have deflection walls provided. Independent deflection walls are to be provided where space permits. For details refer to Queensland Rail Technical Requirement MCE-SR-012.

5.3 Design Report

A design report on the measures adopted for collision protection is to be included in the drawings and documentation to be submitted to Queensland Rail as required by Section 3.1.

6.0 SUPERSTRUCTURE

6.1 General

Footbridge superstructures over existing tracks are to be designed to minimise the time needed for erection, e.g. precast / prefabricated components. The aim is to minimise any delays to train services during

construction from speed restrictions, track closures and / or isolations of the overhead traction wiring equipment.

The connections between the deck and piers are to be designed to minimise the risk of collapse in the event of an earthquake or collision from railway traffic.

6.2 Deck Drainage

Footbridge deck drainage shall discharge in a manner which does not adversely affect railway tracks, associated railway facilities or property occupied by Queensland Rail. Deck drainage discharge via scuppers is not permitted from spans over existing and future railway tracks. Deck drainage pipes are to comply with the requirements for services in Section 8.

7.0 PROTECTION SCREENS

Protection screens are to be designed to protect the railway by preventing:

- public access to overhead traction wiring equipment and the track, and / or
- the throwing of objects at trains, stations and staff / public on the railway corridor.

The minimum requirements for protection screens are provided in Queensland Rail Technical Requirement MCE-SR-008.

8.0 SERVICES

Footbridges are not to disturb Queensland Rail services (signal, telecommunications and OHLE) and other externally-owned services. Existing underground services that are to remain in place are to be protected from loads during construction and operation of the building. Design details are to be submitted to Queensland Rail for review.

Services, including pipes for deck drainage, are not to be attached to the sides or undersides of footbridges over or adjacent to the railway.

Services and their attachment to the overbridge are to have a 100 year design life and are to be designed for replacement without affecting railway operations. Design and material selection is to be subject to review by Queensland Rail. Drainage systems are to be designed to prevent leakage onto the railway corridor.

9.0 WATERPROOFING

Footbridge decks are to be waterproofed to prevent water leaking through to the railway. Details of the material and extent of application are to be shown on the construction drawings.

10.0 ANTI-GRAFFITI COATING

Except in remote areas, piers, parapets and any other parts of footbridges vulnerable to graffiti are to be protected by an approved non-sacrificial coating.

11.0 ADVERTISING SIGNS

Advertising signs and other hoardings are not to be placed on footbridges, unless approved by Queensland Rail.

If existing advertising signs on Queensland Rail property will require removal or relocation because of the proposed works, Queensland Rail must be advised as early as possible. Failure to do so, may cause delays in the start of work. All costs associated with the removal and relocation of these signs are to be borne by the owner of the building.

12.0 CERTIFICATION OF DESIGN AND CONSTRUCTION

The footbridge design is to be carried out in compliance with the Professional Engineers Act. The designer is to specify the functional requirements and the standards used for the design.

Design is to include verification by competent professional engineers, not

directly involved in the design, that the design complies with the specified functional requirements and related standards.

The designer is to provide formal certification to Queensland Rail that the overbridge design and verification requirements have been met. The certification is to include a summary of the specified functional requirements and related standards.

The completed footbridge must be certified by a Registered Professional Engineer of Qld as having been constructed in accordance with the drawings and any approved variations.

13.0 AS CONSTRUCTED DRAWINGS

Within six (6) weeks of practical completion of construction, the constructing authority is to provide Queensland Rail with:

- as constructed drawings (plan and section) for the footbridge, showing the relationship to the railway tracks and all adjacent railway infrastructure, and
- collision protection elements for the footbridge.

Drawings are to be in electronic pdf format.

14.0 ASSOCIATED COSTS INCURRED BY QUEENSLAND RAIL

All of Queensland Rail's costs associated with the review, design and construction of the footbridge and the implementation of Queensland Rail's Technical Requirements will be charged to the footbridge owner or its agent. This includes any remedial work necessary to Queensland Rail property as the result of this work and any accidental damage, as well as costs associated with train delays. Rates will be set by Queensland Rail.

Systems and Capability Technical Requirement

DESIGN AND SELECTION CRITERIA FOR ROAD/RAIL INTERFACE BARRIERS

No: *MCE-SR-007*
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Initial	15.06.2009	Initial (New Queensland Rail/Qld Main Roads document)
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1.0 INTRODUCTION

An intrusion into the railway corridor by an errant vehicle, loss of cargo onto the rail track or debris resulting from the event can cause a major incident and lead to extensive disruptions to railway and road operations.

A major incident could cause:

- Significant loss of life to rail passengers and the occupant(s) of the road vehicle(s);
- Damage to vehicle(s) and train(s);
- Derailed train being hit by a train on adjacent tracks;
- Track blockage;
- Damage to infrastructure; and
- Delays due to the time taken for debris removal.

In light of the increasing potential of incidents in shared corridors, Queensland Main Roads and QR Network collaborated to produce this specification for designers to determine the appropriate road and bridge barrier where the road and the rail are in close proximity without having to go back to first principles each time.

The current standards for road and bridge barriers AS 3845 and AS 5100 assume the main risk of an errant vehicle is to the occupants of the vehicle. In addition to this, Queensland Main Roads "Road Planning and Design Manual" Chapter 8, currently provides guidance on the treatment of roadside hazards but does not take into account adjacent third parties, such as railways.

This document sets out requirements for road and bridge barriers where the road and rail corridors are in close proximity and includes a road/rail barrier selection matrix developed using a risk assessment methodology. It has been further supplemented with a systematic procedure for barrier selection in parallel road and rail corridors and a document on road barrier selection for bridges over rail corridors.

NOTE

This document has been jointly developed by QR Network and Queensland Main Roads (Network Operations and Road Safety Division and Structures Division); any alterations must be jointly endorsed by both Authorities.

This document shall be subject to a review in 5 years from initial date of issue.

2.0 ASSUMPTIONS

- The errant vehicle is assumed to have 1 or 2 occupant(s); and
- Trucks are assumed to be a 36 tonne tanker semi-trailer for road barriers and a 44 tonne tanker semi-trailer for bridge barriers in accordance with AS 3845 and AS5100 respectively.

3.0 EXCLUSIONS

- Level crossings;
- "High centre of gravity" vehicles such as double-decker cattle trucks (Where these vehicles form part of the traffic stream, then the height of barriers needs to be re-evaluated);
- Length of barrier required on bridge approaches;
- At-grade and elevated roads with tight horizontal radius curves where the speed environment transitions between high and low speed; and
- Barriers adjacent to construction sites.

4.0 REFERENCE DOCUMENTS

- AS 3845
- AS 5100
- Queensland Main Roads: Road Planning and Design Manual
- QR Network documents: MCE-SR-001; MCE-SR-006; MCE-SR-014
- Barlow, S., Pritchard, R., Theodoropoulos, A., Troutbeck, R., 2009, "Barriers between road and rail: barriers adjacent to rail explained", 7th Austroads Bridge Conference, Auckland, New Zealand.

5.0 ROAD/RAIL INTERFACE BARRIER SELECTION PROCESS

Suitable reinforced concrete barriers shall be provided between the road and railway corridor as outlined in the following sections. The possible future rail and road status shall be taken into consideration in the barrier selection process to accommodate future requirements.

Note: The road barrier is to be located on the road shoulder.

Step 1: Determine measured horizontal offset between road/rail interface

From the typical design cross-section, determine the measured horizontal offset (X_H) from the edge-line of the road to the closest railway infrastructure (either 3m from the centre-line of the nearest railway track or to the nearest significant QR Network building/structure). Refer to Appendix 1 which shows barrier placement for different road/rail interface scenarios.

Step 2: Apply slope adjustment factor to determine slope adjusted horizontal offset, X_S

The measured horizontal offset (X_H) is adjusted to take into account the slope of the embankment from the road corridor down to the rail corridor. No adjustment is necessary where the rail corridor is above the road corridor. For slopes between 1 to 4 and 1 to 2.5, the following equation is used to calculate the slope adjusted offset.

Slope adjusted horizontal offset $X_S = (X_H \times F_S)$

Where:

X_H = measured horizontal offset

F_S = slope adjustment factor (refer to Table 1)

For embankments with compound slopes, each section with a different slope is calculated individually and each slope adjusted offset is added to obtain the overall slope adjusted offset, X_S , such that:

Slope adjusted horizontal offset $X_S = \sum (X_{Hi} \times F_{Si})$

Embankment Slope (V to H)	F_S
Horizontal/Flat	1.00
Less than 1 to 4	1.00
1 to 4	0.38
1 to 3.5	0.29
1 to 3	0.17
1 to 2.5 or steeper	0.00

Table 1. Slope Adjustment Factors

Example

If a railway was located at the base of a 1 to 3 embankment, and the offset between the railway infrastructure and the hinge point at the top of the embankment was 4.0m, and the distance from the edge-line of the road to the hinge point of the slope was 2.5m (refer to Figure 1.) then:

$$\begin{aligned}
 X_S &= \sum (X_{Hi} \times F_{Si}) \\
 &= (X_{H1} \times F_{S1}) + (X_{H2} \times F_{S2}) \\
 &= (2.5 \times 1.00) + (4.0 \times 0.17) = 3.18\text{m}
 \end{aligned}$$

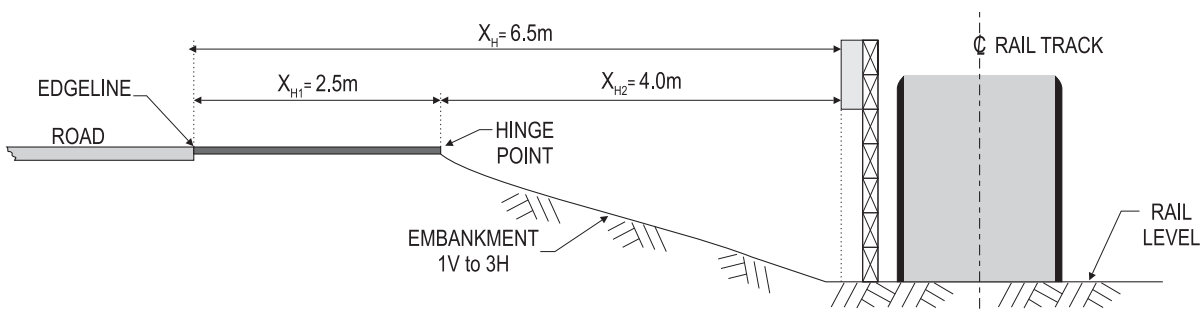


Figure 1. Example: Applying slope adjustment factor

Notes

1. For slopes flatter than 1 to 4, the slope adjustment factor (F_{Si}) should be taken as 1.00. That is, $X_S = X_H$
2. For slopes steeper than 1 to 2.5, slope adjustment factor (F_{Si}) should be taken as 0.00. In this instance, the slope adjusted offset distance (X_S) will become the measured distance from the road edge-line to the top of embankment hinge point.
3. At the locations where the railway is above the level of the road, $X_S = X_H$.

Step 3: Apply horizontal road curve adjustment factor

If the design radius of the road is equal to or less than 2000m, a horizontal curve adjustment factor, F_C , is applied to the slope adjusted horizontal offset determined in the previous step, X_S , to calculate the design offset, X_D , therefore:

The design offset, $X_D = (X_S \times F_C)$

Where:

X_S = slope adjusted offset

F_C = horizontal curve adjustment factor (refer to Table 2)

$X_D = X_H$ where the road is on a straight alignment or the radius is greater than 2000m.

Horizontal curve radii (m)	Horizontal Road Curve Adjustment Factor (F_c)						
	60	70	80	90	100	110	120
100	0.56	0.50	0.43	0.37	0.31	0.26	0.21
150	0.66	0.60	0.54	0.47	0.41	0.34	0.29
200	0.72	0.67	0.61	0.54	0.48	0.41	0.35
250	0.76	0.71	0.66	0.60	0.53	0.47	0.40
300	0.80	0.75	0.70	0.64	0.58	0.51	0.45
400		0.80	0.75	0.70	0.65	0.58	0.52
500			0.79	0.75	0.69	0.64	0.57
600				0.78	0.73	0.68	0.62
700				0.81	0.76	0.71	0.65
800					0.78	0.74	0.68
900						0.76	0.71
1000						0.78	0.73
1200						0.81	0.76
2000							0.84
Design Speed Environment (km/h)	60	70	80	90	100	110	120

Table 2. Horizontal road curve adjustment factors

Note:

1. The design speed environment is 10km/h above the posted speed limit of the road on the approach to the horizontal curve.

Example

Continuing from the previous example, consider that the road also has a 600m horizontal curve, a posted speed of 100km/h and hence a design speed of 110km/h. If $X_s = 3.18m$, the horizontal curve radius on the road is 600 m and the design speed is 110 km/h, then to calculate the design offset:

$$X_D = (X_s \times F_c).$$

$$= (3.18 \times 0.68) = 2.16m$$

Example summary

$$X_D = \sum (X_{Hi} \times F_{Si}) F_C$$

Where:

$X_H = 6.5m = X_D$ if no slope or curve adjustment is required

$X_s = 3.18m = X_D$, if only the slope adjustment is required

$X_D = 2.16m$, if both the slope and curve adjustment factors are required.

The barrier is to be located on the road shoulder.

Step 4: Determine rail status

The railway status should be classified as shown in Table 3.

Rail status	Description
MPE	Main-line electrified (high passenger train frequency), i.e. the suburban network
MC & DG	Main country passenger and goods lines (eg. NCL) & light trafficked dangerous goods lines (i.e. explosive or highly flammable)
SP	Secondary passenger and/or goods lines. 1-5 trains / 24 hours
L	Light country lines < 7 trains per week
C	Coal/mineral lines

Table 3. Rail Status

Step 5: Determine road status

The design speed and road classification should be used to determine the road status. Refer to Table 4.

Road status	Description	Design Speed (km/h)	Upper limit AADT (veh/day)
1A	Arterial & dual carriageway	110	130,000
1B	Arterial & dual carriageway	80	90,000
1C	Arterial & dual carriageway	60	65,000
2A	Arterial, connection roads and rural highways	110	65,000
2B	Arterial, connection roads and rural highways	80	40,000
2C	Urban road	70	10,000
3	Residential Street	60	1,000

Note: The road speeds shown above, represent the design speed.

Table 4. Road Status

Step 6: Select/design road barrier

To select an appropriate road barrier, where a barrier is TL5 (height 1.1m) or TL4; refer to Main Roads document "Road Safety Barriers and End Treatments, assessed as compliant with AS 3845" (www.mainroads.qld.gov.au). Where the required barrier is TL5 (height 1.5m) or TL6, the barrier should be designed for the loads described in Table 5. Refer to road safety barrier "first principles" design procedure for road bridge barriers in the next section.

Barrier Performance Level	Height (m)	Effective height H _e (m)	Transverse Load (kN)	Vehicle Contact Length (m) ^{***}
TL4	0.8	Refer to MR document: "Road Safety Barriers and End Treatments, assessed as compliant with AS 3845" (available on QMR website.)		
TL4	1.1			
TL5	1.1			
TL5	1.5	1.40	500	2.4 (AS 5100.2 Table A2)
TL6	1.5	1.40	750	2.4 (AS 5100.2 Table A2)
TL6*	1.5	1.40	1000	2.4 (AS 5100.2 Table A2)
TL6**	2.0**	1.40	1000	2.4 (AS 5100.2 Table A2)

Notes to table 6a:

* 44 t articulated truck

** 2.0 m height for fire protection

*** Length of barrier that vehicle load is distributed over.

Table 5. Road barrier design criteria

Note: for TL5 barrier (height 1.5m) and TL6 barriers (heights 1.5, 2m) there are no proprietary barriers available in Australia. Advice on their design can be sought from the Road Authority.

Step 7: Determine the road barrier test level and height.

Use Table 6 "road/rail interface barrier selection" to select the appropriate barrier type and design height, using the rail and road status, and design offset, X_D .

Road /Rail corridor characteristics		1A-MPE	1B-MPE 2A-MPE	1C-MPE 1A-MC 1A-C 2B-MPE	1B-MC 2A-MC	1C-MC 2B-MC 1A-SP 2A-SP 2A-C 1B-C 2C-MPE	2C-MC 1B-SP 2B-SP 2B-C 1A-L 2A-L 1C-SP	2C-SP 2C-C 1B-L 3-MPE	1C-L 2B-L 2C-L 3-MC	3-SP 3-C 3-L
Design Offset, X_D (m)	≤4	TL6 2.0	TL6 1.5	TL6 1.5	TL5 1.5	TL5 1.5	TL5 1.1	TL4 1.1	TL4 1.1	TL4 1.1
	5	TL6 2.0	TL6 1.5	TL6 1.5	TL5 1.5	TL5 1.5	TL5 1.1	TL4 1.1	TL4 1.1	TL4 0.8
	6	TL6 2.0	TL6 1.5	TL6 1.5	TL5 1.5	TL5 1.5	TL5 1.1	TL4 1.1	TL4 0.8	
	7	TL6 1.5	TL6 1.5	TL5 1.5	TL5 1.5	TL5 1.5	TL4 1.1	TL4 0.8		
	8	TL6 1.5	TL5 1.5	TL5 1.5	TL5 1.5	TL5 1.1	TL4 1.1			
	9	TL5 1.5	TL5 1.5	TL5 1.5	TL5 1.1	TL5 1.1	TL4 0.8			
	10	TL5 1.5	TL5 1.5	TL5 1.5	TL5 1.1	TL5 1.1				
	11	TL5 1.5	TL5 1.5	TL5 1.1	TL5 1.1	TL4 1.1				
	12	TL5 1.5	TL5 1.1	TL5 1.1	TL5 1.1	TL4 1.1				
	13	TL5 1.1	TL5 1.1	TL5 1.1	TL5 1.1	TL4 1.1				
	14	TL5 1.1	TL5 1.1	TL5 1.1	TL4 1.1	TL4 0.8				
	15	TL5 1.1	TL5 1.1	TL4 1.1	TL4 1.1					
	16	TL5 1.1	TL5 1.1	TL4 1.1	TL4 1.1					
	17	TL5 1.1	TL5 1.1	TL4 1.1	TL4 0.8					
	18	TL5 1.1	TL4 1.1	TL4 1.1	TL4 0.8					
	19	TL4 1.1	TL4 1.1	TL4 0.8						
	20	TL4 1.1	TL4 1.1	TL4 0.8						
	21	TL4 1.1	TL4 1.1							
	22	TL4 1.1	TL4 1.1							
	23	TL4 1.1	TL4 0.8							
	24	TL4 1.1	TL4 0.8							
	25	TL4 0.8								
	26	TL4 0.8								
	27	TL4 0.8								
	28									
	29									
	30									
	31									
	32									
	33									
	34									
	35									

Note: Light Green shaded area denotes that a barrier may be required where directed by the Road and/or Rail authority as determined by a risk assessment.

Table 6. Road / Rail interface barrier selection

Step 8: Increase barrier height for electrification, and/or anti-throw screen (if required)

Additional height may be required for electrification, anti-throw, anti-glare screens and/or fire protection. This is determined on a case by case basis.

6.0 ANTI THROW AND ELECTRIFICATION SCREENS FOR ROAD BARRIERS

Anti throw screens shall be provided on the side of the road or path nearest to the railway, where the horizontal distance from the road edge, fence line or traffic barrier to the nearest track centre line is less than 6m. The anti throw screen shall be 2.4m high, if see-through and 2.0m high, if not see-through.

Electrification screens shall be provided on the side of the road or path nearest to the railway, where the minimum horizontal distance from the road/path, fence line or traffic barrier is less than 3m horizontally (in any direction), from overhead line equipment or wiring. The minimum required height (measured from the highest point of the adjacent pavement) for the electrification screen is 1.8m.

Subject to Rail Authority approval, anti glare screens may be suitable as anti throw or electrification screens. Also, the screens may be incorporated in the height of the crash barrier, subject to Rail Authority approval. Refer to Appendix 2 at the end of this document, and QR Network documents, MCE-SR-006, MCE-SR-001, for additional information.

7.0 BRIDGES OVER RAILWAY CORRIDOR

Suitable reinforced concrete barriers shall be provided over the full width of the railway corridor on both sides of road bridges over railways and on bridge approaches (the length of the approach barrier is to be determined by a risk assessment). The Rail Authority may allow the barrier to partially span the railway corridor, based on the current and future frequency of rail traffic and other railway activity in the railway corridor.

The possible future rail and road status shall be taken into consideration in the barrier selection process and the bridge designed accordingly to also accommodate future barrier requirements.

Road Bridge Overpass/Rail Interface Barrier Selection and Design

Step 1: Determine rail status

The railway status shall be classified as shown in Table 3.

Step 2: Determine road bridge overpass status

The design speed (i.e. the posted speed plus 10km/h) and road classification should be used to determine the road status. Refer to Table 4.

Step 3: Determine the bridge barrier test level and height.

Use Table 7 to select the appropriate bridge barrier type and height, using the rail and road status.

Road Status	Bridge Barrier Height (m) and Barrier Performance Level to AS 5100				
1A	2.0 (Special)	1.5 (Special)	1.5 (Medium)	1.1 (Medium)	1.5 (Special)
1B	1.5 (Special)	1.5 (Medium)	1.1 (Medium)	1.1 (Regular)	1.5 (Medium)
1C	1.5 (Special)	1.5 (Medium)	1.1 (Medium)	1.1 (Regular)	1.5 (Medium)
2A	1.5 (Special)	1.5 (Medium)	1.5 (Medium)	1.1 (Medium)	1.5 (Medium)
2B	1.5 (Special)	1.5 (Medium)	1.1 (Medium)	1.1 (Regular)	1.1 (Medium)
2C	1.5 (Medium)	1.1 (Medium)	1.1 (Regular)	1.1 (Regular)	1.1 (Medium)
3	1.1 (Regular)	1.1 (Regular)	1.1 (Regular)	1.1 (Regular)	1.1 (Regular)
Rail Status	MPE	MC & DG	SP	L	C

Note:

[1.1 (Regular)] denotes the barrier is 1100mm high, measured from the edge of the adjacent road lane pavement level with a barrier performance level "Regular".

Table 5. Road bridge over railway barrier selection

Step 4: Select bridge barrier criteria

Design bridge barrier for loads described in Table 8 and refer to barrier design procedure.

Bridge barrier performance Level	Barrier height (m)	Effective height H_e of transverse load (m)**	Transverse Load (kN)	Vehicle Contact Length (m)***
Regular	1.1	1.05	250	1.1 (AS 5100.2 Table 11.2.2)
Medium	1.1	1.05	500	2.4 (AS 5100.2 Table A1)
Medium	1.5	1.45	500	2.4 (AS 5100.2 Table A1)
Special	1.5	1.45	750	2.4 (AS 5100.2 Table A2)
Special*	1.5	1.45	1000	2.5 (AS 5100.2 Table A2)
Special*	2.0	1.95	1000	2.5 (AS 5100.2 Table A2)

Notes to table:

* 44 t articulated truck

** Length of barrier that vehicle load is applied over.

*** Refer to AS 3845 Figure 3.5 "Dimensions"

Table 6. Bridge barrier design criteria

Step 5: Analyze the barrier structure.

The analysis can be undertaken by either of the proposed methods:

- simple design model
- complex computer model (approval by the Road Authority and Rail Authority is required prior to use)

Refer also to AS 3845, Appendix C, clause 3.4 "Analysis of stresses in rigid barriers".

Simple Design Method

The analysis can be undertaken by assuming the distribution of the transverse load at 45o to the horizontal from the point of application of the load to the deck. Refer to Figure 2 below.

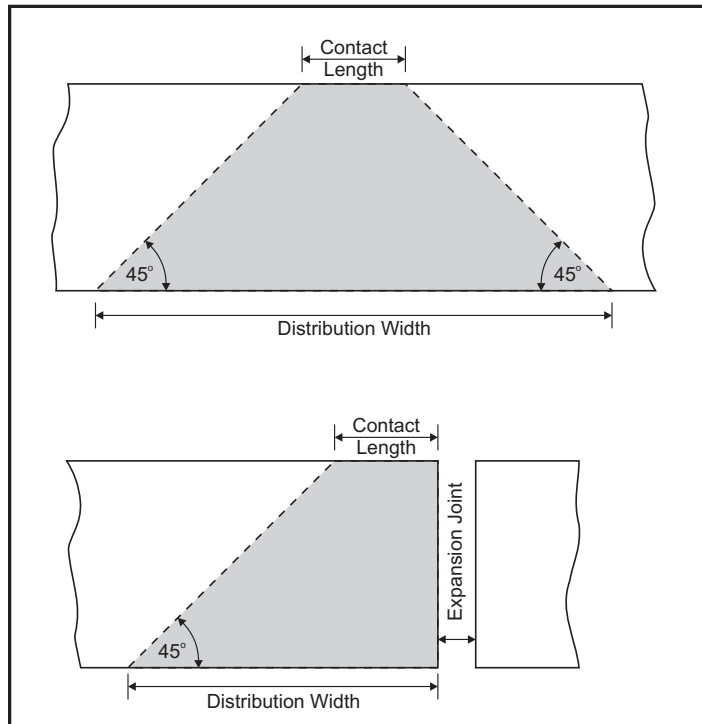


Figure 2. Distribution of load

The design method shall consider the actual distribution of loads that produce the most adverse ultimate bending moment (M^*), ultimate shear force (V^*) and ultimate torsion force (T^*) effects. End effects such as expansion joints shall be considered to determine the effective distribution length. Also, additional analysis of the connection between the barrier and the bridge superstructure is required.

Special analysis case - Bridge to Road Barrier where barrier is anchored by piles/footing

There may be a requirement, such as where a bridge crosses a railway on a "skew" angle, where a barrier needs to be continued from a bridge to a road. In these instances, depending on the barrier performance level, barriers on the road may need to be supported on piles or a footing so that they meet the same requirements as the bridge barrier. This should be undertaken from first principles using a recognised design method approved by both the Road and Rail Authorities.

Step 6: Reinforcement design

Design of reinforcing steel shall be in accordance with AS 5100.5 "Concrete".

Step 7: Transition design

Bridge barriers either need to have a barrier end treatment or a transition between the bridge barrier and the road barrier. Refer to Appendix 3 "Road bridge over rail" which shows the extent of barrier required over railway corridor. In addition to this barrier, a risk assessment is required to determine the length of barrier required on the bridge approaches.

The transition barrier shall be either:

- A barrier conforming to Queensland Main Roads standard drawings; or
- A barrier designed from first principles using a recognised design method approved by both the Road and Rail Authorities.

The design process is similar to the bridge barrier design for the analysis and the reinforcement design. A transition in stiffness may also be required between barrier types and where the height between the barriers varies, the height should be transitioned with a 1 in 10 taper, refer to Appendix 3. (This can be used to obtain the minimum length of the transition.) The most adverse M^* , V^* and T^* effects shall be determined. Load cases should show the transverse loading effects with the required effective height, transverse load and vehicle contact length. A load case is applied separately to each end of the transition segment.

Step 8: Increase barrier height for electrification, and/or anti-throw screen and/or fire protection (if required.)

In addition to the barrier height required to structurally contain/re-direct a vehicle, the height of the barrier may need to be increased due to electrification, anti-throw and/or fire protection requirements. This may be created through the additional of metal screens or by increasing the height of the concrete barrier (refer to Appendix 2).

Note: the additional barrier height is not to be modelled in the above analysis, as it is not required for vehicle redirection. The minimum reinforcement required in the additional barrier height shall be the same as the reinforcement used in the lower section of the barrier. The maximum spacing of the horizontal bars shall not exceed 200mm.

8.0 BARRIER DESIGN CONSIDERATIONS

AS 5100.1 Table 10.4 shows the controlling strength of the test vehicles, associated barrier performance levels and NCHRP report 350 Test Levels (TL). The test levels range from TL2/low performance barrier to TL6/special performance barrier. A 36 tonne articulated tanker has been nominated as the controlling vehicle. (Refer to AS 5100.1 Table B3 and AS 5100.2 Table A2 and to NCHRP Report 350)

Barriers shall be designed to contain any part of the nominated design vehicle, its load and/or debris resulting from the collision and remnants of any secondary collisions, within the road corridor. The design shall take into consideration:

- Strength of the barrier to stop the vehicle or its load penetrating the barrier.
- Barrier height to minimise the risk of the vehicle or its load being propelled over the barrier.
- Containment of debris from any secondary vehicle collisions within the road corridor.
- Limiting the impact of any fire within the road corridor from adversely impacting on railway operations.
- Fire in either corridor can impact both the railway and road corridors from excessive smoke, and can damage infrastructure or in larger fires, power to the railway may be required to be switched off due to safety issues.

Typically, barriers are to be located within the road corridor adjacent to the road shoulder unless directed otherwise by the Road and Rail Authorities. Where the railway is located above the road, a single slope barrier may be incorporated into the base of the embankment or retaining wall to redirect a vehicle and shield the embankment/retaining wall.

For regular, medium and special barriers, concrete barriers are preferred. Afflux considerations in urban areas normally exclude concrete parapets. Where the road is subject to flooding, and an afflux will have an adverse effect on road users and adjacent property owners, steel or other barrier types, as directed by the Road and Rail Authorities, shall be considered.

9.0 ANTI THROW AND ELECTRIFICATION SCREENS ON BRIDGE OVERPASSES

Anti-throw screens

Anti throw screens are required on all road bridges, bike path and foot bridges over a railway corridor. The screen shall be provided over the total width of the corridor unless the Rail Authority has given approval in writing to reduce the length. This approval is based on rail traffic frequency and the extent of other railway activity under the bridge. The minimum extent of the screen on bridges shall be 3m (horizontally) either side of the track centre line, on both sides of the bridge. The height requirement for an anti throw screen is 2.4m, if see-through and 2.0m if not see-through.

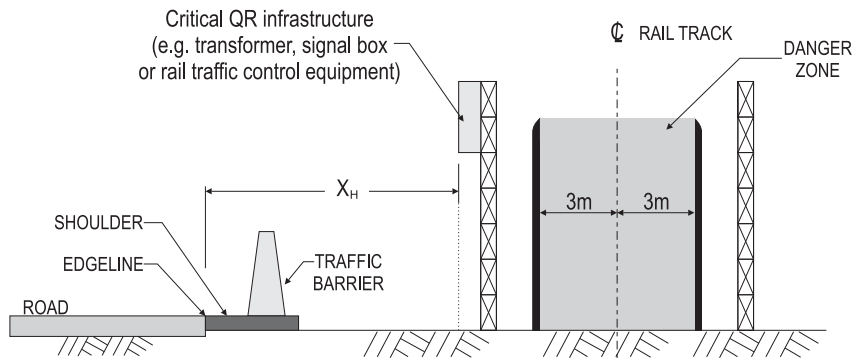
Electrification screens

Electrification screens are required where the railway corridor is electrified. The screen shall be provided over the total width of the corridor unless the Rail Authority has given approval in writing for a reduced screen length to be provided. This approval is based on rail traffic frequency and extent of other railway activity under the bridge. The minimum extent of the screen on bridges shall be 3m (horizontally) either side of the track centre line, or overhead line equipment. The minimum required height of the electrification screen is 1.8m.

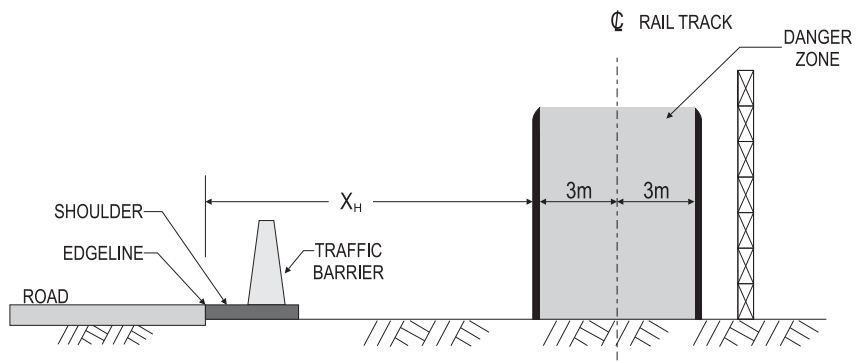
Anti-throw screens and electrification screens

The other main difference between the two screens is the minimum allowable size of the screen openings. The height is measured from the highest point of the adjacent pavement level. The screens may be incorporated in the height of the crash barrier, subject to Rail Authority approval. Refer to Appendix 2, and QR Network documents, MCE- SR – 006 and MCE – SR – 001, for additional information.

APPENDIX 1



HORIZONTAL / FLAT
(Option A)

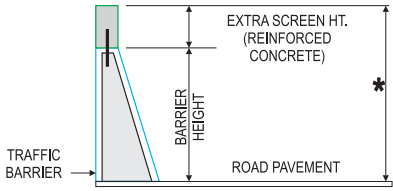


HORIZONTAL / FLAT
(Option B)

NOTE
BARRIERS ARE TO BE LOCATED ON THE ROAD SHOULDER.

Appendix 1

APPENDIX 2



EXTRA SCREEN HT. (REINFORCED CONCRETE)

BARRIER HEIGHT

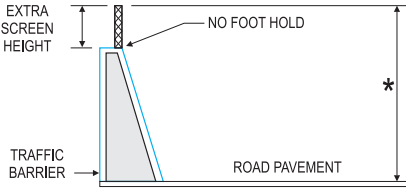
TRAFFIC BARRIER

ROAD PAVEMENT

* TYPICAL ANTI-THROW SCREEN

2.4m IF SCREEN IS SEE THROUGH

2.0m IF SCREEN IS NOT SEE THROUGH



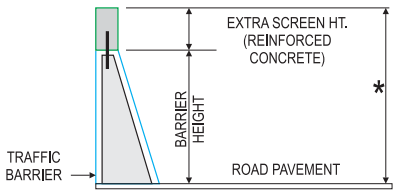
EXTRA SCREEN HEIGHT

NO FOOT HOLD

TRAFFIC BARRIER

ROAD PAVEMENT

TYPICAL BARRIER SECTION (NON ELECTRIFIED RAILWAY)



EXTRA SCREEN HT. (REINFORCED CONCRETE)

BARRIER HEIGHT

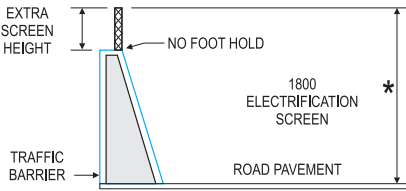
TRAFFIC BARRIER

ROAD PAVEMENT

* TYPICAL ANTI-THROW SCREEN

2.4m IF SCREEN IS SEE THROUGH

2.0m IF SCREEN IS NOT SEE THROUGH



EXTRA SCREEN HEIGHT

NO FOOT HOLD

1800 ELECTRIFICATION SCREEN

TRAFFIC BARRIER

ROAD PAVEMENT

TYPICAL BARRIER SECTION (ELECTRIFIED RAILWAY)

NOTES

1. **GENERAL**
 - FOR BARRIERS ON ROAD OVER RAIL AND WHERE THE ELECTRIFICATION WIRING OR WIRING EQUIPMENT IS <3m HORIZONTALLY FROM SCREEN FOR ROAD/RAIL SEPARATION BARRIERS.
 - EXTRA SCREEN HEIGHT TO BE FIRMLY SECURED TO TRAFFIC BARRIER.

2. **TYPICAL ANTI THROW SCREEN**

<u>SEE-THROUGH</u>	<u>NON SEE-THROUGH</u>
LOUVRE MESH	REINFORCED CONCRETE
WELDED WIRE MESH	GALVANISED STEEL PLATE
PERFORATED STEEL SHEETING	
MAX OPENING IS 25mm x 25mm	

3. **TYPICAL ELECTRIFICATION SCREEN**
 - * PERFORATED STEEL SHEETING
 - * CRIM SAFE WIRE MESH
 - * LOUVRE MESH
 - * APPROVED GLASS PANE

TYPE OF SCREEN TO BE SUBJECT TO RAIL AUTHORITY APPROVAL

4. **FOR ANTI-THROW AND ELECTRIFICATION SCREENS**

ALSO REFER TO QR NETWORK TECHNICAL SPECIFICATIONS
MCE-SR-001, MCE-SR-006 & MCE-SR-015 (ELECTRIFICATION SCREEN SELECTION)

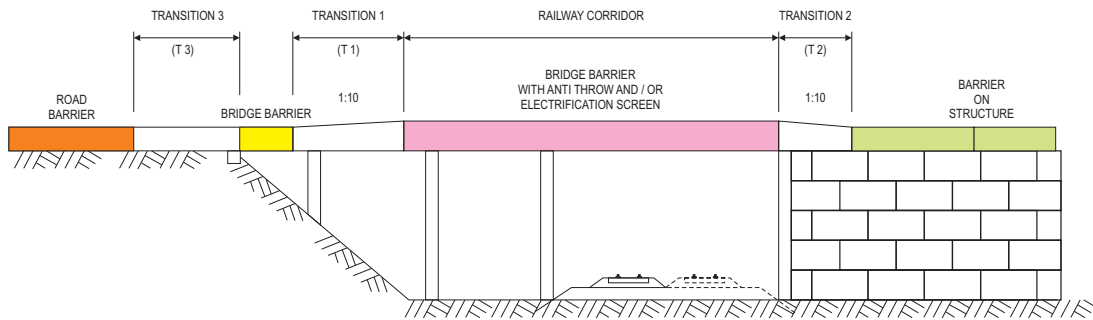
5. **ANTI GLARE SCREEN**

A SUITABLE ANTI HEADLIGHT GLARE SCREEN MAY ALSO BE INCORPORATED IN THE ROAD/RAIL INTERFACE BARRIER WHERE REQUIRED.

ANTI THROW AND ELECTRIFICATION SCREENS

Appendix 2

APPENDIX 3



TYPICAL BRIDGE SECTION

NOTE

- T1 = TRANSITION IN HEIGHT 1(v) TO 10(h)
- T2 = TRANSITION IN HEIGHT 1(v) TO 10(h) AND IN STIFFNESS
- T3 = TRANSITION IN STIFFNESS

BARRIER TRANSITIONS

ROAD BRIDGE OVER RAILWAY CORRIDOR


Appendix 3


Systems and Capability Technical Requirement

PROTECTION SCREENS

No: MCE-SR-008
Issue: Revision A
Date: 30 September 2010

ISSUE	DATE	DESCRIPTION / REASON
Initial	22.12.2009	
Revision A	30. 09.2010	Rebranded with new disclaimer.

APPROVED BY:  DATE: 23-12-2009
PRINCIPAL SYSTEMS ENGINEER (CIVIL)

AUTHORISED BY:  DATE: 23-12-2009
MANAGER TRACK AND CIVIL SYSTEMS

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1.0 INTRODUCTION

This Technical Requirement details the criteria which must be met by providing electrification and anti-throw screens, called protection screens.

Electrification screens are positioned adjacent to live components of the overhead line equipment (OHLE) to protect personnel and members of the public from electrocution. Anti-throw screens are located adjacent to railway infrastructure to prevent injury and damage from objects being thrown at tracks, trains, platforms and other infrastructure.

Protection screens are often required to perform both functions.

This document describes situations and locations requiring protection screens, and the requirements for these screens.

Reference is made to the following additional Queensland Rail Technical Requirement which must also be satisfied:

- MCE-SR-007 *Design and Selection Criteria for Road/Rail Interface Barriers*

Copies of this document may be obtained from Queensland Rail.

All reference documents, e.g. Australian Standards, codes and Queensland Rail Technical Requirements, are to be the latest version.

2.0 SCOPE

This Technical Requirement applies to protection screens constructed by or in liaison with Queensland Rail, for developments adjacent to or in close proximity to Queensland Rail property, to protect Queensland Rail infrastructure and assure public safety.

3.0 GENERAL REQUIREMENTS FOR PROTECTION SCREENS

Structural design must be performed in accordance with the relevant Australian standards.

All screens within 3 metres of the OHLE should be electrically bonded, and designs must be submitted to Queensland Rail for approval.

All screens must be built to prevent climbing up the pedestrian side.

If a screen is to provide electrification protection, any perforations must be less than 8 mm wide. Expanded metal panels can be used, as long as they are oriented to cause objects poked through them to protrude upwards (see Figure 1, L76 Photo, which is as seen from pedestrian face of screen).

See Appendix A Table 1 for more details of electrification screen materials.

Water or other liquid jet hoses must not be used on electrification screens for cleaning purposes.

For more details of electrification screen material requirements, see appendix A. In addition to electrification screens, anti throw protection is often required. In these instances, the electrification screens may be extended higher and used as anti throw screens.

Anti throw screens must extend 2.4 metres vertically above the highest toe hold if see-through, or 2 metres if non see-through. Expanded metal is considered see-through.

Anti throw screens must have openings no greater than 25 x 25 mm.

Return screens are required at any screen end that may be accessible to the public, to prevent climbing onto the back. Screen material must not be easily disfigured by scratching with sharp implements.

4.0 SCREENS ON FOOTBRIDGES AND OVERBRIDGES

Electrification screens are required on all footbridges over electrified track. This screen must extend at least 3 metres horizontally either side of conductors, measured perpendicular to the track.

Electrification screens are required to extend vertically 1.8 m above the highest foothold (usually hand rails).

For footbridges, the preferred option is to have the walking area fully enclosed.

If electrification screen perforations are larger than 3.5 mm wide, and the bridge clearance above conductors is less than 2 metres, extra

protection is required. Extra protection options include:

- Designing the bottom 1 metre of the screen to be solid (no perforations), or
- Installing a hood above the overhead wires, extending at least 1 metre away from the bridge (measured perpendicular to the bridge).

Anti throw screens are mandatory on all bridges. The length of anti throw screens must be adequate to inhibit throwing of objects onto tracks / platforms, and is to be determined on a case by case basis by Manager Track and Civil Systems.

For more details, see Appendix B, Figure 2.

Refer to MCE-SR-007 *Design and Selection Criteria for Road/Rail Interface Barriers*, for height details of screens on top of crash barriers.

5.0 SCREENS ON STAIRS / RAMPS

Electrification screens are required on stairs and ramps within 3 metres horizontally of overhead wires.

The electrification screen must extend vertically 1.8 metres above the highest foothold (usually hand rails).

The screen must extend from the point where conductors are level with screen top, all the way to the top of the stairs / ramp. Below this point, the screen must extend 1 metre towards the bottom, measured horizontally.

If the screen is within 1.5 metres horizontally of the conductor, it must not have perforations larger than 3.5 mm wide.

The need for anti throw screens, and length requirement, is to be determined on a case by case basis by Manager Track and Civil Systems.

See Appendix B, Figure 2 for more details.

6.0 SCREENS FOR BUILDINGS OVER OR CLOSE TO QUEENSLAND RAIL CORRIDOR

Protection Screens may be required for buildings in proximity of railway closer than 20 metres from the centreline of closest track or 10

metres from Queensland Rail property boundary.

All openings (including windows and balconies) on a building facing a Queensland Rail corridor and closer than 10 metres from the Queensland Rail fence, must have protection screens. The extent of the screen is to be determined on a case by case basis, and agreed by Manager Track and Civil Systems.

7.0 SCREENS ON RETAINING WALLS / WING WALLS / EMBANKMENTS

Electrification screens are required on retaining walls, wing walls and other significant embankments within 3 metres horizontally of OHLE. The screen must extend at least 3 metres either side of the OHLE.

Electrification screens are required to extend vertically 1.8 metres above the highest foothold.

The need for anti throw screens, and length requirement, is to be determined on a case by case basis by Manager Track and Civil Systems. See Appendix B, Figure 3 for more details.

8.0 SCREENS ON OR NEAR CORRIDOR BOUNDARY

Protection screens may be required on or near the corridor boundary.

Electrification screens are required if the corridor boundary is within 3 metres of OHLE (see Appendix B, Figure 4).

Anti throw screens are required if members of the public could easily throw objects from outside of the corridor onto tracks / platforms / other equipment.

Requirements for these screens must be determined on a case by case basis, as agreed by Manager Track and Civil Systems.

9.0 SCREENS PROTECTING OHLE FROM CONSTRUCTION WORKS

Protection screens may be required where construction and maintenance works occur on or close to Queensland Rail land. These screens should be erected no closer than 3 metres horizontally from track centreline. Electrification screens must extend at least 3 metres

horizontally past the electrical equipment that they are shielding.

Requirements for these screens are to be agreed by the Project Manager, and monitored by the Person in Charge of Work (PICOW) and Track Protection Officer (TPO).

APPENDIX A: ELECTRIFICATION MATERIAL REQUIREMENTS

Table 1: Screen Suitability.

LOCKER GROUP PRODUCT	SCREEN ACROSS ELECTRIFICATION WIRE – PUBLIC ACCESS		SCREEN ACROSS ELECTRIFICATION WIRE - QR OFFICES		SCREEN ALONG ELECTRIFICATION WIRE – PUBLIC ACCESS	
	SUITABILITY	REQUIRE HOOD	SUITABILITY	REQUIRE HOOD	SUITABILITY	HORIZONTAL CLEARANCE (h)
L7616 (LV16)	yes	no	yes	no	yes	>= 1.5m
LN1663	yes	no	yes	no*	yes	>= 1.5m
L1663	yes	yes	yes	no*	yes	>= 1.5m
RO6451	yes	yes	yes	yes	yes	>= 1.5m
RO7962	yes	yes	yes	yes	yes	>= 1.5m
RO3341 1.6mm thick	yes	no	yes	no	yes	>= 1.0m
211 or (CRIM SAFE EQUIV.)	yes	yes	yes	no*	yes	>= 1.0m
RO2440	yes	no	yes	no	yes	>= 1.0m

* a permanent warning must be placed on the screen and or window ‘ **not to use a hose or other water or liquid pressure device directed on to the screen or window**’. Alternatively, a hood would need to be installed, subject to note 5 below.

Note:

1. Refer to Figure 1 for sample pictures of each screen material, and Appendix B Figure 2 for definitions of horizontal clearance h

1. For (h) = < 1.0m, it is recommended that a solid panel be used.

Screens and panels to be constructed, so that they can absorb impacts from pedestrians (not necessarily deliberate vandalism), **without permanent deformation**.

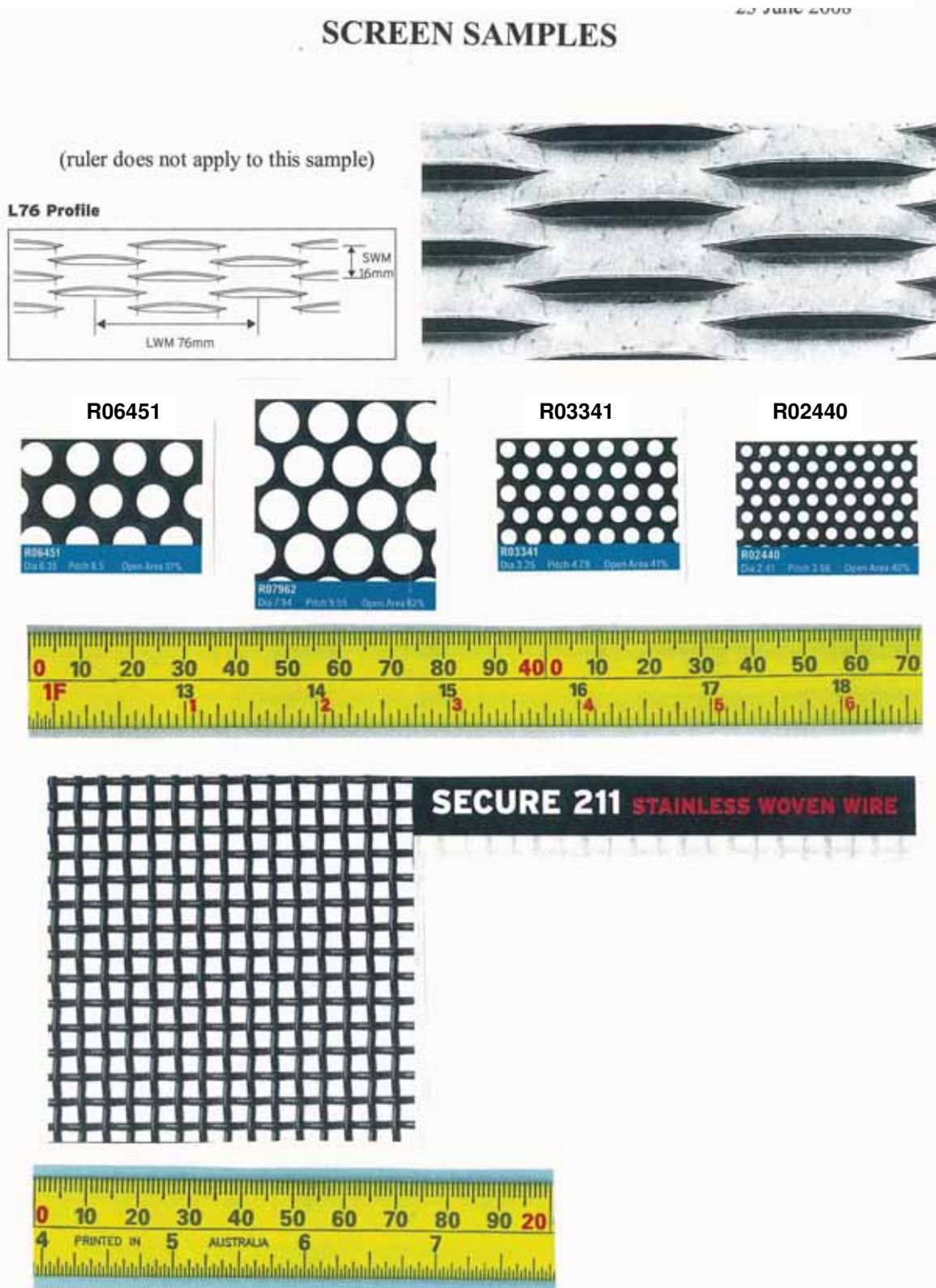
2. Screens are as listed in the current LOCKER group catalogue (March 08). Other type of screens may also be suitable. But these need to be assessed for suitability on a case by case basis by the relevant QR Electrical Department.

3. Screens shown in brackets may not be necessarily available through LOCKER group.

4. For h = > 3 metres, normally there is no requirement for provision of an electrification screen unless specifically advised by QR, although anti throw screens may still be necessary. This requirement may apply to structures, including commercial or residential developments adjacent to the railway and for structures adjacent to the railway during construction.

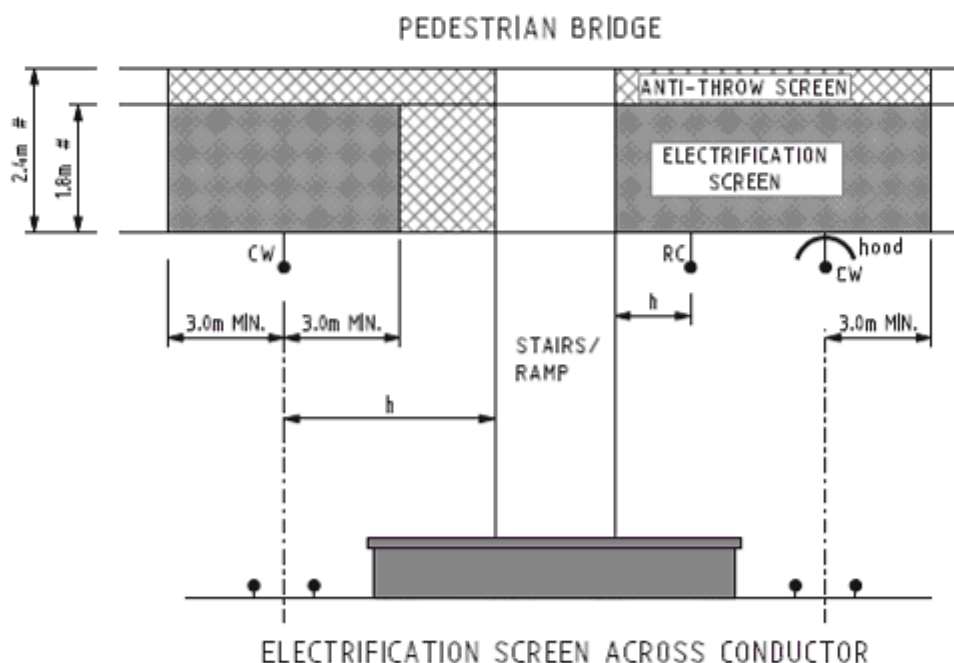
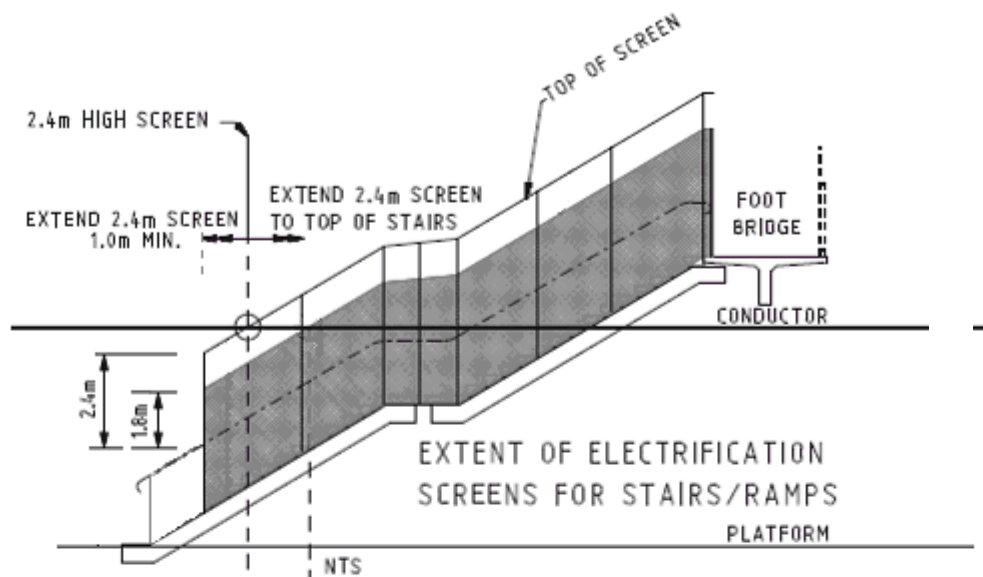
5. A hood is not required where a solid barrier, not less than 1.0m high, measured from pavement level can be provided as part of the electrification screen.

Figure 1: Screen Samples



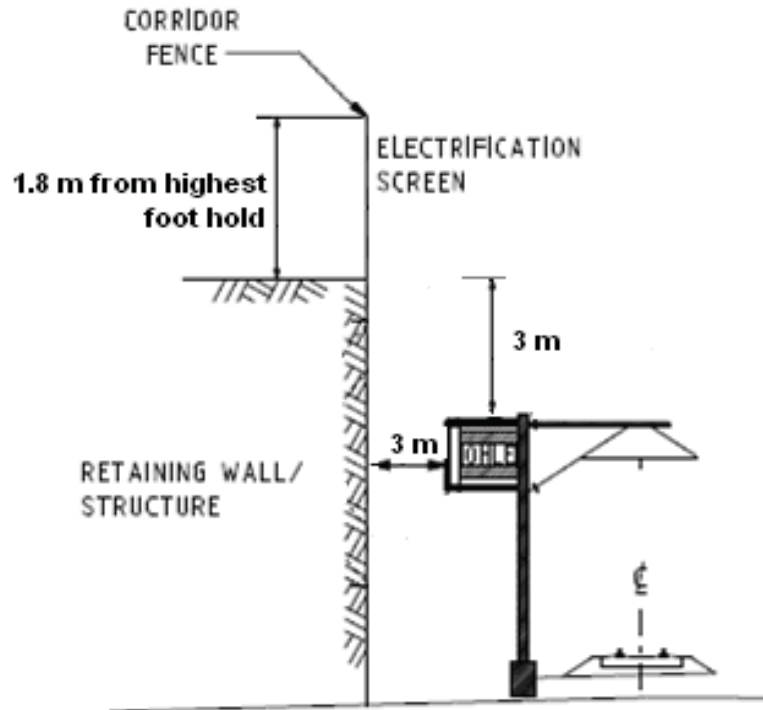
APPENDIX B: SCREEN CLEARANCES

Figure 2: Screens on Stairs / Ramps and Overbridges



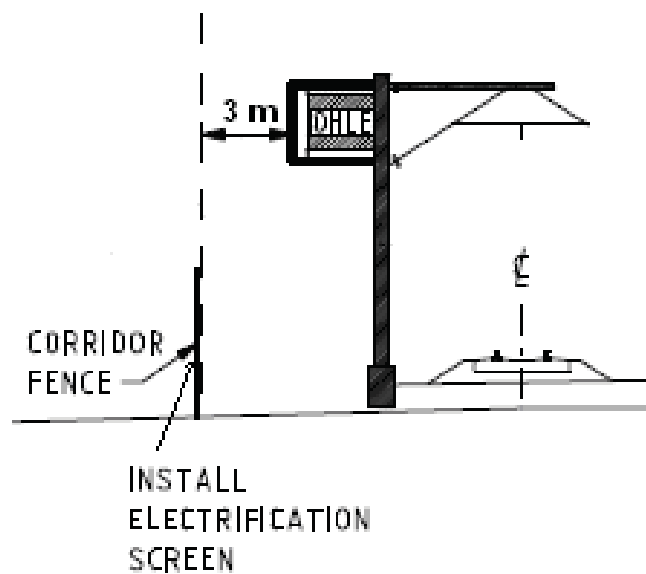
MINIMUM HEIGHT OF SCREEN OR ALTERNATIVELY THE SCREEN IS EXTENDED UP TO THE FOOTBRIDGE CEILING. WHERE THERE IS PROVISION FOR HANDRAILS OR OTHER POSSIBLE FOOTHOLDS. THE TOP OF THE SCREEN IS MEASURED FROM THE HIGHEST FOOTHOLD.

Figure 3: Electrification Screen on structures within 3 m of OHLE



Note: Anti Throw Screens may also be required (see Section 7)

Figure 4: Electrification Screen required if corridor boundary is within 3 m of OHLE





Note: Anti Throw Screens may also be required (see Section 8)

*Systems and Capability Technical Requirement***COLLISION PROTECTION OF SUPPORTING ELEMENTS ADJACENT TO RAILWAYS**

No: MCE-SR-012
Issue: Revision B
Date: 30 September 2010

ISSUE	DATE	DESCRIPTION / REASON
Initial	27.3.2007	
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APPROVED BY:  DATE: 23-12-2009
PRINCIPAL SYSTEMS ENGINEER (CIVIL)

AUTHORISED BY:  DATE: 23-12-2009
MANAGER TRACK AND CIVIL SYSTEMS

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1.0 INTRODUCTION

This Technical Requirement details the criteria which must be met by external party designs for supporting components (piers, columns, walls) of structures (buildings, overbridges, footbridges) over or adjacent to railway property. Reference is made to the following additional Queensland Rail Technical Requirements which must also be satisfied:

- MCE-SR-001 Design of road overbridges,
- MCE-SR-002 Work in or about Queensland Rail property,
- MCE-SR-003 Work adjacent to overhead line equipment,
- MCE-SR-005 Design of buildings over or near railways, and
- MCE-SR-006 Design of footbridges.

Copies of these documents may be obtained from Queensland Rail.

All reference documents, e.g. Australian Standards, codes and Queensland Rail Technical Requirements, are to be the latest version.

Where this Technical Requirement prescribes a different degree of protection than any other standard, including Australian Standards, then this document will take precedence.

2.0 SCOPE

This Technical Requirement applies to the:

- design of new structures, and
- upgrading of existing structures over or adjacent to railway property.

It covers design loads and collision protection methods to be used in the design of supporting elements of buildings, overbridges and footbridges.

The presence of piers between railway tracks is undesirable on safety grounds because of the increased risk of structure collapse from a derailment. There is a preference for structures to be a clear span between abutments.

Provision should be made for the foreseeable development of railway infrastructure,

particularly regarding an increase in the number of tracks.

3.0 DESIGN CONSIDERATIONS

The design of the supporting elements of structures is to comply with:

- AS 5100 *Bridge Design* for collision protection and collision loads, and
- this Technical Requirement and associated Technical Requirements.

The collision loads from AS 5100 are to be modified in accordance with this Technical Requirement.

The design "collision loads" from derailed vehicles referred to in this document are not precise collision loads resulting from derailed rollingstock, but rather, are minimum loads intended to provide a design where the supporting elements have a degree of robustness in the event of a glancing blow from a derailed train. The design collision loads are less than the full collision impact from a loaded train at the maximum permitted speed. The design collision loads may be increased where deemed necessary by the designer.

Subject to approval by Queensland Rail, collision loads and the point of contact (from AS 5100.2 or this document) may be modified:

- if justified by a risk assessment and if other controls are in place, or
- where it can be shown that the loads or point of contact are not appropriate, e.g. where the support has a wide base or where the support is located on ground sloping away from the track.

The design is to consider:

- the collision load and point of contact,
- all permanent loads,
- the applied traffic loads,
- the effect of the collision load on the immediately adjacent, structural member in the superstructure above the relevant supports, and
- the effect of the collision load on the foundations immediately below the relevant supports.

The design of the supports is not to include any assistance by propping action from other

structural elements that may be demolished as the result of a collision.

above rail, i.e. coal loadouts, conveyors to coal loadouts, some overhead pipelines.

4.0 STRUCTURES CATEGORIES FOR DESIGN

Collision design loads and suitable collision protection measures are to be provided based on the:

- **CLASS** of superstructure to be protected,
- **ZONE** or proximity of the support to the tracks, and the
- **SPEED CATEGORY** environment of the track.

4.1 Class of Structure

Structures built above or adjacent to railway tracks are classified as either Class A, B or C Structures according to their use.

Class A Structures

These structures are:

- permanently or semi-permanently occupied, e.g. commercial offices, retail premises, residential developments,
- temporary gathering places for large numbers of people e.g. theatres, cinemas, train station ticket offices, or
- multiple story structures which are only subject to short-term occupancy e.g. multi-story car parks and warehouses.

Collapse of this type of structure would almost certainly lead to multiple deaths of people occupying the structure.

Class B Structures

These structures are:

- sporadically or infrequently occupied, e.g. lifts, waiting areas, footbridges, roadways, road overbridges, .
- single story structures not providing long-term occupancy, e.g. parking areas, single-story warehouses.

Collapse of this type of structure would almost certainly lead to a single death or multiple injuries of people occupying the structure.

Class C Structures

These structures are:

- not occupied, except for maintenance activities, but are capable of crushing the roof of rollingstock in the event of collapse because of their weight and / or height

Collapse of this type of structure would probably lead to a single death or multiple injuries of people occupying the rollingstock.

Lightweight structures close to the track are excluded from this category, as collapse of this type of structure would have a low risk of a single death caused by crushing of the roof of rollingstock, e.g. signal gantries, advertising signs, overhead traction wiring masts.

Additional Considerations

Notwithstanding the above descriptions, a structure may be allocated a higher classification if it is considered by Queensland Rail that there is an increased risk to personal safety based on additional risk factors including:

- number of people occupying the structure,
- number of people travelling in trains,
- high frequency of trains,
- type of train using the line (passenger or freight),
- presence of points and crossings in the vicinity of the structure, and
- curvature of the track or structural configuration of the structure.

4.2 Zone of Structure

Each Class A, B and C structure is further classified according to its distance from the nearest track centre-line as follows:

- **ZONE 1:** support is less than 3 m from track centre-line
- **ZONE 2:** support is more than 3 m and less than 5 m from track centre-line
- **ZONE 3:** support is more than 5 m and less than 10 m from track centre-line
- **ZONE 4:** support is more than 10 m and up to 20 m from track centre-line
- **ZONE 5:** support is behind the terminating end of tracks

4.3 Speed Category

Each Class of structure in each Zone is attributed a speed category as follows:

- **SPEED CATEGORY 1:** 51 km/hr to 160 km/hr (assumed to be passenger trains)
- **SPEED CATEGORY 2:** 21 km/hr to 50 km/hr (assumed to be passenger trains)

- **SPEED CATEGORY 3:** Less than 20 km/hr (assumed to be freight trains)

5.0 DESIGN COLLISION LOADS FOR SUPPORTING ELEMENTS

Notwithstanding the requirements of this document, all supports must be able to carry the permanent and applied loads from the superstructure with half of their cross-section rendered ineffective at the collision point.

Supporting elements adjacent to railways are to be avoided. If it is not possible to avoid having supporting elements adjacent to the track, structures are to be designed with an alternative load path in accordance with AS 5100.2, allowing for 60% live load. Structures without provision for redundancy are to be designed to resist collision loads as described in AS 5100.2, except as modified below.

5.1 Class A Structures

Collision protection is to be provided for Class A structures as follows:

5.1.1 Zone 1

Speed Categories 1, 2 and 3

Collision loads are to be in accordance with the requirements of AS 5100.2 with the following exceptions:

- To be avoided if possible
- The support is to be designed as a continuous wall with minimum dimensions of:

$$L:W \geq 4:1,$$

$$W \geq 0.8 \text{ m and}$$

$$L \geq H/2$$
 where

L	= length of support
W	= width of support
H	= height of support
- Designed to withstand equivalent collision loads of 10,000 kN parallel to the track and 3,500 kN perpendicular to the track applied at 2 m above top of rail.
- No reduction in collision loads is allowed if the support is located on a station platform.

5.1.2 Zone 2

Speed Category 1

Collision loads are to be in accordance with the requirements of AS 5100.2 with the following exceptions:

- The support is to be designed as a continuous wall or as a non-continuous wall made up of individual wall-type sections.
- The wall is to have the minimum dimensions of:

$$L:W \geq 4:1,$$

$$W \geq 0.8 \text{ m and}$$

$$L \geq H/2$$
 where

L	= length of support
W	= width of support
H	= height of support
- Designed to withstand equivalent collision loads of 3,000 kN parallel to the track and 1,500 kN perpendicular to the track applied at 2 m above top of rail.
- Where the support is constructed from individual wall-type sections, an alternative load path is to be provided in the event that the support is struck. The superstructure is to be designed with sufficient redundancy to
 - be capable of supporting the dead load plus 60% of the live load with one or more of the wall-type sections removed. The number of sections to be removed is to be determined by risk analysis and accepted by Queensland Rail.
 - If supports are located on platforms (with 20 m minimum length of platform protection), supports do not have to be designed as walls, but may be designed as columns with applied forces or redundancy as described above.

Speed Category 2

Collision loads are to be in accordance with the requirements of AS 5100.2 with the following exceptions:

- The support should be designed as a continuous wall. However, if this is not possible for technical reasons, individual columns may be used if either a deflection wall or 20 m minimum length of platform is provided in front of the first column and all other columns that are located in an area where there is a high risk of derailment.
- Where supports are protected by a deflection wall or 20 m minimum length of platform, supports are to be designed to

withstand equivalent collision loads of 2,000 kN parallel to the track and 1,500 kN perpendicular to the track applied at 2 m above top of rail.

- The deflection wall is to be designed to withstand equivalent collision loads of 3,000 kN parallel to the track and 1,500 kN perpendicular to the track applied at 2 m above top of rail.

Speed Category 3

Collision loads are to be in accordance with the requirements of AS 5100.2 with the following exceptions:

- Where supports are protected by a deflection wall or 20 m minimum length of platform, supports are to be designed to withstand equivalent collision loads of 1,500 kN parallel to the track and 1,500 kN perpendicular to the track applied at 2 m above top of rail.
- The deflection wall is to be designed to withstand equivalent collision loads of 3,000 kN parallel to the track and 1,500 kN perpendicular to the track applied at 2 m above top of rail.

5.1.3 Zone 3

Speed Category 1

Collision loads are to be in accordance with the requirements of AS 5100.2 with the following exceptions:

- Designed to withstand equivalent collision loads of 3,000 kN parallel to the track and 1,500 kN perpendicular to the track applied at 2 m above top of rail.
- No reduction in collision loads is allowed if the support is located on a station platform.

Speed Category 2

Collision loads are to be in accordance with the requirements of AS 5100.2 with the following exceptions:

- Where supports are protected by a deflection wall or 20 m minimum length of platform, supports are to be designed to withstand equivalent collision loads of 1,500 kN parallel to the track and 1,000 kN perpendicular to the track applied at 2 m above top of rail.
- The deflection wall is to be designed to withstand equivalent collision loads of 3,000 kN parallel to the track and 1,500 kN perpendicular to the track applied at 2 m above top of rail.

Speed Category 3

Collision loads are to be in accordance with the requirements of AS 5100.2 with the following exceptions:

- Where supports are protected by a deflection wall or 20 m minimum length of platform, supports are to be designed to withstand equivalent collision loads of 1,500 kN parallel to the track and 750 kN perpendicular to the track applied at 2 m above top of rail.
- The deflection wall is to be designed to withstand equivalent collision loads of 3,000 kN parallel to the track and 1,500 kN perpendicular to the track applied at 2 m above top of rail.

5.1.4 Zone 4

Speed Categories 1, 2 & 3

Collision loads are to be in accordance with the requirements of AS 5100.2 with the following exceptions:

- Where supports are protected by a deflection wall or 20 m minimum length of platform, supports are to be designed to withstand equivalent collision loads of 750 kN parallel to the track and 750 kN perpendicular to the track applied at 2 m above top of rail.
- The deflection wall is to be designed to withstand equivalent collision loads of 3,000 kN parallel to the track and 1,500 kN perpendicular to the track applied at 2 m above top of rail.

5.1.5 Zone 5

Speed Categories 1, 2 and 3

Suitable buffer stops are to be provided to prevent trains colliding with structures beyond the end of the track. As a minimum, buffer stops are to prevent a low speed collision with the structure.

Unless additional suitable control measures are provided to prevent collision, supporting elements behind buffer stops are to be designed for the same collision load requirements as described above for Zones 1, 2, 3 or 4 for main-line speed. For example, a support located 4 m behind a buffer stop with a main-line speed of 40 km/hr is to be designed to the same requirements as for Zone 2, Speed Category 2.

5.2 Class B Structures

Collision protection is to be provided for Class B structures as follows.

5.2.1 Zone 1

Speed Category 1

Collision loads are to be in accordance with the requirements of AS 5100.2 with the following exceptions:

- To be avoided if possible
- Where redundancy is not provided, the support is to be designed as a continuous wall with minimum dimensions of:

$$L:W \geq 4:1,$$

$$W \geq 0.6 \text{ m and}$$

$$L \geq H/2$$

where L = length of support
 W = width of support
 H = height of support

- Designed to withstand equivalent collision loads of 5,000 kN parallel to the track and 1,500 kN perpendicular to the track applied at 2 m above top of rail.
- No reduction in collision loads is allowed if the support is located on a station platform.

5.2.2 Zone 2

Speed Category 1

Collision loads are to be in accordance with the requirements of AS 5100.2 with the following exceptions:

- Designed to withstand equivalent collision loads of 3,000 kN parallel to the track and 1,500 kN perpendicular to the track applied at 2 m above top of rail.
- No reduction in collision loads is allowed if the support is located on a station platform.

Speed Category 2

Collision loads are to be in accordance with the requirements of AS 5100.2 with the following exceptions:

- Where supports are protected by a deflection wall or 20 m minimum length of platform, supports are to be designed to withstand equivalent collision loads of 2,000 kN parallel to the track and 1,000 kN perpendicular to the track applied at 2 m above top of rail.
- The deflection wall is to be designed to withstand equivalent collision loads of 3,000 kN parallel to the track and 1,500 kN

perpendicular to the track applied at 2 m above top of rail.

Speed Category 3

Collision loads are to be in accordance with the requirements of AS 5100.2 with the following exceptions:

- Where supports are protected by a deflection wall or 20 m minimum length of platform, supports are to be designed to withstand equivalent collision loads of 1,500 kN parallel to the track and 1,000 kN perpendicular to the track applied at 2 m above top of rail.
- Where the superstructure has a supported area of < 50 m², e.g. a mid-section footbridge, supports are to be designed to withstand equivalent collision loads of either:
 - 2,000 kN applied both parallel and perpendicular to the track at 1.2 m above top of rail or
 - 500 kN applied both parallel and perpendicular to the track at 3 m above top of rail.

whichever produces the more adverse effect.

5.2.3 Zone 3

Speed Category 1

Collision loads are to be in accordance with the requirements of AS 5100.2 with the following exceptions:

- Designed to withstand equivalent collision loads of 3,000 kN parallel to the track and 1,500 kN perpendicular to the track applied at 2 m above top of rail.
- No reduction in collision loads is allowed if the support is located on a station platform.

Speed Category 2

Collision loads are to be in accordance with the requirements of AS 5100.2 with the following exceptions:

- Where supports are protected by a deflection wall or 20 m minimum length of platform, supports are to be designed to withstand equivalent collision loads of 1,500 kN parallel to the track and 1,000 kN perpendicular to the track applied at 2 m above top of rail.
- The deflection wall is to be designed to withstand equivalent collision loads of 3,000 kN parallel to the track and 1,500 kN perpendicular to the track applied at 2 m above top of rail.

Speed Category 3

Collision loads are to be in accordance with the requirements of AS 5100.2 with the following exceptions:

- Where supports are protected by a deflection wall or 20 m minimum length of platform, supports are to be designed to withstand equivalent collision loads of 1,500 kN parallel to the track and 750 kN perpendicular to the track applied at 2 m above top of rail.
- Where the superstructure has a supported area of < 50 m², e.g. a mid-section footbridge, supports are to be designed to withstand equivalent collision loads of either:
 - 2,000 kN applied both parallel and perpendicular to the track at 1.2 m above top of rail or
 - 500 kN applied both parallel and perpendicular to the track at 3 m above top of rail.
 whichever produces the more adverse effect.

5.2.4 Zone 4

Speed Category 1

Collision loads are to be in accordance with the requirements of AS 5100.2 with the following exceptions:

- Designed to withstand equivalent collision loads of 3,000 kN parallel to the track and 1,500 kN perpendicular to the track applied at 2 m above top of rail.
- No reduction in collision loads is allowed if the support is located on a station platform.

Speed Categories 2 and 3

Collision loads are to be in accordance with the requirements of AS 5100.2 with the following exceptions:

- Where supports are protected by a deflection wall or 20 m minimum length of platform, supports are to be designed to withstand equivalent collision loads of 750 kN parallel to the track and 750 kN perpendicular to the track applied at 2 m above top of rail.
- Where the superstructure has a supported area of < 50 m², e.g. a mid-section footbridge, supports are to be designed to withstand equivalent collision loads of either:
 - 2,000 kN applied both parallel and perpendicular to the track at 1.2 m above top of rail or

- 500 kN applied both parallel and perpendicular to the track at 3 m above top of rail.
- whichever produces the more adverse effect.

5.2.5 Zone 5

Speed Categories 1, 2 and 3

Suitable buffer stops are to be provided to prevent trains colliding with structures beyond the end of the track. As a minimum, buffer stops are to prevent a low speed collision with the structure.

Unless additional suitable control measures are provided to prevent collision, supporting elements behind buffer stops are to be designed for the same collision load requirements as described above for Zones 1, 2, 3 or 4 for the main-line speed. For example, a support located 4 m behind a buffer stop with a possible main-line speed of 40 km/hr is to be designed to the same requirements as for Zone 2, Speed Category 2.

5.3 Class C Structures

Collision protection is to be provided for Class C structures as follows.

5.3.1 Zone 1

Speed Category 1

Collision loads are to be in accordance with the requirements of AS 5100.2 with the following exceptions:

- To be avoided if possible
- Designed to withstand equivalent collision loads of 3,000 kN parallel to the track and 1,500 kN perpendicular to the track applied at 2 m above top of rail.
- No reduction in collision loads is allowed if the support is located on a station platform.

Speed Category 2

Collision loads are to be in accordance with the requirements of AS 5100.2 with the following exceptions:

- To be avoided if possible
- Where railway traffic is only freight, supports are to be designed to withstand equivalent collision loads of 2,000 kN parallel to the track and 1,000 kN perpendicular to the track applied at 2 m above top of rail.

Speed Category 3

Collision loads are to be in accordance with the requirements of AS 5100.2 with the following exception:

- Where railway traffic is only freight, supports are to be designed to withstand equivalent collision loads of 1,500 kN parallel to the track and 750 kN perpendicular to the track applied at 2 m above top of rail.

5.3.2 Zone 2

Speed Category 1

Collision loads are to be in accordance with the requirements of AS 5100.2 with the following exceptions:

- Designed to withstand equivalent collision loads of 3,000 kN parallel to the track and 1,500 kN perpendicular to the track applied at 2 m above top of rail.
- No reduction in collision loads is allowed if the support is located on a station platform.

Speed Category 2

Collision loads are to be in accordance with the requirements of AS 5100.2 with the following exception:

- Where railway traffic is only freight, supports are to be designed to withstand equivalent collision loads of 1,500 kN parallel to the track and 750 kN perpendicular to the track applied at 2 m above top of rail

Speed Category 3

Collision loads are to be in accordance with the requirements of AS 5100.2 with the following exception:

- Where railway traffic is only freight, supports are to be designed to withstand equivalent collision loads of 1,500 kN parallel to the track and 750 kN perpendicular to the track applied at 2 m above top of rail.

5.3.3 Zone 3

Speed Category 1

Collision loads are to be in accordance with the requirements of AS 5100.2 with the following exceptions:

- Designed to withstand equivalent collision loads of 3,000 kN parallel to the track and 1,500 kN perpendicular to the track applied at 2 m above top of rail.
- No reduction in collision loads is allowed if the support is located on a station platform.

Speed Category 2

Collision loads are to be in accordance with the requirements of AS 5100.2 with the following exception:

- Where railway traffic is only freight, supports are to be designed to withstand equivalent collision loads of 1,500 kN parallel to the track and 750 kN perpendicular to the track applied at 2 m above top of rail.

Speed Category 3

Collision loads are to be in accordance with the requirements of AS 5100.2 with the following exception:

- Where railway traffic is only freight, supports are to be designed to withstand equivalent collision loads of 1,000 kN parallel to the track and 500 kN perpendicular to the track applied at 2 m above top of rail.

5.3.4 Zone 4

Speed Category 1

Collision loads are to be in accordance with the requirements of AS 5100.2 with the following exceptions:

- Designed to withstand equivalent collision loads of 3,000 kN parallel to the track and 1,500 kN perpendicular to the track applied at 2 m above top of rail.
- No reduction is to be allowed in collision loads if the support is located on a station platform.

Speed Category 2

Collision loads are to be in accordance with the requirements of AS 5100.2 with the following exception:

- Where railway traffic is only freight, supports are to be designed to withstand equivalent collision loads of 1,000 kN parallel to the track and 750 kN perpendicular to the track applied at 2 m above top of rail.

Speed Category 3

Collision loads are to be in accordance with the requirements of AS 5100.2 with the following exception:

- Where railway traffic is only freight, supports are to be designed to withstand equivalent collision loads of 750 kN parallel to the track and 500 kN perpendicular to the track applied at 2 m above top of rail.

5.3.5 Zone 5

Speed Categories 1, 2 and 3

Suitable buffer stops are to be provided to prevent trains colliding with structures beyond the end of the track. As a minimum, buffer stops are to prevent a low speed collision with the structure.

Unless additional suitable control measures are provided to prevent collision, supporting elements behind buffer stops are to be designed for the same collision load requirements as described above for Zones 1, 2, 3 or 4 for the main-line speed. For example, a support located 4 m behind a buffer stop with a possible main-line speed of 40 km/hr is to be designed to the same requirements as for Zone 2, Speed Category 2.

6.0 COLLISION PROTECTION MEASURES

6.1 New Structures

In addition to the requirements of AS 5100, the following collision protection measures are to be used.

Because of the risk of derailed rollingstock falling down the embankment slope, piers, walls and columns must not be located in or at the bottom of embankment slopes without protection measures being in place.

Queensland Rail may approve the location of suitable control measures, such as one or more of the following:

- guard and splay rails on the track;
- a retaining structure to widen the embankment; or
- piers, walls or columns complying with this Technical Specification.

The piers, walls or columns are to be smooth-walled, blade piers of heavy construction parallel to the railway track.

Safety refuges are to be:

- provided where the length of pier or wall is greater than 15 m,
- provided where the clearance between the adjacent existing / future track centreline and face of pier / wall is less than 3 m,
- at a maximum spacing of 15 m centres along the pier / wall,
- at least 1.5 m wide by 600 mm deep and 2.2 m high above the adjacent rail level, and
- clearly defined.

6.2 Upgrading Existing Structures

Existing piers and columns which do not satisfy the above requirements are to have deflection walls provided.

Independent deflection walls are to be provided where space permits. Otherwise deflection walls may be integral and are to be a minimum of 3.6 m high, measured from the highest rail level of the adjacent railway track. Queensland Rail will advise on requirements on a case-by-case basis.

Integral deflection walls are to either:

- extend at least 2 m past the end of each pier (or column) in a direction approximately parallel to the railway track, or
- continue past the next pier (or column) if the piers (or columns) are at a clear spacing of less than 4 m.

The extreme ends of integral deflection walls are to taper on the side adjacent to the railway track at 1:6 from 300 mm thick to the full thickness of the deflection wall.

Deflection walls are to be:

- smooth-faced with the face of integral walls extending a minimum of 150 mm beyond the face of the pier (or column) on the side adjacent to the railway track;
- parallel to the railway track,
- constructed of reinforced concrete with a minimum thickness of 450 mm; and
- designed for the appropriate collision loads in this document.

6.3 Additional Requirements for Footbridges

These additional requirements apply to footbridges with a plan area of up to 50 m² per span. For larger spans, the design is to be similar to a road overbridge.

6.3.1 Collision Loads from Railway Traffic

Design is to be in accordance with AS 5100, except for collision loads from railway traffic, which are to be as follows.

Supports located within 7.5 m of the track centre-line, and not complying with the redundancy requirements of AS 5100.2, are to be designed to resist the dead load and a single

concentrated load (applied as an ultimate design load with a load factor of 1.0) of:

- 2,000 kN applied at a height of 1.2 m above top of rail or
- 500 kN applied at a height of 3 m above top of rail,

whichever produces the more adverse effect at any section along the height of the support pier or column. The concentrated loads above may act in any direction and are not considered to act simultaneously.

If the supports are within a railway platform and are:

- at least 2.5 m clear of the platform edge; and
 - 20 m from the end of the platform,
- only the 500 kN collision load need apply.

If the supports are located between 7.5 m and 20 m from the track centre-line, a risk analysis is to be carried out to determine the required concentrated collision load, but with a minimum of 500 kN.

6.3.2 Support Details

Supports are to be monolithic blade piers rather than multiple smaller individual columns.

Blade piers (or blade columns) are to be:

- smooth-faced;
- parallel to the railway track; and
- constructed of reinforced concrete with a minimum thickness of 300 mm and a minimum cross-sectional area of 0.6 m².

Multiple individual column supports will only be permitted where blade piers are shown to be impracticable, and must:

- be constructed of reinforced concrete with a minimum thickness of 450 mm;
- have a minimum cross-sectional area of 0.25 m² for individual columns;
- have a minimum total cross-sectional area of 0.75 m² for all columns in the support; and
- be protected by independent deflection walls designed for the collision loads in Section 6.4.1.

Where steel piers or columns are approved in lieu of reinforced concrete supports, they must:

- comprise at least 4 vertical members suitably braced;
- be designed such that any two members may be demolished without collapse of the structure; and

protected by independent deflection walls designed for the collision loads in Section 6.4.1.

Independent deflection walls must be:

- smooth faced,
- constructed of reinforced concrete with a minimum thickness of 450 mm,
- a minimum of 3.6 m high from the top of rail if less than 4 m clear of the track centreline, otherwise a minimum height of 2.0 m is to apply, and
- designed for the collision loads in Section 6.4.1.

Systems and Capability Technical Requirement

DESIGN OF NOISE BARRIERS ADJACENT TO RAILWAYS

No: *MCE-SR-014*
 Issue: *Revision A*
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 PRINCIPAL SYSTEMS ENGINEER (CIVIL)

AUTHORISED BY: *[Signature]* DATE: *23-12-2009*
 MANAGER TRACK AND CIVIL SYSTEMS

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1.0 INTRODUCTION

Queensland Rail requires noise barriers that provide the necessary sound attenuation, minimise ongoing maintenance, blend aesthetically and consider community issues.

This Technical Requirement details the criteria which must be met by external party designs for noise barriers adjacent to railway property. Reference is made to the following additional Queensland Rail Technical Requirements which must also be satisfied:

- MCE-SR-002 *Work in or about Queensland Rail property,*
- MCE-SR-003 *Work adjacent to overhead line equipment, and*
- EMS/STD/46/004 *Code of Practice – Railway Noise Management.*

Copies of these documents may be obtained from Queensland Rail.

All reference documents, e.g. Australian Standards, codes and Queensland Rail Technical Requirements, are to be the latest version.

2.0 SCOPE

This Technical Requirement applies to the design of new noise barriers to be constructed as part of developments adjacent to or in close proximity to Queensland Rail property.

3.0 GENERAL CONSIDERATIONS

Noise barriers will not be required for Queensland Rail stations, platforms, car parks, pedestrian access paths parallel and adjacent to the property boundary and other special areas as agreed by Queensland Rail.

Wherever practicable, noise barriers are to be constructed on the fence / property boundary. Any variation is to be decided upon in consultation with Queensland Rail.

If there is a gap between the barrier and the Queensland Rail corridor boundary which cannot be maintained by the adjoining property owner, the area is to be sealed with concrete. Unless agreed by Queensland Rail, no landscaping is required to stabilize the batter / slope or a specific need is identified.

4.0 NOISE REDUCTION REQUIREMENTS

Any noise reduction measures (including noise barriers) required must be assessed and designed to reduce noise to acceptable quantitative levels outlined in any of the following:

- current Queensland Development Code(s) relating to proposed sensitive building(s) within transport corridors,
- transport noise policy contained in the relevant local government's planning scheme used to condition proposed sensitive building(s) near a transport corridor, and
- Queensland Rail's Code of Practice - Railway Noise Management when retrofitting or augmenting the railway network.

Note: A *sensitive building* is generally considered to be for residential, educational or medical purposes.

The noise assessment against these acceptable quantitative levels must be carried out by a suitably qualified noise consultant.

In the case of retrofitting or augmenting the railway network, the noise assessment must be accompanied with a report which must be approved by Queensland Rail. In the case of sensitive buildings, the noise assessment must be accompanied by a report verified by at least the responsible building certifier, but often also Queensland Rail.

SERVICEABILITY REQUIREMENTS

Service life of materials used in noise barriers is to exceed 40 years with minimal maintenance. Maintenance required during the service life is to be for aesthetic purposes only.

Barrier materials must be fire resistant, and must not produce toxic fumes when burnt. On ignition, flames must not spread easily. The ash left from any burnt material must not be toxic or harmful to the environment.

Panels must be vandal resistant and must pass the Impact Load Tests described in Appendix A.

The panel material must not be easily disfigured by scratching with sharp implements.

Noise barriers must have faces which are not climbable. They are to be environmentally safe and aesthetically pleasing.

6.0 DOCUMENTATION

The drawings and design details for each type of barrier are to be supplied to Queensland Rail. All drawings must be certified as complying with this Technical Requirement by a Registered Professional Engineer of Queensland with RPEQ Number shown on the drawings.

A site plan is also to be provided and is to show:

- track location,
 - railway corridor property boundaries,
 - contours at 200 mm intervals,
 - location of proposed noise barriers,
 - type / material selected,
 - location of access gates,
 - special features,
 - drainage, and
 - buried services
- as appropriate.

Note: Service searches must be undertaken prior to commencing design and construction. Information from DBYD alone is not enough.

7.0 STRUCTURAL DESIGN REQUIREMENTS

All noise barrier components must be designed in accordance with the relevant Australian Standard(s) for the material being used. Loading combinations are to be determined from AS/NZS 1170.0, and as specified within this document.

All calculations (including serviceability design) are to be based on material properties at an ambient temperature of 40 °C.

7.1 Wind Loads

Wind loads are to be calculated in accordance with AS/NZS1170.2:

- Ultimate – 1000 year ARI
- Permissible – 100 year ARI
- Serviceability – 20 year ARI

The minimum net pressure coefficient to be used is 1.2.

Attention is drawn to the requirements of Table D2(C) of AS/NZS 1170.2 for end and internal

panels, where different pressure coefficient values will be required. Where shown on the drawings, barrier overlaps are not to be classified as end panels.

7.2 Posts

7.2.1 Post Materials

Posts are to be structurally designed Universal Beam (UB) section, unless at a bend or gate. All posts must conform to the relevant Australian Standard(s). Base plates and associated supports are to conform to AS 3678 and AS/NZS 3679.1.

All steel components are to be hot dip galvanised after fabrication in accordance with AS 4680. Damaged areas of galvanising must be made good in accordance with AS 1650.

Timber posts are not to be used.

7.2.2 Post Serviceability Design

The horizontal deflection of the noise barrier post is to be limited to (Height of Barrier)/150 under serviceability wind load.

7.2.3 Post Structural Design

Design of steel components is to be in accordance with AS4100 or AS4600.

Steel posts are to have a minimum section wall thickness of 3 mm.

7.3 Panels

7.3.1 Panel Material

The panel material is to be selected on the basis of acoustic attenuation ability, strength, durability and economy.

Materials must be manufactured in accordance with the relevant Australian Standard(s). If an Australian Standard does not cover the material, full size tests are to be undertaken and certified by a Registered Professional Engineer of Queensland (RPEQ) to prove the material can satisfy the design requirements.

Patterned concrete and fibre composites are the preferred materials for noise barriers. However, plywood panels may be used if agreed to by Queensland Rail.

The panel material must be capable of meeting the following requirements whether above or in contact with the ground:

- Panels are to have a service life of at least 40 years with minimal maintenance. Accelerated testing or other approved methods are to be used to demonstrate the panels will attain the service life specified.
- Panels must be suitable for application of a fire retardant paint to mask graffiti or manufactured from a material that will allow easy removal of graffiti. The process for removal must be environmentally safe and easy to perform.
 - a) It is preferable to use graffiti-resistant material for the panels.
 - b) Generally panels are not required to be coated with anti-graffiti paint, except where specified. In these instances, suitable anti-graffiti paint, approved by Queensland Rail must be used.
 - c) Panels are to be coloured in a way that will not be damaged / faded by graffiti removal, weather or UV light. A texture finish should be of 15 mm depth at maximum.
 - The materials comprising the barrier are to be environmentally safe.
 - The material must have a surface density of at least 15 kg/m² to reduce transmitted sound and provide structural integrity.

7.3.2 Concrete & Cementitious Panels

Precast textured concrete panels must have a minimum concrete strength of Grade N40.

The concrete panels must adhere to the *Colour and Texture in Concrete Walling*, Briefing - 03 of Cement & Concrete Association of Australia (C&CCA).

7.3.3 Fibre Composite Panels

Fibre composite materials are to have their suitability and durability verified by relevant standards or proven by full size testing. The material is to comply with current relevant Australian / overseas standards. Information on the material is to be provided to Queensland Rail for assessment and approval.

7.3.4 Plywood Panels

If the use of plywood panels is agreed to by Queensland Rail, structural design must be in accordance with AS/NZ 2269 and AS/NZ1720.0.

The panel minimum surface density of 15 kg/m² must be satisfied at a site equilibrium moisture content of (approx. 14%).

Structural plywood is to have a minimum Stress Grade of F14 in accordance with AS/NZS 2269. A surface grade quality of CC or better is required. Permitted imperfections under this grade may be left unfilled as long as they are within the size limitations defined in AS/NZS 2269.

Plywood veneers are to be as free of heart as possible and manufactured from hoop pine.

Plywood panels used on the bottom layer of the barrier wall are to be treated to at least Hazard Level 4. Panels used from the second layer upwards must be treated to at least Hazard Level 3 in accordance with the Timber Utilisation and Marketing Act 1987.

The plywood must be treated with ACQ 2100 or Tanalith E wood preservative chemicals. CCA preservative chemicals must not be used. All plywood panels must be free of treatment sludge deposits.

Each veneer must be treated and seasoned before the veneers are bonded.

The treated plywood is to be seasoned to a moisture content of below 18% before delivery to site. Material supplied above this value will be rejected.

The minimum thickness of plywood panels is to be 27 mm.

Slash pine veneers will not be accepted.

The finish on both sides of the panel is to be textured wood with slim line grooves to reduce checking of the surface.

Edge joints must have a strong polypropylene tongue and groove joining system to help prevent warping and eliminate gaps after shrinkage. The edge strip is to be positively fixed to one panel to ensure the strip does not move with potential vibration of the noise barrier.

Ground level panels are to be at least 400 mm high. The upper most panels are to be positively secured by bolts.

7.3.5 Panel Design

Where the method of construction requires that the top of the barrier be stepped, the Contractor is to build the noise barrier so that the top of the wall is not less than the calculated minimum height, and steps are to be equally incremented in height, as far as possible.

Top panels are to have a rounded edge to deter people walking on it, and also to improve the appearance of the barrier. Any edge capping must be suitably protected against corrosion and have the same life span as the panel.

The bottoms of noise barrier panels are to follow either ground level or an edge strip.

Where the method of construction requires that the bottom of the barrier be stepped, no gaps are to be left as a result of stepping, unless required for drainage purposes. The Contractor is to fill all gaps with concrete or other material approved by Queensland Rail.

The barrier must be continuous and solid with no visible or light gaps between panels. For maximum effectiveness, the barrier is to be continuous down to ground level, with any gaps filled (e.g. as a result of stepping).

If damming of water at the bottom of the barrier is likely, discrete drainage points are to be incorporated into the designs without compromising the barrier's ability to achieve acceptable noise levels. The drainage points must not concentrate water flow.

Panels must have positive fastening devices to deter theft. Connection details are to permit erection and removal of the panels on a regular basis.

Noise barriers located close to tracks, such that vehicles cannot gain access between track and barrier, must consist of panels that can be easily removed and manhandled.

7.3.6 Panel Serviceability Design

The horizontal deflection of the panel under serviceability wind is to be limited to $\text{Span}/150$.

To eliminate the need for electrical earthing, steel components from panel to panel must be insulated from each other.

7.4 Fasteners

Connections must be designed to adequately secure all members for the design loading and allow for panel movement where necessary.

Use of screws will not be permitted.

For connections involving timber components, the bolts, etc. must be retightened when the structure reaches the site equilibrium moisture content.

All bolts, nuts and washers must comply with AS 1111, 1112 and 1237, as appropriate.

All bolts, nuts and washers must be hot dip galvanised with a minimum 50 microns thickness coating in accordance with AS 1214. All washers must be hot dip galvanised in accordance with AS 4680.

Alternative coatings will be considered, provided they have at least the equivalent durability as that specified.

Zinc plated bolts or nails are not acceptable.

7.5 Footings

7.5.1 Footing Type

Footings are preferably to be "bored", but "block" footings are allowed if circumstances render boring impractical.

7.5.2 Block Footing

The block footing may be used where one of the following constraints exists:

- access for drilling rig is not practical,
- the ground is not suitable for boring or
- the foundation depth is limited because of an underground service or culvert.

The footing must be designed to prevent instability in overturning, uplift and sliding in accordance with AS/NZS 1170.0 for ultimate loads.

To resist temperature and shrinkage cracking, reinforcement of not less than $500 \text{ mm}^2/\text{m}$ in each direction must be used in exposed surfaces.

The top of the footing is to be at least 300 mm below ground level.

7.5.3 Bored Footing

The bored footing is to be used where access is available and the ground is suitable for boring.

The designer is to use the Broms method (refer to Appendix B) to calculate footing depth. Footing depth is to be increased by an appropriate factor (at least 1.5) if the footing is less than 1.5 m from the edge of an embankment or cutting.

It is to be assumed that existing cuttings within Queensland Rail property will be widened to within 1.0 m of the property boundary. The minimum depth of footing is to be twice the footing diameter.

7.5.4 Finish

The top of the footing must be shaped to shed water away from the post.

7.6 Protective Painting of Steel Posts and Footings

After post installation, a neat, continuous, water-based, bituminous paint "collar" is to be applied on every post up to 150 mm above the finished concrete footing level. This collar is to extend onto the adjacent concrete surface of the footing for a minimum 100 mm from any point on the post.

CONSTRUCTION TOLERANCES

Tolerances are only permitted in order to cater for variations caused during manufacture and construction.

The following tolerances are to apply to the construction of the noise barriers.

TABLE 1 – TOLERANCES

CRITERIA	TOLERANCE
Depth of footing	+ 200 mm - 50 mm
Centre to centre distance between posts	+ 10 mm - 10 mm
Thickness of noise barrier panels	+ 5 mm - 1 mm

CRITERIA	TOLERANCE
Posts: Variation from vertical	5 mm/m for isolated posts Parallel for adjoining posts
Protective treatment of timber	In accordance with this document and TUMA
Hot dip galvanizing: structural members	Coating thickness of 80 microns min. in accordance with AS4680

9.0 ASSOCIATED COSTS INCURRED BY QUEENSLAND RAIL

All of Queensland Rail's costs associated with the review, design and construction of the noise barriers and the implementation of Queensland Rail's Technical Requirements will be charged to the building owner or its agent. This includes any remedial work necessary to Queensland Rail property as the result of this work and any accidental damage, as well as costs associated with train delays. Rates will be set by Queensland Rail.

APPENDIX A: IMPACT TEST FOR NOISE BARRIER PANELS

Noise Barrier Panels must be able to withstand the following Impact Test.

The test panel is to be subjected to impact energy of 150 Joule, consisting of four (4) load repetitions of an impactor. This is to simulate a concerted attack by vandals.

The impactor is to be manufactured from steel of density 7.8 t/m³ and spherical in shape.

An impact energy of 150 Joule is achieved by dropping the impactor from a specific height, H (in mm) onto the horizontal test panel. The impactor is raised so that its centre of gravity is at height, H which is calculated from the equation:

$$H = \frac{15300}{m}$$

where H = Drop Height in millimetres
 m = Mass of Impactor in kilograms

For solid panels, the point of impact is typically at mid-span and 150 mm from the free edge or in a location to give the worst effect. If the panel consists of boards that have internal voids, the point of impact must be mid-span and centrally between the internal stiffeners of the outermost board. Where applicable, the panel must not weigh more than the maximum allowable weight defined in the Technical Requirement.

The panel is considered to have passed the test if it remains serviceable after the four load repetitions. That is, it will still perform its function as a noise barrier and can withstand its design load without shortening its service life.

The results of the test are to be certified by a Registered Professional Engineer of Queensland (RPEQ).

APPENDIX B: BROMS METHOD FOR BORED FOUNDATIONS

An acceptable method for the design of footing depth is based on Brom's theory as follows.

Applicable case is short pile in cohesive soils.

$$F = \frac{H_u}{9 \times S_u \times D}$$

$$M_{\max} = H_u \times (E + 1.5D + 0.5F)$$

$$G = \sqrt{\left(\frac{M_{\max}}{2.25 \times S_u \times D} \right)}$$

$$L = 1.5D + F + G$$

Where:

- D = Diameter of footing (m)
- E = Height of barrier / 2 (m)
- F *Depth to zero shear point minus 1.5*D (m)*
- G = Depth of footing minus F minus $1.5 \times D$ (m)
- H_u = Ultimate lateral shear (kN)
- L = Depth of footing (m)
- M_{\max} = Maximum ultimate lateral bending moment in footing (kN.m)
- S_u = Factored undrained shear strength of soil (kPa)


adf


Systems and Capability Technical Requirement

REQUIREMENTS FOR SERVICES UNDER THE RAILWAY CORRIDOR (NON-QR SERVICES)

No: *MCE-SR-016*
 Issue: *Revision A*
 Date: *30 September 2010*

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AUTHORISED BY:  DATE: 22-10-2009
 MANAGER TRACK AND CIVIL SYSTEMS

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1.0 INTRODUCTION

This Technical Requirement details the criteria which must be met by:

- external service owners,
- QR and external authorities where the service is jointly owned, and
- external service owners where QR uses a proportion of the service, where the services are to traverse QR property and / or pass under railway tracks.

The requirements for solely QR-owned services on QR property are covered in Technical Requirement MCE-SR-17.

Although the relevant Australian Standards for undertrack service crossings are used as the basis for this Technical Requirement, a number of special measures are required. These are to increase the level of safety for the railway as well as for field staff performing future excavation work in the vicinity of those crossings. Increased depths below the track and natural ground surface or the provision of stronger encasing pipes are required to minimise the potential dangers caused by combustible, high pressure or high voltage services.

Those additional measures have been determined from past experience with undertrack excavation failures and the need to perform the work in an operationally challenging environment.

The interaction of QR track protection staff and the drilling / boring operators is described. A fundamental measure for preventing railway traffic damage and derailment is continuous observation by contractor's and QR staff during the excavation work under and in the vicinity of the tracks. Any variation from the pre-existing track geometry will be immediately assessed by QR staff on site for the necessary imposition of traffic restrictions and follow-up remedial trackwork.

The minimum depths of services below the track have generally been increased over the Australian Standards' minimum requirements in order to decrease the effects of the bore on the surface and to improve safety for future excavation work in the area.

A range of drilling / boring / tunnelling / pipe ramming / trenching methods are available and it will remain the responsibility of the service provider and contractor to determine the most appropriate method for each job site subject to appropriate geotechnical assessment. The method chosen and the appropriate controls must aim to eliminate the possibility of lifting / lowering / altering the track geometry in any way.

Wet boring (high pressure water drilling) must not be used under any circumstances.

Where this Technical Requirement prescribes a higher degree of protection than any other standard, including Australian Standards, then this document will take precedence.

2.0 ALL UNDERTRACK SERVICES

2.1 Australian Standards and Codes of Practice

AS 4799 "Installation of underground utility services and pipelines within railway boundaries" provides for the minimum requirements, while also allowing the railway authority to impose those additional safety matters described in this Technical Requirement.

Water Services Association of Australia provides guidance for undertrack crossings by water and sewer pipes through their "Water Supply Code of Australia" and "Sewerage Code of Australia".

1289 “Methods of testing soils for engineering purposes” provides information for the compaction of backfill where a service has been installed in a trench.

2.2 Safety During Service Installation and Maintenance

It is the responsibility of the service owner / its agent to perform safely all work associated with the installation and maintenance of the service.

The following additional QR Standard Requirements must be satisfied while all workers are on QR property:

- MCE-SR-002 “Requirements for work in or about QR property”, and
- MCE-SR-003 “Requirements for work adjacent to overhead line equipment” (if appropriate).

2.3 Orientation and Location of Services

All externally-owned services should be orientated in plan to pass through QR property in a straight line and within approximately 5° of 90° to the track centreline. This restriction may be relaxed in exceptional circumstances at the discretion of the Rail Manager if the depth of the service is greater than 4 m below formation level or if geotechnical investigation shows that the bore will be self-supporting under railway loads.

No services should pass within 5 m horizontally of any infrastructure foundation. If this is impractical in a specific location, the details of the situation need to be presented to the Rail Manager for a determination based on the nature of the footing and the diameter of the pipe.

No services are to be located under track turnouts or crossovers.

The clear horizontal distance between an existing service and a new service should be greater than 2 m. For new services being installed as a group, it is preferable to combine all services into a single enveloping pipe. For a number of bores in a group, the minimum clear horizontal distance between enveloping pipes within the group should be 2 m.

No service will be allowed vertically above / below and parallel to another service or an existing service.

Where a new service is to pass above / below an existing service at 90°, a vertical clearance typically greater than 300 mm should be achieved. The owner of the new service must contact the existing service owner for a determination of the required clearance in each case. This clearance will depend on the accuracy of the installation method (trench, laser guided micro-tunnelling, etc.) and the nature of the crossing (gas, water, fibre optic cables, etc.)

No manholes, chambers, pits or anchor blocks are to be installed in QR property as part of services solely owned by non-QR authorities. For pipelines carrying liquids under pressure, a valve is to be installed in the pipeline (on the inlet side) outside of the QR boundary.

For a service which QR jointly owns or where QR uses an externally-owned service, and where that service runs along the corridor, the alignment will be:

- within approx. 1 m of the boundary fence,
- more than 6 m from the toe of a bank or top of a cutting, and
- more than 10 m from the nearest rail.

The contractor is responsible for determining the exact locations of all underground services in the vicinity of the proposed work. The approximate locations of QR-owned services will be provided in response to the contractor’s application. It should be noted that many QR services

(water, sewerage, electrical, signalling, etc.) do not have permanent markers showing their locations and have not been installed at right angles to the track and at the minimum depths below the track as nominated in AS 4799.

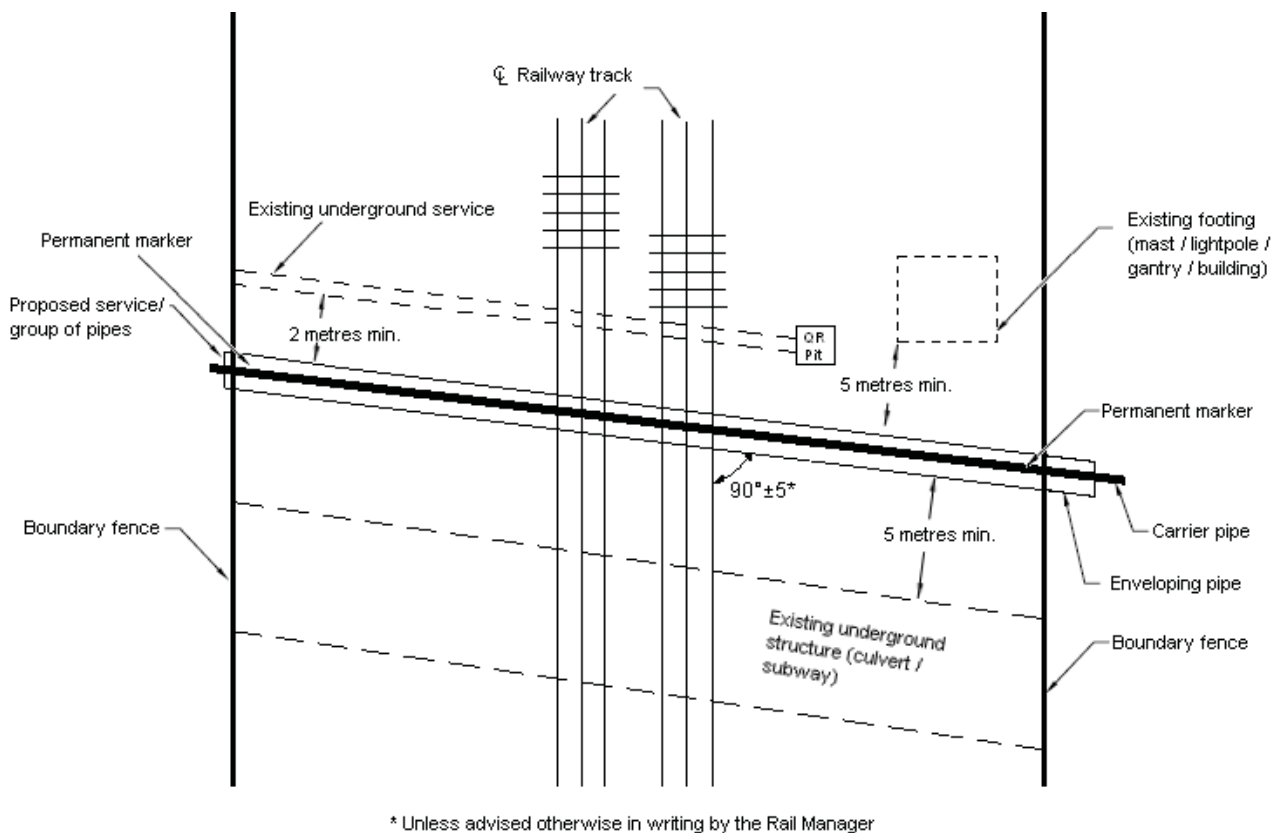


Figure 1: Plan Showing Service Pipe Crossing the Railway Corridor

2.4 Location of Entry and Exit Pits

For drilling / boring / tunnelling methods, entry and exit pits are to be outside of QR property. For safety reasons, the movement of the contractor's staff on QR property is to be minimised.

2.5 Geotechnical Advice

For bore holes / tunnels greater than 150 mm dia. and prior to any excavation work commencing on site, the service owner / its agent is required to obtain a geotechnical assessment of the ground conditions (soil types and depth of water table) over the length of the bore. For smaller diameter holes, this advice can be sought at the discretion of the service owner / its agent. This information is to be used by the service owner / its agent to determine the most suitable method for the work and the detailed equipment requirements to successfully complete the bore without causing any disruption to the track and ground surface.

The contractor must be made aware that obstacles, such as large rocks, old rails and old timber bridge piers, may be encountered while excavating through railway embankments. Problems have also been encountered where the bore has broken into loose material, e.g. ballast, causing the loose material to run freely into the bore, creating a sink hole / subsidence at the surface.

If exploratory vertical bore holes are to be sunk, they must not be on the line of the tunnel. They must be properly backfilled and sealed.

2.6 Protection of Services - Safety for Future Excavations

For fuel / gas lines, water supply and sewers, an enveloping pipe is required to be used for the full length of the service under QR property.

The enveloping pipe shall be able to withstand the impact of an excavator, e.g. a steel enveloping pipe grouted outside and inside would be suitable. Plastic materials are generally not suitable, however HDPE pipe with impact resistance of PN20 and material PE100 would be acceptable. In this case, grouting may be required outside, but not inside; the ends of the enveloping pipe being sealed. Other types may be submitted to the Rail Manager for comment on suitability / acceptability. If a suitable impact resistant enveloping pipe is used, the minimum depth below formation level and ground level is 2 m.

If the provision of an impact resistant enveloping pipe is impractical in a specific location / application, the depth of the service must be increased to a minimum of 3 m below both formation level and ground level in an attempt to eliminate the possibility of future accidental damage.

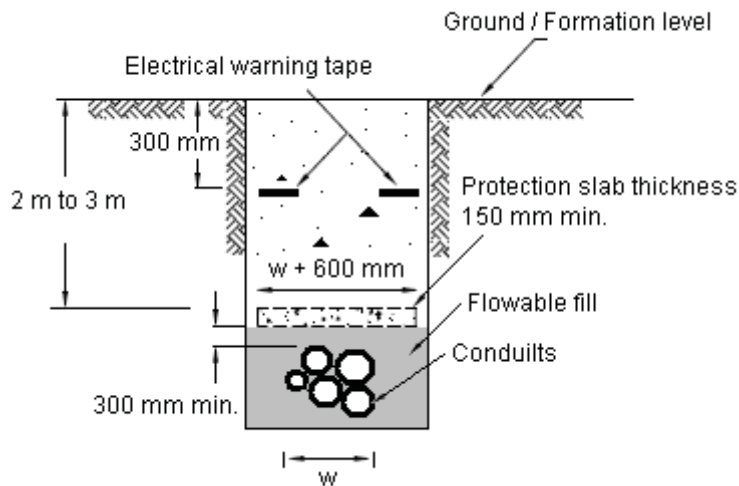
2.6.1 Electrical Power Cables

These requirements apply to low and high voltage cables.

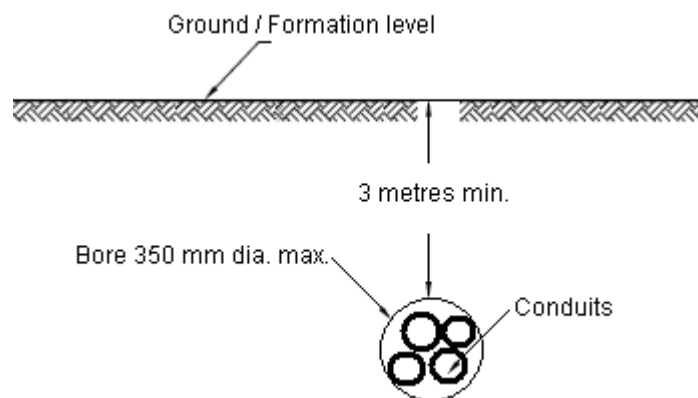
There are three acceptable methods of installation, viz.:

- **Trench** This method is suitable for HDPE conduits where the top of a protection slab (above the conduits) is between 2 m and 3 m depth below both formation level and ground level. An enveloping pipe is not required in this case. Protection from future excavation will be achieved with the use of a protection slab similar to that described in AS 4799. The slab is to be minimum 150 mm thick reinforced concrete designed to resist excavator impact. It is to be 600 mm greater in width than the group of conduits and is to be placed centrally over the conduits. Electrical warning tapes are also to be used. The minimum depth of the top of the conduits below the underside of the slab is to be 300 mm. Groups of conduits below the slab are to be protected by backfilling the trench with flowable grout (approx. 2 MPa) up to a minimum of 300 mm above the uppermost conduit.
- **Directional drilling** HDPE conduits (without an enveloping pipe) may be used where the depth of the top of the bore is greater than 3 m below both formation level and ground level. The conduits are to be installed within a single bore with a maximum diameter of 350 mm. If a larger bore is necessary, a different installation method must be used.
- **Micro-tunnelling** This method can be used in conjunction with an enveloping pipe of HDPE where the top of the bore is between 2 m and 3 m below formation level and ground level.

The HDPE conduits are to be at least designation PN12.5 and material PE100. The HDPE enveloping pipe is to be at least designation PN20 and material PE100.



*Installation in a Trench
(section through trench)*



Installation by Directional Drilling (section through bore)

Figure 2: Vertical Sections Showing Electrical Power Services Under the Railway Corridor

2.6.2 Gas Lines

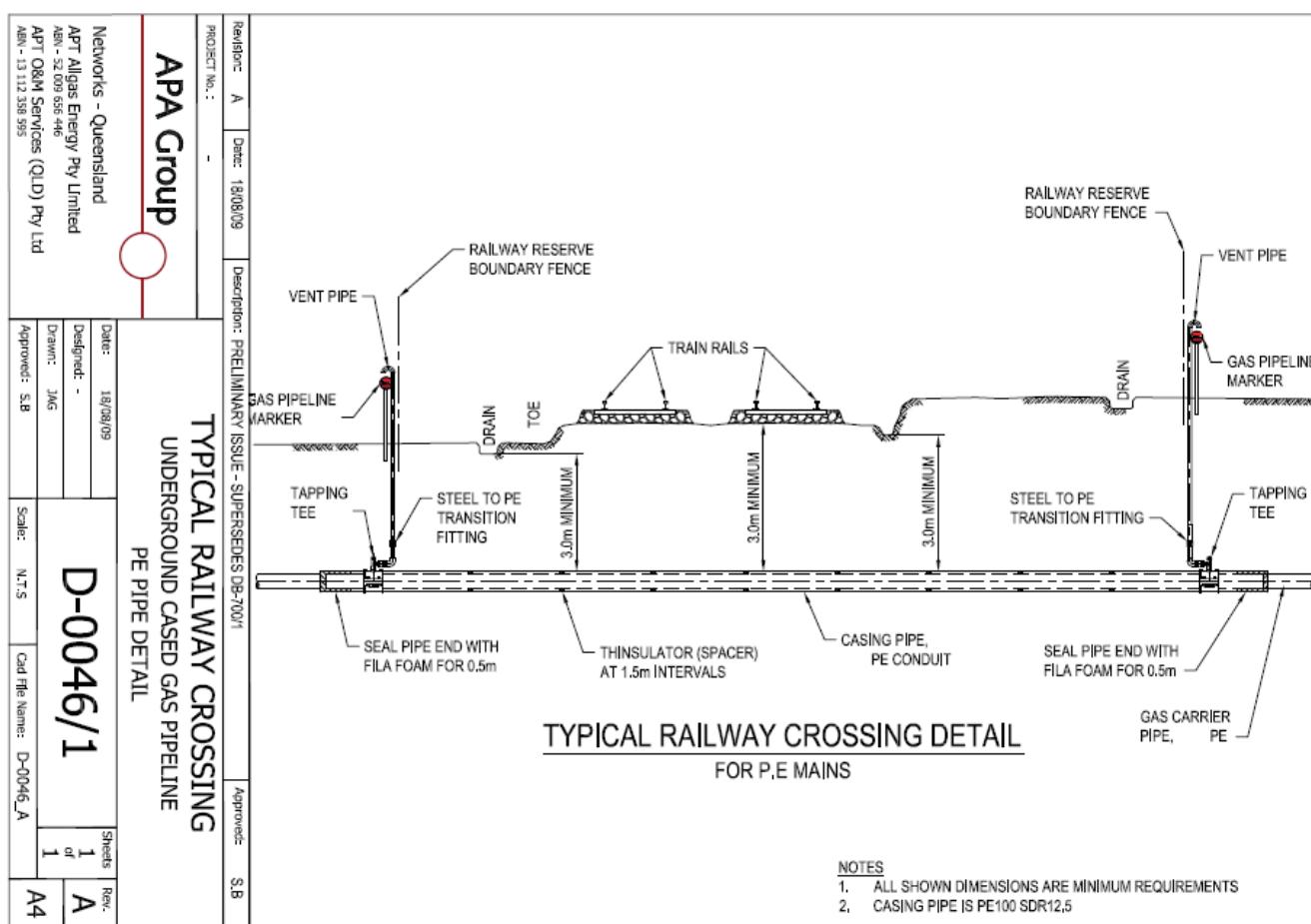
P.E. Gas Carrier Pipe

There are three acceptable methods of installation, viz.:

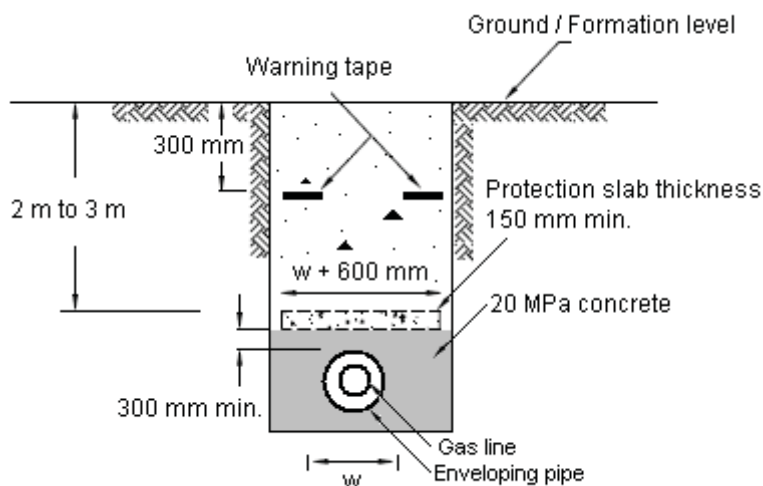
- Trench** This method is suitable for a HDPE enveloping pipe protected from above by a concrete slab where the top of the slab is between 2 m and 3 m below formation level and ground level. Protection from future excavation will be achieved with the use of a protection slab similar to that described in AS 4799. The slab is to be minimum 150 mm thick reinforced concrete designed to resist excavator impact. It is to be 600 mm greater in width than the enveloping pipe and is to be placed centrally over it. Warning tapes are also to be used. The minimum depth of the top of the enveloping pipe below the underside of the slab is to be 300 mm. The gas line below the slab is to be protected by backfilling the trench with min. 20 MPa mass concrete up to a minimum of 300 mm above the top of the enveloping pipe.

- **Directional drilling** A HDPE enveloping pipe may be used where the depth of the top of the bore is greater than 3 m below both formation level and ground level. The maximum diameter of the bore is to be 350 mm.
- **Micro-tunnelling** This method can be used in conjunction with a HDPE enveloping pipe where the depth of the top of the bore is greater than 3 m below both formation level and ground level.

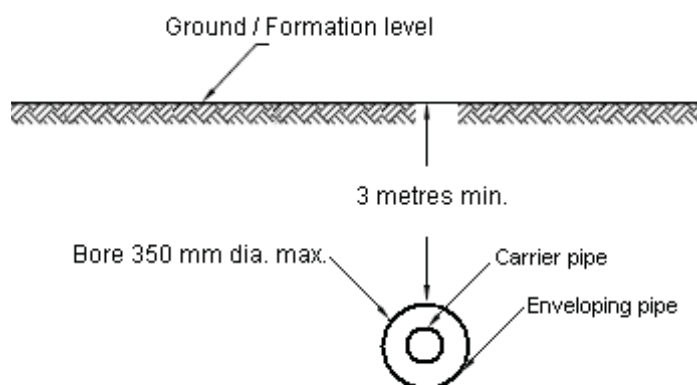
The HDPE enveloping pipe is to be at least designation PN12.5 and material PE100. In all cases, the space between the gas pipe and the enveloping pipe is to be sealed and vented at the ends outside of QR property. The vent pipes are to be clear of and not attached to the boundary fence.



*Enveloping Pipe and Venting Arrangement- Underground Gas Pipeline
Courtesy of APA Group*



*Installation in a Trench
(section through trench)*



*Installation by Directional Drilling
(section through bore)*

Figure 3: Vertical Sections Showing Gas Line Under the Railway Corridor

Steel Gas Carrier Pipe

2.7 Boreholes Below the Water Table

This condition can greatly increase the likelihood of subsidence or heave at the surface. In those excavation methods where it is necessary to balance the hydrostatic pressure of the groundwater with pressurised slurry inside the bore, the risk to track safety is unacceptable and the work must be performed during a track closure. The service owner must be informed of its liability for the cost of repairs resulting from any damage to railway property and for any disruption to train services. This can be substantial.

preferred installation method in this situation is pipe ramming, where the spoil is not removed until the enveloping pipe is fully in place. A track closure would not be required.

2.8 On-site QR Involvement

Before work commences, an on-site meeting is to be held between a QR representative (usually the Track Maintenance Supervisor) and the contractor. The contractor is to explain all details of the work and also present the Work Method Statement (Track Safety).

The Rail Manager and / or Rail Maintainer will conduct field audits during the progress of the work to check on compliance with the Work Method Statement (Track Safety).

A Track Protection Officer is required to be on site at all times while the contractor is on QR property.

The Rail Maintainer will appoint a track competent person to be on site at all times while undertrack work is being performed under or within 3 m horizontally of the railway tracks. The role of the track competent person will be:

- to observe the work,
- to ensure the safety of railway traffic by assessing any changes in the track alignment / level and applying a speed restriction / closure / other formal operational control if required,
- for pipes greater than 600 mm dia., to arrange for inspections of the site while running the road, checking for any changes in the track alignment / level during the week after the completion of work, and
- to arrange for repairs by the Rail Maintainer, should any settlement / heave / alignment problems occur in the track.

Undertrack work by the contractor must not proceed unless QR's track competent person and Track Protection Officer are on site.

The Track Maintenance Supervisor is to inform the local track maintenance gang of the location and timing of the service installation.

The Rail Maintainer is required to apply a speed restriction of 25 km/hr for trains crossing the bore while the work is in progress. This is to reduce vibrations and pressure exerted on the bore and the boring equipment. For pipes greater than 600 mm dia., a speed restriction of 50 km/hr for trains crossing the bore is to be applied for 2 days after completion of the work.

2.9 Track Monitoring

The track competent person (from Rail Maintainer's staff) on site will observe the work and take any appropriate actions to ensure the safety of railway traffic.

The contractor is responsible for engaging a suitably qualified surveyor (registered with the Surveyors' Board) to monitor the alignment and level of each track at the service crossing. For example, if the service passes under four tracks, each track is to be monitored.

The requirements for track monitoring during the work are as follows:

- Survey marks are to be established in pairs on sleepers along each track, one on each side of the rails of each track. The marks need to be on the sleepers closest to the centre-line of the pipe, and then at 2 m, 5 m, 8 m and 10 m away from the pipe in both directions along each track.
- Prior to the start of boring, the surveyor must take the datum readings for alignment and level.

- While the bore is under and within 3 m horizontally of the track ballast, the surveyor must take readings between 15 and 40 minutes prior to the passage of every train across the bore.
- Readings need to be taken using a Total Station surveying instrument (for alignment and level) and / or a Spirit Level (for level). The surveyor must check the results immediately against the datum readings.
- Any deviation from the datum must be reported to the track competent person immediately, so that they can assess the situation and implement any necessary actions to protect railway traffic.
- Should remedial works to track / formation / drainage be performed, further monitoring of the situation will be required until all movement has stabilised.

Monitoring by the contractor is to be continued after the completion of the work in case of settlement or lift in the following situations:

- pipes greater than 600 mm dia. (all installation methods),
- all directional drilling and micro-tunnelling installations (all pipe diameters) where the bore has passed through expansive clays. The contractor is to advise the Rail Maintainer of the presence of this type of clay.

Readings are to be taken after each of the next three trains, at the end of the next day, and then after another 2 days.

2.10 Permanent Markers

The Contractor is to provide permanent markers at QR property boundaries directly above the service as described in AS 4799. These markers will remain the property of the service owner and it will be their responsibility to maintain them in good condition and to make any replacements as required.

The Rail Maintainer will:

- Check the installation of the markers,
- Maintain a register of the locations and nature of all services under QR property for its own use, and
- Conduct future regular inspections in accordance with the Civil Engineering Structures Standard SAF/STD/0080/CIV.

2.11 As Constructed Drawings

As constructed plan and section drawings (in electronic pdf format), showing the vertical and horizontal alignment of the service in relation to the ground surface, railway track and all infrastructure within approx. 10 m of the service, shall be submitted to QR's Property Section within 30 working days after practical completion of the service installation for permanent storage.

2.12 Associated Costs incurred by QR

All of QR's costs associated with the work and the implementation of these Technical Requirements will be charged to the undertrack service owner or its agent. This includes any remedial work necessary to the track and trackside drains as the result of this work and any accidental damage, as well as costs associated with train delays. Rates will be set by QR.

3.0 DIRECTIONAL DRILLING

The process of directional drilling involves a number of drilling and reaming runs before the enveloping pipe is installed in the bore. A pilot hole is first drilled from the entry pit to the exit pit. This is followed by a number of cuts with reamers of increasing size until the final diameter is reached. The enveloping pipe with a diameter smaller than the bore is then pulled through the bore. At the completion of the work, the annulus between the enveloping pipe and the bore remains filled with a clay slurry. If a drilling / reaming run is interrupted for more than 2 days before running the full length of the bore, precautions must be taken to prevent the equipment from seizing in the bore.

During drilling, reaming and pipe installation, a specially designed slurry is pumped at high pressure through the drill pipes to the cutting head, from where it is forced back along the outside of the pipes, thereby clearing away the cuttings and providing some support to the bore. A potential problem exists if the bore becomes suddenly obstructed and the slurry pressure rises rapidly. The slurry either lifts the ground surface (including the track) or it breaks through to the surface in a fissure. Because of this problem and the serious implications for railway traffic, directional drilling requires strict operational controls.

It should be noted that certain soil types, e.g. clays, appear to be more prone to lifting of the surface. From QR's experience, it is clear that this can occur despite reasonable controls and vigilance on the part of the operator of the equipment. Consequently, for directional drilling it is expected that track alignment problems will occasionally occur. To control the consequences and prevent derailments, it is imperative that track monitoring procedures and the requirements of Section 2.7 are fully in place.

At all times during the work, the contractor must remain vigilant to the slurry and water pressures and the return flow from the bore to ensure that the bore remains clear. The pressure must not be allowed to increase to a level which will cause track heave.

AS 4799 does not cover the specific requirements for this type of work.

The following special conditions shall apply:

- Only pipes with a diameter up to and including 250 mm (max. hole dia. 350 mm) are permitted to be installed using directional drilling. Larger pipes are to be installed by boring and pipe jacking, micro-tunnelling, pipe ramming or trenching as approved by the Rail Manager.
- Under the track and within 3 m horizontally of the track ballast, the minimum depth of the top of the bore is to be 3 m below the top of railway formation (underside of ballast). This depth restriction may be relaxed in exceptional circumstances at the discretion of the Rail Manager if specific site conditions and service arrangements make this requirement impractical.
- From the QR boundary to 3 m horizontally from the track ballast, the minimum depth of the top of the bore will be 2 m below ground surface level. This is to minimise restrictions on the future use of the railway corridor.
- To reduce the possibility of track lift as a result of an undesirable increase in slurry / mud pressure, the pump equipment should have fitted an automatic cut-off device which will shut off the pump immediately a pre-determined increase in the slurry pressure is reached. An expert's recommendation for this cut-off pressure and the contractor's confirmation that the chosen pressure has been set are to be provided to the Rail Maintainer before drilling commences. The contractor should also provide evidence that the cut-off device has been calibrated and is in sound functioning condition.
- The contractor is to provide QR with a Work Method Statement (Track Safety) including:
 - Plan and longitudinal section showing location (horizontally and vertically) of other services and railway corridor infrastructure within approx. 10 m of the proposed service. Information to be shown typically includes property boundaries, railway

tracks, culverts, bridge piers, buildings and footings for masts. The locations of the entry and exit pits, the proposed pipe alignment and the depths of the service below the ground and formation levels, as well as horizontal clearances to the nearest existing services and structures are to be shown.

- Copy of the geotechnical recommendations as they relate to possible surface heave / subsidence problems associated with the soil type.
- The work process including controls, process monitoring and the automatic slurry cut-off pressure. This pressure is to be determined and certified by a qualified and experienced expert competent in this field, as determined appropriate for the geotechnical site conditions.
- Establishment arrangements.
- Survey arrangements to establish the bore alignment.
- Identification of the risks and methods of control for possible problems that could cause interference to the railway track (lifting / settlement / change of alignment).
- Track monitoring procedures to detect lifting / settlement / change of alignment.

These points should be addressed briefly in a single document. One copy will need to be provided to QR Property for assessment as part of the application and a second copy provided to the Track Maintenance Supervisor at the pre-start meeting.

- The directional drilling, reaming and pipe installation work under the track formation must be performed during certain hours set by QR. This will avoid peak railway traffic times. In suburban areas, the available time would be typically 9:30 am – 2:30 pm.
- Directional drilling work is to stop temporarily while a train is crossing the bore site. Notification of train arrival times will be communicated to all on-site staff by the Track Protection Officer.

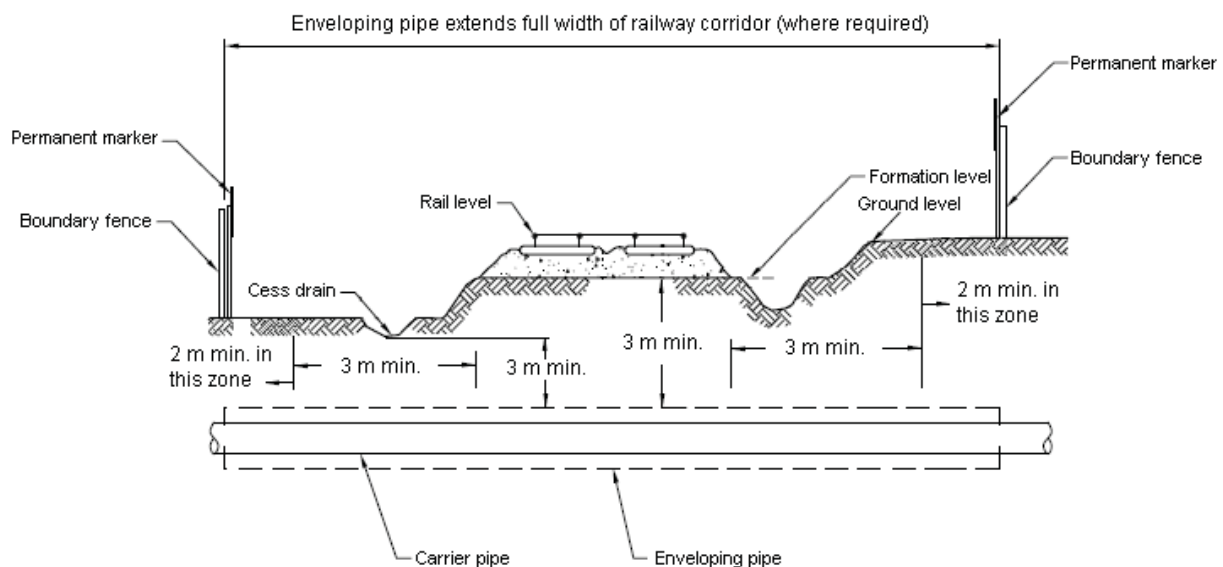


Figure 4: Cross-section Showing Service Pipe Under the Railway Corridor Installation by directional drilling

4.0 PIPE JACKING / TUNNEL BORING / MICRO-TUNNELLING

“Micro-tunnelling” is a method of excavation used for the smaller diameter pipe jacking work. “Tunnel boring” is another method of excavation which uses a shield and a rotating cutting head. The “pipe jacking” covers a number of different excavation methods, including “tunnel Boring” and “micro-tunnelling”. It generally involves making a bore using a cutting head and shield attached to the enveloping pipe, which is pushed forward by hydraulic jacks. Additional

pipes are lowered into the entry pit and joined to the previous pipe. The cutting and jacking process is then continued. The process leaves a negligible gap between the bore and the outside of the enveloping pipe.

There are a variety of different cutting heads, face support, excavation and spoil removal methods used, depending on the ground conditions. Steering of the excavation can be achieved by such means as laser and computer guidance for the shield. It is important that suitable equipment and methods are used to control the stability of the face of the tunnel, particularly in unstable ground.

AS 4799 covers the minimum requirements for this type of work. However, the following special conditions shall also apply:

- Pipes of any diameter may be installed using pipe jacking / micro-tunnelling.
- The minimum depth of the top of the bore will be 2 m below both the top of the railway formation (underside of ballast) and the ground surface level. This is to minimise restrictions on the future use of the railway corridor. This depth restriction may be relaxed in exceptional circumstances at the discretion of the Rail Manager if specific site conditions and service arrangements make this requirement impractical.
- The contractor is to provide QR with a Work Method Statement (Track Safety) including:
 - Plan and longitudinal section showing location (horizontally and vertically) of other services and railway corridor infrastructure within approx. 10 m of the proposed service. Information to be shown typically includes property boundaries, railway tracks, culverts, bridge piers, buildings and footings for masts. The locations of the entry and exit pits, the proposed pipe alignment and the depths of the service below the ground and formation levels, as well as horizontal clearances to the nearest existing services and structures are to be shown.
 - The work process including controls and process monitoring.
 - Establishment arrangements.
 - Survey arrangements to establish the bore alignment.
 - Identification of the risks and methods of control for possible problems that could cause interference to the railway track (lifting / settlement / change of alignment).
 - Track monitoring procedures to detect lifting / settlement / change of alignment.

These points should be addressed briefly in a single document. One copy will need to be provided to QR Property for assessment as part of the application and a second copy provided to the Track Section Supervisor at the pre-start meeting.

- The boring and pipe jacking work under the track formation must be performed during certain hours set by QR. This will avoid peak railway traffic times. In suburban areas, the available time would be typically 9:30 am – 2:30 pm.
- Boring / pipe jacking is to stop temporarily while a train is crossing the bore site. Notification of train arrival times will be communicated to all on-site staff by the Track Protection Officer.
- The enveloping pipe must be installed to the full extent of the bored length prior to the passage of every train across the bore site.
- A cementitious grout (5 MPa) is to be pressure injected into the annular space between the outer surface of the enveloping pipe and the bored hole. This work is to be done between trains. A requirement for internal grouting between the carrier pipe and the enveloping pipe will be determined for each case.

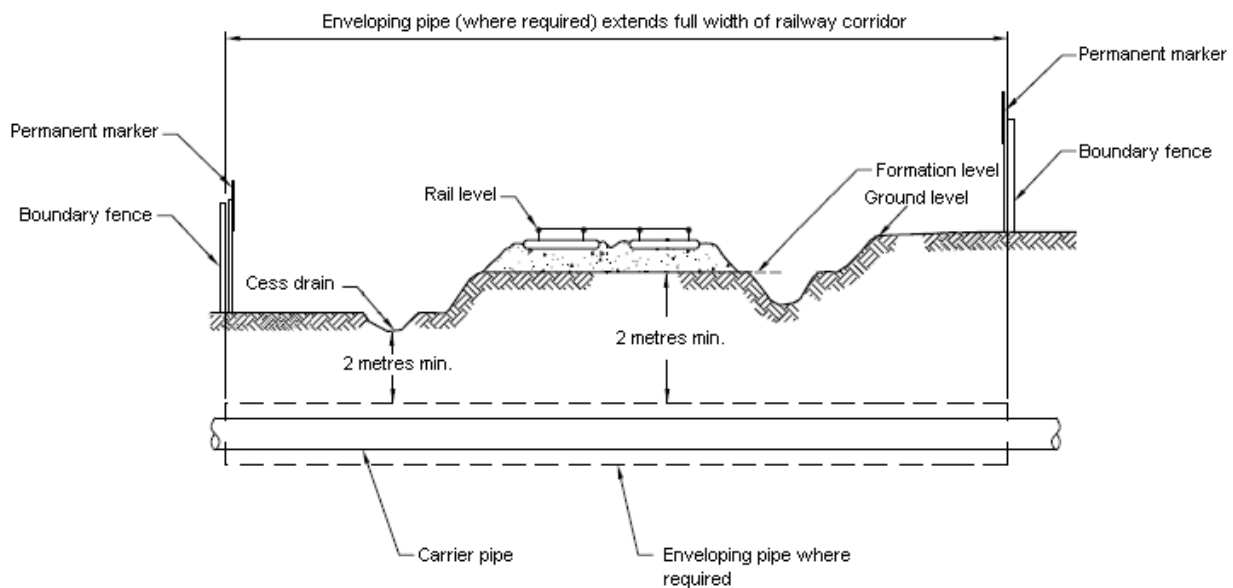


Figure 5: Cross-section Showing Service Pipe Under the Railway Corridor Installation by boring and jacking / micro-tunnelling / pipe ramming

5.0 MICRO-TUNNELLING

The term “micro-tunnelling” is normally applied to the smaller pipe diameters a range of . The process of micro-tunnelling involves making a bore using a cutting head slightly larger than the size of the enveloping pipe. The enveloping pipe is constructed by consecutively jacking pipes into the bore with the leading edge always directly behind the auger bit. Additional pipes are lowered into the entry pit and welded / connected to the previous pipe. The boring and jacking process is then continued. During boring, a specially designed slurry is pumped at low pressure into the bore, providing continuous support at the face of the excavation. The slurry returns through the centre of the enveloping pipe to continuously clear away the cuttings. The progressing bore is supported by the enveloping pipe.

This method is preferred to directional drilling because of the lower slurry pressures and support given to the bore by the enveloping pipe, with a consequently reduced likelihood of lifting the ground surface should a blockage occur.

AS 4799 covers the minimum requirements for this type of work, as it is similar to boring and pipe jacking. However, the following special conditions shall also apply:

- Pipes of any diameter may be installed using micro-tunnelling.
- The minimum depth of the top of the bore will be 2 m below both the top of the railway formation (underside of ballast) and the ground surface level. This is to minimise restrictions on the future use of the railway corridor. This depth restriction may be relaxed in exceptional circumstances at the discretion of the Rail Manager if specific site conditions and service arrangements make this requirement impractical.
- The contractor is to provide QR with a Work Method Statement (Track Safety) including:
 - Plan and longitudinal section showing location (horizontally and vertically) of other services and railway corridor infrastructure within approx. 10 m of the proposed service. Information to be shown typically includes property boundaries, railway tracks, culverts, bridge piers, buildings and footings for masts. The locations of the entry and exit pits, the proposed pipe alignment and the depths of the service below the ground and formation

levels, as well as horizontal clearances to the nearest existing services and structures are to be shown.

- The work process including controls and process monitoring.
- Establishment arrangements.
- Survey arrangements to establish the bore alignment.
- Identification of the risks and methods of control for possible problems that could cause interference to the railway track (lifting / settlement / change of alignment).
- Track monitoring procedures to detect lifting / settlement / change of alignment.

These points should be addressed briefly in a single document. One copy will need to be provided to QR Property for assessment as part of the application and a second copy provided to the Track Section Supervisor at the pre-start meeting.

- The micro-tunnelling work under the track formation must be performed during certain hours set by QR. This will avoid peak railway traffic times. In suburban areas, the available time would be typically 9:30 am – 2:30 pm.
- Micro-tunnelling work is to stop temporarily while a train is crossing the bore site. Notification of train arrival times will be communicated to all on-site staff by the Track Protection Officer.
- A cementitious grout is to be pressure injected into the annular space between the outer surface of the enveloping pipe and the bored hole. This work is to be done between trains. A requirement for internal grouting between the carrier pipe and the enveloping pipe will be determined for each case.

6.0 PIPE RAMMING

The process of pipe ramming involves direct driving of a steel enveloping pipe in a similar fashion to pile driving. Additional pipes are lowered into the entry pit and welded / attached to the previous pipe. The ramming process is then continued. The spoil within the pipe is only removed once the pipe is fully in place with the use of compressed air and / or water or an auger. There is no gap between the outside of the enveloping pipe and the surrounding soil. This method is preferred because water and pressurised slurries are not used during installation of the enveloping pipe and do not come into contact with the surrounding soil. Soil disturbance around the pipe is minimised, with no ground heave / settlement occurring during / after installation.

AS 4799 does not cover the specific requirements for this type of work. The following special conditions shall apply:

- Pipes of any diameter may be installed using pipe ramming.
- The minimum depth of the top of the bore will be 2 m below both the top of the railway formation (underside of ballast) and the ground surface level. This is to minimise restrictions on the future use of the railway corridor. This depth restriction may be relaxed in exceptional circumstances at the discretion of the Rail Manager if specific site conditions and service arrangements make this requirement impractical.
- The contractor is to provide QR with a Work Method Statement (Track Safety) including:
 - Plan and longitudinal section showing location (horizontally and vertically) of other services and railway corridor infrastructure within approx. 10 m of the proposed service. Information to be shown typically includes property boundaries, railway tracks, culverts, bridge piers, buildings and footings for masts. The locations of the entry and exit pits, the proposed pipe alignment and the depths of the service below the ground and formation levels, as well as horizontal clearances to the nearest existing services and structures are to be shown.
 - The work process including controls and process monitoring.
 - Establishment arrangements.
 - Survey arrangements to establish the bore alignment.
 - Identification of the risks and methods of control for possible problems that could cause interference to the railway track (lifting / settlement / change of alignment).

- Track monitoring procedures to detect lifting / settlement / change of alignment. These points should be addressed briefly in a single document. One copy will need to be provided to QR Property for assessment as part of the application and a second copy provided to the Track Section Supervisor at the pre-start meeting.
- The pipe ramming work under the track formation must be performed during certain hours set by QR. As there is never any unsupported material in this method, and consequently no danger of surface heave or subsidence, it is not necessary to avoid work during peak railway traffic times.
- Pipe ramming can continue while trains are crossing the bore site.
- The requirement for internal grouting between the carrier pipe and the enveloping pipe will be determined for each case.

7.0 TRENCHING

The process of trenching involves the excavation of a trench across QR property and under the tracks, causing disturbance to the formation, ballast and track. Normally, excavation under the track would be done during a track closure, but if this is not possible, the use of track supports will be necessary.

Trenching is the most expensive and time consuming method. However, it may lend itself to low traffic lines where the equipment for other methods is not readily available.

All QR's costs related to trenching are to be paid by the service owner. In addition to the cost of a track closure, these include the following work which would be performed by QR staff:

- removal and replacement of the track components,
- removal, replacement and compaction of the ballast, and
- the provision of temporary track supports (if required).

AS 4799 covers the minimum requirements for this type of work with the following modification. After the service has been placed in the trench, it will be necessary to backfill with fine crushed rock, sand, gravel, lean mix concrete or other material approved by the Rail Manager. The backfill is to be compacted to 90% of the maximum dry density (Modified Compaction Test) up to 600 mm below formation level. The top 600 mm is to be compacted to 95% of the maximum dry density (Modified Compaction Test). This is to be in accordance with AS 1289.E2.1.

The following special conditions shall also apply:

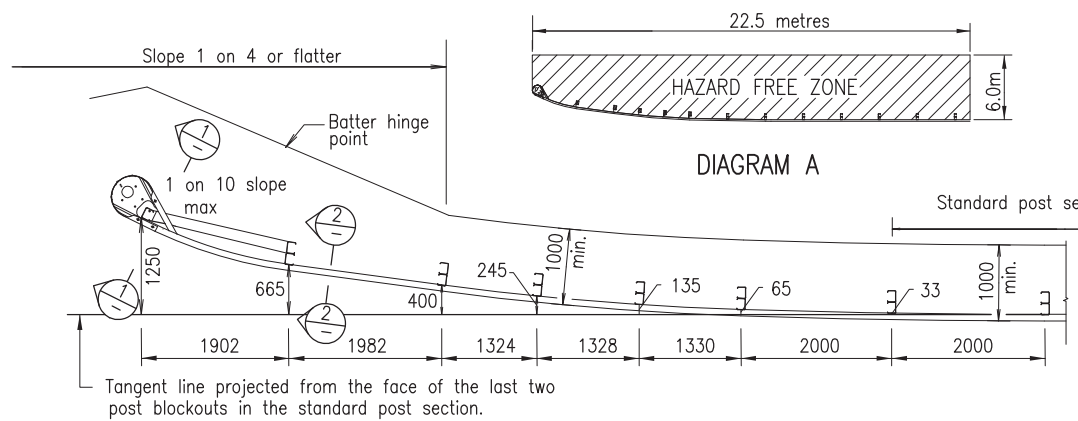
- Pipes of any diameter may be installed using trenching.
- The minimum depth of the top of the enveloping pipe will be 2 m below both the top of the railway formation (underside of ballast) and the ground surface level. This is to minimise restrictions on the future use of the railway corridor. This depth restriction may be relaxed in exceptional circumstances at the discretion of the Rail Manager if specific site conditions and service arrangements make this requirement impractical.
- The contractor is to provide QR with a Work Method Statement (Track Safety) including:
 - Plan and longitudinal section showing location (horizontally and vertically) of other services and railway corridor infrastructure within approx. 10 m of the proposed service. Information to be shown typically includes property boundaries, railway tracks, culverts, bridge piers, buildings and footings for masts. The proposed pipe alignment and depths below the ground and formation level, as well as horizontal clearances to the nearest existing services and structures are to be shown.
 - The work process including controls and process monitoring.
 - Establishment arrangements.

- Survey arrangements to establish the bore alignment.
- Identification of the risks and methods of control for possible problems that could cause interference to the railway track (settlement / change of alignment).
- Track monitoring procedures to detect settlement / change of alignment.

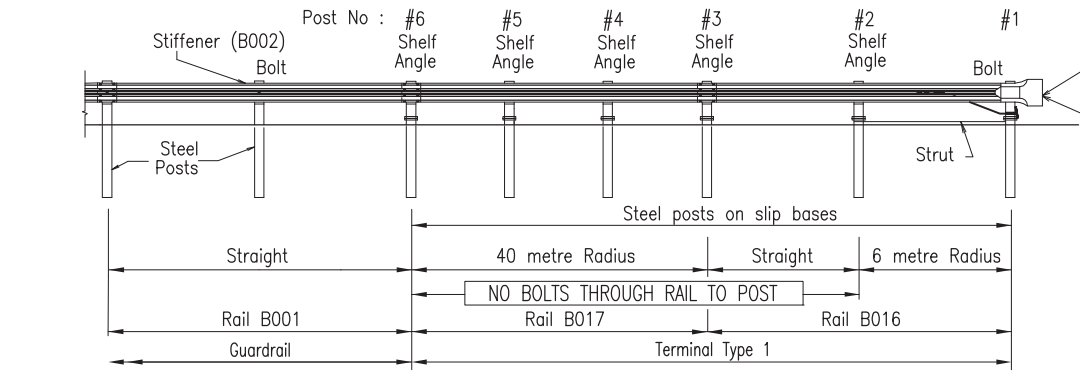
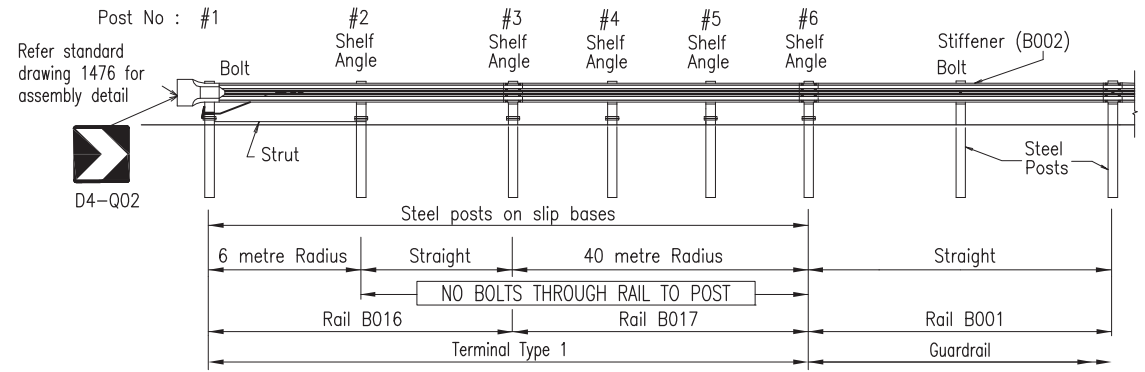
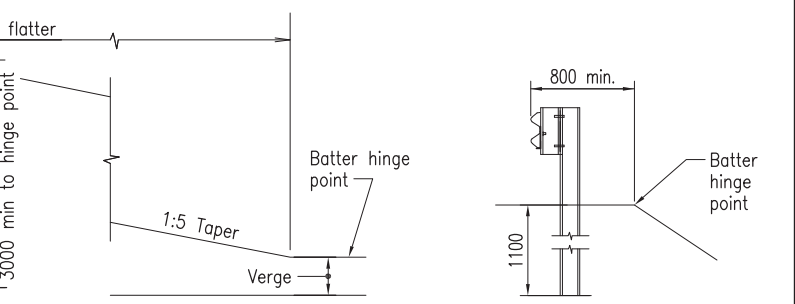
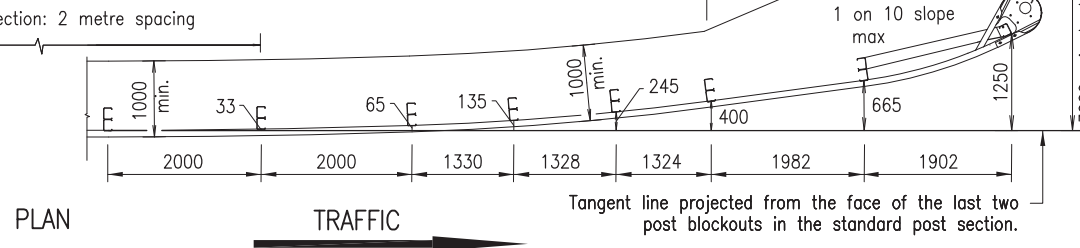
These points should be addressed briefly in a single document. One copy will need to be provided to QR Property for assessment as part of the application and a second copy provided to the Track Section Supervisor at the pre-start meeting.

- The trenching work under QR property must be performed during certain hours set by QR. This may be during a track closure or between trains and under traffic.

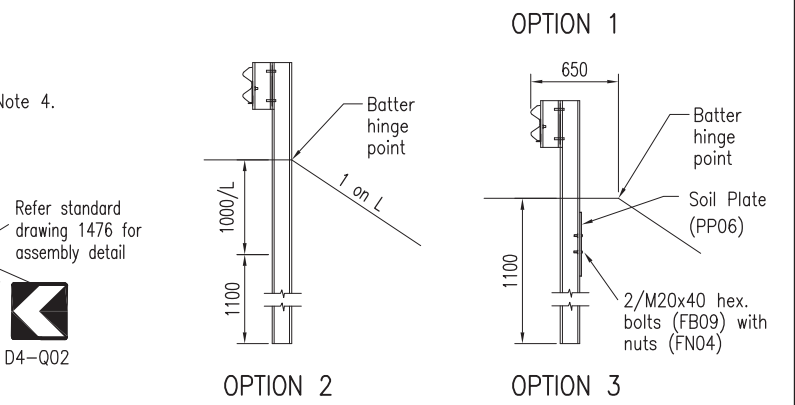
Excavations will cease while a train is crossing the site. Notification of train arrival times will be communicated to all on-site staff by the Track Protection Officer.



The area immediately behind the terminal shown hatched in Diagram A should be reasonably traversable and free from fixed object hazards. If a clear runout is not possible, this area should at least be similar in character to adjacent unshielded roadside areas.



ELEVATION TWO WAY TRAFFIC



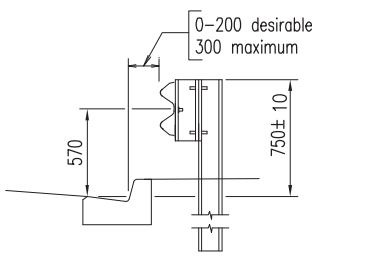
GUARDRAILS ON EXISTING ROAD ONLY - OPTIONS 1 TO 3 (NORMAL INSTALLATION)

NOTES:

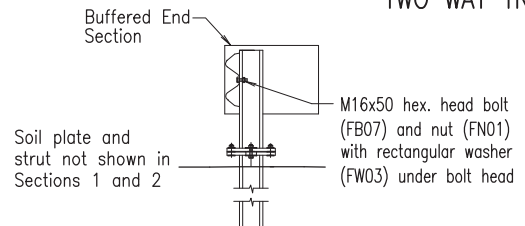
- TIGHTENING OF NUTS: Nut FN01 for slip base plates to be tightened to 25 Nm. Nut FN05 to cable assembly to be tightened so that there is no slack in the cable. All other nuts shall be snug tight to AS4100.
- FLAME CUTTING of galvanised post or rail is not permitted.
- THE MELT SYSTEM extends from Post #1 to Post #6, a length of 8 metres.
- MELT at the departure end from Post No. #1 to #2 inclusive, shall be a mirror image of the approach end.
- GUARDRAIL LAPS are to be in the direction of adjacent traffic to avoid exposing the end of the rail to oncoming vehicles.
- STIFFENER PLATES shall be used at standard posts without a rail lap.
- THE MINIMUM INSTALLED LENGTH of W beam barrier shall be: 28 metres for a two way road - i.e. a MELT both ends. 20 metres for a one way road - i.e. a MELT on the approach end way departure end treatment on the depart end.
- DIMENSIONS are in millimetres unless otherwise shown.

ASSOCIATED DOCUMENTS:
 Department of Main Roads Manual of Standard Drawings Roads
 Department of Main Roads Manual of Standard Specifications Roads

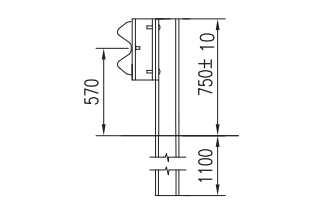
REFERENCED DOCUMENTS:
 Standard Drawings:
 1043 Standard Bar Shapes Drawing 1 of 2 and 2 of 2
 1044 Standard Hook, Lap and Bend Details; and General Steel Reinforcement Information
 1476 Steel Beam Guardrail - Terminal Components
 1477 Steel Beam Guardrail - Posts and Blockouts, Soil and Bearing Plates, Slip Base Plate
 1478 Steel Beam Guardrail - W Beam Anchor Bracket Delineation Unit Post on Base Plate Abraham Blockout
 1479 Steel Beam Guardrail - Bolts, Nuts, Screws and Washers, Cable Assembly with Fasteners
 1480 Steel Beam Guardrail - Fabrication Details for W Beam Rails and Rail Components
 1482 Steel Beam Guardrail - W Beam and Their Beam Assemblies
 1490 Steel Beam Guardrail - Installation and Setout Footing Details
 Standard Specifications:
 MRS11.03 Drainage, Retaining Structures and Protective Treatments
 MRS11.14 Road Furniture
 Australian Standards:
 AS/NZS 3845 Road Safety Barrier Systems
 AS/NZS 4671 Steel Reinforcing Materials



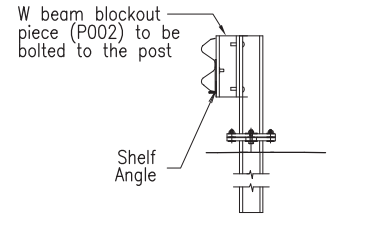
GUARDRAIL BEHIND KERB



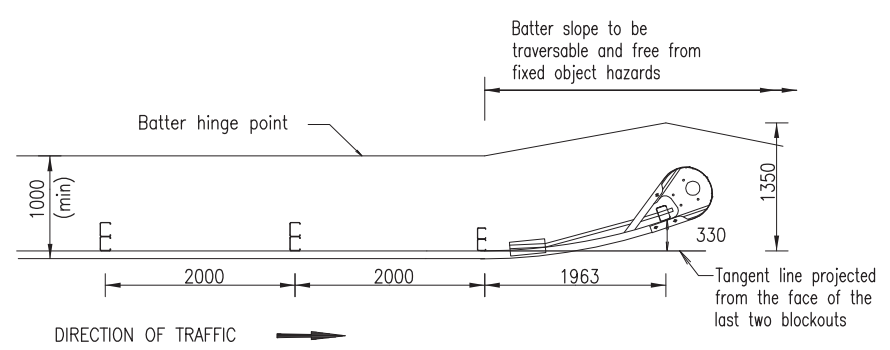
SECTION 1



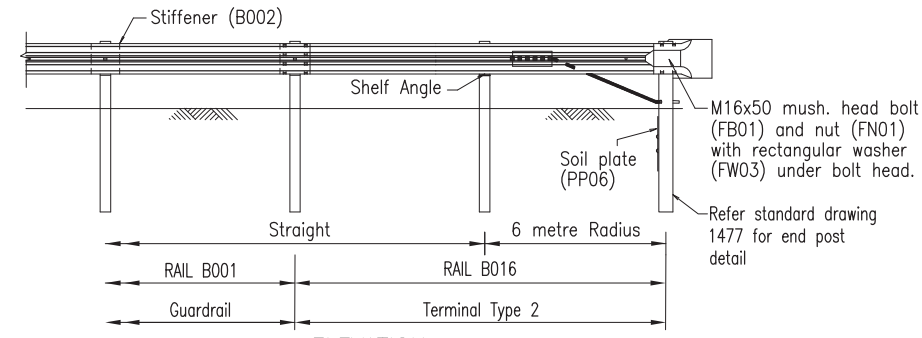
STANDARD STEEL POST



SECTION 2

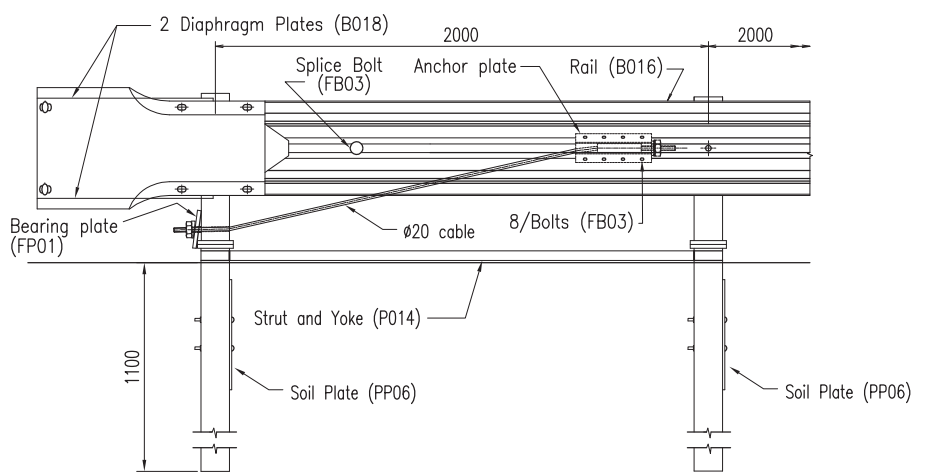


PLAN



ELEVATION ONE WAY TRAFFIC DEPARTURE END TREATMENT (approach end same as two way traffic)

One way traffic departure end treatments are to be used on safety barriers only when there is no possibility of opposing traffic impacting them. They are not to be used within clear zone of opposing traffic.

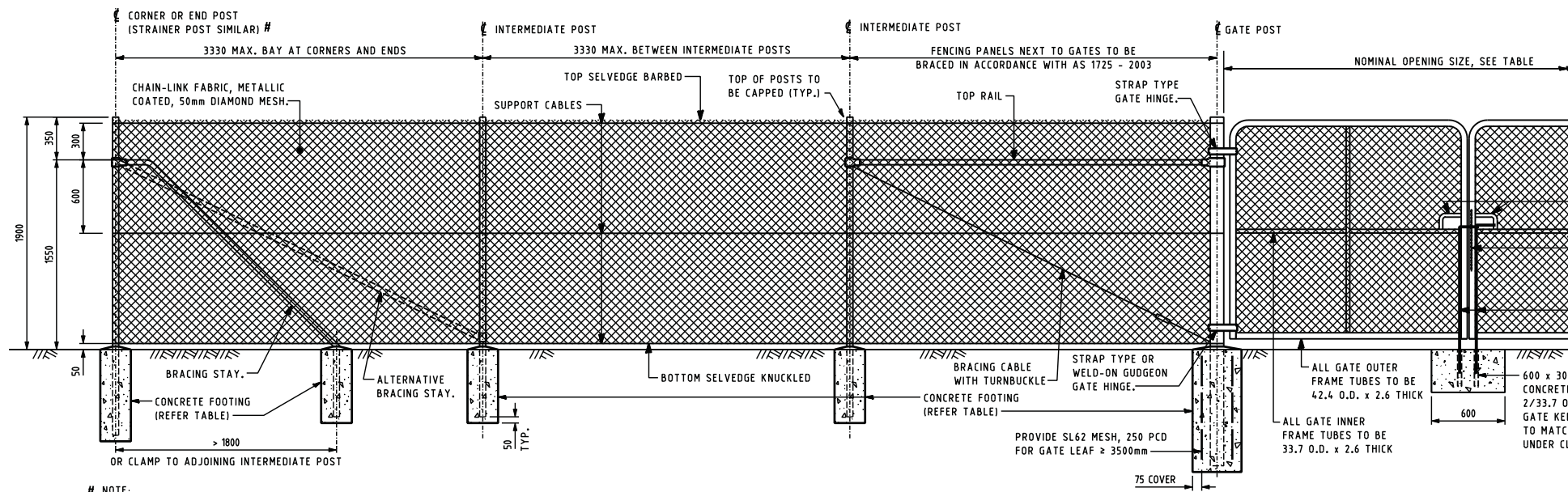


Kerbs shall not be located in front of Terminal Type1. Specialist advice should be sought regarding alternative kerb location and treatment.

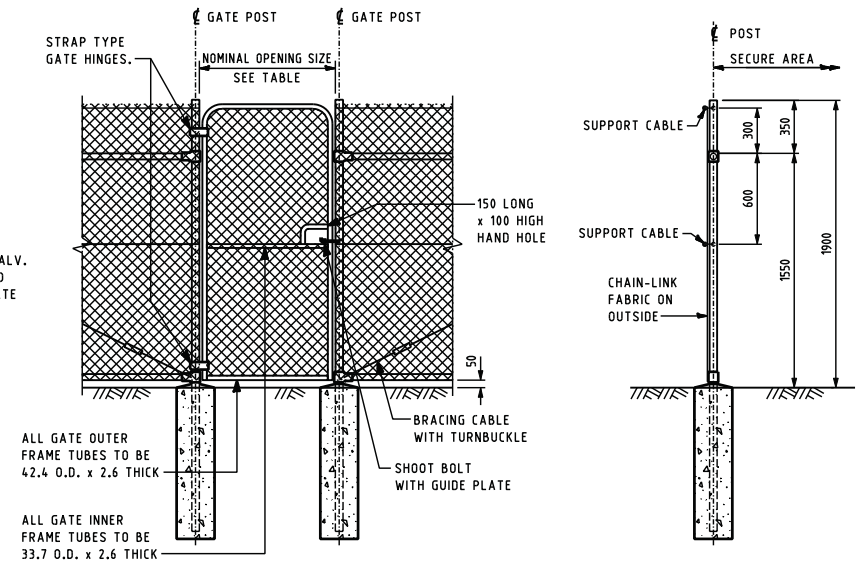
ELEVATION - APPROACH END

1474

STEEL BEAM GUARDRAIL			
INSTALLATION AND SETOUT	Size A3	Drawing No	
	Not to Scale	1474	
		Date 6/06	
		A	B



NOTE: STRAINER POST ASSEMBLIES SHALL CONSIST OF DIAGONAL BRACING STAYS EACH SIDE OF POST AS SHOWN ON CORNER POST DETAIL. STRAINER POSTS SHALL BE INSTALLED AT 150m MAXIMUM INTERVALS ON STRAIGHT LENGTHS AND AT ANY SIGNIFICANT CHANGES IN DIRECTION IN ACCORDANCE WITH AS 1725 - 2003.



TYPICAL SECTION
SCALE 1 : 25

ORDERING CONSIDERATIONS:

MOWING STRIP	ONLY INSTALLED WHERE SPECIFIED BY QR INFRASTRUCTURE OWNER. COST SHARING OPTIONS MAY BE NEGOTIATED WHERE ADJOINING OWNERS MAKE SPECIFIC REQUEST FOR INSTALLATION OF MOWING STRIP.
PLASTIC COATING	NOT PROVIDED UNLESS SPECIFIED BY QR INFRASTRUCTURE OWNER. COST SHARING OPTIONS MAY BE NEGOTIATED WHERE ADJOINING OWNERS MAKE SPECIFIC REQUEST FOR PROVISION OF PLASTIC COATED CHAIN-LINK FABRIC. COATING COLOUR PREFERENCE (BLACK OR GREEN) TO BE CONFIRMED WITH QR INFRASTRUCTURE OWNER AND ADJOINING OWNER.
"LIGHT DUTY" (2.5mm) CHAIN LINK FABRIC	"HEAVY DUTY" (3.15mm) FABRIC MAY BE REPLACED WITH "LIGHT DUTY" (2.5mm) FABRIC ONLY WHERE SPECIFIED BY QR INFRASTRUCTURE OWNER. NOTE: "LIGHT DUTY" CHAIN-LINK FABRIC PROVIDES FOR ONLY APPROX. 60% OF THE LOAD BEARING CAPACITY OF "HEAVY DUTY" CHAIN-LINK FABRIC.
BARBED WIRE SECURITY	REFER STD DRG No. 2542 FOR DETAILS. ONLY INSTALLED WHERE SPECIFIED BY QR INFRASTRUCTURE OWNER. COST SHARING OPTIONS MAY BE NEGOTIATED WHERE ADJOINING OWNERS MAKE SPECIFIC REQUEST FOR INSTALLATION OF BARBED WIRE SECURITY.
CRANKED POST TOPS	REFER STD DRG No. 2542 FOR DETAILS. ONLY INSTALLED WHERE SPECIFIED BY QR INFRASTRUCTURE OWNER. 3 ROWS BARBED WIRE OR 2400 HIGH CHAIN-LINK FABRIC ALTERNATIVES TO BE CONFIRMED BY QR INFRASTRUCTURE OWNER. CRANKED POST TOPS NOT TO PROJECT OUTSIDE QR PROPERTY.

GENERAL NOTES:

- ALL DIMENSIONS ARE IN MILLIMETRES, UNLESS NOTED OTHERWISE.
- ALL STEEL PLATES SHALL BE GRADE 250 MIN. IN ACCORDANCE WITH AS/NZS 3678.
- ALL FILLET WELDS SHALL BE NOT LESS THAN 3 mm.
- ALL WELDING SHALL BE IN ACCORDANCE WITH AS/NZS 1554 PART 1.
- ALL BOLTS, NUTS AND WASHERS SHALL BE HOT DIP GALVANISED IN ACCORDANCE WITH AS 1214.
- AREAS WHERE GALVANISING (OR PLASTIC COATING) HAS BEEN REMOVED BY WELDING OR ABRASIONS SHALL BE CLEANED OF FOREIGN MATTER INCLUDING WELDING SLAG AND PAINTED WITH TWO COATS OF AN APPROVED ORGANIC ZINC-RICH PAINT TO PROVIDE A MIN. DRY FILM THICKNESS OF 0.10mm. COLOUR MATCHING SHALL BE ACHIEVED WHERE DIRECTED BY THE INSPECTOR.
- CONCRETE SHALL BE GRADE N25 IMINJ.
- "SL" DENOTES GRADE D5000 REINFORCING MESH IN ACCORDANCE WITH AS/NZS 4671:2001.

FENCING NOTES:

- ALL POSTS AND RAILS SHALL BE STEEL CIRCULAR HOLLOW SECTION (CHS) GRADE C250 IN ACCORDANCE WITH AS 1163 - 1991 "STRUCTURAL STEEL HOLLOW SECTIONS".
- ALL PIPE CLAMP FITTINGS, GATE HINGES, GATE KEEPERS, etc SHALL BE "DOWNEE" OR AN APPROVED EQUIVALENT.
- EACH RAIL BETWEEN POSTS SHALL BE A CONTINUOUS LENGTH.
- ALL TUBES, FITTINGS AND FASTENERS SHALL BE HOT DIP GALVANISED AFTER FABRICATION IN ACCORDANCE WITH AS 4680.
- FENCING MATERIALS INCLUDING WIRES, BARBED WIRE (WHERE ORDERED) AND CHAIN-LINK FENCING FABRIC SHALL BE MANUFACTURED IN ACCORDANCE WITH AS 2423-2002 "COATED STEEL WIRE FENCING PRODUCTS".
- ERECTION SHALL BE IN ACCORDANCE WITH AS 1725 - 2003 "CHAIN-LINK FABRIC SECURITY FENCES AND GATES", UNLESS NOTED OTHERWISE.
- FENCING WIRE SHALL BE CONTINUOUS FROM GATE POST TO GATE POST AND BE CONSTRUCTED WITH 1800 mm HIGH CHAIN-LINK FABRIC. CHAIN-LINK FABRIC SHALL BE "HEAVY DUTY", MANUFACTURED FROM 3.15 mm DIA. GALV. CORE WIRE, WITH UNIFORM 50mm DIAMOND MESH. THE TOP SELVEDGE SHALL BE BARBED AND THE BOTTOM SELVEDGE SHALL BE KNUCKLED.
- SUPPORT CABLES SHALL CONSIST OF 2 x 3.15mm DIA. GALV. CABLE WIRE, TWISTED TOGETHER BETWEEN POSTS, OR 1 x 4mm DIA. GALV. HELICOIL CABLE WIRE HELIX SPIRALLED. SUPPORT CABLES SHALL BE INSTALLED IN ACCORDANCE WITH AS 1725 - 2003.
- LACING WIRE SHALL BE 2mm DIA. GALV. WIRE INSTALLED IN ACCORDANCE WITH AS 1725 - 2003.
- TIE WIRE TO SECURE CHAIN-LINK FABRIC TO POSTS, AND SECURE SUPPORT CABLES TO INTERMEDIATE POSTS, SHALL BE 2 x 1.57mm DIA. GALV. WIRES, OR 1 x 2mm DIA. GALV. WIRE. TIE WIRE TO SECURE CHAIN-LINK FABRIC TO CABLES SHALL BE 1 x 1.57mm DIA. GALV. WIRE TWISTED TWICE AND NEATLY CUT OFF, OR 2mm DIA. GALV. WIRE NETTING CLIPS. TIE WIRES SHALL BE AND INSTALLED IN ACCORDANCE WITH AS 1725 - 2003. (SEE ALSO TIE-OFF DETAIL)
- BRACING CABLES (WITH TURNBUCKLE) SHALL CONSIST OF 2 x 3.15mm DIA. GALV. CORE WIRES TWISTED TOGETHER AND TENSIONED IN CONJUNCTION WITH A GALVANISED 12mm TURNBUCKLE. BRACING CABLES SHALL BE GALVANISED AND INSTALLED IN ACCORDANCE WITH AS 1725 - 2003.
- STRAINER ASSEMBLIES SHALL BE INSTALLED AT 150m MAXIMUM CENTRES ON STRAIGHT LENGTHS AND AT SIGNIFICANT CHANGES IN DIRECTION. ALL CORNER AND STRAINER PANELS SHALL HAVE BRACING INSTALLED IN ACCORDANCE WITH AS 1725 - 2003.
- BOLLARDS SHALL BE INSTALLED AT GATES TO SECURE OPEN GATE PANELS ONLY WHERE DIRECTED BY QR INFRASTRUCTURE OWNER. SEE DETAILS THIS DRAWING.
- IN CORROSIVE ENVIRONMENTS EXTRA GALVANISING SHALL BE PROVIDED FOR POSTS AND/OR PLASTIC COATED MESH (WHERE ORDERED).

GATE NOTES:

- GATE FRAME CONFIGURATION, FABRICATION AND INSTALLATION SHALL BE IN ACCORDANCE WITH AS 1725 - 2003.
- WHERE STRAP TYPE HINGES ARE USED AT BOTH TOP AND BOTTOM OF GATE, A COLLAR SHALL BE WELDED TO THE GATE FRAME TO PROVIDE A BEARING SURFACE FOR EITHER TOP OR BOTTOM HINGE. BOTH STRAP TYPE AND GUDGEON GATE HINGES SHALL BE WELDED TO GATE POSTS.
- SINGLE GATES SHALL BE FITTED WITH SHOOT BOLT, DOUBLE GATES SHALL BE FITTED WITH FLAG PIN DROP BOLT AS SHOWN ON THE DRAWING.
- ALL GATE FRAMES SHALL BE WELDED. FRAMES SHALL BE HOT DIP GALVANISED AFTER FABRICATION IN ACCORDANCE WITH AS 4680.
- GATES SHALL BE INSTALLED FOR QR PURPOSES ONLY. GATES SHALL NOT BE INSTALLED FOR DOMESTIC USE.

FENCE MEMBERS AND FOOTINGS SIZES

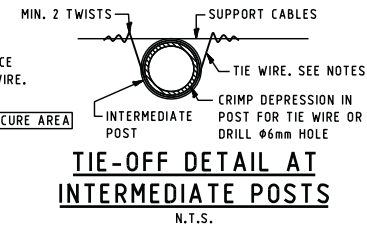
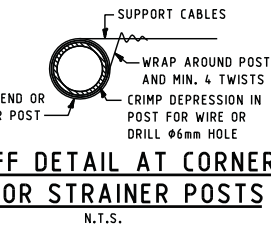
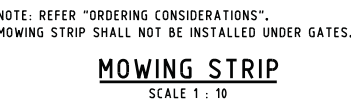
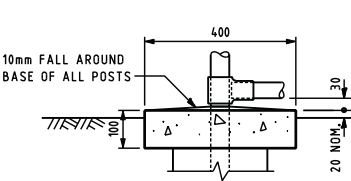
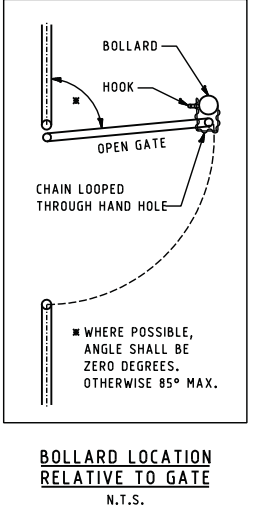
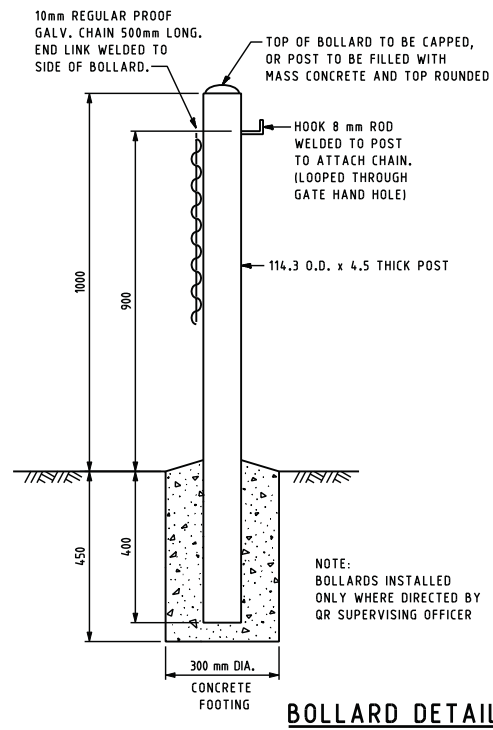
TYPE OF MEMBER	TUBE SIZE	CONCRETE FOOTING
END, CORNER AND STRAINER POSTS	60.3 O.D. x 3.6 THICK	φ250 x 750 DEEP
INTERMEDIATE POSTS	48.3 O.D. x 3.2 THICK	φ250 x 600 DEEP
TOP RAIL	42.4 O.D. x 3.2 THICK	-
BRACING STAY	42.4 O.D. x 3.2 THICK	φ250 x 600 DEEP
GATE POSTS FOR GATE LEAF SHOWN		
1800mm AND UNDER	60.3 O.D. x 3.6 THICK	φ250 x 900 DEEP
2000 UP TO AND INCLUDING 3000mm	88.9 O.D. x 4.0 THICK	φ300 x 1000 DEEP
3500 UP TO AND INCLUDING 4000mm	114.3 O.D. x 4.5 THICK	φ400 x 1100 DEEP

GATE TABLE

LOCATION	NOMINAL OPENING SIZE	LEAF TYPE (NOMINAL SIZE)
PEDESTRIAN - PUBLIC ACCESS	1800	SINGLE 1800 OR DOUBLE 900
PEDESTRIAN - QR STAFF ONLY	1200	SINGLE 1200
VEHICULAR	3000 MIN. 8000 MAX.	DOUBLE 1500 (MIN.) DOUBLE 4000 (MAX.)

FENCING IN ELECTRIFIED AREAS:

- IN GENERAL THESE FENCES ARE SELF EARTHING. HOWEVER, IN SPECIAL CIRCUMSTANCES, USUALLY DUE TO PROXIMITY TO ELECTRIFICATION WIRING OR WIRING EQUIPMENT SUPPORTS OR SUBSTATIONS, EARTHING OR INSULATED SECTIONS MAY BE REQUIRED IN ACCORDANCE WITH QR MANAGER ELECTRICAL ENGINEERING REQUIREMENTS.
- GATES AND BOLLARDS SHALL BE POSITIONED TO PREVENT AN OPEN GATE FROM COMING WITHIN 2.0m OF ELECTRIFICATION WIRING EQUIPMENT SUPPORTS OR ANY METALWORK CONNECTED TO THEM.
- SUPPORT CABLES SHALL BE GALVANISED ONLY (NO PLASTIC COATING).

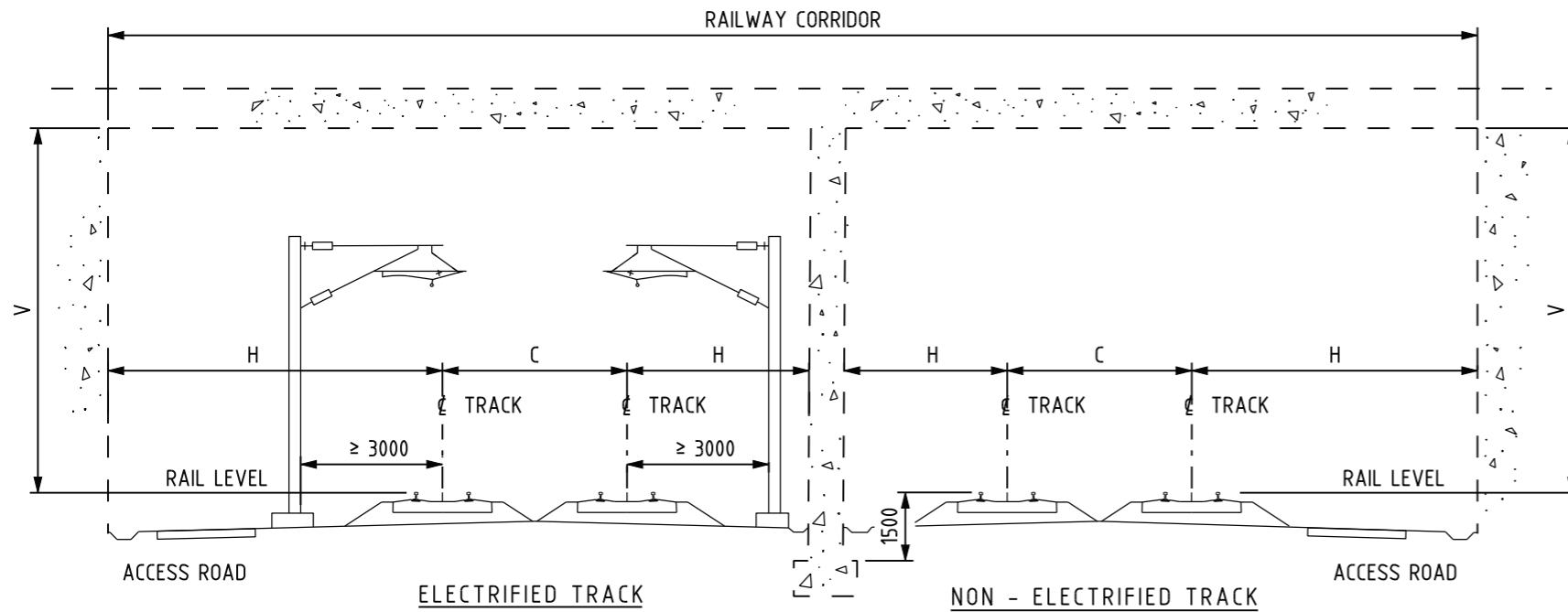


THIS FENCE IS SUITABLE FOR USE ALONG RAILWAY CORRIDOR. REFER TO CURRENT QR FENCING SAFETY AND SECURITY MANAGEMENT SYSTEM FOR LOCATIONS AND TYPES OF FENCING. DRAINAGE AND OVERLAND FLOW SHALL BE CONSIDERED PRIOR TO INSTALLATION OF FENCE.

THIS DRAWING SUPERCEDES STD DRG No. 2067



FILE No. A 20018.2	WIND LOADS AS 1170.2 : 2002 REGION C WIND SPEED : V100 = 56 m/s TERRAIN CATEGORY 1	© QUEENSLAND RAIL, CIVIL ENGINEERING COPYRIGHT PROTECTS THIS PUBLICATION. EXCEPT FOR PURPOSES PERMITTED BY THE COPYRIGHT ACT, REPRODUCTION BY WHATEVER MEANS IS PROHIBITED WITHOUT THE PRIOR WRITTEN PERMISSION OF QR. ENQUIRIES SHOULD BE ADDRESSED TO: MANAGER CIVIL ENGINEERING, QR, GPO BOX 1429, BRISBANE 4001.	ALTERATIONS	DESIGNED A.T. SEPT 02	APPROVED	<p>QUEENSLAND RAIL - CIVIL ENGINEERING</p> <p>STANDARD SECURITY FENCE</p> <p>50mm CHAIN LINK FABRIC</p>	DRAWING NUMBER
2544	ISSUE	SCALES SHOWN ARE FOR AN A1 SIZE ORIGINAL DRAWING		CHECKED B.S. JUNE 03	<p>L. STEPHENSEN 27/08/04 CIVIL STANDARDS MANAGER DATE</p> <p>RPEO No. 3250 ISSUE AUTHORISED</p>		DRAWING NUMBER
				DRAWN M.J.M. SEPT 02			2544
				CHECKED A.J.H. JUNE 04			ISSUE
				PASSED A.T. JULY 04	B. R. HAGAMAN 27/08/04 MANAGER CIVIL ENGINEERING DATE		



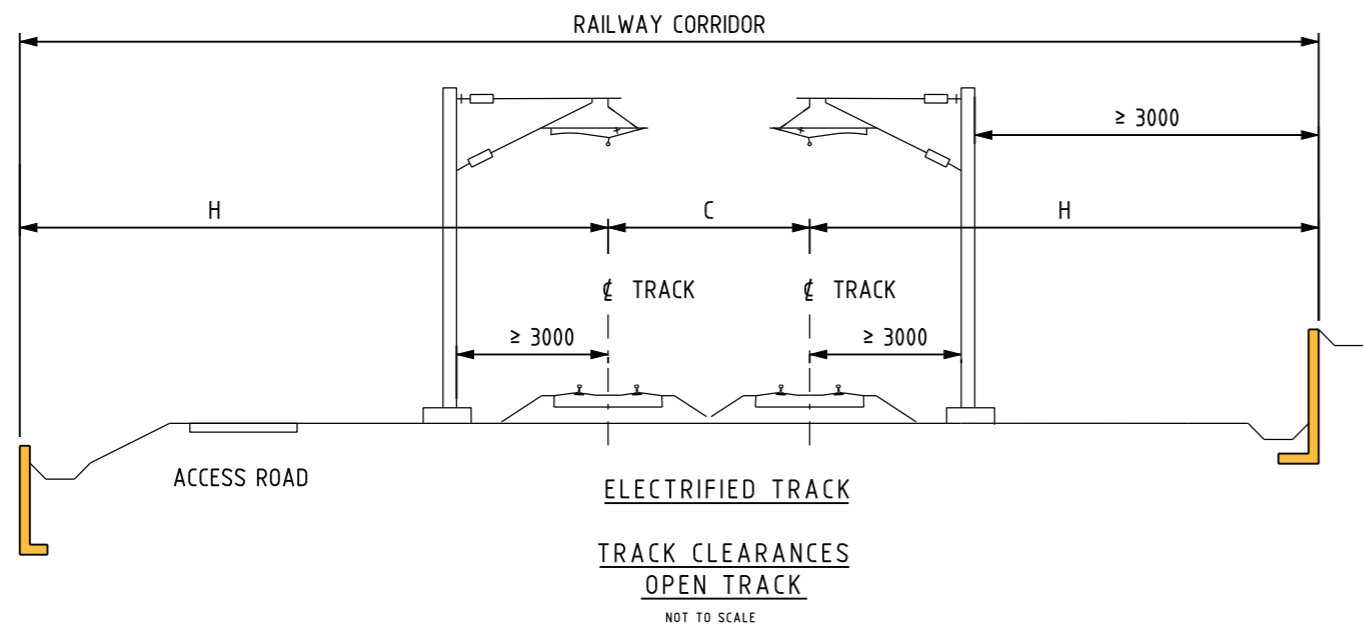
TRACK CLEARANCES
ROAD OVERBRIDGES, FOOTBRIDGES AND BUILDINGS

NOT TO SCALE

MINIMUM CLEARANCES		
	CLEARANCE	DESCRIPTION
H	3500 + DRAIN WIDTH	NO ACCESS ROAD ABUTMENT / FENCE / WALL < 40 m ALONG TRACK
	4500 + DRAIN WIDTH	NO ACCESS ROAD. ABUTMENT / FENCE / WALL ≥ 40 m ALONG TRACK
	7500 + DRAIN WIDTH	WITH ACCESS ROAD ABUTMENT / FENCE / WALL < 40 m ALONG TRACK
	8500 + DRAIN WIDTH	WITH ACCESS ROAD ABUTMENT / FENCE / WALL ≥ 40 m ALONG TRACK
C	4000	NON-COAL LINES - MINIMUM
	4500	COAL LINES - MINIMUM
	6000	ALL LINES - DESIRABLE
V	7900	ROAD OVERBRIDGES, FOOTBRIDGES & BUILDINGS < 40 m ALONG TRACK
	9000	BUILDINGS ≥ 40 m ALONG TRACK
	4300	LOADING FACILITIES OVER NON-ELECTRIFIED 1067mm & 1435mm DEDICATED SIDINGS WITH TRACK FIXED DIRECT TO CONCRETE SLAB OR TO SPILLAGE PIT GIRDERS
	4600	LOADING FACILITIES OVER NON-ELECTRIFIED 1067mm & 1435mm DEDICATED SIDINGS WITH BALLASTED TRACK
	5400	LOADING FACILITIES OVER NON-ELECTRIFIED 1067mm & 1435mm NON-DEDICATED SIDINGS WITH BALLASTED TRACK

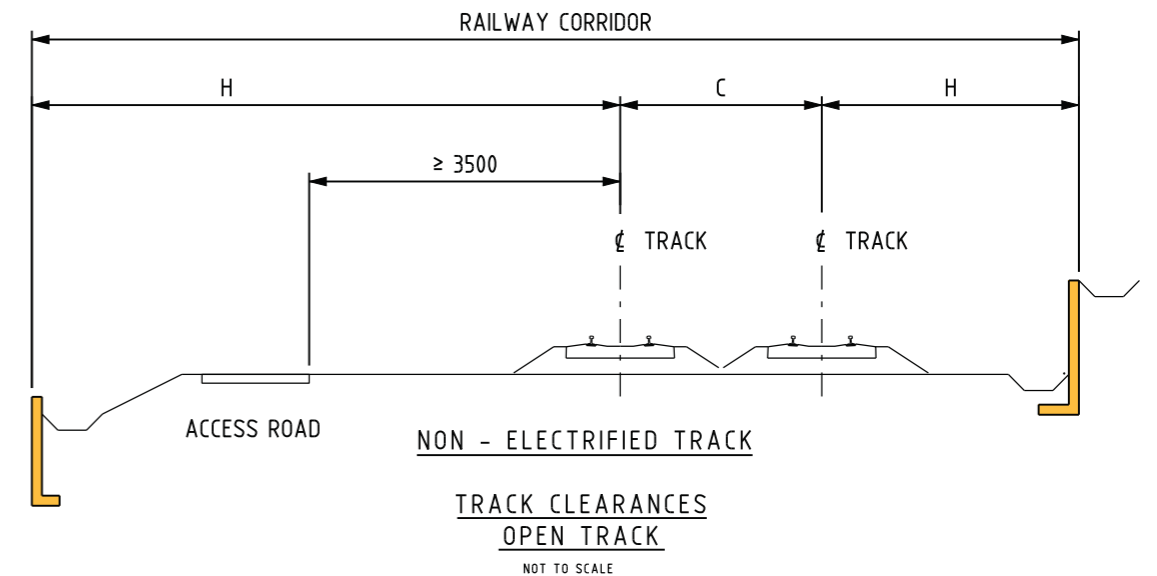
NOTES :-

- ALL DIMENSIONS ARE IN MILLIMETRES, UNLESS OTHERWISE SHOWN.
- NUMBER OF TRACKS IS INDICATIVE. FOR FUTURE TRACK ARRANGEMENTS CONTACT THE MANAGER TRACK AND CIVIL SYSTEMS.
- REFER TO THE MANAGER TRACK AND CIVIL SYSTEMS FOR GUIDANCE REGARDING STRUCTURES REQUIRING LESSER CLEARANCES THAN SHOWN HERE. THIS MAY ALSO INCLUDE PLATFORMS AND AWNINGS, POINTS MACHINERY, SIGNS AND SIGNALS, WHERE SPACE IS RESTRICTED AND STRUCTURES OVER PRIVATE SIDINGS, TUNNELS, FALSEWORK AND TEMPORARY FORMWORK.
- FOR FOOTBRIDGES THE VERTICAL CLEARANCE IS TO BE AT LEAST 500 mm MORE THAN THE HEIGHT OF EXISTING/PROPOSED LIVE OVERHEAD LINE EQUIPMENT.
- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH QR TECHNICAL REQUIREMENT MCE-SR-008 PROTECTION SCREENS.
- THIS DRAWING COVERS NARROW, STANDARD AND DUAL GAUGE TRACKS.
- VERTICAL CLEARANCE FOR NON - ELECTRIFIED TRACKS INCLUDES PROVISION FOR FUTURE ELECTRIFICATION.
- FOR INCLUSION OF TRACKSIDE EQUIPMENT, CONTACT QR FOR ANY ADDITIONAL CLEARANCE.



TRACK CLEARANCES
OPEN TRACK


NOT TO SCALE

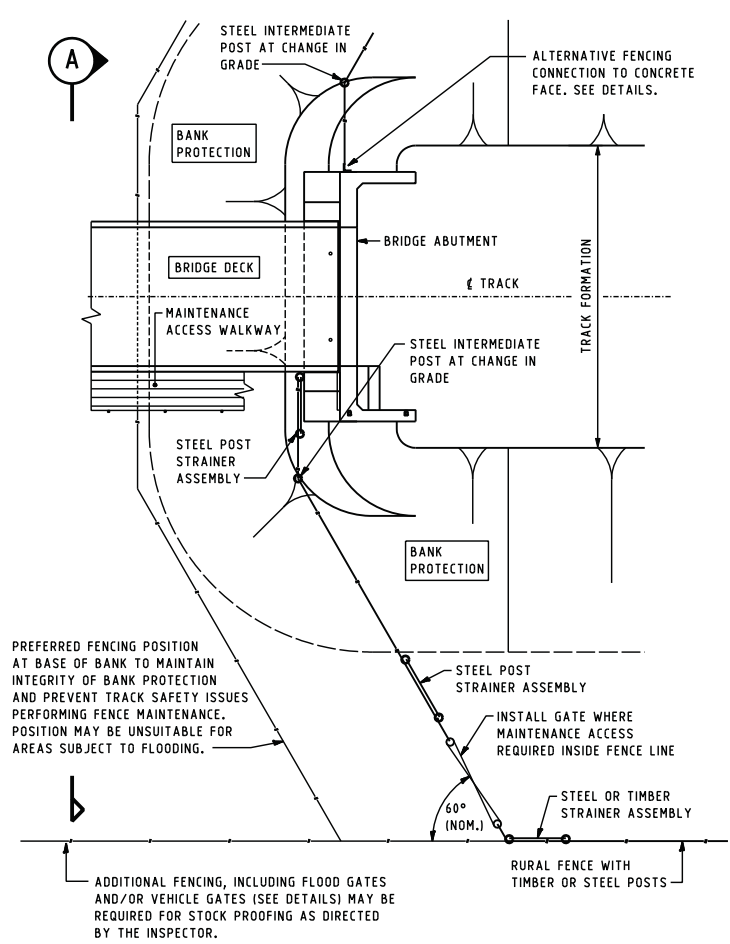


TRACK CLEARANCES
OPEN TRACK

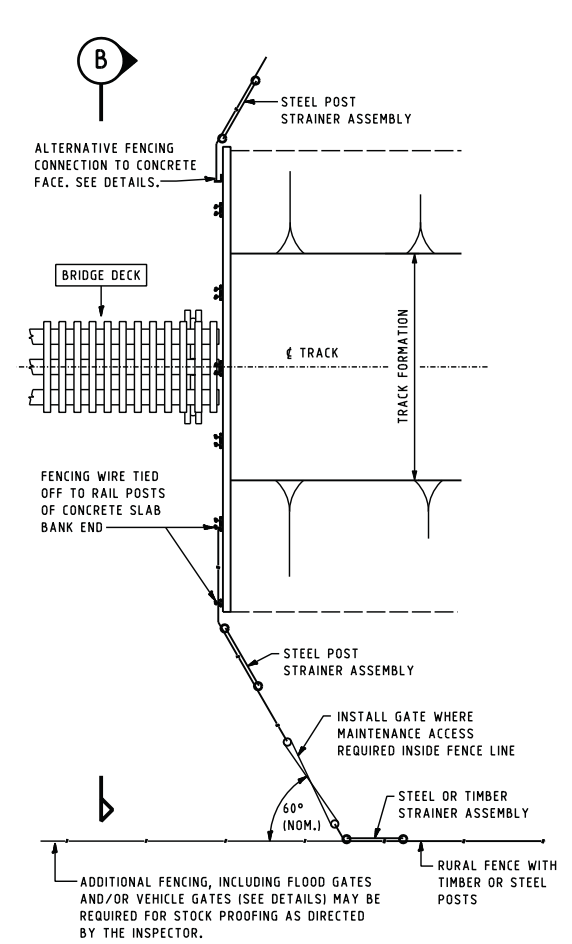
NOT TO SCALE

THIS DRAWING SUPERSEDES 2461A

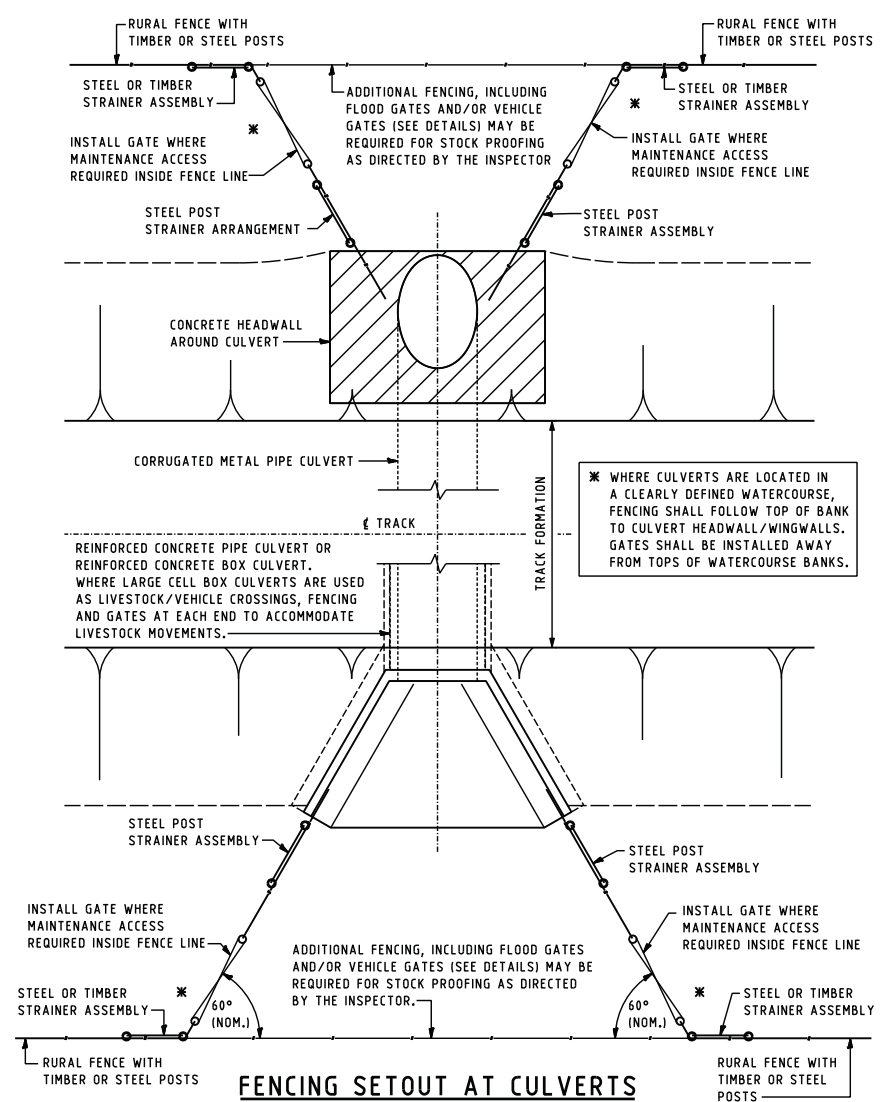
FILE No.	CM 117.1	COPYRIGHT PROTECTS THIS PUBLICATION. EXCEPT FOR PURPOSES PERMITTED BY THE COPYRIGHT ACT, REPRODUCTION BY WHATEVER MEANS IS PROHIBITED WITHOUT THE PRIOR WRITTEN PERMISSION OF QR Network Pty Ltd. ENQUIRIES SHOULD BE ADDRESSED TO CIVIL MANAGER, QR Network Pty Ltd, GPO BOX 1429, BRISBANE 4001.	DESIGNED	L. K.	14.12.09	ALTERATIONS		RECOMMENDED			 QR Network Pty Ltd - ACN 132 181 116 STANDARD CLEARANCES FOR NEW STRUCTURES	DRAWING NUMBER	2754	ISSUE	1
DRAWING NUMBER	ISSUE		CHECKED	A. S.	15.12.09	CKD.	AUTHORISED	_____	_____	_____		_____			
2754	ISSUE		DRAWN	J.W.C.	17.12.09			_____	_____	_____		_____			
		SCALES SHOWN ARE FOR AN A1 SIZE ORIGINAL DRAWING	CHECKED	L. K.	12/09			APPROVED	A. SADRY 23/12/09 PRINCIPAL SYSTEMS ENGINEER DATE						
			APPROVED	A. SADRY 23.12.09 SENIOR CIVIL DESIGN ENGINEER DATE				ISSUE AUTHORISED	J. POWELL 23/12/09 MANAGER TRACK AND CIVIL DATE						



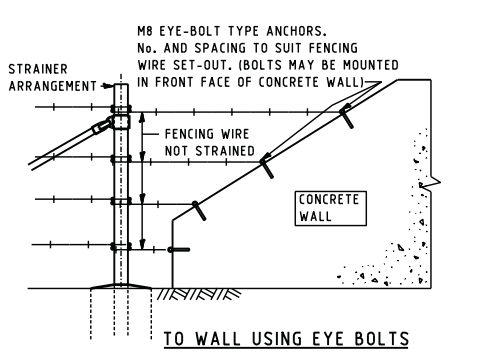
FENCING SETOUT AT BRIDGE ENDS WITH CONCRETE ABUTMENTS
SCALE 1 : 100



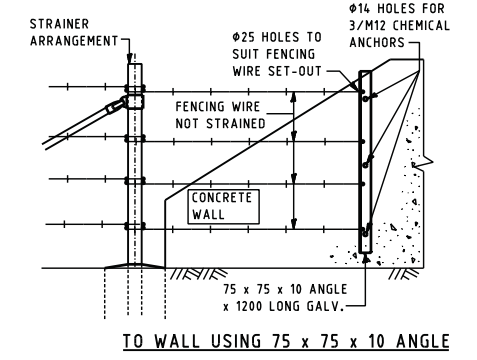
FENCING SETOUT AT BRIDGE ENDS WITH CONCRETE SLAB BANK ENDS OR SIMILAR RETAINING STRUCTURES
SCALE 1 : 100



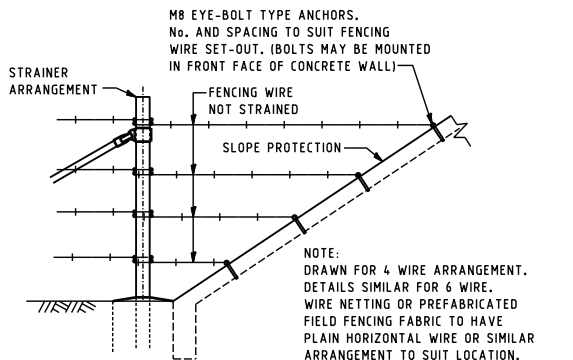
FENCING SETOUT AT CULVERTS
SCALE 1 : 100



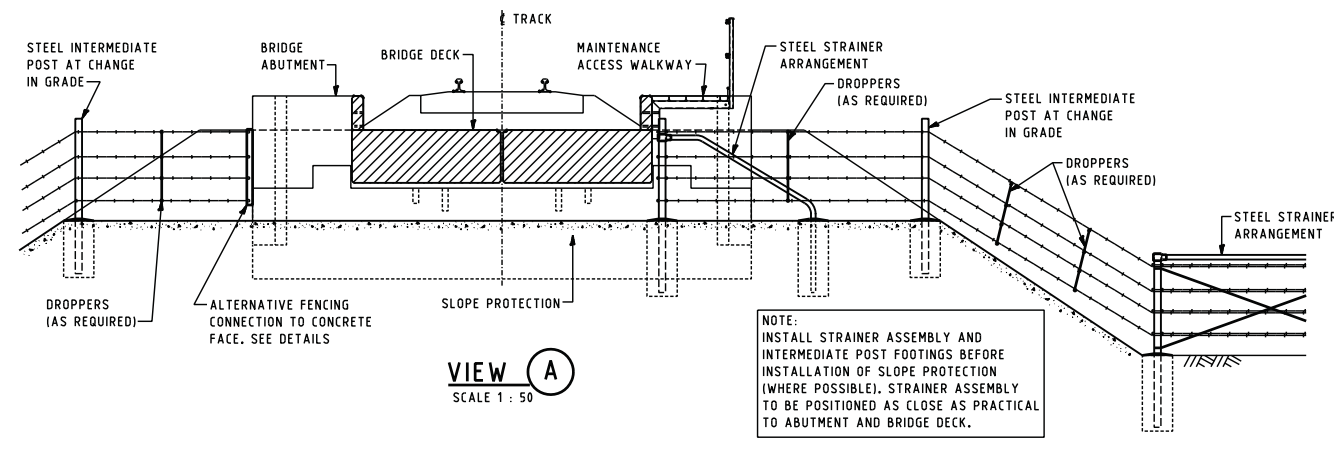
TO WALL USING EYE BOLTS



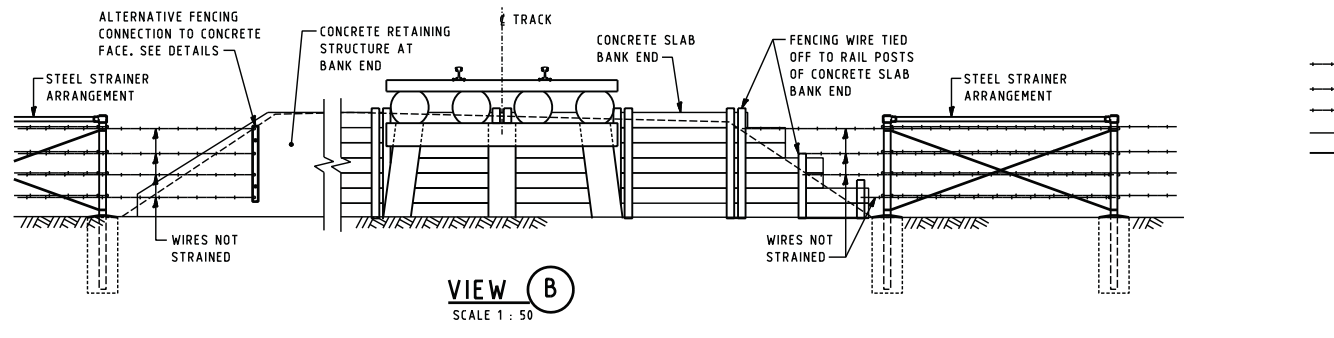
TO WALL USING 75 x 75 x 10 ANGLE



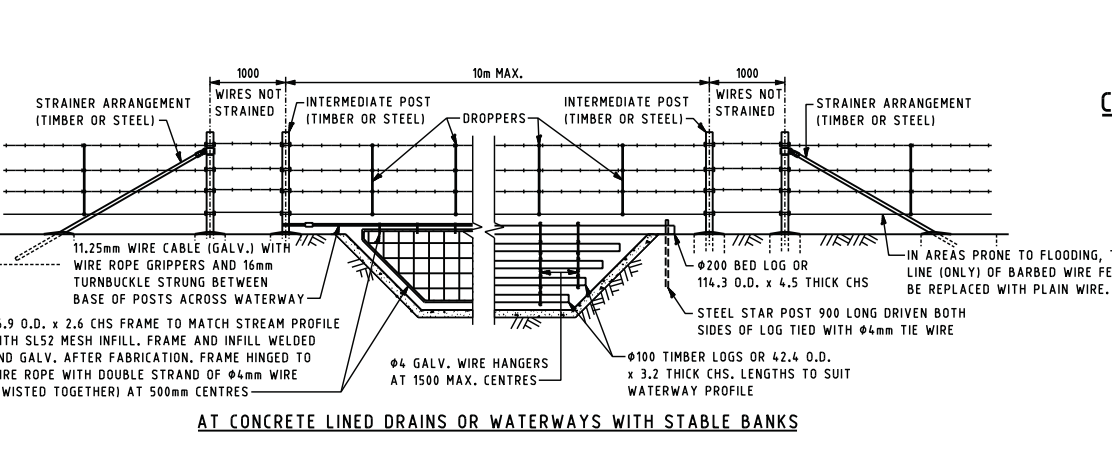
TO SLOPE PROTECTION



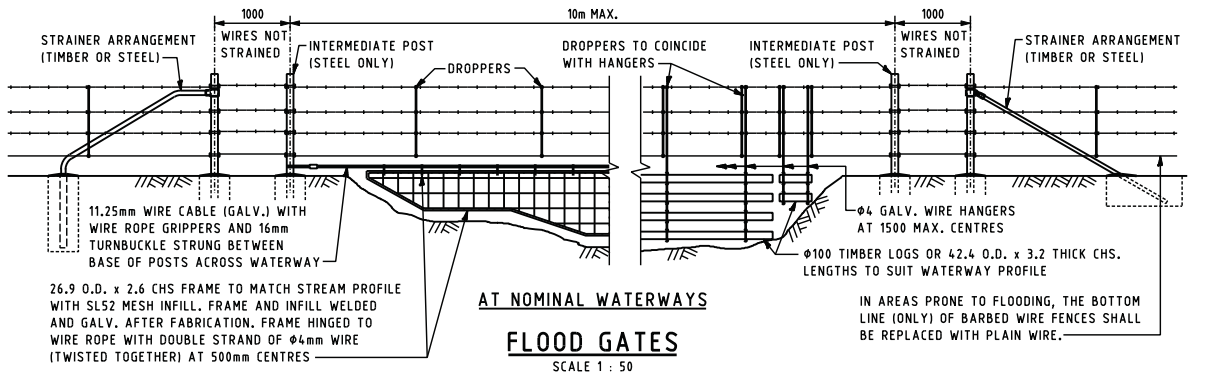
VIEW A
SCALE 1 : 50



VIEW B
SCALE 1 : 50



AT CONCRETE LINED DRAINS OR WATERWAYS WITH STABLE BANKS



AT NOMINAL WATERWAYS FLOOD GATES
SCALE 1 : 50

ALTERNATIVE FENCING CONNECTIONS TO CONCRETE FACES
SCALE 1 : 25

- NOTES:**
- ALL DIMENSIONS ARE IN MILLIMETRES, UNLESS NOTED OTHERWISE.
 - THIS DRAWING TO BE READ IN CONJUNCTION WITH STD DRG No.'s 2548 AND 2549.
 - ALTERNATIVE FENCING ARRANGEMENTS OR FIXINGS TO BE SUBMITTED TO THE MANAGER CIVIL ENGINEERING FOR APPROVAL PRIOR TO CONSTRUCTION OF FENCE.

THIS DRAWING SUPERCEDES STD DRG No.'s 2136 & 2137

1:25 0 500 1000mm

1:50 0 1000 2000mm

1:100 0 2000 4000mm

FILE No.	A 20018.2
DRAWING NUMBER	ISSUE
2550	

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SCALES SHOWN ARE FOR AN A1 SIZE ORIGINAL DRAWING

ALTERATIONS	
DESIGNED	ADAPTED FROM STD DRG No's 2136 AND 2137
CHECKED	
DRAWN	M.J.M. MAY 03
CHECKED	A.J.H. JUNE 04
	A.T. OCT 03
PASSED	A.T. JULY 04

APPROVED	
	L. STEPHENSEN 27/08/04 CIVIL STANDARDS MANAGER DATE
	RPE No. 3250 ISSUE AUTHORISED
	B. R. HAGAMAN 27/08/04 MANAGER CIVIL ENGINEERING DATE

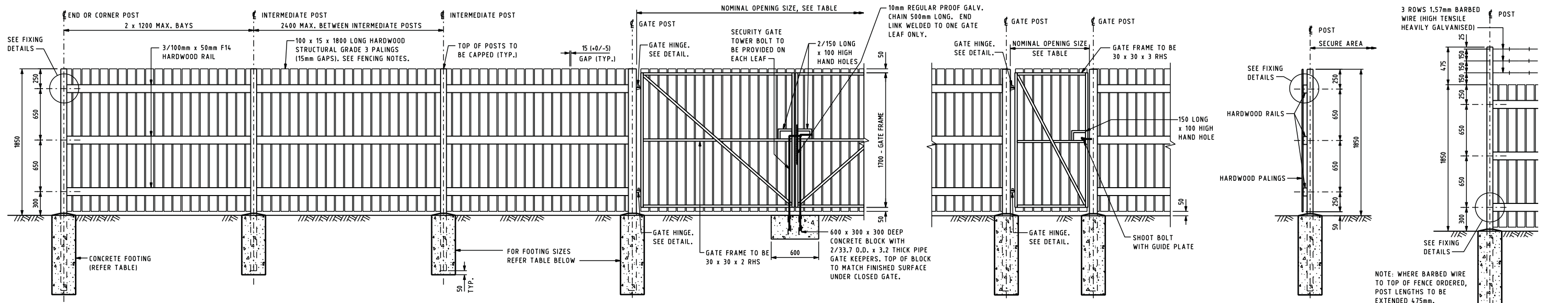


QUEENSLAND RAIL - CIVIL ENGINEERING

STANDARD
RURAL FENCES

MISCELLANEOUS SITE LAYOUT DETAILS

DRAWING NUMBER	ISSUE
2550	



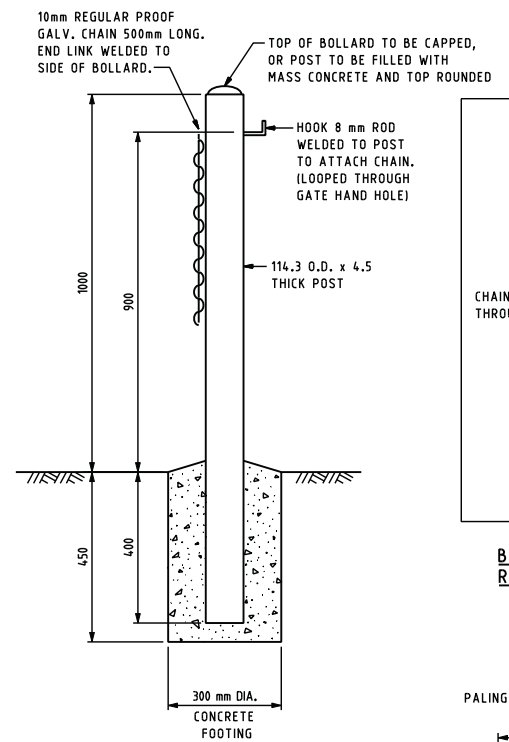
TYPICAL ELEVATION
SCALE 1 : 25

DOUBLE LEAF GATE
SCALE 1 : 25

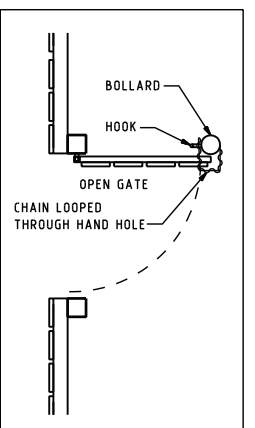
SINGLE LEAF GATE
SCALE 1 : 25

TYPICAL SECTION
SCALE 1 : 25

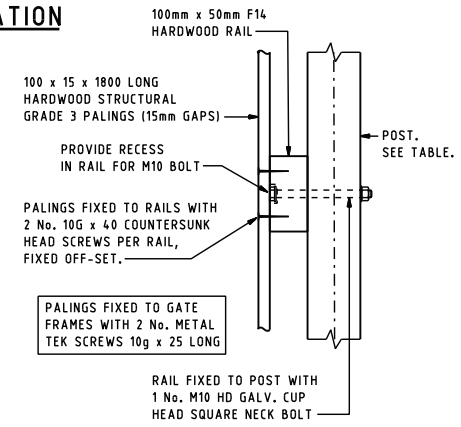
ELEVATION SHOWING EXTENDED POST FOR BARBED WIRE FIXING (WHERE ORDERED)
SCALE 1 : 25



BOLLARD DETAIL
SCALE 1 : 10



BOLLARD LOCATION RELATIVE TO GATE
N.T.S.



FIXING DETAILS
SCALE 1 : 5

ORDERING CONSIDERATIONS:

MOWING STRIP	ONLY INSTALLED WHERE SPECIFIED BY QR INFRASTRUCTURE OWNER. COST SHARING OPTIONS MAY BE NEGOTIATED WHERE ADJOINING OWNERS MAKE SPECIFIC REQUEST FOR INSTALLATION OF MOWING STRIP.
BARBED WIRE SECURITY	ONLY INSTALLED WHERE SPECIFIED BY QR INFRASTRUCTURE OWNER. COST SHARING OPTIONS MAY BE NEGOTIATED WHERE ADJOINING OWNERS MAKE SPECIFIC REQUEST FOR INSTALLATION OF BARBED WIRE.
LAPPED FENCE PALINGS	ONLY INSTALLED WHERE SPECIFIED BY QR INFRASTRUCTURE OWNER. COST SHARING OPTIONS MAY BE NEGOTIATED WHERE ADJOINING OWNERS MAKE SPECIFIC REQUEST FOR INSTALLATION OF LAPPED FENCE PALINGS.

GENERAL NOTES:

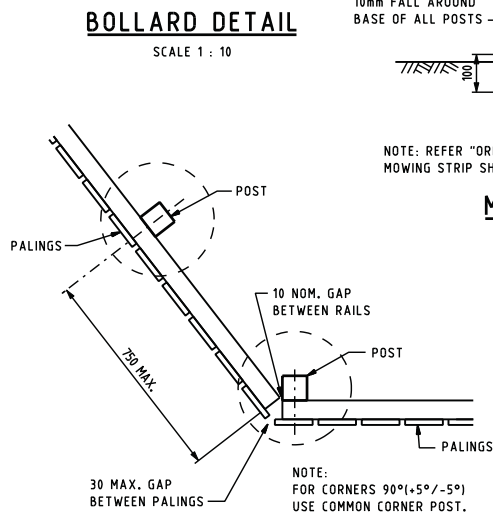
- ALL DIMENSIONS ARE IN MILLIMETRES, UNLESS NOTED OTHERWISE.
- ALL STEEL PLATES SHALL BE GRADE 250 MIN. IN ACCORDANCE WITH AS/NZS 3678.
- ALL FILLET WELDS SHALL BE NOT LESS THAN 4 mm.
- ALL WELDING SHALL BE IN ACCORDANCE WITH AS/NZS 1554 PART 1 AND PART 2.
- ALL BOLTS, NUTS AND WASHERS SHALL BE HOT DIP GALVANISED IN ACCORDANCE WITH AS 1214.
- AREAS WHERE GALVANISING HAS BEEN REMOVED BY WELDING OR ABRASIONS SHALL BE CLEANED OF FOREIGN MATTER INCLUDING WELDING SLAG AND PAINTED WITH TWO COATS OF AN APPROVED ORGANIC ZINC-RICH PAINT TO PROVIDE A MIN. DRY FILM THICKNESS OF 0.10mm.
- CONCRETE SHALL BE GRADE N25 (MIN.).

GATE NOTES:

- SINGLE GATES SHALL BE FITTED WITH SHOOT BOLT, DOUBLE GATES SHALL BE FITTED WITH FLAG PIN DROP BOLT AS SHOWN ON THE DRAWING.
- ALL GATE FRAMES SHALL BE WELDED. FRAMES SHALL BE HOT DIP GALVANISED AFTER FABRICATION IN ACCORDANCE WITH AS 4680.
- GATES SHALL BE INSTALLED FOR QR PURPOSES ONLY. GATES SHALL NOT BE INSTALLED FOR DOMESTIC USE.

GATE TABLE

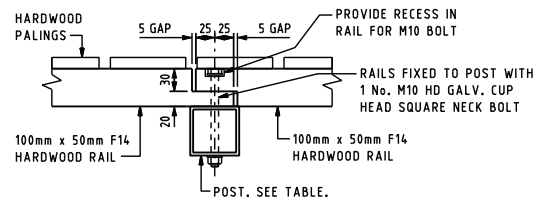
LOCATION	NOMINAL OPENING SIZE	LEAF TYPE (NOMINAL SIZE)
PEDESTRIAN - PUBLIC ACCESS	1800	SINGLE 1800 OR DOUBLE 900
PEDESTRIAN - QR STAFF ONLY	1200	SINGLE 1200
VEHICULAR	3600	DOUBLE 1800



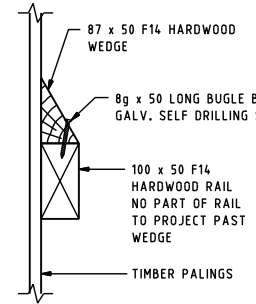
FENCE CORNER DETAIL
SCALE 1 : 10

NOTE: REFER "ORDERING CONSIDERATIONS". MOWING STRIP SHALL NOT BE INSTALLED UNDER GATES.

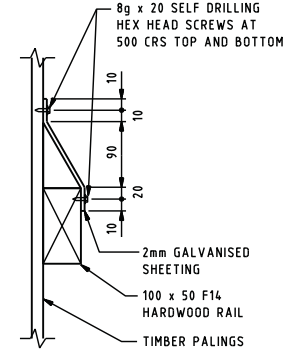
MOWING STRIP
SCALE 1 : 10



HARDWOOD RAIL JOINT DETAIL
SCALE 1 : 5

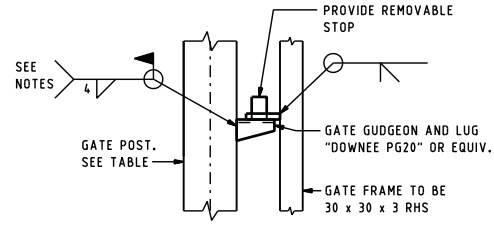


HARDWOOD TIMBER
SCALE 1 : 5



GALVANISED SHEETING
SCALE 1 : 5

FENCE RAIL DETAIL AT SECURITY LOCATION e.g. ADJACENT TO POOL
SCALE 1:5

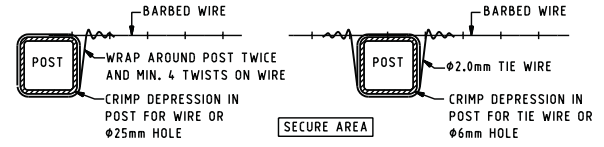


GATE HINGE DETAIL
SCALE 1 : 5

FENCE MEMBERS AND FOOTINGS SIZES

TYPE OF MEMBER	TUBE SIZE	CONCRETE FOOTING NON-COHESIVE AND COHESIVE SOILS Cu < 20kPa (SEE NOTES)	CONCRETE FOOTING COHESIVE SOILS Cu > 20kPa (SEE NOTES)
INTERMEDIATE POSTS	75 x 75 x 4 RHS	Ø300 x 1500 DEEP	Ø300 x 800 DEEP
END/CORNER POSTS	75 x 75 x 4 RHS	Ø300 x 1500 DEEP	Ø300 x 1000 DEEP
GATE POSTS	100 x 100 x 4 RHS	Ø300 x 1500 DEEP	Ø300 x 1000 DEEP

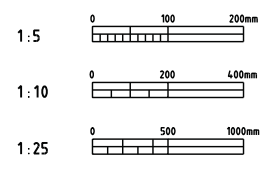
THIS FENCE IS SUITABLE FOR USE IN AREAS WHERE SECURITY FENCING REQUIRES AN ENHANCED PRIVACY OR AESTHETIC COMPONENT SUCH AS: CAR PARKS; STATION SURROUNDS; HIGH PUBLIC TRAFFIC AREAS ADJOINING SENSITIVE RAILWAY INFRASTRUCTURE OR RAILWAY CORRIDOR. MAY ALSO BE USED WHERE ADJOINING OWNER REQUESTS ENHANCED PRIVACY FROM RAILWAY INFRASTRUCTURE OR RAILWAY CORRIDOR, OR OTHER SPECIAL CIRCUMSTANCES. COST SHARING OPTIONS MAY BE NEGOTIATED WITH ADJOINING OWNERS IN THESE CIRCUMSTANCES.



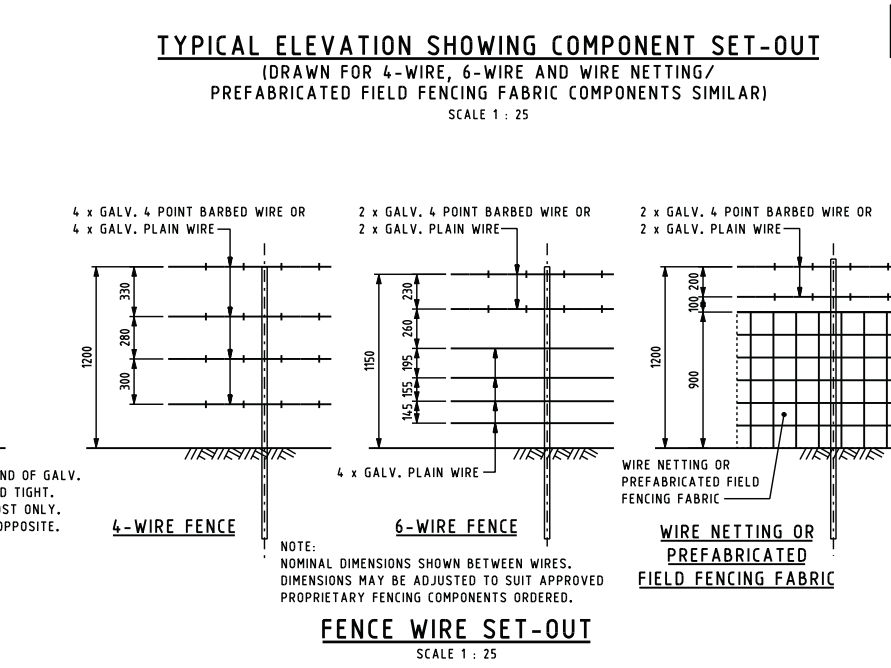
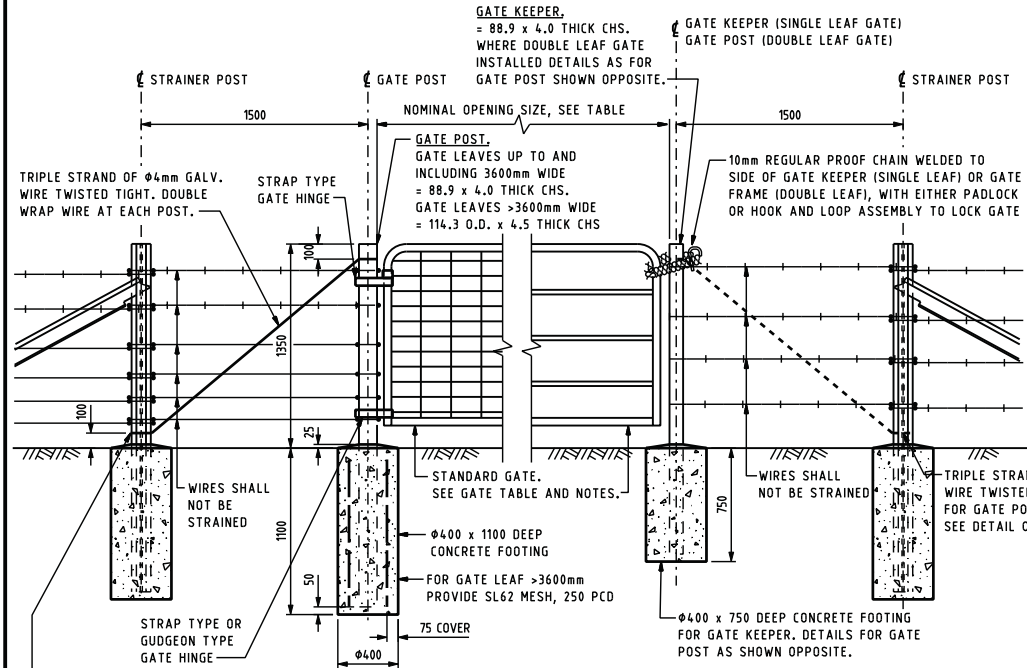
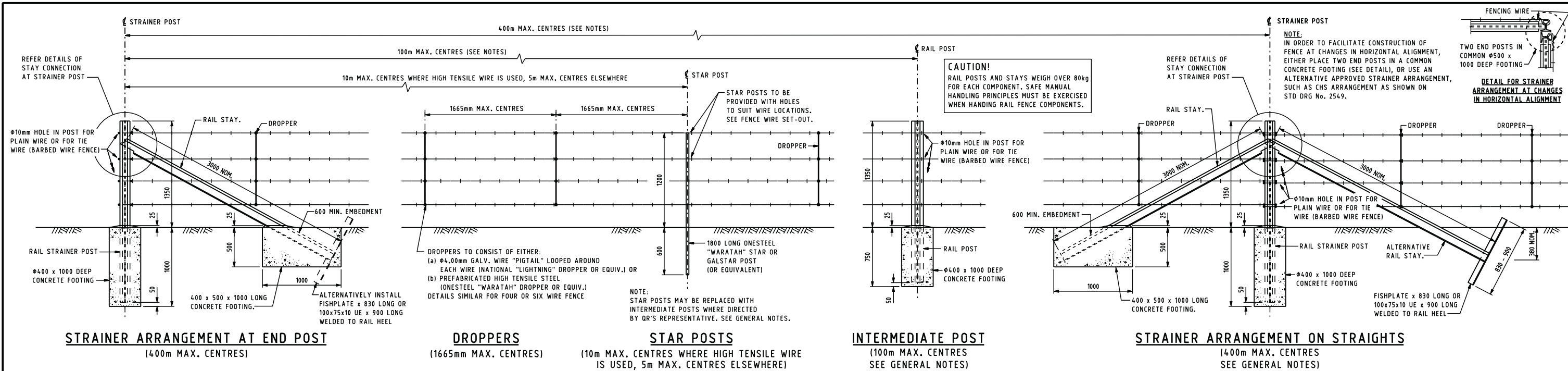
AT END OR STRAINER POSTS

AT INTERMEDIATE POSTS

BARBED WIRE TIE-OFF DETAILS (WHERE ORDERED)
N.T.S.



FILE No. A 20018.2	WIND LOADS AS 1170.2 : 2002 REGION C WIND SPEED : V100 = 56 m/s TERRAIN CATEGORY 1	QUEENSLAND RAIL, CIVIL ENGINEERING COPYRIGHT PROTECTS THIS PUBLICATION. EXCEPT FOR PURPOSES PERMITTED BY THE COPYRIGHT ACT, REPRODUCTION BY WHATEVER MEANS IS PROHIBITED WITHOUT THE PRIOR WRITTEN PERMISSION OF QR. ENQUIRIES SHOULD BE ADDRESSED TO: MANAGER CIVIL ENGINEERING, QR, GPO BOX 1429, BRISBANE 4001.	ALTERATIONS A NOTES FOR FENCING IN ELECTRIFIED AREAS I.S. 27.8.04 B RAIL WEDGES FOR SECURITY AREAS I.S. 19.6.05	DESIGNED A.T. JAN 03 CHECKED B.S. JUNE 03 DRAWN M.J.M. JAN 03 CHECKED A.J.H. JUNE 04 PASSED A.T. OCT 03 A.T. JULY 04	APPROVED I. STEPHENSON 5/08/04 CIVIL STANDARDS MANAGER DATE RPED No. 3250 ISSUE AUTHORISED B.R. HAGAMAN 5/08/04 MANAGER CIVIL ENGINEERING DATE	QUEENSLAND RAIL - CIVIL ENGINEERING STANDARD TIMBER FENCE DRAWING NUMBER 2545 ISSUE B
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STANDARD FENCES TABLE

AREA	DEVELOPED RURAL	RURAL
ADJOINING PROPERTY WITHOUT LIVESTOCK	4 PLAIN WIRE	4 PLAIN WIRE
ADJOINING PROPERTY WITH SHEEP	6 PLAIN WIRE	2 BARBED WIRE 4 PLAIN WIRE
ADJOINING PROPERTY WITH CATTLE	4 PLAIN WIRE	4 BARBED WIRE
ADJOINING PROPERTY WITH OTHER LIVESTOCK	SEE FENCING NOTES.	SEE FENCING NOTES.

STANDARD GALV. FENCING WIRE TYPES

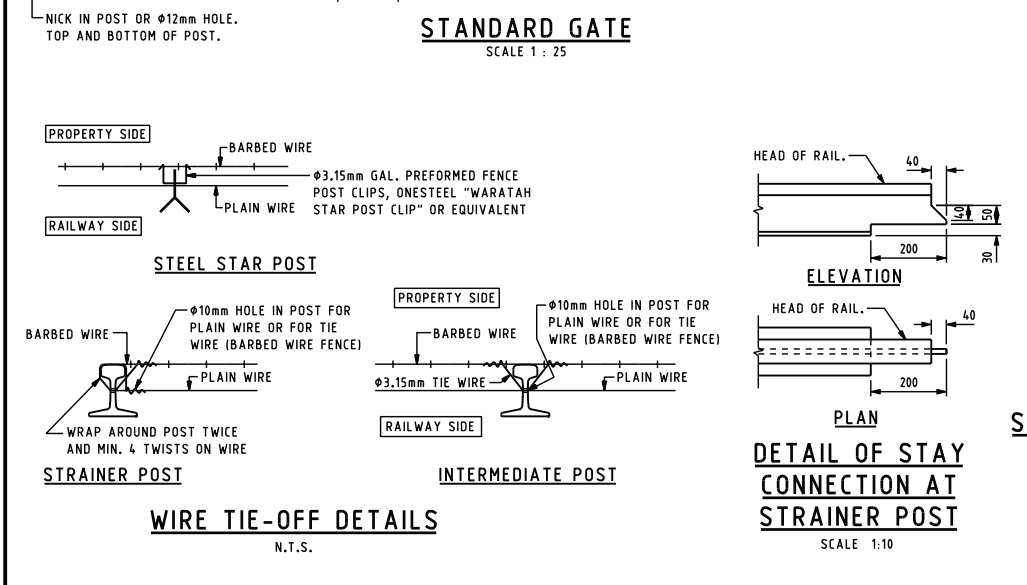
PLAIN WIRE SHALL BE 4.00mm GALV. SOFT WIRE.
BARBED WIRE SHALL BE 2.50mm GALV. 4-POINT SOFT WIRE.

HIGH TENSILE WIRES MAY BE USED ONLY WHERE APPROVED BY THE QR INFRASTRUCTURE OWNER AND THE ADJOINING LAND HOLDER IN AREAS SUCH AS LOW FIRE RISK AREAS.

GATE TABLE FOR STANDARD GATES

LOCATION	NOMINAL OPENING SIZE	LEAF TYPE (NOMINAL SIZE)
PEDESTRIAN - QR STAFF ONLY	1200	SINGLE 1200
PEDESTRIAN - PUBLIC ACCESS	1800	SINGLE 1800 OR DOUBLE 900
STATION YARD ACCESS	7200	DOUBLE 3600
TRACK CROSSING FOR VEHICLE - PUBLIC, PRIVATE OR QR	3600 TO 9600	SINGLE TO 4800 OR DOUBLE TO 9600 TO SUIT APPLICATION

- GENERAL NOTES:**
- ALL DIMENSIONS ARE IN MILLIMETRES, UNLESS NOTED OTHERWISE.
 - THIS DRAWING SHALL BE READ IN CONJUNCTION WITH STD DRG NO. 2550.
 - ALL BOLTS, NUTS AND WASHERS SHALL BE HOT DIP GALVANISED IN ACCORDANCE WITH AS 1214.
 - AREAS WHERE GALVANISING HAS BEEN REMOVED BY WELDING OR ABRASIONS SHALL BE CLEANED OF FOREIGN MATTER INCLUDING WELDING SLAG AND PAINTED WITH TWO COATS OF AN APPROVED ORGANIC ZINC-RICH PAINT TO PROVIDE A MIN. DRY FILM THICKNESS OF 0.10mm.
 - CONCRETE SHALL BE GRADE N25 (MIN.).
 - "SL" DENOTES GRADE D5000 REINFORCING MESH IN ACCORDANCE WITH AS/NZS 4671:2001.
 - WHERE PRODUCT NAMES HAVE BEEN NOTED, AN APPROVED EQUIVALENT MAY BE SUBSTITUTED.
 - ALTERNATIVE FENCING SYSTEMS SHALL BE SUBMITTED TO THE MANAGER CIVIL ENGINEERING FOR APPROVAL PRIOR TO INSTALLATION.



- FENCING NOTES:**
- THE TYPE OF FENCING WIRE INSTALLED (4 WIRE OR 6 WIRE/BARBED OR PLAIN), INCLUDING WIRE DIA. AND TENSILE STRENGTH, SHALL BE CONFIRMED BY QR INFRASTRUCTURE OWNER, IN CONJUNCTION WITH ADJOINING LAND HOLDER REQUIREMENTS TO KEEP LIVESTOCK OFF RAIL CORRIDOR.
 - PLAIN WIRE SHALL BE FED THROUGH HOLES IN POSTS, BARBED WIRE SHALL BE ATTACHED TO POSTS ON THE SIDE REMOTE FROM THE RAILWAY. WIRE NETTING/PREFABRICATED FIELD FENCING FABRIC SHALL BE ATTACHED TO POSTS IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS. SEE DETAIL.
 - WIRE NETTING/PREFABRICATED FIELD FENCING FABRIC SHALL ONLY BE INSTALLED UPON APPLICATION FROM ADJOINING LANDHOLDER, AFTER NEGOTIATION INTO ADDITIONAL COST/MAINTENANCE RESPONSIBILITIES OF FENCE. WIRE NETTING/PREFABRICATED FIELD FENCING FABRIC SHALL NOT BE USED IN UNDULATING COUNTRY.
 - FENCING MATERIALS INCLUDING PLAIN WIRE, BARBED WIRE, WIRE NETTING/PREFABRICATED FIELD FENCING FABRIC SHALL BE MANUFACTURED IN ACCORDANCE WITH AS 2423 - "COATED STEEL WIRE FENCING PRODUCTS FOR TERRESTRIAL, AQUATIC AND GENERAL USE".
 - FENCING MATERIALS INCLUDING PLAIN WIRE, BARBED WIRE, WIRE NETTING/PREFABRICATED FIELD FENCING FABRIC SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.
 - ALL WIRES SHALL BE GALVANISED IN ACCORDANCE WITH AS 4534.
 - GATE POSTS SHALL BE STEEL CIRCULAR HOLLOW SECTION (CHS) GRADE C250 IN ACCORDANCE WITH AS 1163 - 1991 "STRUCTURAL STEEL HOLLOW SECTIONS".
 - ALL PIPE CLAMP FITTINGS, GATE HINGERS, GATE KEEPERS, etc SHALL BE "DOWNEE" OR AN APPROVED EQUIVALENT.
 - ALL TUBES, FITTINGS AND FASTENERS SHALL BE HOT DIP GALVANISED AFTER FABRICATION IN ACCORDANCE WITH AS 4680.
 - STRAINER POSTS SHALL BE PROVIDED AT INTERVALS NOT EXCEEDING 400 METRES AND AT ALL CHANGES IN DIRECTION OF LINE AND AT FENCE INTERSECTIONS AND ENDS.
 - INTERMEDIATE POSTS SHALL BE PROVIDED AT INTERVALS NOT EXCEEDING 100 METRES AND WHERE A CHANGE IN VERTICAL GRADE OCCURS.
 - WHERE GOOD QUALITY SOIL AND GROUND CONDITIONS ENCOUNTERED, POST HOLES MAY BE BACKFILLED IN WELL COMPACTED LAYERS, OR POSTS MAY BE DRIVEN INTO 75mm DIA. HOLES TO DEPTHS AS SHOWN ON THE DRAWING. USE OF ALTERNATIVE FOOTINGS SHALL BE APPROVED BY QR'S REPRESENTATIVE.
 - STAR POSTS SHALL BE HEAVY DUTY STEEL WITH PROTECTIVE PAINTED COATING, "ONESTEEL WARATAH STAR POST" OR EQUIVALENT. IN HIGHLY CORROSIVE ENVIRONMENTS STAR POSTS SHALL BE GALVANISED (OR USE "ONESTEEL WARATAH GALSTAR POST" OR EQUIVALENT) AS DIRECTED BY QR'S REPRESENTATIVE. STAR POSTS SHALL BE DRIVEN INTO GROUND.
 - FOR ENHANCED FENCE STRENGTH AND STABILITY, STAR POSTS MAY BE REPLACED WITH INTERMEDIATE POSTS WHERE DIRECTED BY QR'S REPRESENTATIVE.
 - IN AREAS PRONE TO FLOODING, THE BOTTOM LINE (ONLY) OF BARBED WIRE FENCES SHALL BE REPLACED WITH PLAIN WIRE.

- GATE NOTES:**
- WHERE STRAP TYPE GATE HINGERS ARE USED AT TOP AND BOTTOM OF GATE A COLLAR SHALL BE WELDED TO THE GATE FRAME TO PROVIDE A BEARING SURFACE FOR EITHER TOP OR BOTTOM HINGE. STRAP TYPE HINGERS SHALL BE WELDED TO POSTS, GUDGEON TYPE HINGERS MAY BE EITHER WELD-ON OR BOLT THROUGH TYPE.
 - GATE PANELS SHALL BE 5-BAR OR MESH INFILL PROPRIETARY ITEMS TO THE QR REPRESENTATIVE'S APPROVAL.
 - CUSTOMISED GATES MAY BE CONSTRUCTED FROM 33.7 x 3.2 CHS OUTER FRAME AND 26.9 x 2.6 CHS INNER FRAME TO QR'S REPRESENTATIVE APPROVAL WHERE REQUIRED.
 - POSITIONS OF GATES FOR TRACK CROSSINGS FOR VEHICLES FOR PUBLIC, PRIVATE OR QR PURPOSES TO BE DETERMINED IN ACCORDANCE WITH THE RELEVANT SAFETY AND OPERATIONAL PROCEDURES.
- FENCING IN ELECTRIFIED AREAS:**
- FENCES SHALL BE EARTHED AT FREQUENT INTERVALS. THIS IS ACHIEVED BY THE USE OF FENCING WITH RAIL POSTS (SEE DETAILS THIS DRAWING). IN SPECIAL CIRCUMSTANCES, USUALLY DUE TO PROXIMITY TO ELECTRIFICATION WIRING OR WIRING EQUIPMENT SUPPORTS OR SUBSTATIONS, EARTHING OR INSULATED SECTIONS MAY BE REQUIRED IN ACCORDANCE WITH QR MANAGER ELECTRICAL ENGINEERING REQUIREMENTS.
 - GATES AND BOLLARDS SHALL BE POSITIONED TO PREVENT AN OPEN GATE FROM COMING WITHIN 2.0m OF ELECTRIFICATION WIRING EQUIPMENT SUPPORTS OR ANY METALWORK CONNECTED TO THEM. (FOR BOLLARD DETAILS REFER STD DRG NO. 2544)

FILE No. A 20018.2
DRAWING NUMBER 2614
ISSUE A

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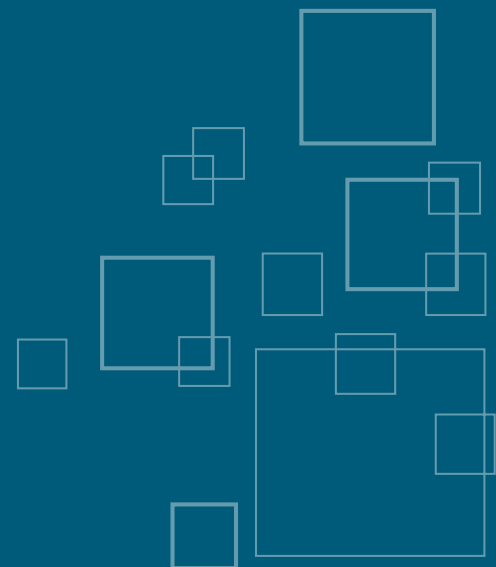
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Queensland Rail Station design guide



Queensland Rail Station design guide

PS-CS-MAN-0013

Version 3.1. July 2010



Station design guide

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VERSION	DATE	DESCRIPTION
INITIAL	September, 2004	MCE – SR – 011 Authorised by I.Stephensen, Civil Engineering
2.0	March, 2007	MCE – SR – 011 Issue Authorised by B.Hagaman, Civil Engineering Services Document author Dennis Nichols & Assoc. Architects
3.0	December, 2008	PS – CS – MAN – 0013 Process owner Theo Taifalos, Authorised by Peter Woods,
3.1	July, 2010	PS – CS – MAN

Preface

This document provides guidance for those involved in the design of Queensland Rail railway stations and related infrastructure. It focuses on the goals that must be achieved at new stations. It is a design guide only and generally seeks to set minimum desirable standards. It is not intended to replace relevant Commonwealth or State legislative requirements.

Queensland Rail recognises that, in the upgrading of existing stations, some compromises may be necessary. However, the goals defined in this document must always remain the goal of the designers. Departures from those ideals can only occur with the express permission of Queensland Rail. For that reason, this document establishes a sequence of submission/approval processes throughout the design/documentation period as detailed in Part 1, Section 5, WORK STAGES. It should be noted, however, that this document is not intended to preclude alternative solutions, particularly if they exceed the minimum defined standards.

Technical requirements are listed in the Appendices.








It is expected that the Station Design Guide will be updated every six months or as needed to respond to changes in legislation, regulations, standards and Queensland Rail policies.

   Rail and busway network map

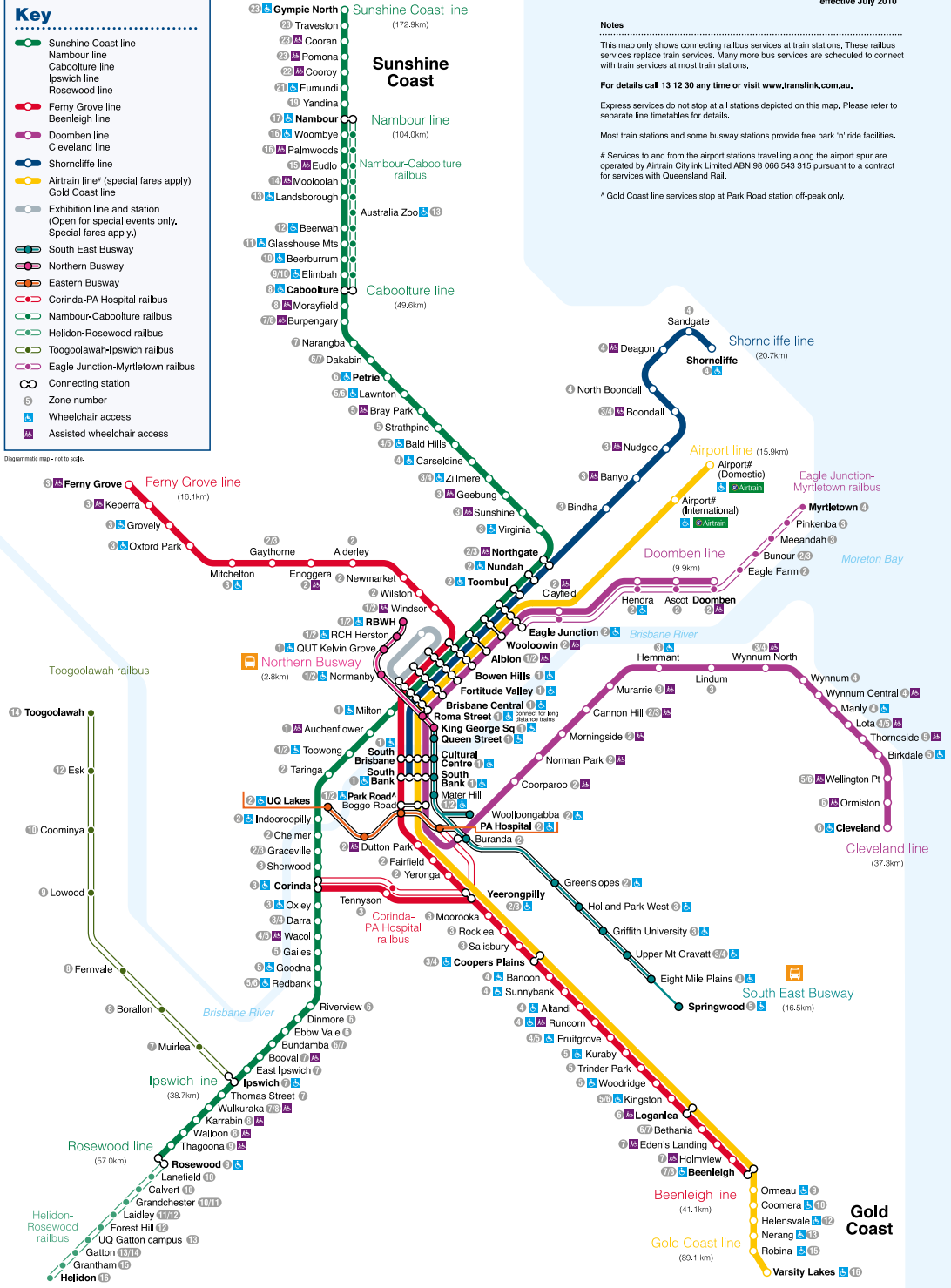


effective July 2010

Key

-  Sunshine Coast line
-  Nambour line
-  Caboolture line
-  Ipswich line
-  Rosewood line
-  Ferry Grove line
-  Beenleigh line
-  Doomben line
-  Cleveland line
-  Shorncliffe line
-  Airtrain line* (special fares apply)
-  Gold Coast line
-  Exhibition line and station (Open for special events only. Special fares apply.)
-  South East Busway
-  Northern Busway
-  Eastern Busway
-  Corinda-PA Hospital railbus
-  Nambour-Caboolture railbus
-  Helidon-Rosewood railbus
-  Toogoolawah-Ipswich railbus
-  Eagle Junction-Myrtlewood railbus
-  Connecting station
-  Zone number
-  Wheelchair access
-  Assisted wheelchair access

Diagrammatic map - not to scale.



Notes

This map only shows connecting railbus services at train stations. These railbus services replace train services. Many more bus services are scheduled to connect with train services at most train stations.

For details call 13 12 30 any time or visit www.translink.com.au.

Express services do not stop at all stations depicted on this map. Please refer to separate line timetables for details.

Most train stations and some busway stations provide free park 'n' ride facilities.

* Services to and from the airport stations travelling along the airport spur are operated by Airtrain CityLink Limited ABN 98 066 543 315 pursuant to a contract for services with Queensland Rail.

^ Gold Coast line services stop at Park Road station off-peak only.

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1.0 Background

Queensland Rail passenger services include the SEQ network. The SEQ network extends from the centre of Brisbane south to Beenleigh and Varsity Lakes on the Gold Coast, north to Ferny Grove, Shorncliffe, Caboolture and Gympie North, east to Cleveland and west to Ipswich and Rosewood.

The SEQ network covers approximately 396 route kilometres of track with 144 train stations. Based on 2008/09 records, Queenslanders make an estimated 66 million passenger journeys per year within SEQ, with a daily average of 180,822 journeys.

The Station Design Guide is to be used to guide the design and documentation of stations. It documents the relevant governmental regulations and Queensland Rail standards. The applicability of subsequent regulatory changes must be negotiated with Queensland Rail.

2.0 Vision

2.1 THE SEQ CUSTOMER CHARTER

We are committed to providing you with:

- clean and tidy environments
- punctual and reliable transport
- responsive and efficient customer service

Train stations book-end the public transport journey, present a public face to individual communities along the Line, and make the first impression to prospective passengers.

In its continuing efforts to provide high quality transport facilities Queensland Rail is gradually upgrading the station facilities associated with the SEQ network

2.2 WHAT THE SAFETY PILLAR MEANS TO QUEENSLAND RAIL

“Safety doesn’t just happen”
“Safety is our number one priority”

Queensland Rail want to ensure that everyone goes home safely. We are all responsible for ensuring the success of Queensland Rail’s ZERO Harm Policy and we are committed to our safety goal.

To ensure all work areas across our business commit themselves to safety, we will:

- Make safety achievable in everything that we do
- Develop safety training that is relevant to our job tasks
- Ensure safety messages are easily understood
- Keep safety uppermost in our minds

It is Queensland Rail’s intention that the provision of upgraded station facilities will generally deliver the following benefits to its customers.

Stations will ultimately:

- be accessible to all members of the community
- be safe to use, and feel safe to use, day and night
- be functional
- be engaging for the Customer and Community
- be aesthetically pleasing
- provide a high standard of service
- generate community pride in Queensland’s public transport system
- be environmentally responsible
- be cost effective to maintain.

It is intended that upgrades will also benefit Queensland Rail staff working at stations by providing:

- a pleasant work place
- a safe work environment
- high levels of customer satisfaction
- improved staff facilities

This document has been prepared as the first stage in fulfilling Queensland Rail’s vision while also seeking to identify the unique opportunities and constraints that govern the design of railway stations.

3.0 Introduction

3.1 GENERAL

The Station Design Guide is in three parts.

Part 1 of the document covers the design processes and sequences unique to the delivery of stations and interchanges, with emphasis on the skills required for successful station design.

Part 2 focuses on the technical requirements for the provision and integration of each component of station infrastructure.

Part 3 is a series of Appendices containing further technical and support information.

Note: The upgrade of stations across the network is a gradual process and a full upgrade of a station to compliance with current standards will not always be possible. Upgrades may need to be phased in where appropriate and in some instances will be undertaken as part of a further extension or reconstruction of the station.

This guide does not explore the Queensland Rail procedures and requirements for train operations or for staff use of the stations.

The Station Design Guide is intended to be a “living document”. It is revised periodically without notice. Prior to using this document, please confirm with Queensland Rail that it is the current edition.

3.2 CUSTOMER EXPERIENCE

To further the goal of Queensland Rail, to deliver a quality rail and integrated transport service to our customers, we must pay close attention to the following customer experience points at our stations.

1. Station Entrance

The opportunity to welcome our customers into Queensland Rail Passengers care can be accomplished through providing clear and consistent signage and wayfinding options. We need to offer a safe entrance and passage for our customers but be mindful of how they will access our facilities ensuring it is as simple as possible. Plan the point of access in relevance to the point of entry and point of train boarding, often they can be disjointed.

2. Ticketing

Care needs to be taken in where ticketing facilities including AVVM's, Ticket Windows & SACID's are placed so that they don't interfere with traffic flow but are easily assessable to passengers. If SACID's are placed too close to busy exits they can create congestion at peak periods. This will become even more pertinent as paper ticketing is discontinued.

3. Waiting Areas / Shelters

Must offer sufficient shelter from the elements as well as create a feeling of security. Train information is to be readily available and there should be sufficient seating. The seating needs to accommodate expected growth for the station, special events and swelled numbers of customers due to service disruptions. Public Address systems are to be clearly audible.

4. Platform Area

This area is crucial in regards to safety. This is to be clearly legible with no form of conflicting messages. Platform height is to be level with the treadplate of a train door. The platform surface is to grade away from the track (to avoid any wheeled apparatus rolling on to the track) & be free from slip, trip & fall hazards. Platform and train information (PIDS, TIPS etc) should be clearly in sight.

3.3 RATIONALE

The regulations under the Federal Disability Discrimination Act 1992 (DDA) are now the basis for station design. Those regulations, the “Disability Standards for Accessible Public Transport” (DSAPT) override State-based regulations such as the Building Act and its regulations including the Building Code of Australia (BCA), except where issues are not covered under DSAPT. The DSAPT of 2002 and subsequent Amendments together form the highest level of design regulation for public transport conveyances, premises and infrastructure within this Country.

**DDA is not an “add-on”
It is the essence of the station design**

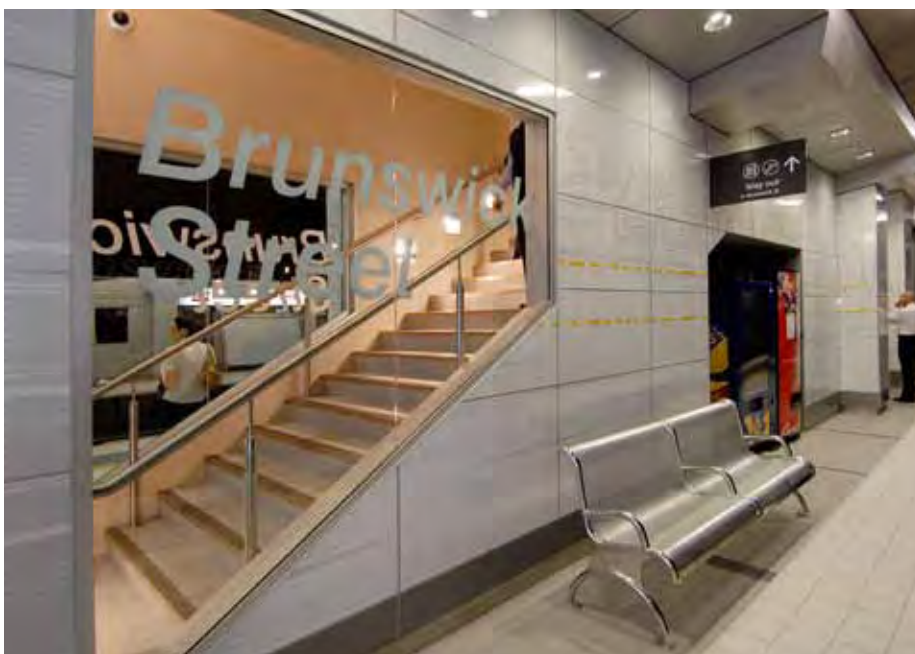
The reasons for this statement are twofold:

- Station design is essentially an exercise in site planning. Like all good design within the built environment, site planning is, at its core, the design of circulation.
- Circulation design on a station site is essentially the design of Paths of Travel. Every path of travel within transport infrastructure in Australia must comply with the requirements of the DSAPT.

Station design begins with determining the optimum location for the train Boarding Points for persons requiring assistance (refer PLATFORMS section). From those points compliant paths of travel must connect site entries, toilets, ticketing, shelter/waiting, parking for persons with disabilities, bus stops, taxi zones, passenger set-down areas, Emergency and Disability Assistance Phones, etc. The site furnishings such as buildings, lifts and the like are then “wrapped-around” the paths of travel.

Designers should ensure that the paths of travel are as simple as possible. Competent circulation design is “legible”, is easily comprehended by visitors and requires little additional “way-finding” assistance. The most important aspect of station design is that all persons including those with a disability can safely access a station and board a train (and in reverse). When additional facilities are provided for patrons, a similar level of service must be provided for persons with disabilities.

The following sections describe the nature of the consultancy work, the required sequence of that work and the means by which Queensland Rail monitors progress and quality of that work (progressive submissions and checklists).



3.4 SITE FUNCTION

A railway station is a significant node within a larger journey.

It is essentially a path of travel through, or past, a number of facilities including:

- Platform(s)
- Customer and staff services. These include ticketing, toilets, office, stores, etc. depending on the topography of the site, these services may be located on a platform or on a concourse above or below the platforms.
- Site access facilities. These include parking, entry/exit paths, pedestrian access paths, etc.

A railway station can also be a place of work.

3.5 SEQ STATION CATEGORIES

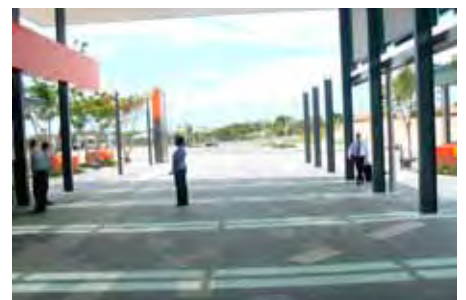
Citytrain station network categorisation system

Following is a categorisation system to enable Customer Services to identify stations that will enable them to develop the Customer Service Standards required at the stations nominated in each category.

For each station the following elements are refined:

- Assets required at each station aligned to the station category
- Condition of the assets aligned to the station category
- Presentation standards at each station aligned to the station category
- Customer service training requirements for staff

(Knowledge of local transport connections, public facilities, shopping centres etc.)



3.6 HERITAGE LISTINGS

Many Queensland Rail sites or components of sites are listed on various registers of Heritage Significance. A list of heritage listed Queensland Rail assets is appended to this document. The Heritage Registers may change in detail over time. Consult the most recent version prior to commencing design work.

Queensland Rail will advise the procedures to be followed for approvals at particular sites, but note the following:

- New work at heritage sites is to respect the heritage values but is to be obviously new.
- The approval process will usually require a series of three-dimension images of the proposed superimposed over photographs of existing, or equivalent.
- If work is being undertaken on a state heritage listed building the work must comply with the Queensland Heritage Act 1992.
- Queensland Rail personnel must refer any heritage related enquiries to the Senior Property Officer Heritage, Strategy and Operations, Queensland Rail Property Division.



3.7 BROAD OBJECTIVES

The design objectives may be summarized as follows:

1. To provide a high level of comfort and amenity for the travelling public.
2. To create bright, clean, aesthetic surrounds consistent with the image of a modern efficient passenger train network.
3. To provide safety and security for customers and Queensland Rail personnel on and around stations, platforms, car parks and pedestrian pathways.
4. To provide high level of security measures for Railway property.
5. To comply with the Crime Prevention Through Environmental Design (CPTED) principles.
6. To reduce the risk of crime and disorder at stations, by minimizing rewards, provocations and excuses for its commission.
7. Design the Station Facilities so they are easy to maintain without the need for track closures or isolations for general cleaning and maintenance.
8. To permit independent travel for all passengers on the Queensland Rail passenger network.
9. To improve efficiency in the day to day operation of each station.
10. To provide a minimum standard of comfort and amenity for station staff.
11. To provide realistic means of reducing ongoing maintenance costs associated with graffiti and vandalism.
12. To construct new works in such a manner as to minimize disruption to passenger and rail services.
13. To proudly promote social and environmental responsibility through “best practice” urban design (eg. use of water sensitive urban design) and genuine public consultation.
14. To standardise key facilities such as core zones, safety features, ticketing, signage, etc throughout the SEQ network.
15. To provide the most energy efficient station possible.
16. To improve the Customer Experience by providing a coordinated information package for each station.

3.8 BASIC CONCEPTS

The following list outlines a set of design concepts, intended to help implement the design objectives:

- Queensland Rail is committed to achieving high levels of customer satisfaction. The journey from the entry to Queensland Rail property through to boarding the train (and vice-versa) must be designed as an appropriate dynamic experience. The customer has a right to enjoy that experience. This principle must extend to the links to other public transport nodes as well as to residential, commercial and educational facilities
- To reduce security hazards and maintenance problems by application of the Crime Prevention Through Environmental Design (CPTED) principles including maintenance of clear lines of sight. Platforms must be kept clear of unnecessary structures to ensure that they are open. Shelters with screens and windbreaks are preferred to enclosed waiting rooms. The screens and windbreaks must be designed to maintain optimum visibility and minimise maintenance
- Station structures must be kept to a minimum size, allowing for an efficient working space. Ideally the station buildings should be consolidated to a single building
- Tickets are purchased from the ticket office or from a ticket machine (eg. Add Value Vending Machine – AVVM) or remote sales office before travel. Auto-deduction (via Stand Alone Card Interface Device -SACID's) from an appropriately charged Go -Card is an alternative
- Standard components and designs as described in this guide must be used as far as possible across the network to achieve consistency for users, to maintain a consistent image and to reduce costs
- The network must allow passengers to travel as independently as possible and in a dignified manner
- At least two (2) exits should be provided on each platform to prevent passengers from being trapped. However, a minimum number of entrances/exits should be provided for the purposes of:
 - facilitating CCTV coverage of persons entering the station

- the apprehension of offenders
- The positioning of entrances/exits and the number of footbridges/ pedestrian mazes should be considered from the point of view of reducing the incentives for unsafe track crossings
- There should be no obstructions near entrances/exits that would impede a person's 180 degree forward vision
- Station office and toilets, where possible, should be located within an entry concourse rather than on platforms. Items such as security cameras should, wherever possible, be located as to achieve maximum coverage. Lighting must be even and use of light poles should be minimised
- The location of new station buildings are to be approved by Queensland Rail Passenger. If a station has more than 2 platforms, a station building off the platform is preferred
- Core Zone (boarding point, priority seat, wheelchair waiting spaces, blue and white striped line; emergency and disability assistance phone; lighting; CCTV) are provided for in the design phase

New station design must also take into account:

1. Legibility of pedestrian and vehicular circulation.
2. Consistency in spatial/visual character throughout the site and across the network
3. Accessibility for maintenance purposes
4. Colour scheme and compatibility with cleaning, appearance and maintenance
5. Finishing materials and design for maintainability, durability and cleanability
6. Facilities for bus/taxi/rail interchange and private vehicle passenger set-down
7. The ability to repair and replace station components with minimum disruption to station operations
8. Workplace Health and Safety issues
9. Proximity of structures to overhead rail traction wiring must allow for clearances for maintenance personnel
10. The overall operation of the station eg. The location of the ticket counters, parking areas, passenger set-downs, etc.

3.9 DESIGN CONSIDERATIONS

There are a number of important design considerations that should be applied to the design of new stations and the refurbishment/upgrading of existing stations.

Application of this document will ensure that all stations will eventually attain a minimum standard of finish appropriate to their function and location. Under certain circumstances at existing stations, some of these requirements may be varied subject to a submission to Queensland Rail outlining the requested deviation, discussing the rationale and justifying how the proposed change will achieve the intended outcome.

It is Queensland Rail policy to design buildings and other infrastructure for a 50 year economic life.

3.10 COMPLIANCE

Station construction and refurbishment must comply with the latest version of the following legislation, standards and specifications:

- Disability standards including: Disability Standard for Accessible Public Transport (DSAPT).
- Design for Access and Mobility AS 1428
- Building Code of Australia (BCA) and referenced standards
- Civil Engineering Structures Standard SAF/STD/0080/CIV (CESS)
- Manual of Uniform Traffic Control Devices.
- AS2890 part 6 – parking for persons with disabilities.
- Technical Specifications – There are a number of standard requirements that contractors, working in or about Queensland Rail property, must abide by. These standard requirements are contained in the documents listed below:

- MCE-SR-002 – Requirements for Work in or About Queensland Rail property
- MCE-SR-003 – Requirements for Work Adjacent to Overhead Live Equipment
- Queensland Rail pedestrian level crossing details and AS1742.7.
- MCE-SR-006 - Requirements for the design of footbridges
- MCE-SR-007 – Design and selection criteria for road/rail interface barriers
- MCE-SR-008 – Protection screens
- MCE-SR-005 – Requirements for the design of buildings
- MCE-SR-012 – Protection of supporting elements adjacent to railways.
Note: These documents can be found on the Queensland Rail BMS intranet site.
- Queensland Rail station lighting guidelines – the Webb Report.
- Crime Prevention Through Environmental Design (CPTED).
Note: Security Analysis and Planning Unit, Queensland Rail Passenger can provide advice and guidance on CPTED issues.
- Local Authorities Planning Instruments and Civil Engineering Standards

The following table sets out the nationally agreed levels of Security Alert:

Level	Description
Low	Terrorist attack not expected
Medium	Terrorist attack could occur
High	Terrorist attack is likely
Extreme	Terrorist attack is imminent or has occurred



Principle

Design and site development to reflect SEQ's subtropical climate, reinforce local character and achieve innovation and design excellence.

Policies

- 8.3.1 Ensure that new development and redevelopment in established urban areas reinforce the strengths and individual character of the urban area in which the development occurs.
- 8.3.2 Ensure that new government buildings respond with high-quality design to the urban context in which they are to be located, and that particular attention is afforded to making high-quality public spaces.
- 8.3.3 Ensure all development and appropriate infrastructure, such as public transport stations, incorporate subtropical design principles, including orientation, siting and passive climate control.

Notes

The Urban Design Alliance of Queensland outlines the following fundamental ideas that can be used as a framework to achieve desirable urban qualities. Cities and towns must be:

- sustainable
- liveable
- viable
- responsible
- memorable.

The Queensland Government established the Board for Urban Places to advise on high-quality urban design and to provide general and project-specific advice on urban design, planning, architecture, landscape architecture, sustainability and built environment issues.

Subtropical environment

Increased energy consumption has become a substantial national trend. Despite this, the orientation, siting and design of buildings to respond to local climatic conditions are largely neglected. The building industry, designers, developers and owners need to consider local climatic factors during design and construction.

Climate-responsive building—or passive climate control—involves using natural methods to reduce energy consumption by designing, constructing and using materials appropriate to a specific climate. SEQ is Australia's only subtropical metropolitan region. Design must be more responsive to the subtropical environment and appropriate design principles should guide all planning and design considerations.

Subtropical design principles for SEQ

- Recognise sub-regions: recognise and reflect SEQ's diverse climatic, landscape, cultural, and habitat sub-regions when applying design principles.

8.3.4 Achieve design excellence for all new prominent buildings and public spaces in the Brisbane central business district, regional activity centres and transit communities.

8.3.5 Provide an accessible and high-quality public realm in all Development Areas by allocating or revitalising open space and creating well-designed public places.

Programs

8.3.6 Prepare a Model Code for Smart Growth to guide state and local governments on sustainable approaches to planning of Regional and Local Development Areas and development standards for new urban areas.

8.3.7 Utilise the Board for Urban Places to deliver high-quality urban design outcomes in the region's urban environment.

- Respect topography: protect the integrity and character of the hills, mountains and ridgelines that frame and define the subtropical environment.
- Diversify the built environment: incorporate diverse building densities, heights, types, and scales into new development.
- Consider local character and design: recognise how contemporary design and appropriate building materials contribute to the subtropical environment's character and diversity.
- Integrate with nature: design for appropriate climate-based orientation, provide shade and allow the breeze, sunlight and natural environment to penetrate.
- Acknowledge informality: recognise the informal relationships among the natural, built and rural environments.
- Use vegetation: use extensive native vegetation and large shade trees in private and public spaces, particularly along pedestrian and cycling corridors.
- Ensure open space diversity: diversify, integrate and design open space to form networks.
- Incorporate access to open space: reflect the proximity of nature in subtropical environments and SEQ's outdoor-based lifestyle in the access to open space.
- Design for water: reflect the importance and presence of water, and provide public access to any natural or artificial waterways.
- Develop outdoor centres: include outdoor dining, entertainment, recreation, sheltered public transport access and shaded pedestrian pathways to create informality and a village-like character.
- Develop outdoor meeting places: incorporate outdoor meeting places into building and design.

4.0 Station Categories

1. Premium Criteria

- Flagship location
- Extreme frequency of service
- Extreme passenger demand (consistent)
 - Peak (business)
 - Off Peak
 - Tourists
 - Different generations
- Destination or changeover locations for passengers
- Servicing multiple lines (attracts passengers from all points of network)
- Intra-modal and multi-modal
- Security requirements (Resource and technical based)
- Resource deployment centre
- Independently accessible for people with disabilities
- Facilities provided for a wide range of access requirements
- High level of Customer Information provision systems (Resource and technical based)
 - LCD real-time train information screens
 - Network information LCD screens
 - On Station Public Address announcements
 - Information at the station office or a booth on the Network and services offered in SEQ
 - Information boards should have relevant information displayed at all times re:operations (timetables, track closures, service alterations, extra services etc)
- Commercial opportunities
 - Coffee Shops
 - Eateries
 - Newsagencies
- Assets have a High Level of finish to enhance the image of the station
- Public Car parking is not a consideration

Note: Some locations may not meet all of the requirements however are still in the category due to meeting the major requirements or will in the future.

2. Interchange Criteria

- High frequency of service
- High passenger demand
 - Peak (business)
 - Off Peak
- Intra-modal and multi-modal

Origin/Destination Stations

- Transport hub
- Other Train Services/lines
- Bus interchange (not necessarily connecting)
- Can be a Traveltrain location
- Taxi ranks
- High level of Customer Information provision systems (Resource and technical based)
 - LCD or LED real-time train information screens
 - Network information LCD screens
 - Automated Public Address announcements
 - Information on Network and services offered in SEQ (can be in an “Information Shelter”)
- Security requirement (Resource and technical based)
- Independently accessible for people with disabilities
- Facilities provided for a wide range of access
- Resource deployment (Station or business related)
- Destination or changeover locations for customers
- May have commercial opportunities
 - Coffee Shops
 - Eateries
 - Newsagencies
- Assets have a High Level of finish
- May or may not have a large shopping centre in close proximity
- Requirement for a high volume of car parking to be available

“Information shelter” is a concept containing various information for customers at one central location on a station that would have:

- A large network map
- A local map including location of local bus stops

- An electronic Next Train Information system (NTI)
- Network or location timetable
- Contact Phone numbers
 - Police
 - Taxi
 - Passenger Service Officers
 - Lost Property
 - DDA Information

3. Commuter Criteria

- Weekday staff presence dictated by Customer service requirements as determined by the business
- Assets have a hard wearing level of finish to meet the functions required at the station for image and presentation
- Customer Information provision systems
 - Information on Network and services offered in SEQ (can be in an “Information Shelter”)
- Car parking to be available depending of current and predicted patronage
- Some commercial opportunities may exist in the local area
 - Coffee Shops
 - Eateries

“Information shelter” is a concept that would see various information for customers at one central location on a station or on each platform that would have:

- A large network map
- A local community map
- An electronic Next Train Information system (NTI)
- Network or location timetable
- Contact Phone numbers
 - Police
 - Taxi
 - Passenger Service Officers
 - Lost Property
 - Disability Access Information

Note: Some locations may not meet all of the requirements however are still in the category due to meeting the major requirements or will in the future.

Category	Component	Premium	Interchange	Commuter	Local
Surface & Egress	Carpark: 10 kms from Central	As Req	Yes	Yes	Yes
	Footbridge	As Req	As Req	As Req	As Req
	Subway	As Req	As Req	As Req	As Req
	Lift	Yes	Yes	Yes	Yes
	Quality Finished Flooring	As Req	As Req	N/A	N/A
	Pathways	Yes	Yes	Yes	Yes
	Coping Stones	Yes	Yes	Yes	Yes
	Platform Edge TGSI's	Yes	Yes	Yes	Yes
	Drains & Grates	Yes	Yes	Yes	Yes
	Gardens & Grass	As Req	As Req	As Req	As Req
	Escalators	As Req	N/A	N/A	N/A
	Platforms	Yes	Yes	Yes	Yes
	Ramps	As Req	As Req	As Req	As Req
	Stairs	Yes	Yes	Yes	Yes
Buildings	Station Office	Yes	Yes	Yes	As Req
	Waiting Area – Attached to office / On concourse	As Req	Yes	Yes	Yes
	Shelters	As Req	Yes	Yes	Yes
	Cleaners Room with external access	Yes	Yes	Yes	Yes
	Toilets	Yes	Yes	Yes	Yes
Building Fittings	Quality Finished Walls	As Req	As Req	N/A	N/A
	TIPS	Yes	Yes	Yes	Yes
	EDAP (Help) Phones	Yes	Yes	Yes	Yes
	Public Phones	Yes	Yes	Yes	Yes
	Bins	Yes	Yes	Yes	Yes
	Charity Bins	N/A	As Req	As Req	As Req
	Baby Change	Yes	Yes	Yes	Yes
	Sharps Bin	Yes	Yes	Yes	Yes
	Sanitary Bins	Yes	Yes	Yes	Yes
	Accessible Toilets	Yes	Yes	Yes	Yes
	Soap Dispenser	Yes	Yes	Yes	Yes
	Hand Wash Basins	Yes	Yes	Yes	Yes
	Hand Paper / Dryer	Yes	Yes	Yes	Yes
	Toilet Roll Dispenser	Yes	Yes	Yes	Yes
	Mirror	Yes	Yes	Yes	Yes
	Platform Seats / Resting Rails	Yes	Yes	Yes	Yes

4. Local Criteria

- Moderate to low frequency of service
- Origin station
- Peak hour passengers
- Low multi-modal usage
- Moderate passenger demand
- Security requirement (largely technical)
- Accessibility for people with disabilities is – independent access
- Facilities provide for a wide to moderate range of access requirements
- Assets have a hard wearing level of finish to meet the functions required at the station for image and presentation
- Customer Information provision systems (Technical based)
 - Information on Network and services offered in SEQ (can be in an “Information Shelter”)
 - Automated On Station Public Address announcements
 - Information boards should have relevant information displayed at all times re:operations (timetables, track closures, service alterations, extra services etc)
- Car parking to be available depending on current and predicted patronage

“Information shelter” is a concept that would see various information for customers at one central location on a station or on each platform that would have:

- A large network map
- A local community map including location of local bus stops
- An electronic Next Train Information system (NTI) Network or location timetable
- Contact Phone numbers
 - Police
 - Taxi
 - Passenger Service Officers
 - Lost Property
 - Disability Access Information

Note: Some locations may not meet all of the requirements however are still in the category due to meeting the major requirements or will in the future.

5.0 Design team notes

A well designed station becomes a long term positive asset to Queensland Rail. It helps to generate high levels of customer satisfaction. There is a body of research and anecdotal evidence to indicate that these attributes can increase patronage and decrease both anti-social behavior and general maintenance costs. Because Queensland Rail is the long term owner/operator of stations, the design process, team and sequence must be set up and managed in a manner that maximizes these benefits.

The design of railway stations is quite different from the design of a bridge or a typical building. A station is a genuinely public place – its function and layout must be easily comprehended and accepted by the general public. That essential, though intangible function (legibility) must also be achieved within a strongly axial form and severe spatial constraints.

- For the purpose of building approval for proposed work, Queensland Department of Works - Project Services is the nominated authority
- For stations requiring upgraded hydraulic works, approval must be obtained from the local authority and the relevant drainage plans must to be prepared by a qualified hydraulic consultant
- Workplace Health and Safety Act – WH&S must be in accordance with the Workplace Health and Safety Act and all relevant provisions. Personnel engaged with construction works on stations are required to attend a Safety Induction course run by Queensland Rail prior to commencement of work on site. For additional information on safety requirements refer Station Operations.
- TRANSLink train station signage manual and Queensland Rail Accessible station signage guide.

5.1 REQUIRED SKILLS

The following statements are intended to assist Queensland Rail, its partners and its consultants to select the most appropriate personnel for the tasks that together comprise the station design process.

All team members must:

- Possess demonstrated teamwork skills and a commitment to achieving team goals.
- Fully understand the Queensland Rail requirements.
- Possess a demonstrated understanding of the Queensland Rail corporate mission and its implications.
- Have a clear understanding of the DSAPT and its referenced Standards
- Have a clear understanding of Queensland Rail station design policies

For successful application of DSAPT, the design team priority must be the resolution of circulation planning issues prior to designing or locating the larger elements and services.

The following is a summary of the disciplines needed within the design team for successful station design outcomes.

- 1 Design management
- 2 Site planning and circulation design
- 3 Accessibility and DDA requirements advisor
- 4 Civil design
- 5 Building design
- 6 Structural design
- 7 Electrical design
- 8 Overhead Traction System
This work is often done by Queensland Rail personnel. If so, it is the responsibility of the design manager to ensure effective integration of those personnel into the project team.
- 9 CCTV
This work is often done by Queensland Rail personnel. If so, it is the responsibility of the design manager to ensure effective integration of those personnel into the project team.
- 10 Mechanical design
- 11 Hydraulic design
- 12 Landscape design
- 13 Environmental engineering and sustainable design
- 14 Interior design (where applicable)
- 15 Signage design and location
- 16 Cost control
- 17 BCA certification
- 18 Crime Prevention through Environmental Design.

Note this will be in association with CCTV Analysis Unit and Security Analysis and Planning Unit, Queensland Rail Passengers.

5.2 CERTIFICATION REQUIREMENTS

Queensland Rail expects all consultants to use an accredited Project Quality Plan and to use highly qualified personnel for its work. The following are the minimum requirements:

- **Engineering work.** All engineering work must be supervised, checked and certified by a qualified engineer holding RPEQ certification including engineering drawings.
- **Architectural work.** All building design work must be produced under the supervision of and signed by a person currently registered as an Architect in the state of Queensland.
- **Landscape work.** Landscape design, must be produced under the supervision of and drawings must be signed by a person classified as a Registered Landscape Architect.
- **Surveying.** Survey work must be carried out under the supervision of and all survey drawings must be signed by a person licensed as a surveyor in Queensland.
- **BCA certification.** To be carried out by a person appropriately licensed by the Queensland Building Services Authority



6.0 Work stages

The following would normally be completed by Queensland Rail prior to the preparation of the design brief. Designers must check the data provided and advise Queensland Rail of further information required.

6.1 PRE-DESIGN REQUIREMENTS

1. Identify the following items as required

- Identify area of land required
- Make approach to Queensland Rail property division to make preliminary investigations into ownership of land/possible land acquisition process
- Native Title
- Cultural heritage
- Planning compliance requirements
- Locality and Topography
- Any study of requirements to determine the number of car parks, bus bays, standing, taxi, People with disabilities (PWD) car parks, long and short term car parks (secured and unsecured), bicycles and motorbike parking requirements.
- Road , pedestrian, Bicycle Access
- Location of existing services – Water, Sewage, storm-water, Electricity, Telecommunications, Closed Circuit Television Security (CCTV)
- Track Position and clearances
- Platform location, station buildings & footbridge location and layout
- Existing surface drainage patterns
- Local Authority Requirements

2. Examine Environmental Assessments and other environmental documentation (where applicable) to understand key environmental constraints (i.e. contamination, vegetation, stormwater, community)—request more information if required.

3. Examine existing survey data—request more information if required.

4. Examine existing geotechnical data

6.2 STATION WORKS BRIEF

The extent of new works and alterations to existing facilities will vary with each station. A design brief must be prepared and signed off by the relevant Queensland Rail sponsor group(s).

Work by Queensland Rail. A STATION FITOUT SUMMARY must be completed in accordance with Appendix A to this guide and formally agreed upon prior to the commencement of the design sequence.

Design sequence:

- (i) Concept plans to be submitted and approved.
- (ii) Design brief to be submitted and approved.
- (iii) Design consultants to be selected and appointed.
- (iv) Detailed “Layout Plans” to be submitted, reviewed, edited and approved.
- (v) “Final tender package” to be submitted, reviewed, edited and approved.
- (vi) “Complete tender package” to be submitted and signed.
- (vii) “Complete tender package” to be re-submitted electronically.

The detailed requirements of each of stages (iv) to (vii) must be clearly defined in the brief.

6.3 CONSULTANCY WORK STAGES

Following appointment, the design consultancy will typically proceed via the following stages:

- Layout Plan for Approval
- Final Tender Package
- Complete Tender Package
- Tendering
- Construction Phase
- As-constructed documents

The precise work required during each stage must be clearly defined in the project brief.

The brief must also define the time for each stage, or alternatively a process for achieving agreement on times.

Appendix A contains an example definition of work prepared for a medium sized station upgrade. It will need amending for other types and sizes of work.



6.4 DRAWINGS

Presently there are two documents which deal with the production of Hard Copy and Electronic Drawings

Hard copy drawings are to be produced in accordance with the Drafting Standards Manual. Electronic drawings must conform to both the Drafting Standards Manual and the Specification of Electronic Drawings.

Electrical drawings are to include switchboard, circuit loading and cable sizing down to sub-circuit level. All control wiring must be detailed. Supplied design information should include the designed maximum demand, voltage drop and fault loop impedance at each switchboard.

Use Queensland Rail standard specifications modified with project-specific clauses as required. New and modified specifications are to comply with MCE-SR-004 Guidance for preparation of tender specifications.

Work as executed (“as built” or “as constructed”) drawings are required for architectural, structural, mechanical, hydraulic and electrical and must detail all changes from the contract drawings. Drafting standard must be to AS1100.

The electrical as-constructed drawings must include:

- Switchboard shop drawings.
- Detailed and complete sub circuiting, sub-mains and mains schematic drawings and layouts.
- Final drawings must be arranged so that all platform circuits are shown on a single drawing and logical areas such as car parks, or overbridges and stairs are shown on separate drawings.

- Drawings with half a platform on each drawing etc or unrelated details whilst suitable for construction are not considered suitable for as constructed drawings.

The Contractor must provide Queensland Rail with one preliminary copy and, after receiving written approval of acceptance of the preliminary copy, submit two sets of print copies, one set on film and an electronic copy of all drawings for use with either Microstation or Autocad.

As a general rule, practical completion for Queensland Rail projects is not to be granted until the final as-constructed drawings are submitted.



7.0 Glossary of terms

Item	Meaning
Accessible	An adjective meaning fully compliant with DSAPT
AVVM	Add Value Vending Machine – a large machine (915 wide, 610 deep, 1830 high) that dispenses paper tickets and change and recharges go cards.
BCA	Building Code of Australia
Boarding Point	A specific point on a platform where train boarding assistance is available. Except at terminus stations, a properly designed platform will have only one boarding point.
Boarding point mat	A tactile mat containing the boarding symbol installed by Queensland Rail at the boarding point
Boarding symbol	The international symbol for accessibility
Bumrests	See Resting Rails
CCTV	Closed circuit television security system – usually used to describe the cameras, but also applies to monitors, conduiting, cabling and equipment racks
CESS	Civil Engineering Structures Standard – a numeral is added to the end to identify the specific standard (eg CESS8). These are available from Queensland Rail.
Colour contrast	As defined in the QUT report
Coping	The edge of a platform – usually a strip of 600mm wide (up to 690 on older sites). There are specific Queensland Rail cross-sectional requirements
Core Safety Zone	A section of a platform containing the Boarding Point, priority seat, wheelchair waiting spaces, blue and white striped line, lighting, CCTV and NTI/EDAP and possibly other TIPS equipment. It may also include the AVVM.
CPTED	Crime Prevention Through Environmental Design – the current title for a series of long-established site planning principles
DDA	Federal Disability Discrimination Act 1992
Designated (or dedicated) space (or waiting area)	A priority seat + two WCWS
Drafting Standards Manual	A Queensland Rail document
DSAPT	Disability Standards for Accessible Public Transport – the DDA transport regulations
EDAP	Emergency and Disability Assistance Phone (usually a pedestal mounted passenger assistance item)
HAL	Hearing Augmentation Loop. A wire that is located around the core area and at ticket counters. It uses magnetic induction to link the PA system and/or the ticket seller directly to hearing aids.
High Level Platform	A station platform with coping level (nominally) 1050mm above rail level
Legibility	A fundamental goal of site planning – refers to the ease with which a person can comprehend and use the key elements of site layout (paths) without the need for signage or other way-finding devices.
Low Level Platform	A station platform with coping level (nominally) 810mm above rail level
Luminance contrast	As defined in AS1428.2
Mast	A vertical structural element supporting the traction wiring system
Maze	A sequence of fences and, often, automatic gates at each entry to a pedestrian level crossing of the rail tracks.
MUTCD	Manual of Uniform Traffic Control Devices

NTI	Next Train Information machine (similar to EDAP – gives real-time information as voice and a small text screen)
NTI/EDAP	A pedestal containing both types of passenger assistance equipment
Overhead Traction Wiring	All parts of the 25000 volt electrical system including the return conductors, masts and other support structure as well as structure bonds.
Paths of Travel	Pedestrian movement spaces
Platform	That part of a station (usually raised above track level) from which passengers board trains
Priority seat	DDA compliant seating (for at least two persons) located in the Core Area of each platform and identified as “Reserved for Persons with Disabilities”.
QUT report	Colour and luminance contrast tests (April 2005) of typical elements at selected Queensland Rail sites. Refer to Queensland Rail for further advice.
Resting Rails	An item of platform furniture sometimes used in lieu of seats. Note: Resting Rails do not satisfy any DDA requirements and require care in their use.
SACID	Stand Alone Card Interface Device – a pedestal mounted go card reader
Shoreline	An edge detectible by a person using a “cane” for guidance. A shoreline may be a wall, kerb or tapping rail. Or it could be a change of texture such as TGSI’s or grass.
Slip Resistant	Surfaces that are categorised as “low” – “very low” when tested to AS/NZS 4663:2004 OR “R10” – “R13” when tested to AS/NZS 4586:2004.
Tapping rail	A kerb-like rail used to create a clean shoreline for the vision impaired
TGSI	Tactile Ground Surface Indicator – slightly raised buttons or lines on pavements for the guidance of the vision impaired (also refer AS1428.4)
Ticket Office	A term used by Queensland Rail to describe the main enclosed staff work area at a station. It contains a range of facilities and functions.
TIPS	Train Information Passenger Services. Items of equipment that provide real-time arrival/departure information. The most commonly used TIPS are NTI/EDAP units and LCD Screens, overhead two or three line LED panels also exist in the Network.
Train Stop Marks	Coded symbols applied by Queensland Rail to the platform coping to indicate to the train driver the required stopping position.
Vending machine	Includes AVVM, ATM as well as snack and beverage machines
WCWS	Wheelchair waiting space – a 1300 x 800 space (in pairs located beside the priority seat and within 5000 of the boarding point) identified by signs
Webb Report	A report commissioned by the Australian Railways Association for the purpose of clarifying station lighting requirements

1.0 Platforms & surfaces

Queensland Rail aspires to station environments that are bright, spacious, Friendly, legible, welcoming and socially and environmentally responsible

The character of a station must be compatible with both its physical context and relevant Queensland Rail policy.

On each platform, all identified paths of travel, including but not limited to the following, are required to comply with DSAPT.

1.1 GENERAL

This section summarises the major design constraints for railway platforms. Module CESS 8 of the Queensland Rail Civil Engineering Structures Standard defines technical design criteria for platforms. The criteria listed below are the requirements for new platforms. It is recognised that in the redesign of existing platforms these standards may not be fully achievable. Any solution that does not fully comply with these standards must be approved in writing by Queensland Rail. Refer to Part 1, Clause 3.08.4.

A railway platform must be designed primarily as a node, or Customer Experience point within a journey. As such, functional paths of travel must be designed/considered first. Objects such as buildings, shelters, ticketing and the like are ancillary to the “journey” and the design of their location and layout is of secondary importance.

Queensland Rail prefers paths of travel to be as wide as is required by the anticipated patronage (generally a minimum of 1800mm wide clear of obstructions from ground surface to 2400mm high). There may be circumstances in which a narrower path might be approved by Queensland Rail for use on existing stations. Wider paths will be required in areas of increased

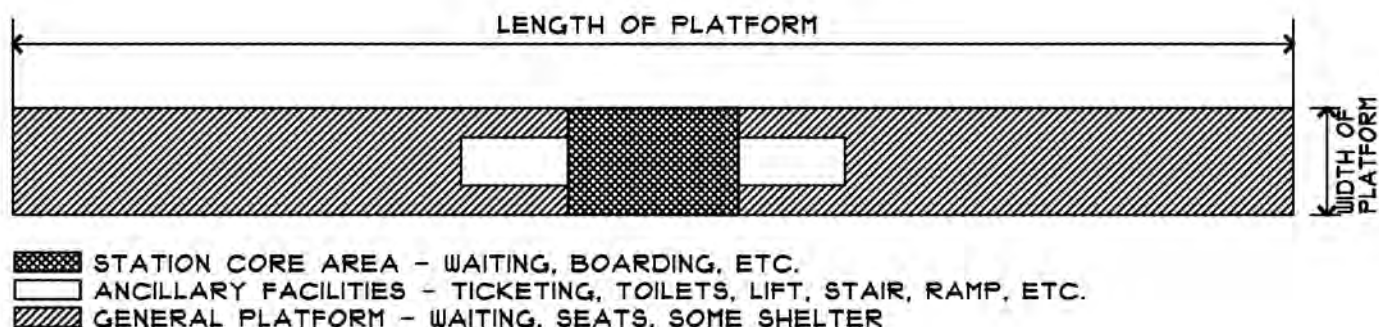
pedestrian density. These path widths are in addition to circulation space required at lifts, boarding points, stair and ramp entries and at vending machines and must accommodate anticipated demand growth.

The focal point of the path of travel at a railway station is the “core area”. This area comprises the “boarding point”, the emergency and disability assistance phone and the waiting areas for persons with disabilities. Where possible this area should be minimised in length (approx 15m) for security reasons. It is to be marked with blue and white markings.

The balance (non-core) of the platform comprises the “support” and ancillary facilities which may include ticket counter, ticket machine, toilets, lift, stairs, ramp, general waiting areas, staff offices, etc. Refer to diagram 1.

On each platform, all identified paths of travel, including but not limited to the following, are required to comply with DSAPT.

- From the lift to the boarding/ waiting (core) area via the Emergency & Disability Assistance 'Phone (EDAP).
- From the stairs to the core area via the EDAP.
- For the full length of the platform. The side of this path must adjoin the side of the platform edge TGSI's furthest from the coping.
- From the core area to the DDA compliant toilet (if station has toilet facilities).
- From the core area to the ticket counter.
- From the core area to the ticket vending machine.
- Between lift, stairs, ticket counter (if any), ticket machine, payphone, toilets (if any), non-core-area seating and shelter, snack vending machines, and the like.



MAJOR COMPONENTS OF A PLATFORM

Diagram 1

Paths of travel must be “legible” – as short and uncomplicated as possible and easy to conceptualise in advance. This is also a critical safety issue for those with limited comprehension skills (and everyone is susceptible to the effects of momentary distraction).

Any object on or near a path of travel is a potential collision hazard. Avoid “Clutter”. Minimise the number of objects (overhead traction masts, buildings, shelter posts, columns, light & camera poles, bins, signs, etc) on the platform. Ensure that they are easily visible through a combination of sight-lines and colour scheme.

Bins, hose-cocks, electrical and communications cabinets, conduits, planters, gate latches, down-pipe bases, etc must be located at least one metre clear of the side of any required path of travel and in positions that do not generate hazards to users of the path of travel.

1.2 PLATFORM SHAPE

Ensure that platforms comply with CESS 8 and as follows.

New Platforms

- Queensland Rail prefers new platforms to be 160 metres long with signals positioned to allow the full use of the platform. This facilitates bidirectional train operation if required.
- All new platforms must be on straight sections of track. The straight section of track must extend at least 30 metres beyond the ends of the platform before any track curves or turnouts.
- Queensland Rail requires that any object (building, downpipes, stair, lift, seat, pole, bin, mast, etc) on a platform be at least 4000mm from the platform edge. This increases to 4050mm to the face of functional objects such as ticket counters, vending machines, AVVM and the like.

- The minimum width of new platforms is determined by adding the object setback (previous dot point) to the width of the object. For example, an island platform containing a 3600mm wide building with vending machines will require a minimum width of 11700mm (4050+3600+4050).
- For double sided island platforms both copings must be at the same level.
- Clear lines of sight along platforms are essential for passenger safety and efficient train operations.
- The platform surface is to have a max 1:40 gradient falling away from the coping stones to prevent prams, wheelchairs etc rolling onto the tracks.
- All new platforms are required to be high level platforms for the full length of the platform. Refer to Queensland Rail for the details of high level platforms.

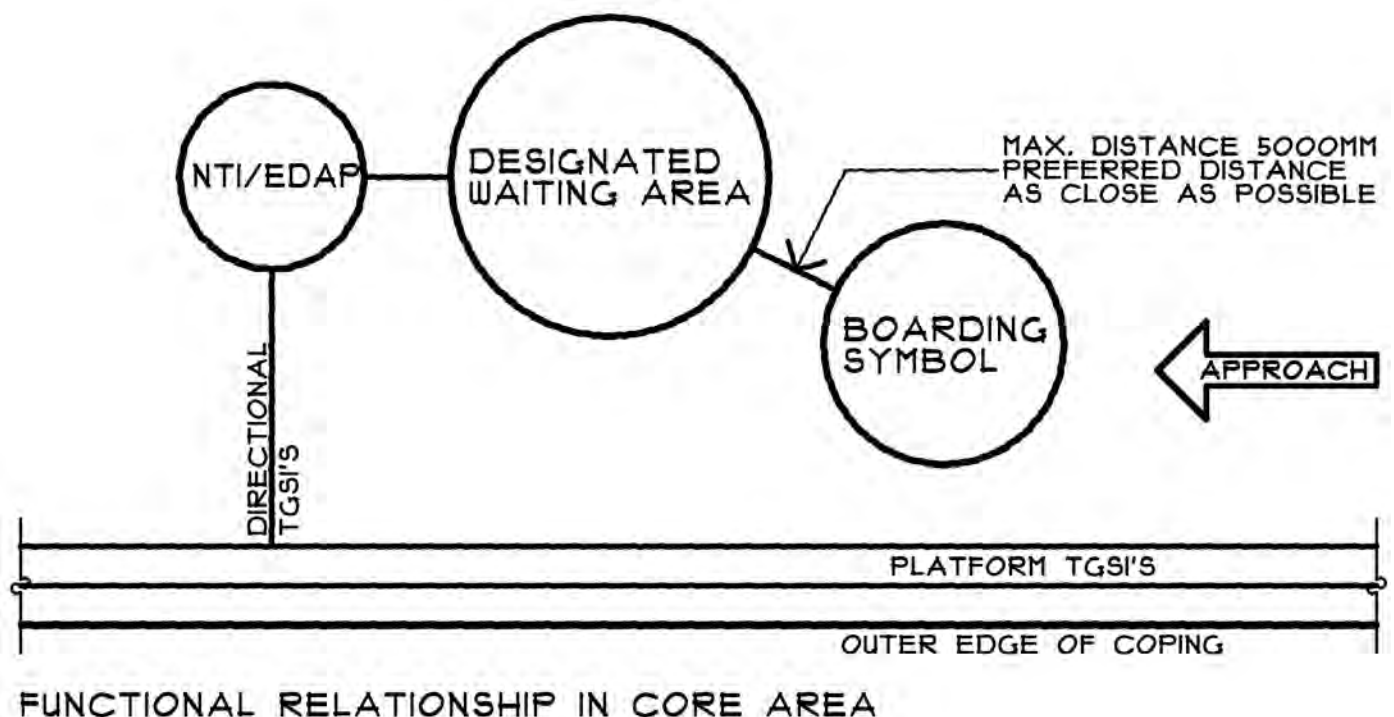


Diagram 2

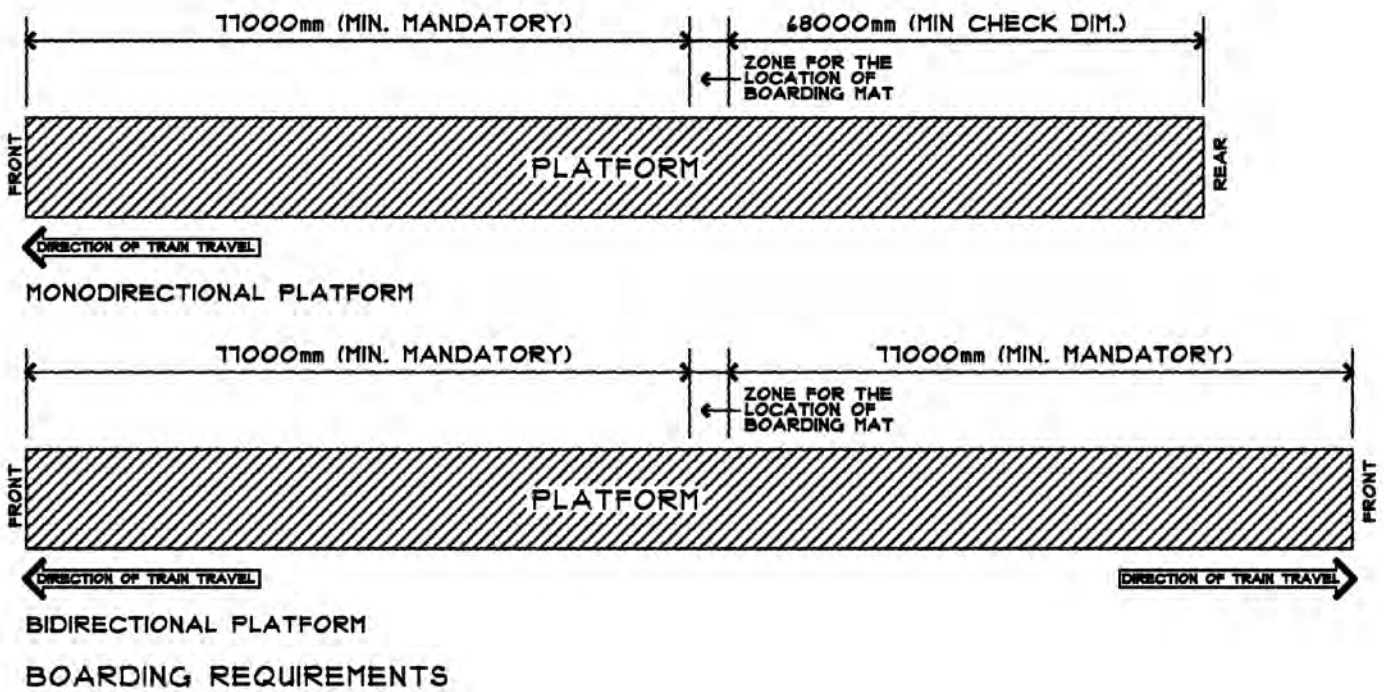


Diagram 3

The standards for new platforms apply to existing platforms to the extent possible within the site constraints.

As a general requirement low level platforms shall be raised to high level platforms to the greatest extent, (length wise), possible. Refer to Queensland Rail for advice.

At existing platforms, the platform width (including copings and TGSI's) at any point determines the facilities that may be located upon it at that point. At these minimum sizes, most objects on platforms will be within 1000mm of a path of travel and will require colour contrast to 1500mm high.

The following are the minimum widths usually required to achieve compliant paths of travel past facilities on existing platforms. In extreme circumstances at existing stations, where these minimums cannot be achieved, Queensland Rail might approve narrower paths of travel for short distances. Refer to Part 1, Clause 3.3.

- 4200mm (1200+1800+1200) is the minimum width for those parts of an island platform (the ends) that can be completely free of fittings and furnishings (seats, bins, shelters, light poles, etc).
- 4500mm is the minimum width for those parts of an island platform (near the ends) that can be completely free of fittings and furnishings other than light poles, etc.
- 3000mm is the minimum width for those parts of a single side platform that are completely free of fittings and furnishings (and boarding areas).
- 7300mm is the minimum width for an island platform with a narrow shelter.
- 4300mm is the minimum width for a single side platform with a shelter.
- 8500mm is the minimum width for an island platform containing a stair or "through" lift.
- 5400mm is the minimum width for a single side platform containing a stair or "through" lift.
- 8600mm is the minimum width for an island platform with standard, double sided shelter.
- 8800mm is the minimum width for a double sided platform island containing a "turn-around" lift.
- 5800mm is the minimum width for a single side platform containing a "turn-around" lift.
- 10000mm is the minimum width for an island platform to permit a station building to be installed.
- 11000mm is the minimum width for an island platform with a station building with vending machines along the side.
- 7000mm is the minimum width for a single side platform with a station building.

For island platforms both copings must be at (or close to) the same level.

Clear lines of sight along platforms are essential for passenger safety and efficient train operations.



1.3 CORE AREA

The “core area” is a fixed location on each platform that combines the boarding and waiting facilities for persons with disabilities with safety monitoring and lighting for the general public. Diagram 2 illustrates the required relationship between these facilities.

Boarding Point

Queensland Rail has nominated a boarding point on a platform for persons with disabilities at a specific door in each train. The location of that door when the train is stationary is the “Boarding Point”. The “Boarding Area” is the space required for the portable boarding ramp plus that required for wheelchair manoeuvring to access the ramp. A boarding point must be provided for each platform as follows:

- The centreline of the boarding area must be at least 77 metres from the end of the platform at the “front” end of the train, and at least 68 metres from the other end of the platform as illustrated in Diagram 3. The 77M dimension may increase on existing sites (eg. to give the driver a clear view of signals).
- Drawing CM1994 also applies. It shows, in addition to boarding point locations, the locations of the train stop marks. The train stop marks are installed by Queensland Rail.
- On a platform with bidirectional train operation, the boarding point centreline must be at least 77 metres from both ends of the platform.

- On an island platform with bidirectional train operation both sides, both boarding points should align at minimum 77M from each end.
- The surface of the boarding area must be slip-resistant and grade away from the cope at a maximum of 1 in 40.
- The boarding area must be at least 4 metres deep (3M for high level platform) from the edge of the platform and 4 metres wide. This area must be free of all obstacles including directional TGSI’s to the NTI/EDAP.
- The boarding point symbol is part of a “mat” provided by Queensland Rail. Its location must comply with diagram 3 and orientation must comply with diagram 4.
- It is recommended that the boarding area be covered.
- As the train guard’s position is adjacent to the boarding area, clear lines of sight are required from this area to every door of the train and to any nearby train operation signals.
- If possible, the hearing augmentation loop should cover the boarding area.

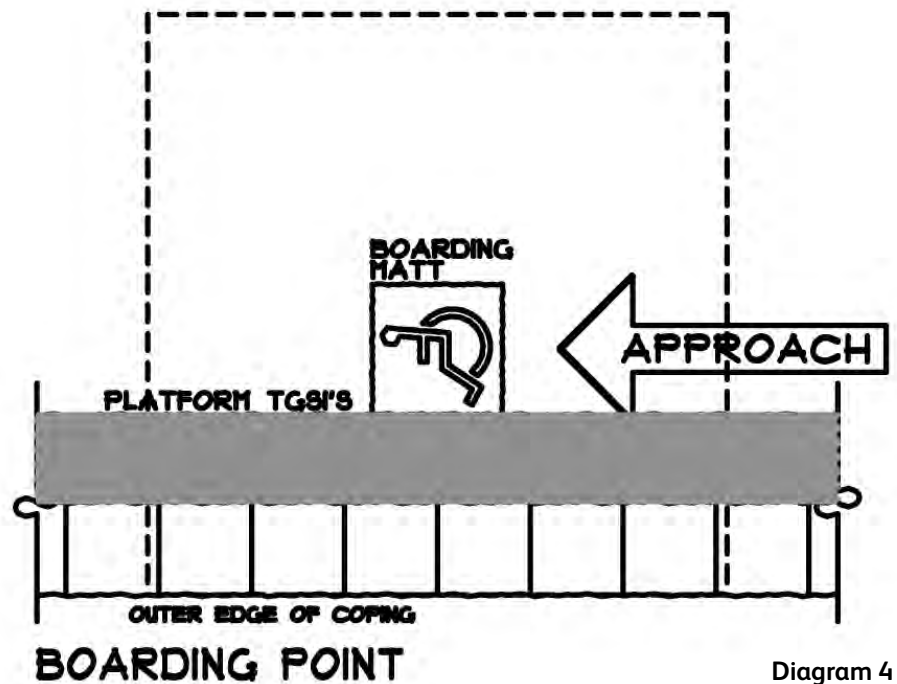
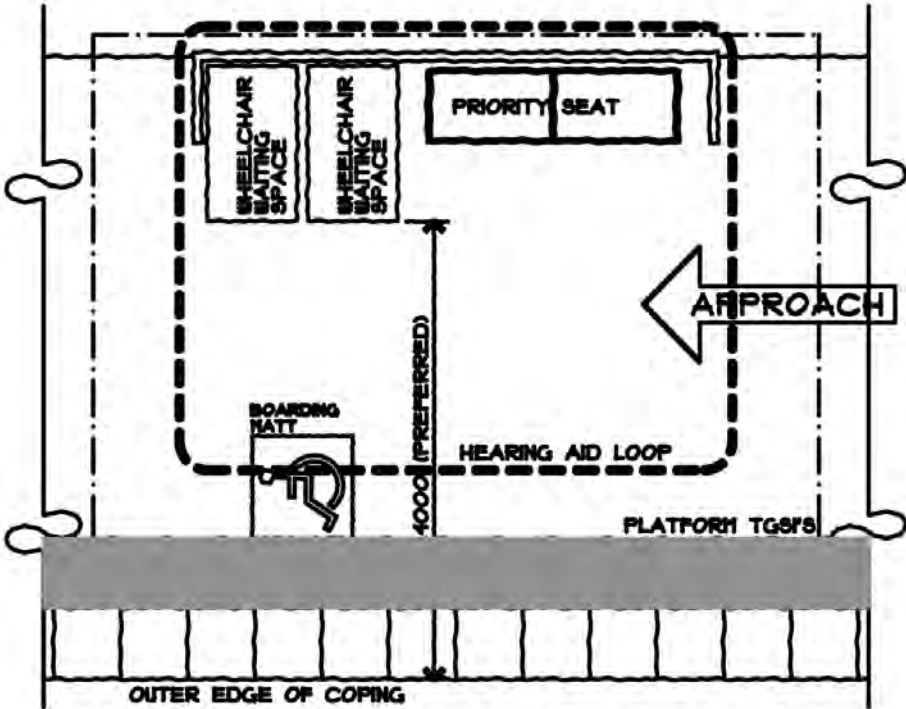


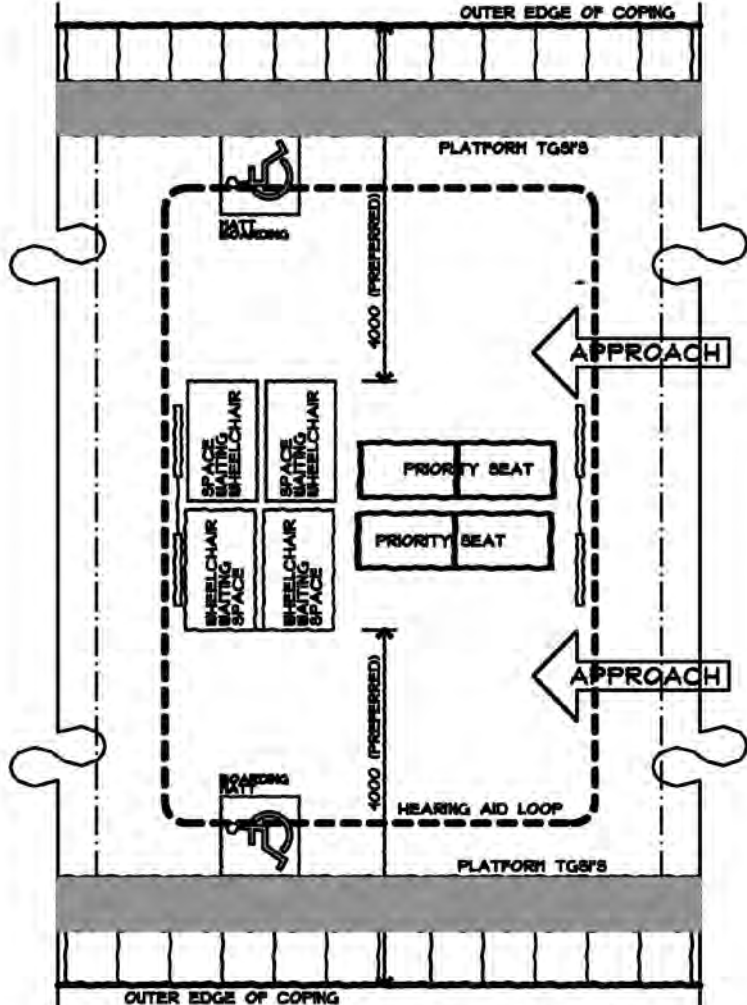
Diagram 4



Diagram 5

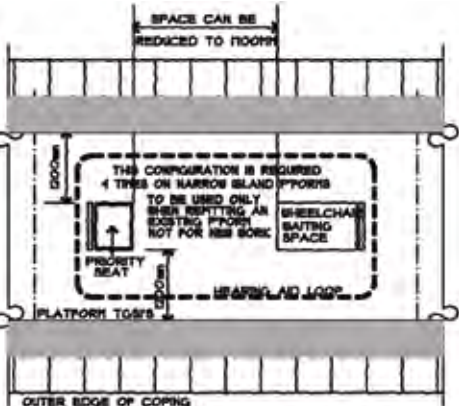


WHEELCHAIR WAITING SPACE AND SEATS IN SIDE PLATFORM SHELTER



WHEELCHAIR WAITING SPACE AND SEATS IN ISLAND PLATFORM SHELTER

Diagram 6



WHEELCHAIR WAITING SPACE & SEATS IN SHELTER ON NARROW EXISTING PLATFORMS

NOTE- QR APPROVAL REQUIRED

Diagram 7

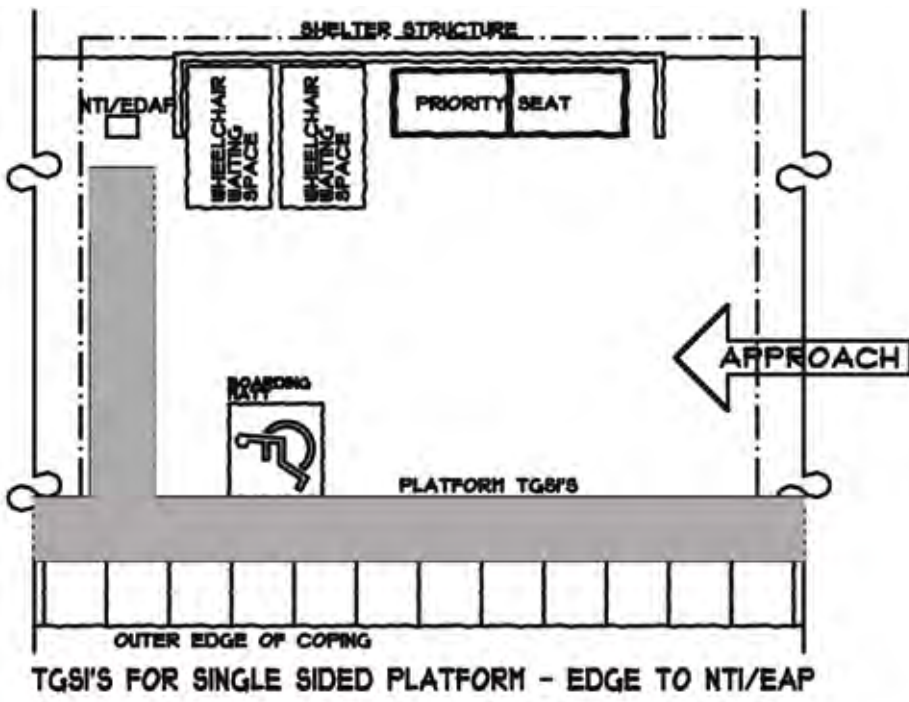


Diagram 8

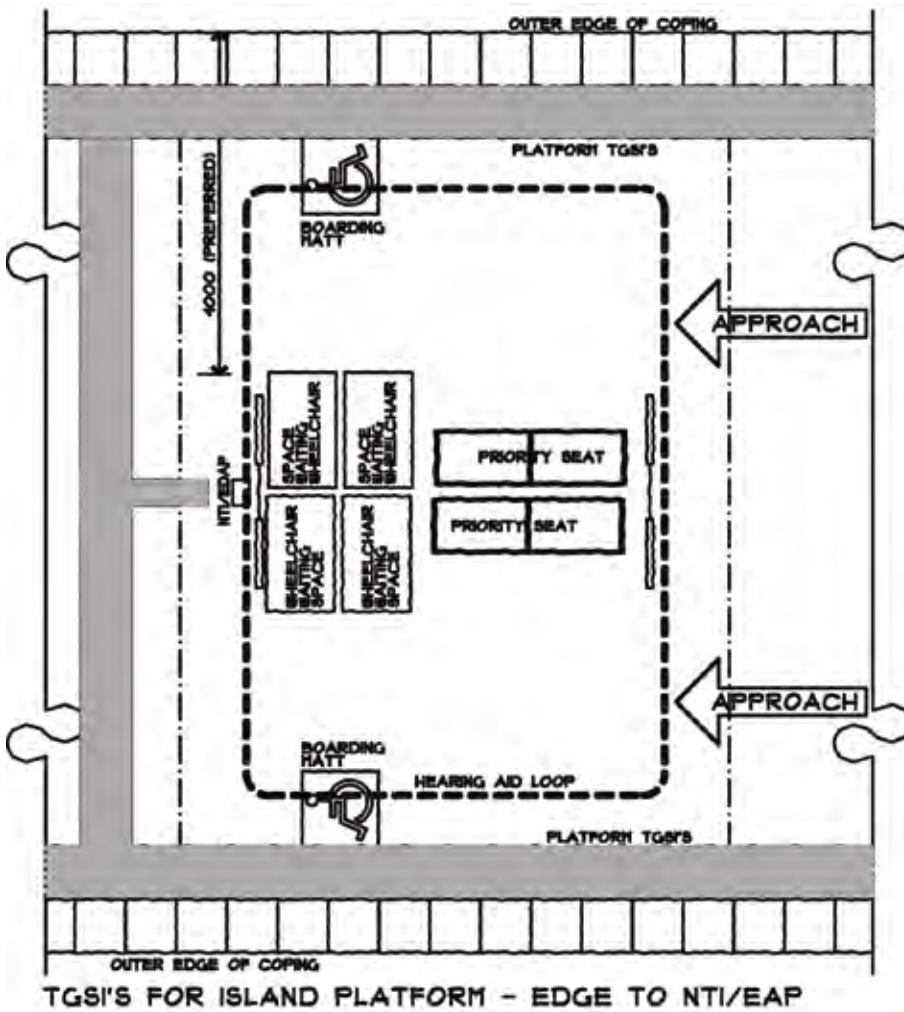


Diagram 9

Waiting Space

A dedicated waiting area for persons with disabilities is required for each platform. The following defines the minimum requirement, but Queensland Rail may increase the number of spaces where justified by patronage.

- One standard seat (Queensland Rail drawing 2487 in Appendix H) is required at each waiting area. These are referred to as “priority seats”. Note that the front edge of the seats must be at least 500mm clear of the edge of any path of travel to accommodate leg space.
- Two 1300 x 800mm wheelchair waiting spaces (wcws) are required at each waiting area.
- The seat(s) and wcws must be adjacent to the boarding area. For existing sites they may be within 5 metres. Diagrams 5 & 6 illustrate the preferred layouts for different platform conditions.
- Persons within the waiting area must be able to see an approaching train and must be visible to the train guard when the train is stationary.
- While gradients up to 1 in 40 are permissible, it is preferable to grade the ground surface within the waiting area at a max of 1 in 60.
- The surface must be non-slip and free draining.
- The waiting area should be under cover. If a standard shelter is to be used, it may be supplied in kit form by Queensland Rail (refer Section 8). The consultant is responsible for documenting its location and the contractor is responsible for constructing footings and slab and transporting and erecting the shelter.
- The waiting shelter roof height and pitch should not be too great as to allow rain onto waiting passengers.
- The hearing augmentation loop must cover the whole of the waiting area.
- Fully accessible signs must identify the wcws and the seats as reserved for persons with disabilities.
- WCWS do not require further identification by symbols or ground definition as used on rollingstock and buses.
- Illumination levels for waiting areas and signs and symbols (horizontal and vertical) are prescribed in the DSAPT and summarised in the Webb Report.
- DSAPT requires luminance and colour contrast for seats, signs, symbols and TGSI's.
- Passenger information systems such as TIPS and destination signs must be visible to persons using the priority seats and wcws.
- Public address systems must be clearly audible to persons in the waiting area.
- Any alarms (audible and visible) must be accessible to persons in the waiting area.
- For refurbishment of existing narrow platforms, Queensland Rail may approve alternative waiting area layouts. Diagram 7 illustrates an example of such a layout that used 800mm seats (Queensland Rail drawing 2671).

NTI/EDAP

A combined next train information unit (NTI) and emergency and disability assistance 'phone (EDAP) must be located near the waiting area.

- The NTI/EDAP must be located such that a person travelling from the lift to the waiting space is aware of its existence. It is also preferred that a person moving from stairs to waiting space encounters similar awareness.
- Queensland Rail requires that the path from the platform edge TGSI's to the NTI/EDAP be defined by yellow, directional TGSI's. The preferred configurations are shown in Diagrams 8 & 9.
- Minimise the need for people using wheelchairs to cross TGSI's.
- The consultant is required to document the location of the NTI/EDAP and the TGSI's. The contractor must install footings, conduits and the (Queensland Rail supplied) pedestal. Queensland Rail will install and commission the NTI and EDAP units.
- *The directional TGSI's to the NTI/EDAP are part of the station wayfinding cues Refer to section 23 for further details on wayfinding.*

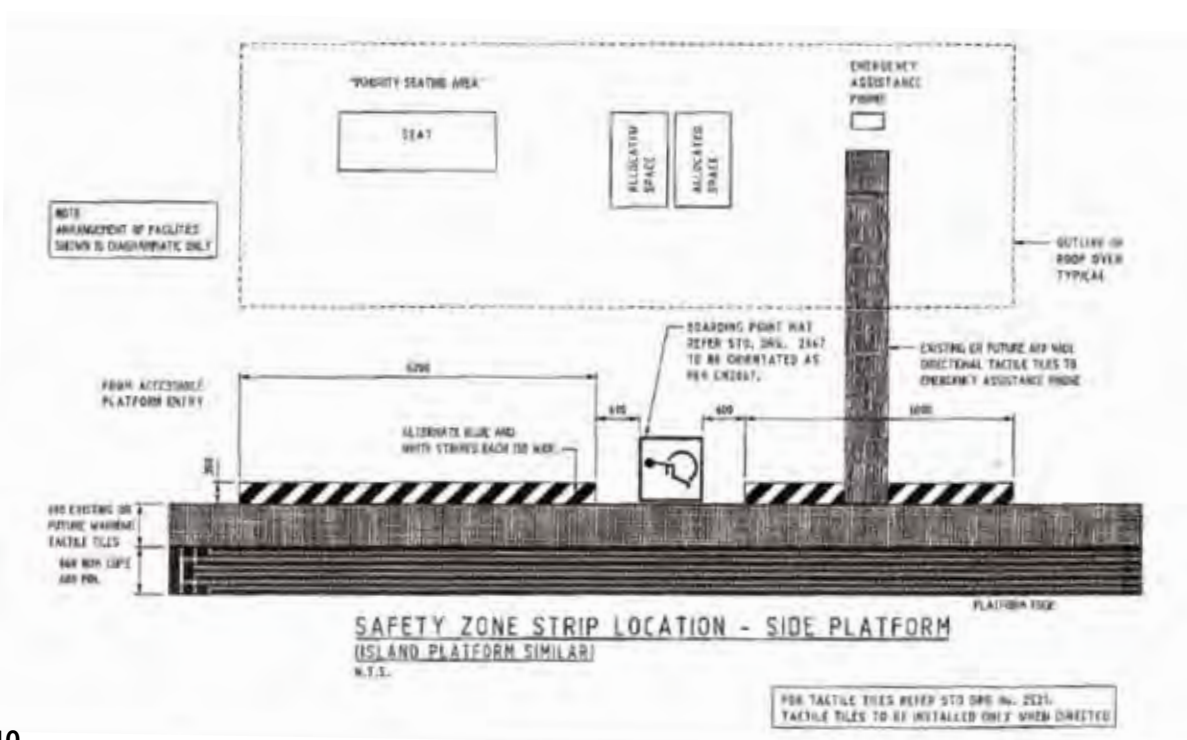


Diagram 10

Surface Markings

Minimise the number of surface markings. Ensure that those that are used are non-slip and do not generate a trip hazard.

Blue/white safety-zone marking will be required in the core zone where instructed by Queensland Rail in accordance with Diagram 10. Queensland Rail recommends a non slip coating (Degacote C1) or approved equal as the preferred finish for the blue and white safety zone markings.

White Cope paint details: Watty, Permo Pave non slip white.

‘Stay Behind Yellow Line’ mats are to be installed as follows:

- For an island or side platform with no end access: Place mats spaced at 15m from each end, then a mat, then 15m, then a mat, then mats at 10m spacing.
- For a platform with access from both ends: Place the mats at 10m centers for the whole platform.
- For a platform with access from one end: The non access end receives the 15m treatment as above, however the access end receives the 10m treatment.

1.4 NON-CORE AREA

While the Core Area “controls” the design there are many other elements required on a functioning railway station platform. Each of these elements is dealt with in detail elsewhere in this design guide. This section focuses on the positioning of such functions relative to the Core Area. Diagram 11 illustrates the preferred relationship between these functions.

1.4.1 Ticket Counter

The ticket counter when attended has three main functions

1. Ticket sales / Go Card sales
2. Staff contact for advice or assistance
3. Security via observation of activities

It should therefore

- Be close enough to the core area for the convenience of persons with disabilities but not so close as to cause conflict between queuing, waiting, boarding and circulation spaces.
- Afford staff at the window maximum view of the core area.
- Be free from glare caused by low-angle morning and afternoon sun.
- Be free from distractions such as acoustic reverberation
- Have sufficient circulation space for anticipated peak customer demand.
- Be fitted with a pull-down blind.

Diagram 12 shows the required circulation space for customers at ticket counters.

Refer to Section 9 of this document for ticket counter requirements.

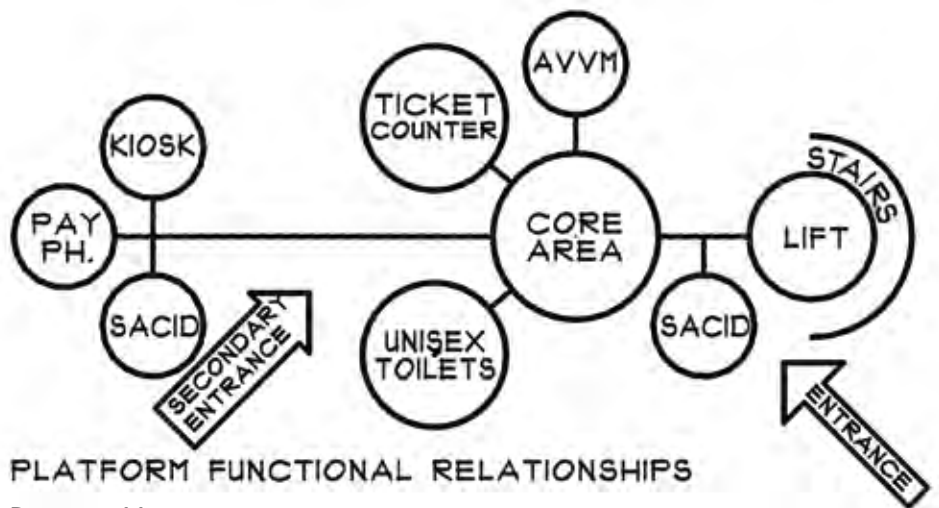


Diagram 11



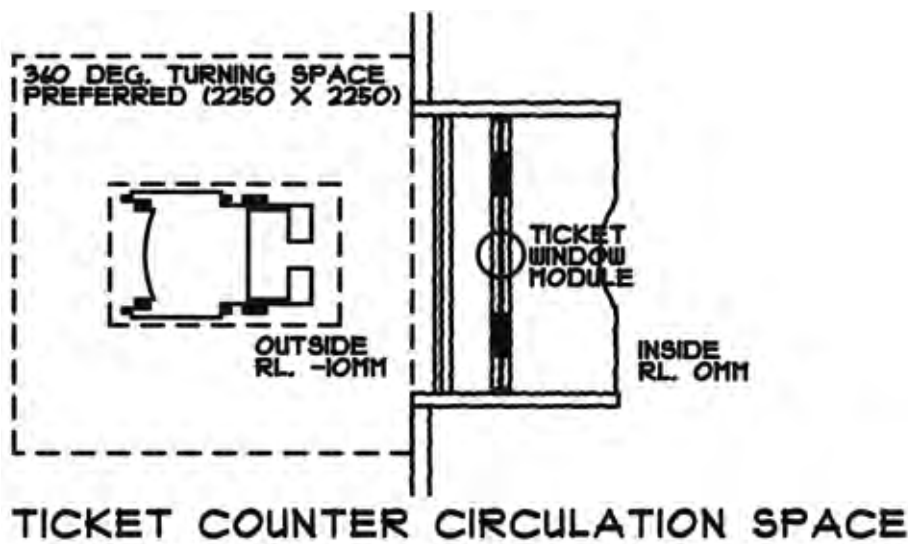


Diagram 12

1.4.2 Toilets

The number and type of toilet facilities to be provided will be determined by Queensland Rail Refer to Station Categorisation information. At least one toilet needs to have the following:

- Accessible under the provisions of DSAPT – many persons with disabilities are ambulant and can use std toilets.
- Close enough to the core area for the convenience of persons with disabilities but not so close as to cause conflict between queuing, waiting, boarding and circulation spaces.
- Provided with sufficient circulation space.

Separate unisex toilet facilities are to be provided for staff, confirm with Queensland Rail.

Refer to Section 12 of this document for toilet requirements.

1.4.3 Lifts

It is anticipated that lift(s) in combination with overpass or underpass will be required at most stations to satisfy the “accessibility” requirements of the DSAPT.

Diagram 13 illustrates the three lift car sizes commonly used by Queensland Rail. The car size may need increasing to suit anticipated demand at some stations – Queensland Rail will advise.

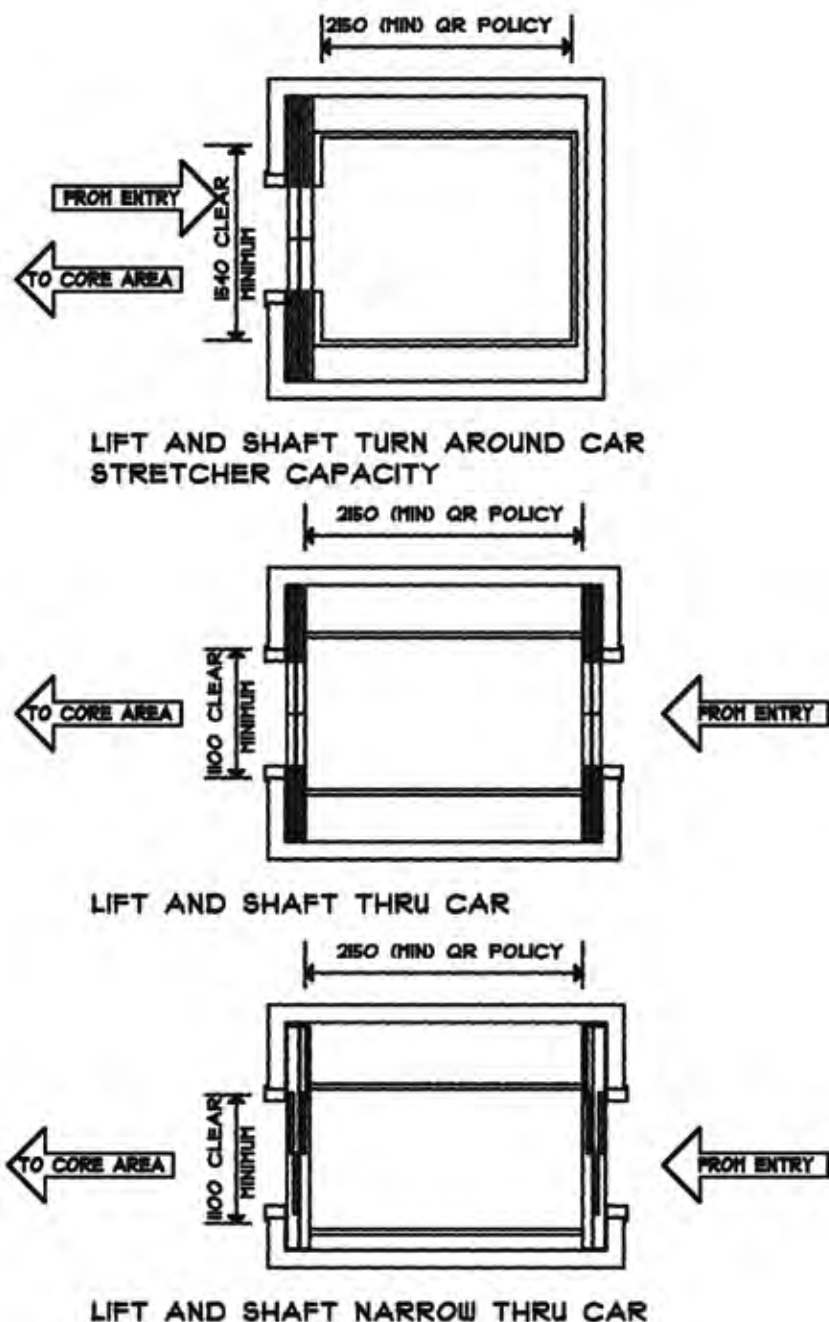
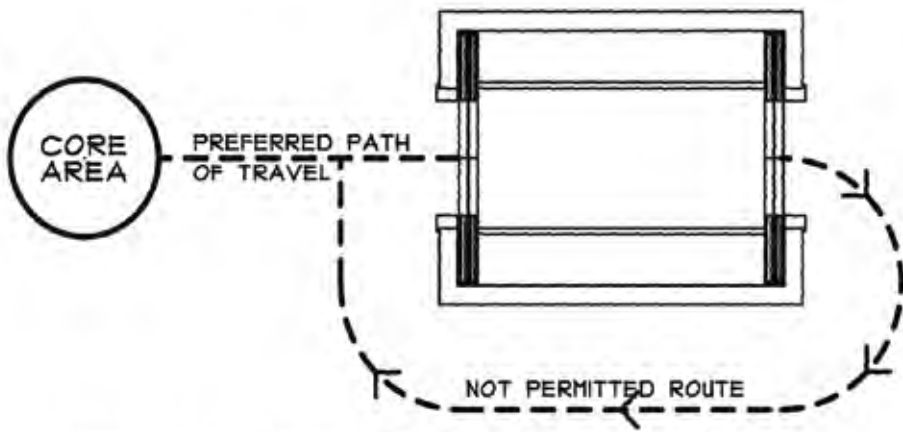


Diagram 13



LIFT ENTRY AND EXIT PREFERENCES

Diagram 14

The location of the lift at an existing station is often dictated by the width of the platform or availability of land. However, the following is preferred.

- The path from the lift door to the core area is to be as short and as direct as possible. Refer to Diagram 14.
- The lift door should be observable by staff at platform level ticket counters.
- A minimum 2.4 metre square covered waiting space is to be provided at the lift entry.
- Provide for 360 degree wheelchair turning space at both the lift entry and the lift call panel location.

The threshold level of the lift door has often generated gradient and crossfall problems on platforms. 1 in 40 is the maximum permissible gradient for new work in pedestrian areas.

The lift call panel must be at least 500mm clear of wall, rail or other obstacle. The lift door must not face towards the platform edge.

Refer to Section 4 of this document for requirements for lifts.



1.4.4 Stairs or Ramps

Most platforms will require stair or ramp access. Like the lift, the location is often dictated by available platform width. The following is preferred.

- The path from the stair or ramp to the core area is to be as direct as possible. Its length is not as critical as that from the lift to the core area.
- Provide adequate circulation/ queuing space at the entry to the stair or ramp.
- Locate any SACID(s) sufficiently clear of the top of stair or ramp to permit circulation without risk of fall.
- Locate any SACID(s) sufficiently clear of the top or bottom of stairs to eliminate need to queue on stairs.

The proximity of top of stair to lift exit at overpass level can generate potential hazards. Diagram 15 shows the preferred relationship. However, as this offset configuration is often not possible on existing platforms, Queensland Rail may approve direct alignment if the space between lift and stair is increased and the walls are generously splayed. Bollards are NOT to be used at the top of stairs. If stairs are opposite a lift entrance on an overbridge, the first riser must be sufficiently clear of any path of travel to allow the required TGSI's to be located clear of that path. Diagram 16 shows the preferred relationship and the "splay" of walls required to improve sight-lines.

The first riser must be sufficiently clear of any path of travel to allow the required TGSI's to be located clear of that path. Diagram 16 shows the preferred relationship and the "splay" of walls required to improve sight-lines.

Stairs & ramps must not exit towards the platform edge.

Refer to Section 3 of this document for ramp and stair requirements.

1.4.5 General Covered Area

Queensland Rail will determine for each site the extent of covered area required on the platforms and the degree to which cover is achieved by special or standard shelters.

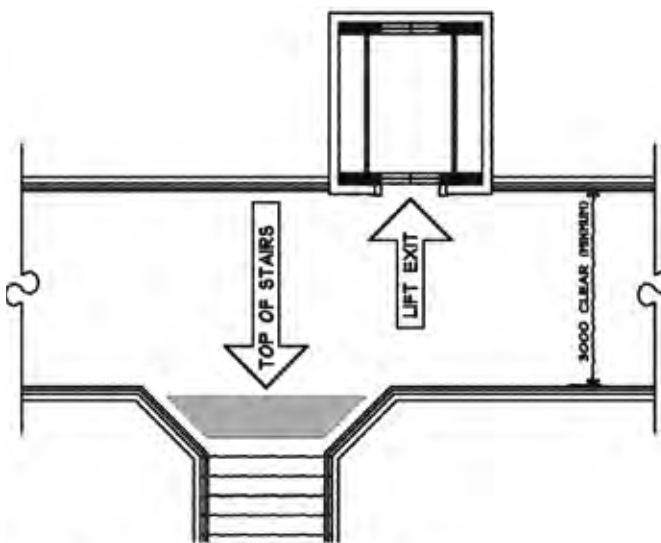
Standard shelters are dealt with in Section 8 of this document. Special shelter structures are required to achieve similar configurations such as:

- Adequate space for required functions.
- Minimal number of support posts, walls, etc.
- Post locations well clear of paths of travel.
- All base plates below surface or concealed within structure.
- Clear height for security cameras (CCTV), etc.
- Clearances from overhead traction wiring system.
- Workplace safety at various working heights (maintenance).
- Colour contrast issues.
- Protection from the elements for waiting passengers.
- Sufficient height for TIP's eg LCD's or LED's.

1.4.6 Other Issues on Platforms

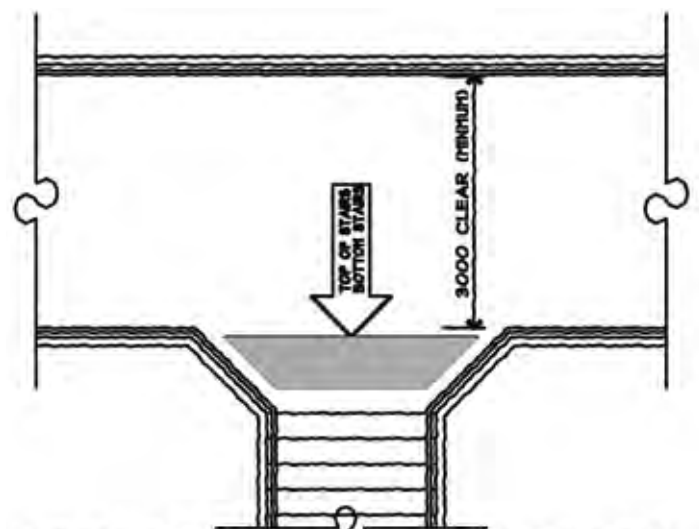
Every element required to be on a platform needs to be located as an integral part of the design process. Common issues not already mentioned are addressed as follows:

- Refer to Section 2 for surface markings and fitments.
- Refer to Section 10 for general seating, bins, resting rails and the like.
- Refer to Section 11 for vending machines, advertising signs and telephones.



LIFT ENTRY/EXIT NOT DIRECTLY OPPOSITE STAIRS

Diagram 15



STAIR ACCESS TO UNDER/OVER PASS

Diagram 16

SOURCES OF REQUIREMENTS FOR PLATFORMS

Item	Standard	Requirement
Width access path		
	DSAPT Clause 2.4(1)	
AS 1428.2 Clause 6.4		
HREOC exemption	HREOC exemption does not apply to new sites or to new work at existing stations.	
Gradient access path	DSAPT Clause 2.1(2)	
AS 1428.1 Clause 5.2a		
Cross fall access path	DSAPT Clause 2.1(2)	
AS 1428.1 Clause 5.1.1b	Queensland Rail prefers 1:40 to 1:60. Min 1:100 for drainage.	
Sides of access path	DSAPT Clause 2.5	30% luminance contrast for adjacencies.
Obstructions		
	Queensland Rail standard for existing stations only	Bollards not permitted in access paths. Poles and masts in the access path to be painted safety yellow (Y14) from ground up to 1500mm or fenced off.
Manoeuvring area	DSAPT Clause 3.1	
AS 1428.2 Clause 6.2		
Passing areas	DSAPT Clause 4.1	
AS 1428.2 Clause 6.5a		
Surface		
	DSAPT Clause 10.1	
BCA 2008 DP7		
Lighting		
	AS 1428.2 Clause 19.1	Refer to Webb Report.
Resting points	DSAPT Clause 5.1 & 5.2	
AS 1428.2 Note Clause 7 & Clause 27.1a	Resting points every 60m. Seating to be provided.	
Shelters	Queensland Rail Standard	
Waiting areas - priority seats	DSAPT Clause 7.1	
	In waiting areas min 2 seats available for people with a disability or 5% of total. "Priority Seating Area" sign to be provided on seat back or on wall.	
Wheelchair waiting spaces	DSAPT Clause 7.2	
AS 1428.2 Clause 17.1	Min 2 allocated spaces or 5% of the area. Identified by sign attached to a structure or platform surface on a mat	
Wheelchair waiting space dimensions	DSAPT Clause 9.1	

AS 1428.2 Clause 6.1	800mm wide x 1300mm long. Level area with 1:40 to 1:100 cross fall.	
Boarding Point	DSAPT Clause 8.1(1)	
AS 1428.1 Clause 14.2 Figure 32 & 33	Firm and level surface (1:40 to min 1:100). Access symbol AS 2899.1 symbol 131 (ISO 7001 symbol 031) placed on platform surface.	
1.5 continued		
TGSI's		
	DSAPT Clause 18.1	
AS 1428.2 Clause 18.1		
AS 1428.4 Figure A5		
HREOC agreement	Vertical abutment tolerance 3mm.	
Platform width to board by portable ramp	Queensland Rail standard	Min 4000mm from platform edge or 3000mm for high level platforms.
Circulation space to use consoles, food and ticket vending machines	DSAPT Clause 3.1	
AS 1428.2 Clause 6.2		
DSAPT Guidelines 3.2	Surface slip resistant with max 1:40 to 1:100 cross fall.	
Drinking fountain Circulation space	DSAPT Clause 3.1	
Pay Telephones circulation space	AS 1428.2 Clause 30.1	
Pay Telephones dimensions	AS 1428.2 Figure 35	
Hearing loops	DSAPT Clause 26.1	
AS 1428.2 Clause 21.1	Induction loop most practical for railway stations. International symbol of deafness as a sign or decal to be placed at the boundaries of hearing loop area. System must not be subject to interference from, or cause interference to, other equipment.	

1.6 TYPICAL PLATFORM LAYOUTS - ISLAND PLATFORM

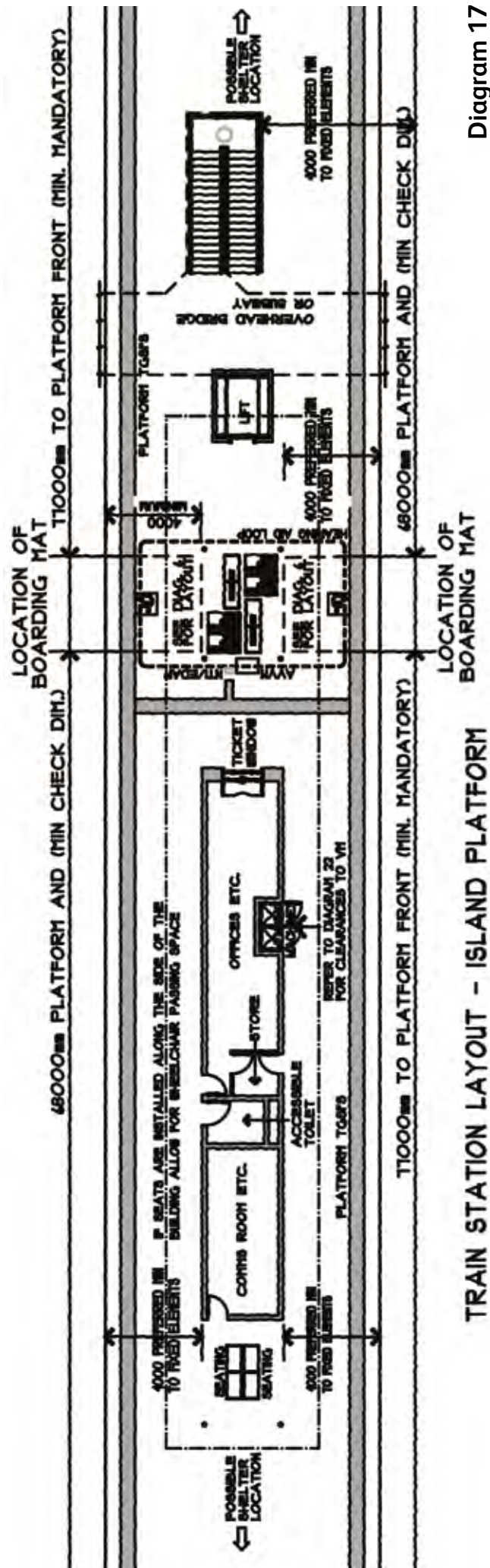
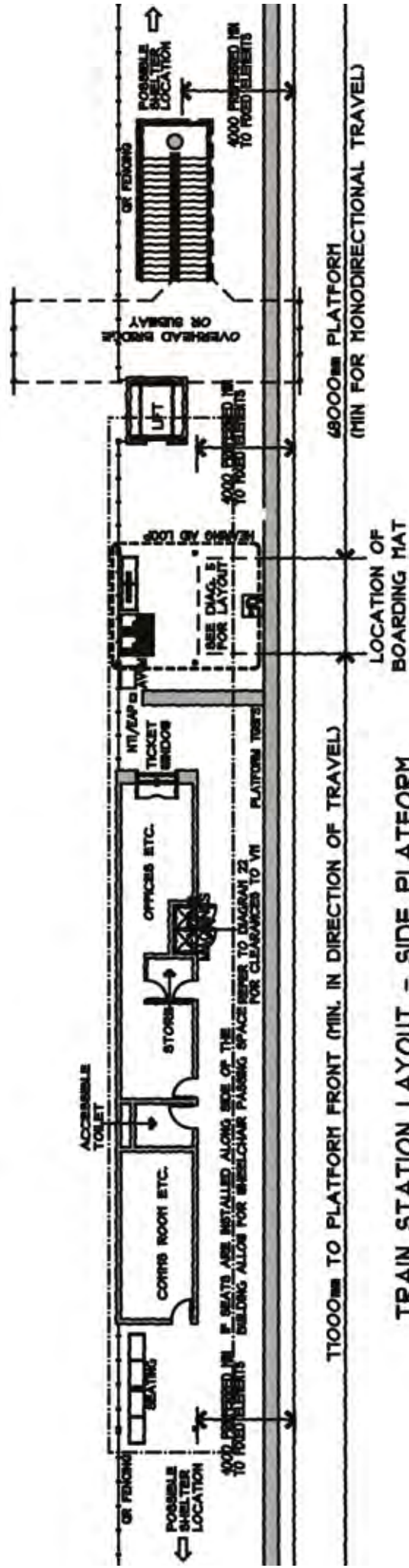


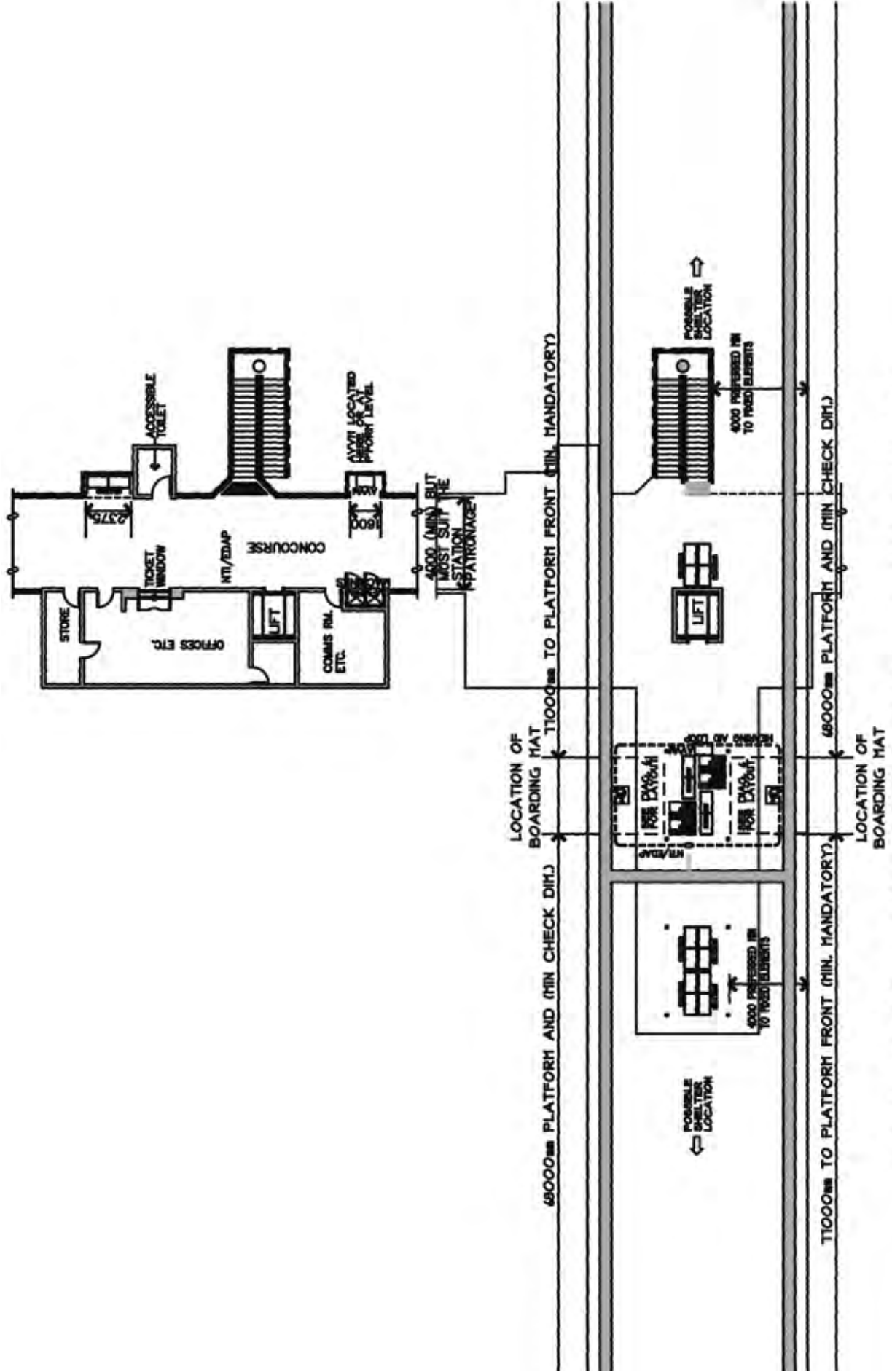
Diagram 17



TRAIN STATION LAYOUT - SIDE PLATFORM

Diagram 18

1.6 TYPICAL PLATFORM LAYOUTS – ISLAND PLATFORM + CONCOURSE



TRAIN STATION LAYOUT – CONCOURSE + ISLAND PLATFORM

Diagram 19

2.0 Surfaces

Queensland Rail has slip resistance test results for many surfaces commonly found in Railway Stations.

Those results can be made available if necessary. However, actual compliance for new surfaces is the responsibility of the designer.

2.1 GENERAL

The key issues to be addressed when designing surfaces in pedestrian areas are:

- Surfaces are to be slip resistant when dry or wet
- Surfaces are to be free draining
- Gradients and crossfalls must comply with the DSAPT
- Abrupt changes of level cannot exceed the limits set by DSAPT.
- Colour and luminance contrast must comply with the DSAPT.
- Surfaces must be reasonably even and free of irregularities that could trap heels or confuse persons using a cane.
- Avoid unnecessary sharp transitions in colour/gradient/texture that can cause confusion for those with a vision impairment.

2.2 SLIP RESISTANCE

All surface elements (asphalt, concrete, tiles, paving, pit lids, grates, markings, etc) must be non-slip when wet or dry.

New surface materials must be rated at least R10 to R12 resistance as defined in Table 5 of AS4586.2004. Refer to the latest standard.

Slip resistance: Existing surfaces must be rated Low to Very Low notional contribution of the floor surface to the risk of slipping when water wet in accordance with Table 1 AS 4663 and moderate to very low notional contribution of the floor surface to the risk of slipping when dry in accordance with Table 2 AS 4663. Reference for compliance should be made to HB197:1999.

Existing surfaces must be rated HIGH to VERY HIGH as defined in Tables 1 or 2 of AS4663.2004.

Queensland Rail has slip resistance test results for many surfaces commonly found in Railway Stations.

Those results can be made available if necessary. However, actual compliance for new surfaces is the responsibility of the designer.

Garden mulch, pebbles and leaf litter can generate slippery conditions. Refer to Section 16.

2.3 DRAINAGE

Surfaces must be free draining. Surface water must not be able to build up or pond in any pedestrian area.

This requirement necessitates particular attention to:

- Gradients in asphalt surfaces.
- Gradients on landings.
- Detailing of junctions between different surface materials.
- Location of field inlets.
- Location of footings for masts, posts, seats, etc.
- Location of free standing equipment.

As it is often necessary to clean railway station areas, this requirement applies to all pedestrian areas regardless of the degree of cover or enclosure.

2.4 GRADIENTS & CROSSFALLS

Floor surfaces in platform pedestrian areas must be of even grade (maximum 1:40) sloped away from platform edges with falls to suit platform drainage & field inlets as well as accessibility requirements.

Ramps at stations must be designed in accordance with DSAPT. Heavily textured broom finish concrete is recommended for ramp surfaces.

2.5 TRIP HAZARDS

DSAPT requires surfaces to comply with clause 6.6 of AS1428.2. Exposed structure base plates are not permitted within pedestrian areas.

2.6 COLOUR & LUMINANCE CONTRAST

The requirement for colour & luminance contrast between various surface elements must be considered when choosing materials.

A common problem arises from the practice of using both asphalt and concrete for different parts of the same platform. A material/colour combination chosen for its contrast with asphalt often fails to achieve adequate contrast with dry concrete in full sun conditions. The concrete in such a situation would need to be coloured eg dark grey.



Light pavement colours can also generate glare. This reduces depth perception for many people.

The requirements for colour and luminance contrasts are generated by the need to assist persons with vision impairments to find appropriate “shorelines” for directional guidance. The regulations cover the most common shorelines such as TGSI’s, handrails and door jambs. But the same principles must be extended to other shore-lining elements such as tapping rails, kerbs, floor/wall junctions and garden beds/turf (only external to platforms) where they form the edge of a path of travel.

2.7 EVENNESS

Uneven surfaces such as pavers can give confusing messages to a vision impaired person who relies on a cane.

Sudden changes in crossfall can be similarly confusing and can also generate navigational difficulties for persons in wheelchairs.

Drainage grate “slots” must comply with DSAPT and the grates must be slip resistant.

2.8 PLATFORM EDGES

Platform edge copings (600 mm minimum for new platforms and up to 690mm wide on existing platforms) at all stations must be delineated with the use of a white cope paint. In addition to white copings, a 600mm wide band of yellow warning TGSI’s are to be installed on platforms to indicate minimum distance back from platform edge. The non-track edge of the TGSI’s is to be minimum 1200mm from the platform edge of the coping on stations. On higher speed sections of track, greater set-back distances will be required as advised by Queensland Rail.

White Cope paint details: WattyI, Permo Pave non-slip white finish.

New platforms to have coping (600mm wide) made with white cement (or tiles if approved by Queensland Rail) to eliminate need for painting platform edges and warning tactile tiles, 2 rows, (600 mm wide approximately) in “Granito” Canary Yellow or approved equivalent (Refer to Queensland Rail for options). For further details on the coping stone and TGSI layout, refer to Drawings 2531 and 2585 – See Queensland Rail for drawings.

Platform edge TGSI’s must be as per CESS 8, clause 8.6.4. Drawing 2531 also shows the required TGSI layout at platform ends.

2.9 SURFACE MARKINGS

The International symbol for accessibility is to be applied to the platform surface using a pre-printed mat at pre-determined locations (boarding points). Where multiple boarding points are required (platforms with combined terminus and through train use) Queensland Rail may require an additional mat indicating the function of the particular symbol.

Where it is not practicable to install an appropriate sign, a similar mat may be installed by Queensland Rail to define wheelchair waiting spaces.

Train stop marks require approval to be shifted and prior to shifting Queensland Rail will arrange notification of train crew. The approval to shift the marks shall be undertaken, in conjunction with Queensland Rail, in the design phase of the project. Note the design approval process can take up to eight weeks. Construction approvals require 2 weeks notice to shift.



3.0 Ramps & stairs

The compliant means of DDA access to platforms are lifts and/or ramps. Queensland Rail prefers lifts to be installed in new designs.

Stairs are an acceptable, and useful, adjunct to lifts or ramps.

Every publicly accessible ramp or stair within Queensland Rail property must comply with the DSAPT.

3.1 GENERAL

The compliant means of DDA access to platforms are lifts and/or ramps. Queensland Rail prefers lifts to be installed in new designs.

Stairs are an acceptable, and useful, adjunct to lifts or ramps.

Every publicly accessible ramp or stair within Queensland Rail property must comply with the DSAPT.

3.2 LOCATION

Refer to Clause 4.04.4 for stair location.

Ramps are difficult to “fit into” island platforms and are only “efficient” at moving people over relatively small vertical distances. Ramps for platform access are only appropriate where topography permits.

3.3.1 Stairs

Queensland Rail prefers steps to be 150mm rise x 300mm going. On existing sites, Queensland Rail might approve slightly steeper stairs, but they must still comply with the DSAPT. Consistency in rise (or going) throughout any flight of stairs (including top and bottom risers) is both a regulatory requirement and a critical safety issue.

- There cannot be more than 18 risers between landings and, after 36 risers there must be a change of direction of at least 30 degrees. Note: Contact Queensland Rail for instructions if this is not possible as related to a platform.
- Queensland Rail prefers integral colour non-slip nosings to treads/risers. Queensland Rail prefers 65 to 75mm on the tread and 50mm on the riser. Paint-on colour contrast strips are not acceptable. For new Stairs Queensland Rail prefers:— Latham Asbrabronz (or similar Queensland Rail approved) recessed, slip resistant safety stair tread nosings with brown inserts (product number B744VS-WAK). These are to be cast into the step so that the top of the bronze body finishes level with the tread. For existing stairs: Allstate Linemarking Queensland Rail stair nosing, Queensland Rail prefers:- 50* 75mm, yellow with illuminated strips.
- Treads are to be non-slip and free draining but at maximum grade of 1 in 100 at right angles to the direction of travel. The treads must be level parallel with the direction of travel on existing stairs. To ensure that the treads are level it may be necessary to apply a non-slip material to the back of the stair tread. All non-slip treatments must meet the current Australian Standards.
- Queensland Rail prefers dark grey concrete stairs in order to achieve contrast with nosings and appear comparatively clean. Other materials may be considered.



- Risers must be closed.
- All must be low-maintenance.
- Colour contrast TGSI's must be correctly located.
- Landings are to be free draining at a maximum gradient of 1 in 50 (but riser height must remain constant across width of tread).
- The first riser (top or bottom) to stairs must be sufficiently clear of any intersecting path of travel to ensure that TGSI's and/or handrail extensions do not protrude into the path – Queensland Rail drawing CM2343 identifies requirements at typical intersections.

3.3.2 Ramps

- Ramp gradients/lengths are in accordance with DSAPT.
- Changes of gradient must be sharply defined.
- Ramps over 5.4 metre net length need 1800mm clear width between handrails to satisfy the wheelchair passing space requirements. This is a minimum requirement – the actual width should be compatible with anticipated demand.
- The top or bottom of a ramp must be sufficiently clear of any intersecting path of travel to ensure that TGSI's and/or handrail extensions do not protrude into the path – Queensland Rail drawing CM2343 identifies requirements at typical intersections.
- Ramps and landings are to be non-slip.
- Landings are to be free draining at a maximum gradient of 1 in 50 (at right angles to the top or bottom of the ramp).
- Colour contrast TGSI's must be correctly located.
- The bottom of a ramp must not exit towards the edge of a platform.

3.3.3 Kerb Ramps

- Kerb ramp configurations are to be in accordance with the DSAPT.
- Changes of gradient must be sharply defined.
- Ramps are to be non-slip – preferably broom-finished concrete.
- Kerb ramps on Queensland Rail property are not to be fitted with TGSI's (Except where the other side of the road is a council kerb ramp with TGSI's).
- Kerb ramps constructed as part of a project outside Queensland Rail property are to be fitted with the TGSI's as required by the local authority.
- The kerb ramp at as shown below left has a sharply defined shape and achieves colour contrast from the dark pavement surrounds.
- Kerb points should be aligned with the direction of travel.

3.3.4 Handrails

- Handrails are to comply with DSAPT.
- Second (children's) rails are not to be installed on Queensland Rail property unless instructed otherwise.
- Queensland Rail prefers handrail systems to be stainless steel with nominal 42.2mm diameter rails.
- Queensland Rail requires tapping rails or kerbs – not kerb rails.
- Handrail and tapping rail are to contrast (luminance and colour) with their backgrounds. Queensland Rail prefers this contrast to be achieved by colouring the background (a SS rail against a matt blue background has been accepted). Where it is not possible to control the background, the rails must be Y14 yellow gloss. Queensland Rail is evaluating surface finish systems and will advise its preference. The handrail system strength must be certified as adequate by a RPEQ.
- Handrails must be fitted to all stairs, landings and ramps and balustrades along an access path.
- Handrails are required to project well beyond the ends of ramps and stairs. Ensure that these projections are well clear of pathways or movement spaces. Handrails must return to the wall or down to the floor.
- For long handrails, expansion/contraction joint systems should provide a continuous smooth surface however 5mm gaps are acceptable if the edges are rounded.

3.3.5 Balustrades

- Balustrades must comply with the BCA.
- Queensland Rail prefers balustrades/fences to be dark in colour – preferably black.
- Queensland Rail has standard balustrade / fencing designs for use.
- Refer to clause 10.3.

3.3.6 Head Clearance

- DSAPT mandates minimum 2000mm clear head height in all pedestrian spaces. Queensland Rail requires 2400mm clear height for effective CCTV coverage. TIPS, CCTV and the like, must be out of normal reach.
- Head clearance problems most commonly occur under stairs and the like.
- Care should be exercised when locating on-wall elements such as cabinets, sub-boards, noticeboards, hose cocks, signs, and the like to maintain required clearances.
- Non-vertical, tilted or sloping structures may have sections of reduced head clearance if the slope is excessive.

3.4. SUMMARY OF DDA REQUIREMENTS – KERB RAMPS

This table is a summary of the minimum requirements under the regulations. These will need adjusting to accommodate anticipated patronage at many stations.

ITEM	STANDARD	REQUIREMENTS
Width	DSAPT Clause 6.1 AS 1428.2 Clause 8.4.1. Figure 8 AS 1428.1	1200mm min between angled sides.
Length	DSAPT Clause 6.1 AS 1428.2 Clause 8.4.1 Figure 8 AS 1428.1	1520mm max
Gradient	DSAPT Clause 6.1 AS 1428.2 Clause 8.4.2a AS 1428.1 Clause 5.8.2 & Figure 8 BCA 2008 Clause D2.10	1:8mm max uniform gradient with 45° slope on inward sides. Graded in direction of travel. Sides to form a sharp edge with ramp.
Cross fall	AS 1428.1 Clause 5.6 & Figure 5	Cant and cross fall 1:40 max.
Barrier	AS 1428.1 Clause 5.8.2b	900mm min high can be provided where transverse pedestrian traffic.
Landing	AS 1428.1 Clause 5.8.2 & Figure 8	From top of ramp 1330mm long. Sharp transition from end of ramp. Uniform gradient.
Surface	AS 1428.2 Clause 8.4.5	Slip resistant. Ramp colour to contrast with adjoining surface.
TGSI's	Queensland Rail standard	No TGSIs used on Queensland Rail kerb ramps



3.5 SUMMARY OF DDA REQUIREMENTS –RAMPS

This table is a summary of the minimum requirements under the regulations. These will need adjusting to accommodate anticipated patronage at many stations

ITEM	STANDARD	REQUIREMENTS
Width	DSAPT Clause 6.1 AS 1428.2 Clause 8.1a	1200mm min, 1800mm if over 6m in length.
Gradient	DSAPT Clause 6.1 AS 1428.2 Clause 8.1b AS 1428.1 Clause 5.3	If length is <1520mm gradient 1:8; >1520mm gradient 1:14 – 1:19. Gradient constant between landings.
Cross fall	AS 1428.1 Clause 5.1.1b	1:40.
Landings	DSAPT Clause 6.1 AS 1428.1 Clause 5.7	Located at top, between sections and bottom of ramp. 1200mm long. If gradient 1:14, every 6m. If 1:19 every 14m.
Passing areas	DSAPT Clause 4.1 AS 1428.2 Clause 6.5	When ramp is <1800mm wide passing areas to be provided every 6 m on ramp. At the 6m point either the sloped section or a landing to be widened to min 1800mm.
Head clearance	AS 1428.1 Clause 5.1.1b	2000mm vertical.
Surface	AS 1428.2 Clause 8.4.5 AS 1428.1 Clause 5.1.2 BCA 2008 Clause D2.10c	Slip resistive. Uniform with no water ponding. If grating used, gaps 13mm wide x 150mm long.
Lighting		In accordance with the Webb Report
Handrail height	AS 1428.1 Clause 6.1c	860mm -1000mm high with 600mm clear space above. Height to be consistent throughout.
Handrail surface	AS 1428.2 Clause 10.1.1	Continuous slip resistive gripping surface. No rotation of rail in fittings.
Handrail profile	AS 1428.1 Clause 6.1a	30mm - 50mm uniform cross section. 5mm min radius at exposed edges and corners. Installed with 2700 clear hand space.
Wall - handrail gap	AS 1428.1 Clause 6.1h	50mm min.
Handrail return	AS 1428.2 10.1.1b BCA 2005 D3.3(a)(ii)	End of rail to extend 300mm parallel to floor surface, then turn 1800 for 100mm or return to wall or end post to the ground.
Handrail contrast	Queensland Rail Standard	30% luminance contrast with background.
Kerb rails	AS 1428.1 Clause 5.3 f	65mm - 75mm above floor level. Rail aligned to ramp edge or 100mm away from ramp path.
Balustrade	BCA 2005 Clause D2.16	When there is a drop of 1m or more a continuous barrier is required. See BCA for details.
TGSI's	AS 1428.2 Clause 18.1 AS 1428.4 (1992) Clause 6.2, Figure 4	600mm wide warning TGSI's to be 300mm +/- 10mm from top and bottom of ramp. Width of TGSI's 600 +/- 10mm mm. Must have 30% colour contrast with adjacent surface. Vertical abutment tolerance 3mm.
Domed button	1428.2 Clause 10.1.1c	Domed button to be placed on top of handrail 150mm +/- 10mm from end.

3.6 SUMMARY OF DDA REQUIREMENTS –STAIRS

This table is a summary of the minimum requirements under the regulations. These will need adjusting to accommodate anticipated patronage at many stations

ITEM	STANDARD	REQUIREMENTS
Stair width	BCA 2005 Clause D2.9	No min or max width, except for emergency stairs which are 1000mm between handrails. Width may be divided by a handrail if >2m.
Handrails	AS 1428.2 Clause 10.1.2b	Inside handrail to be continuous on stairs and landings. Outside handrails to be the same if practicable.
Handrail contrast	AS 1428.1 Clause 10.1.2c	30% luminance contrast with background walls.
Wall - handrail gap	AS 1428.1 Clause 6.1	50mm min.
Handrail extension & return	AS 1428.1(2001) Clause 9.2(c); Figure 17	BOTTOM OF STAIRS - handrail is extended downwards from the last riser at a vertical angle I tread width plus extension 300mm horizontal with landing. Turn end 1800 or return fully to end post to ground or wall face. TOP OF STAIRS – handrail is extended 300mm min horizontal with landing. Turn end 1800 or return fully to end post to ground or wall face.
Balustrade	BCA 2008 Clause 2.16	Where people could fall 1m or more a continuous barrier is required. Top to be 865mm minimum above nosings and bottom not to permit a 125mm sphere to pass through.
Lighting	AS 1428.2 Clause 19.1 AS 1680.2.1 Appendix E	Refer to Webb Report
TGSI's	AS 1428.1 Figure 17 AS 1428.4 (1992)	600mm wide warning TGSI's min 600 +/- 10mm from last riser on top and bottom landings except in enclosed stairways where this can be reduced to min 300 +/- 10mm. Where landings are enclosed, TGSI's can be replaced by a continuous outer handrail. Must have 30% colour contrast with adjacent surface. Vertical abutment tolerance 3mm.
Domed button	1428.2 Clause 10.1.1c	Domed button 4-5mm high and 10-12mm diameter placed on top of handrail 150mm +/- 10mm from end. Used to replace warning TGSI.



4.0 Lifts

In most cases, the lift is the primary means of unaided access to platforms for persons with mobility impairment. It is therefore a significant component of the “journey” mentioned in previous sections.

4.1 PURPOSE

A correctly equipped lift at a railway station must perform two major functions:

- It enables persons with mobility impairments to change levels without assistance.
- The announcement can provide directional advice.

4.2 TECHNICAL REQUIREMENTS

Queensland Rail has standard lift specifications for new lifts and for refurbishing existing lifts. Drawing 2593 and Queensland Rail Specification Part 39 form the basis for these specifications. As compliance with the regulations for lifts is an extremely complex issue, no deviation from those specifications will be permitted.

Queensland Rail requires that all new lifts be capable of carrying Queensland Ambulance Service stretcher. Three lift car configurations are possible.

13 person through lift car.

13 person narrow through lift (restricted space only).

13 person turn-around lift.

The latter two are only to be used with specific approval of Queensland Rail.

Diagram 13 in 1.4.3 illustrated the shapes of these lift cars.

4.3 LOCATION

The lift should be placed as close as possible to the platform core area. The lift door at platform level must face the core area. There must be clear lines of sight from the lift (when the platform door is open) towards the core area, ticket counter (if any) and ticket machine (if any). The lift door must not face the platform edge.

The lift door at street or parking level should face the main direction of pedestrian approach/exit.

At each landing level there must be sufficient manoeuvring space for a 180 degree wheelchair turn centred on the lift call panel. A similar space must face the centreline of the lift door. For all new stations, the lift call panel must be to the right-hand side of the lift door on the face of the shaft. Stand-alone lift call panels may be required in some “upgrade” projects; but they are only permitted with the written permission of Queensland Rail.

Diagram 14 in 1.4.3 illustrated these various space and path requirements.

4.4 MATERIALS

The lift shaft construction must be glass vandal resistant and low maintenance.

Under some circumstances the shaft will need to comply with

- CESS 7 – Protection of Structures against Collision with Rolling Stock.
- MCE - SR - 006: Requirements for the design of footbridges over or near railways
- MCES - SR - 012: Protection of supporting elements adjacent to railways.
- ASS100

The external materials must be graffiti resistant or at least easy to clean. Ceramic tiles must be heavy duty, vandal resistant, fully bedded, have a hard glazed gloss surface and be at least 200mm square. Note polished ceramic and other porous tiles are not permitted. Mosaics are not permitted. Tile grout must be epoxy grout for cleaning of vandalism purposes.

Community art programs, particularly through local schools, have often produced suitable cladding materials for lift shafts at railway stations. Such programs must be approved in advance by Queensland Rail.

The colour scheme must support the colour and luminance contrast requirements of the DSAPT.



5.0 Pedestrian underpasses & overpasses

Track crossings by pedestrians must occur by either an underpass (subway) or an overpass (footbridge). Both are difficult to secure and observe and can contain spaces in which persons can feel trapped and intimidated. Where the topography of the station site permits, an underpass or overpass should be designed so as to exit directly to ground level. When combined with clear sightlines, bright colours, gentle grades and good illumination, a sense of safety is generated.

Underpasses are not to be used where there is a risk of flooding. They should also be avoided where CPTED principles cannot be achieved in its design ie line of sight, suitable width, passive surveillance etc.

5.1 DIMENSIONS

Underpasses and overpasses are, at peak times, transition spaces for large numbers of people and must be designed for likely demand.

Width: The minimum permissible width is 1800mm clear between hand rails. But more width is usually required for passenger flow and general comfort. Narrow subways can be particularly claustrophobic. The structure width must allow for equipment such as SACID's or NTI's to be located behind the handrails. Increase the width at entry/exit to lift, stairs, ramp, etc.

Height: Sufficient height must be provided to permit the installation of three-line LED (470mm high) panels or LCD panels at sufficient height to be out of general reach. This should allow adequate line of sight for CCTV cameras. Queensland Rail prefers a minimum of 2.4 metres to underside of LED/LCD panels.

5.2 LAYOUT

Stairs opposite lifts in footbridges narrower than three metres are to be avoided. Refer to clause 1.04.4,

Avoid abrupt changes of direction, maintain long, clear sightlines, avoid concealed entrances/exits, splay walls at T junctions, install handrails to full length of both underpasses and overpasses, design balustrades of overpasses in a manner that prevents objects or liquids coming into contact with the traction wires.

5.3 FORM AND MATERIALS

The form of such structures must be compatible with the scale and character of a railway station. It must be compatible with its (often suburban) context.

Adequate ventilation is essential and design must comply with AS1668. Where required heat activated mechanical ventilation is to be used.

Generally an overpass should be designed to be as open as possible. This has been achieved in many ways utilising mesh and glass. Liaise with Queensland Rail to determine the quality of finish required for the specific project as illustrated by the Varsity Lakes image on page 45.

The "enclosure" of an overpass must prevent the dropping or pouring of matter down onto the electrical wiring even during routine maintenance.

5.4 STRUCTURE AND SUPPORT

Comply with the requirements of the following documents:

- MCE - SR - 006: Requirements for the design of footbridges over or near railways
- MCES - SR - 012: Protection of supporting elements adjacent to railways.
- MCES – SR – 008: Protection screens.
- AS5100
- Refer to Queensland Rail for accepted mesh types and sizes for both electrification and throw screens.
- Refer to Queensland Rail for details of fall arrest systems. Refer to Part 2, Page 50, Title Shelter - Limitations. Other systems are to be referred to Queensland Rail for approval.

6.0 Security & CPTED

The Queensland Rail Passenger Service Security Section has produced CPTED document (refer to the appendix). That document is in a checklist format and summarises many elements of competent site planning. It can be obtained from Queensland Rail. Another important reference for CPTED principles is the QLD police CPTED Guidelines.

For any major station upgrade, new station or station retrofit a security risk assessment should be completed in conjunction with the Security Analysis and Planning Unit Queensland Rail Passenger. This is particularly important when upgrading an existing station and historic data of crime / incidents can be referred to.

As security is essentially the product of competent design, the following paragraphs stress the key principles.

6.1 SECURITY AND SAFETY FOR CUSTOMERS AND STAFF

- Competent application of the CPTED principles (Crime Prevention Through Environmental Design).
 - Eliminate or minimise hiding areas – e.g. enclosed shelters, entrances to Toilets, landscaped pockets.
 - Improve visibility along Platforms and between Platforms and external environment. For example: the use of open fencing and shelters in lieu of solid structures, or the placement of advertising boards.
 - Existing enclosed waiting rooms are no longer recommended and should be replaced by open shelters.
 - Station Staff to be afforded a maximum line of sight to platforms and to public facilities eg toilets
- Station buildings to be kept to a minimum size and generally consolidated to a single structure.
- Levels of lighting within building structures and to platforms to achieve established Queensland Rail Standards and to be evenly graded between areas of different illumination.
- EDAP's complete with blue light must be installed at all Station Platforms, well located and clearly defined.
- Pay Phones should be installed at each Station.
- Platform copings must be highlighted with a white, non-slip finish to clearly define platform edges and enhance safety for passengers boarding and alighting trains.
- A band of Y14 yellow warning Tactile Ground Surface Indicators (TGSIs) must be provided to all station platforms between 600mm and 1200mm from the platform's edge (900mm to 1500mm on high speed platforms).
- 8Platform cross falls are to be directed away from the platform edge coping.

6.2 SECURITY FOR CASH

A safe is to be provided at every attended station. The size and type of safe will be advised by Queensland Rail.

6.3 SECURITY FOR STAFF

- Provide a self-contained environment around the Ticket Office area.
- Maximise lines of sight to platforms as above.
- Increase security through the use of security bars, roller shutters, SS sheeted solid core external doors and sturdy locks to station doors, etc.
- In the design of non-standard ticket counter, cash drawers must be kept out of sight of customers but in close proximity to the ticket counter.
- Secure staff car parking. Staff car parks must be positioned under direct camera surveillance or be easily observed and be as close as possible to the office area.

6.4 SECURITY FOR PREMISES

Security for the Premises must include, but is not limited to the following:-

- Provide an adequate level of illumination around station buildings and shelters. The illumination level must comply with the DSAPT and be evenly graded with no "dark" spots.
- All perimeter windows and entries must be protected with approved roller shutters.
- Skydomes should be used to increase day lighting to all areas, but they must be of an approved construction/size which inhibits intruder entry.
- Commercial roller shutters installed to doors and windows of ticket offices must be electrically operated and securely fixed against vandalism when closed. To have emergency manual chain. To be galvanised finished. (The standard ticket counter module already incorporates a roller shutter of this type.)
- Glass enclosures on platforms (such as Platform Supervisor's Office) are only to be used at fully attended stations and must be under full-time camera surveillance.
- Locking systems: specific criteria for station locking are contained in Section 13. Locking systems to station office doors to platforms must incorporate deadlock and be of sturdy chrome plated brass construction.
- Lockable pit lids in public areas.
- General and security lighting controlled by PE and time switch.

6.5 STRATEGIES TO MINIMISE VANDALISM

- Use of thin-gauge or easily damaged materials particularly in public areas is not acceptable.
- Platform furniture to be robust, stainless steel/HD plastic and fixed in position, preferably to a concrete footing, with tamper-resistant bolts. (Refer Drawing 2487 – Passenger Seating).
- Finishes to metal furniture to be tough and scratch-resistant, such as Stainless Steel.
- Vandal-resistant fixtures and fittings to be used throughout.
- Wall surfaces to be finished in a material, which is easily cleaned without damaging the substrate. Examples include glazed tiles, pre-finished steel/aluminium face panels and anti-graffiti film applications. Avoid the use of external paint finishes unless specifically approved by Queensland Rail. Ceramic tiles smaller than 200 x 200mm are not permitted on Queensland Rail property. The use of mosaic tiles is strictly prohibited.
- Stainless steel hail guards are to be fitted to downpipes in gutters.
- The lowest 2 metres of downpipes are to be vandal resistant or protected from damage.
- Hose cocks on Platforms and in pathways are to be recessed into the surface under lockable, slip resistant lids.

6.6 CCTV COVERAGE

The security camera system is usually determined by Queensland Rail, but the following need to be considered during station design

1. CCTV cameras must cover ticket counters, AVVM's, payphones and any emergency assistance phone.
 - Cameras and cabling should be placed out of the reach of persons and placed in vandal resistant housings, to minimise the chance of vandalism.
 - Consider placing cameras at carpark and pedestrian entrances and exits to obtain useful facial identification shots of offenders, to facilitate apprehension.
 - Consider placing cameras at the entrances to car parks to enable the capture of number plates. This will assist to identify offenders who enter the station car parks in a vehicle.
 - Consider the placement of cameras so that they cover each other to reduce the possibility of them being stolen or vandalized. CCTV cameras located inside the 3 meter electrification exclusion zone or Queensland Rail corridor is not acceptable.
 - Consider the images generated by the cameras at night and therefore, whether lighting is appropriate.
 - Consider using signs informing persons of the presence of CCTV, if used throughout the station, to increase the perceived risk of detection for offenders and enhance perceptions of safety.
 - For existing stations ensure a CCTV audit is completed in conjunction with the CCTV unit with recommendations to be built upon.

6.7 RESOURCES & FURTHER READING

Brisbane City Council (no date). Crime Prevention Through Environmental Design (CPTED) Planning Scheme Policy. Accessed on 08/07/2008 from http://www.brisbane.qld.gov.au/bccwr/plans_and_strategies/documents/crime_prevention_whole_policy.pdf

Brisbane City Council (no date). Public Toilet Design Guidelines. Accessed on 08/07/2008 from http://www.brisbane.qld.gov.au/C:STANDARD::pc=PC_68#cpted

QLD Police. Crime Prevention through Environmental Design. Accessed on 08/07/2008 from <http://www.police.qld.gov.au/programs/crimePrevention/cpted.htm>

Department for Transport. Improving Personal Security Across the Whole Journey. Accessed on 08/07/2008 from http://www.dft.gov.uk/pgr/crime/personal_security/

Department for Transport. Secure Stations Scheme. Accessed on 08/07/2008 from <http://www.dft.gov.uk/pgr/crime/sss/>

Felson, M., Belanger, M. E., Bichler, G. M., Bruzinski, C. D., Campbell, G. S., Fried, C. L., Grofik, K. C., Mazur, I. S., O'Regan, A. B., Sweeney, P. J., Ullman, A. L., & Williams, L. M. (1996). Redesigning hell: Preventing crime and disorder at the Port Authority Bus Terminal. In R.V.Clarke (Eds.) Preventing Mass Transit Crime. Crime Prevention Studies (volume 6., pp. 5-92). Monsey, NY: Willow Tree Press.

La Vigne, N. (1996). Safe Transport: Security by Design on the Washington Metro. In R.V.Clarke (Eds.) Preventing Mass Transit Crime. Crime Prevention Studies (volume 6., pp. 163-193). Monsey, NY: Willow Tree Press.

Office of the Deputy Prime Minister. (2004). Safer Places: The Planning System and Crime Prevention. Office of the Deputy Prime Minister. Accessed on 08/07/2008 from <http://www.communities.gov.uk/publications/planningandbuilding/saferplaces>

Sarkissian Associates Planners and ACT Planning and Land Management. (2000). Act Crime Prevention & Urban Design Resource Manual. Canberra: Department of Urban Services – Planning and Land Management.

7.0 Platform lighting

In order to clarify the requirements for lighting, Queensland Rail on behalf of the ARA commissioned a report from Webb Queensland. That report, issued in July 2004, has formed the basis for station lighting design to date.

7.1 GENERAL

There are three major determining factors for the illumination levels on platforms:

1. The DSAPT references various standards.
2. The requirements of the CCTV system.
3. Passenger comfort and safe use.

Each works in a slightly different way to determine:

- The spaces to be illuminated,
- The illumination levels for each,
- The light level gradients between areas of different illumination.

7.2 WEBB REPORT

In order to clarify the requirements for lighting, Queensland Rail on behalf of the ARA commissioned a report from Webb Queensland. That report, issued in July 2004, has formed the basis for station lighting design to date. A copy of the summary table is included in Appendix E.

No deviation from the Webb report is permitted without written Queensland Rail approval.

7.3 TECHNICAL REQUIREMENTS

In view of the above Queensland Rail has assembled requirements for illumination levels and lighting performance and these are nominated in the electrical design requirements. For current requirements refer to Appendix E - Electrical for specific requirements.



8.0 Shelter

In the Queensland climate, the provision of some shelter from sun and rain is an integral component of the Queensland Rail customer service obligations. The amount of shelter required at any site is a product of peak departing customer number and will be identified in each station design brief.

8.1 MINIMUM REQUIREMENTS

The following areas must be under cover:

- The circulation space in front of the ticket counter.
- The circulation space in front of any fare payment machine. (AVVM)
- Priority seating and wheelchair waiting spaces.
- The circulation space in front of the emergency assistance 'phone.
- The circulation space in front of each lift door linking through to the boarding point.

If possible, the following should also be under cover:

- The paths of travel between the core area and the ticket counter, fare payment machine, emergency assistance 'phone, toilets, lift, stairs and/or ramp.
- The paths of travel between the core areas of all platforms.
- Waiting spaces at bus stops, taxi bays and passenger set-down areas.
- Additional space as defined in the design brief for each station.

8.2 LIMITATIONS

Height: In extensive sheltered areas sufficient height must be provided to permit the installation of three-line LED (approx 470mm high) panels at sufficient height to be out of normal human reach. This should also allow adequate line of sight for CCTV cameras.

The shelter location must permit maintenance personnel to work with adequate clearances from the overhead traction system and the return conductors. Refer to Queensland Rail for details of fall arrest systems. Any structure that needs accessibility over 2m, may need "Safety Link" Anchor Points & Fall Arrests. "Height Dynamics" are 'Safety Links' preferred contact for the design, supply and installation of fall arrests and anchor points.

Diagram 20 illustrates the configuration of the standard shelter variants. Standard drawings exist for each shelter type.

8.3 STANDARD SHELTERS

In an effort to achieve some degree of consistency of visual character across the network, Queensland Rail has developed a suite of standard shelters for general use.

The suite is based on a standard "kit" which can be supplied by Queensland Rail and assembled and installed by the contractor on the floor slab constructed by the contractor. The consultant must commission a soils investigation and adjust the foundation material and/or footing system accordingly.

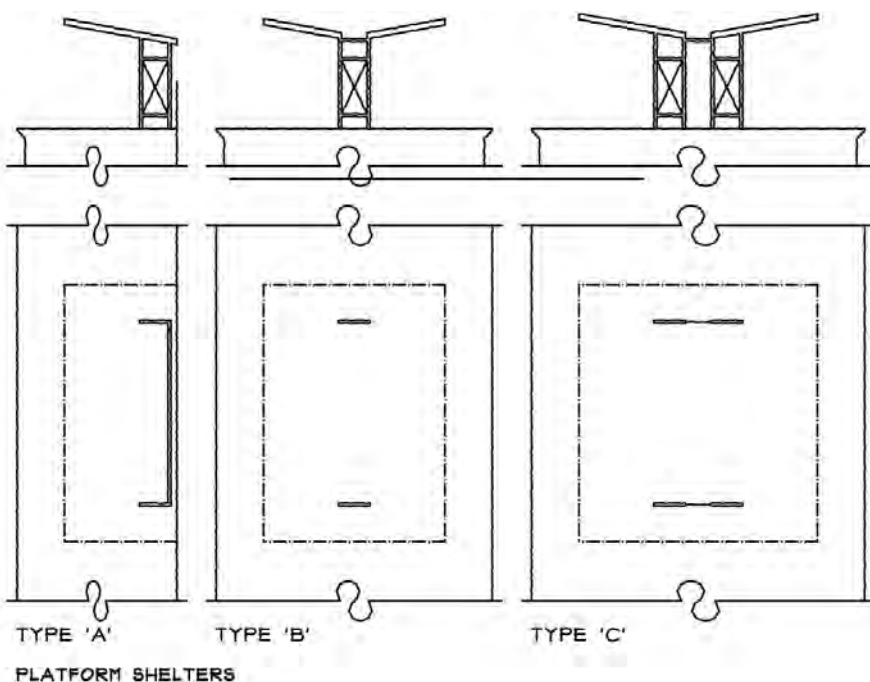


Diagram 22

9.0 Ticket counters

The ticket counter is the first point of personal contact for customers and therefore provides the best opportunity to make a positive impression.

9.1 GENERAL

The ticket counter is the first point of personal contact for customers and therefore provides the best opportunity to make a positive impression. The Ticket counter must be strategically located to offer:

1. Proximity to station platform access points and to steps of overhead footbridges, subways and lifts with a clear line of sight from one to the other.
2. Convenient purchase of tickets and access to timetable information.
3. Clear vision to Entry/Exit points of the station platform. Where possible, clear vision of toilets and car parks is desirable.
4. Security surveillance of as much as the station precinct as possible.
5. No steps or additional levels to be in front of the ticket office, or between internal / external office area.

9.2 TICKET COUNTER

Ticket counters must be easily recognisable.

1. Most suburban stations will require a single ticket counter generally positioned at one end of the station building under cover, offering easy public recognition and maximum visibility to station platform.
2. At designated stations an additional ticket counter may be required for high volume ticket sales at certain times or for long distance ticket sales.
3. The number and bench height of ticket counters required will be advised by Queensland Rail.

9.3 STANDARD

Queensland Rail has developed a standard ticket counter module that satisfies the various regulations. This module is to be used without modification in all new stations. It is also to be used in station upgrades although, in extreme cases, it may be necessary to modify the module to fit within existing structure. Modification can only occur with the written approval of Queensland Rail.

Alternatively, there may be cases where it is more appropriate (with written Queensland Rail approval) to carry out relatively simple modifications to an existing ticket counter facility.

Queensland Rail has pre-purchased ticket counter modules in kit form.

The consultant is responsible for documenting the location and installation of the kit.

The contractor is responsible for collecting the kit from the designated supplier, transporting it and for on-site assembly and installation.

Two power circuits and one lighting circuit are required to be hard wired to specific outlets and equipment. Ticketing and data circuits will be installed by TransLink.

Queensland Rail is investigating the possibility of a customer service button for the ticket office installed on the outside of the ticket office window behind the roller shutter. The intent is that it would be signed and DDA compliant in height. Refer to Queensland Rail for details.

9.4 DRAWINGS

Contact Queensland Rail for up to date drawings.

- Ticket counter module.
- Typical installation details.



10.0 Street furniture

Furniture of various types must be provided at stations for the safety and convenience of customers

10.2 SEATS

Low maintenance, resistance to vandalism and suitability for use in both internal and external areas are paramount factors in the design of platform seating.

Queensland Rail may provide seats constructed from perforated corrugated stainless steel sheet on tubular frames in accordance with Drawing 2487 – Platform Seating (refer Diagram 18 photo on right). Seating must be provided in core zones and evenly spaced along the platform. Seating must also be provided on platforms and along other paths at maximum 60 metre centres.

Seats (and related 500mm leg space) must be located clear of paths of travel.

Seats must be securely fixed to the ground. Top surfaces of footings must be level with adjoining surfaces – avoid trip hazard.

10.3 RAILS & BARRIERS

All stairs, ramps and footbridges must be provided with balustrades. Balusters must be placed such that the horizontal separation gap between balusters must not be greater than 120mm.

Balustrades around stairwells and on overpasses must be at least 2000mm high and free from toe holds. Higher screens are required depending on the proximity to the overhead traction equipment.

Handrails attached to the balustrade must be stainless steel, fixed at a height of 865mm to 1000mm above stair nosings and walkways and in compliance with the DSAPT.

At stations, ramps and stairs within 3000mm of overhead traction equipment must have protective screens. These have been constructed from expanded galvanised type mesh, but a lighter, more transparent material is now preferred. Such screens also act as a barrier in lieu of fencing or balustrades.

Wherever a rail or barrier is installed, a “tapping rail” is required.

10.4 FENCES

All fencing to Station property should allow clear vision across the Station from outside public areas, and should not offer a potential billboard for graffiti.

Queensland Rail currently uses fencing similar to Smorgon ARC “Custodian” type, 1500 mm overall height. For construction details refer to Drawing 2547 – Standard Station Fencing. Dark colours are preferred.

Fencing to station buildings of an historical significance may be designed to suit particular architectural details eg picket fences.

Extent and design for alternate fencing must be to the approval of Queensland Rail.

Fencing must be erected at platform ends to discourage commuters from crossing the rail lines, and at the same time visually defining the platform end.

The extent of fencing is to be kept to a minimum. It is necessary for the full extent of new fencing and associated gates to be agreed with Queensland Rail. The purpose of fencing should not be to “fix” poorly designed circulation.

In many cases it may be appropriate to retain existing chain wire type boundary fences along and beyond the platform area, provided they are in good condition.

At designated stations, a screened enclosure may be provided for refuse bins to be collected by local Contractors.

Fences located near pedestrian or vehicular circulation spaces must be a sufficient distance from the road or path to allow clear lines of sight. This is critical at or near pedestrian crossings.

10.5 BINS

Bins should be carefully sited on station platforms to encourage maximum public usage eg. near seating, exits and other potential sources of litter such as kiosks. Bin must not be placed within 1000mm of access paths.

New dual bins for general waste and recycling contact Queensland Rail for details.

Bin dimension are:
Height 1360mm
Width 630mm
Depth 630mm

10.6 RESTING RAILS

Where there is limited space Queensland Rail has found resting rails (bumrests) useful. Note: Resting rails do not satisfy any DSAPT requirements but may be used for general public areas.

The photo below shows a typical resting rail installation at Nundah station.

Resting rails must be located at least 500mm clear of any path of travel.

10.7 BOARDING RAMPS

At high level platforms, shorter boarding ramps than those carried on trains are often required. The short boarding ramp must be stored in a cabinet located on the platform near the boarding area. The cabinet must be vandal resistant, have a key-lockable door and have all edges rounded to minimum 5mm radius. The cabinet is to be recessed into another structure. It must not be free-standing or pole mounted.



10.8 BICYCLE STORAGE

Storage for bicycles is provided at selected stations and located near to station entry and exit points, but clear of major pedestrian paths.

The number of and requirement for bicycle storage as well as the associated access paths must be subject to advice from Queensland Rail.

Bicycle Storage may comprise of the following and maybe singular or all three types at a station.

- Open bike racks
- Bike cages
- Bike lockers

If approved for use, bicycle lockers must be fabricated from sheet metal complete with diagonal partitioning to facilitate storage of two (2) bicycles. Queensland Rail supplies these items.

10.9 BOLLARDS

The DSAPT requires that bollards do not obstruct the path of travel within transport premises.

Where it is necessary (eg to prevent entry of vehicles, or to define zone limits) use a colour contrasted post as follows:

- Minimum 100mm diameter
- Minimum 1500mm high in pedestrian areas
- Minimum 1500mm high and gloss Y14 yellow in vehicular areas

However, it is preferable that spaces are designed to eliminate the need for bollards.

Alternative site planning & design elements must be considered to eliminate the need for bollards which are used as barriers to stop vehicular entry. Examples of design elements are landscaping, lightpoles, sculptures, street furniture and handrails.

Alternative solutions above must integrate with the site wayfinding, complying with DSAPT principles.

Refer to Queensland Rail for site specific security requirements.



11.0 Free standing equipment

This section is intended to cover the spatial and technical design requirements of that wide range of equipment that is deemed necessary or desirable on railway stations.

11.1 GENERAL

This section is intended to cover the spatial and technical design requirements of that wide range of equipment that is deemed necessary or desirable on railway stations.

Equipment commonly encountered on railway stations include:

- Add Value Vending Machine (AVVM) – dispenses tickets and can be used to “add value” to a go card. Also operates as a “change” machine.
- Stand Alone Card Interface Device (SACID) – tag on/tag off device for go cards.
- Faregates – tag on / tag off device for Go card with gates to restrict entry / exit.
- Emergency and Disability Assistance Phone (EDAP) – emergency call and help point for persons with disabilities.
- Next Train Information Unit (NTI) – provides information to passengers. A combined NTI/EDAP is used in the platform core area.
- Pay ‘phones.
- Snack vending machines.
- Beverage vending machines.
- Commercial service points.
- Drinking fountain.
- Advertising panels.
- Information screens.
- LED / LCD panels (TIPS).
- Blade signs.
- Other directional signs, “priority seating” signs and wheelchair waiting space signs.
- Regulatory signs.

Note that the AVVM and the EDAP are required to be within view of a CCTV camera.

TRANSLINK TICKETING EQUIPMENT

One AVVM is to be placed on each platform at side platform stations adjacent to the boarding point

One AVVM is to be placed on island platform stations adjacent to the boarding point

Where physically possible and allowable under DDA, SACIDs are to be placed on the right side of all exits.

Translink Fare Gates – These must be located in an area where they will not get wet. In addition, the floor surface should slope away from each side of the gates.

PROHIBITION

Loose, free standing equipment (eg A frame signs) is not permitted within pedestrian areas on Queensland Rail property.

11.2 USER CIRCULATION SPACE

Most equipment requires the customer to touch or approach closely for use. The circulation space in front of the machine is therefore a critical design parameter for locating it. The space to be allocated to any machine must include the 180 degree wheelchair turn area. That space may overlap infrequently used paths, but it must be totally clear of main paths of travel and clear of any path of travel along platform edges. Adequate queuing space must also be provided.

Circulation space considerations cannot apply to overhead information screens or panels; but even those can only be read from within a limited area. Provide sufficient space to minimise the risk of blockage of required paths of travel by persons pausing to read these signs.

The DSAPT requirement is for a 180 degree wheelchair turn space to be located at the user face of the machine and centred on the areas of required user interaction. Depending on the relative anticipated demand, the circulation spaces for some machines are permitted to overlap (i.e. the machines located side-by-side). Diagram 21 illustrates these requirements.

The wheelchair turn space must be clear of any required through path of travel. In the case of “essential” equipment (AVVM or SCAID or EDAP) it would be prudent to permit a 360 degree wheelchair turning space. This facilitates use by persons with limited use of one hand.

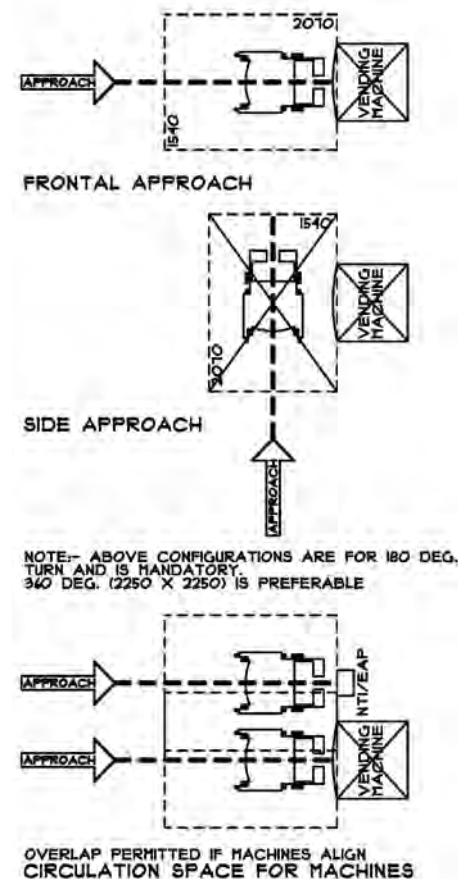


Diagram 21

11.3 HAZARD REDUCTION

Additional space must be allowed at machines that require servicing in-situ. The door must be able to be opened and mobile servicing equipment trolleys must be accommodated without conflict with a path of travel. Diagram 22 illustrates this requirement.

It is desirable to locate machines in areas of high visibility and preferably within range of a CCTV camera.

Ticket machines and some snack vending machines can generate significant queues at peak times. Locate the machine in a manner that minimises the risk of blockage to required paths of travel (particularly along platform edge).

A SACID should be adjacent to a path of travel, but, because of its shape it could generate a hazardous situation. Drawings S31106, S31107, S31108 & S31112 (in Appendix H) illustrate various methods of minimising the hazard.

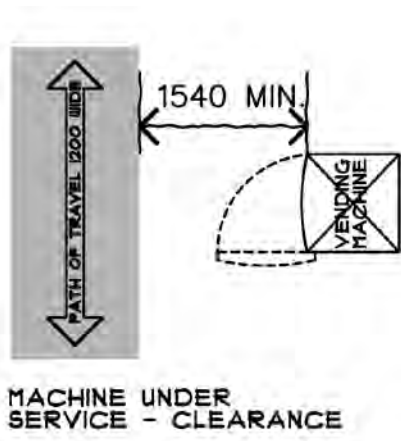


Diagram 22

11.4 INSTALLATION ISSUES

Standard Queensland Rail footing details exist for AVVM, SACID, NTI/EDAP and AVVM+NTI/EDAP. These are included in Appendix H.

Food vending machines must be located on a concrete pad. Enclosure sizes for a single vending machine need to be 1100mm wide x 1200mm deep in plan by 2100mm high. If intended for 3 vending machines dimensions are 3100mm wide x 1200mm deep in plan by 2100mm high. (Refer to Appendix E) Asphalt surfacing under such machines is not permitted.

The footing details for the AVVM, SACID, NTI/EDAP, etc also show the conduits required for each.

Other machines require services as follows:

- Snack vending machines – usually a secure power outlet.
- Beverage vending machines – often power, water and drainage/sewer.
- Drinking fountain – water and drainage/sewer.
- Non Queensland Rail machines – usually power and data connection.

Most equipment, when located in a recess, requires space around it for ventilation. In most cases this is 100mm minimum sides and back and 300mm above. These spaces are to be faced with removable panels of “crimsafe” mesh (or alternative design solution) to prevent litter accumulation or other inappropriate use.

The space above a SACID to 1800mm above floor (x 500mm square) is also required to be clear for servicing purposes.

The front panel of an AVVM and of most vending machines is a door that must be openable to about 120 degrees for servicing purposes.

11.5 DRINKING FOUNTAIN

Queensland Rail will advise if drinking fountain(s) are required.

If a drinking fountain is required, it must comply with the DSAPT in shape, location and operation.

Refer to Appendix C for further details

11.6 PAYPHONE

Provide a compliant Pay Phone in an approved location at each station if requested by Queensland Rail.



12.0 Toilets

Existing stations earmarked for refurbishment must receive at least the minimum requirements for public toilets in the Disability Standards for Accessible Public Transport. New station buildings must be designed with compliant, publically accessible, well-lit and well-ventilated toilets.

12.1 GENERAL

It is a Queensland Rail intention that wherever possible public amenities be provided at all SEQ Stations.

Existing stations earmarked for refurbishment must receive at least the minimum requirements for public toilets in the Disability Standards for Accessible Public Transport. New station buildings must be designed with compliant, publically accessible, well-lit and well-ventilated toilets.

Following is a guide to the station toilets required for the different station categories. Refer to the detailed design brief for the specifics of particular sites.

Premium Station Requirements:

- Male toilets including urinals
- Female toilets
- Unisex accessible toilet
- Parenting room with children's toilet & baby change table

Interchange Station:

- One male toilet
- One female toilet
- One unisex accessible toilet with a baby change table

Commuter Station:

- Two unisex accessible toilets with baby change tables

Local Station:

- One accessible unisex toilet facility with a baby change table

Staff Amenities (all staffed stations):

- Minimum of one unisex accessible toilet with a hand basin. Staff toilets are to be separate from the public toilets with access from within the station building.

12.2 DESIGN REQUIREMENTS

The following points highlight the key issues to be considered when designing Public Toilets:

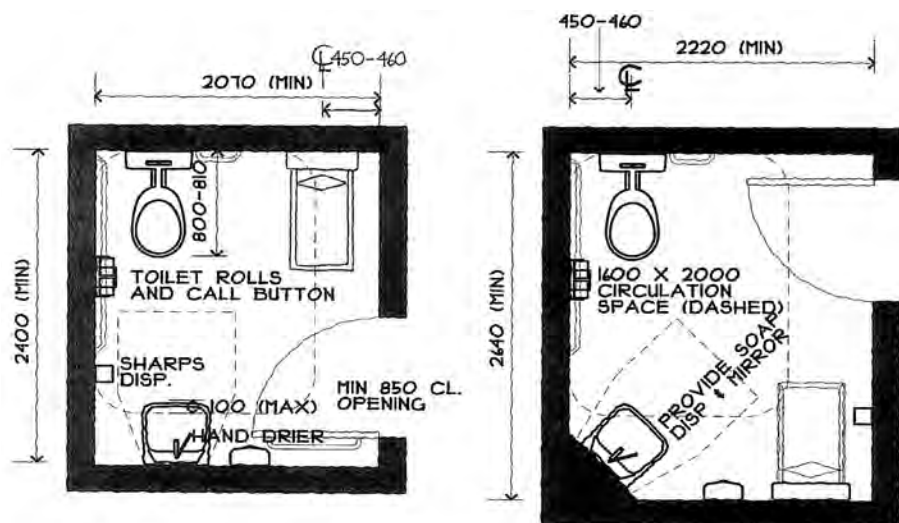
1. Accessible toilets facilities for people with disabilities must be provided at all SEQ Stations. These facilities must conform to the Disability Standards for Accessible Public Transport.
2. Toilets must be robust and resistant to vandalism. Pans and basins must be securely fixed to walls and floor. Cisterns should be concealed. Pans to public toilets should incorporate soft polythene type seats.
3. Provide "Sharps" disposal containers in each public cubicle. Note Queensland Rail supply item.
4. Provide sanitary bins in the female and unisex toilets. Note Queensland Rail supply item.
5. Finishes to public toilets generally must be as follows:

- (a) Smooth, glazed heavy duty wall tiles. On stud framed walls, tiles are to be fitted on 18mm minimum compressed fibre cement sheet.
- (b) Fully vitrified floor tiles (R11 Slip resistance).

Note: Mosaic tiles are not to be used on Queensland Rail property.

- (c) Ceilings flush-jointed fibre cement (minimum 6mm thick) with acrylic paint finish.
- (d) Toilet partitions (if applicable) tiled or laminated. Toilet cubicle doors to have 300 mm high gap below and above door.
- (e) Generally no tiles smaller than 150mm x 150mm will be approved for use on Queensland Rail sites.

6. Provide cold water service only with 240V sensor style taps.
7. Provide a wall mounted front fold-down baby change table in the accessible toilet area.
8. Where possible provide positive ventilation. Otherwise provide sensor activated exhaust ventilation and lighting.



NOTE: ALL NOTES APPLY TO EACH DIAGRAM AND SHALL BE READ IN CONJUNCTION WITH CODES

TOILET LAYOUTS

Diagram 23

9. Provide sensor Activated Hand Dryers hard wired.
10. Make provision for future installation of an emergency call button located within the toilet facility.
11. Make provision for the future installation of hard-wired, 240V soap dispensers (currently sensor soap dispensers are battery operated). Queensland Rail will advise type when they are approved for use.
12. Provide a mirror and shelf adjacent to the basin. Note: The statutory heights for top and bottom of a mirror are measured to the mirror; not to the frame.
13. Provide single, lockable, self-contained cubicles that open onto busy public space (with internally opening vandal resistant doors and self-closing hinge). It is recommended that they be placed in locations where they are visible by station staff and/or CCTV cameras. (Toilets with air lock style entry are not preferred if toilets are to be left open during station hours. Lobby/maze type entrances or the use of privacy screens at entries reduce natural surveillance of the toilet entrance area and provide a secluded area for drug use and loitering.)
14. Where multiple cubicles are provided, the dividers between them must not have gaps at the bottom.
15. A translucent lobby type screen with gaps on the top and bottom may be used where a number of cubicles/urinals must be provided. Long urinal troughs are not recommended. Minimum 850mm clear width door opening.
16. Doors on gravity hinges.
17. In accessible toilets ensure colour and luminance contrast to door frame (to door), door handle (to door), shelf (to wall), emergency call button (to wall), toilet paper dispenser (to wall), handdryer(to wall), pan (to floor), flush buttons (to wall).
18. Provide emergency lighting in the toilet.
19. The external toilet door is to be a low glare stainless steel surface.
20. Refer to Appendix C, C3 Toilet fittings for Queensland Rail specified fittings.

12.3 SUMMARY OF DDA REQUIREMENTS FOR ACCESSIBLE TOILETS

This table is a summary of the minimum requirements under the regulations. These will need adjusting to accommodate anticipated patronage at many stations.

Take photographs in black and white to gain an understanding of likely perception by many persons with vision impairments.

Grovely uses a range of tiles to establish contrast.

Note how the hand dryer on the white wall achieves limited contrast.

The Birkdale toilet uses highly vandal resistant fittings whereas Grovely (below left) uses proprietary lines. Birkdale uses yellow tiles behind each fitting to achieve contrast. Print both

There is an image of the preferred baby change module.

Mitchelton uses dark, semi-matt wall tiles to achieve both colour and luminance contrast. Note the wall tiles are smaller than the Queensland Rail preferred.



ITEM	STANDARDS	REQUIREMENTS
Signage	DSAPT Clause 17.1, 17.2 AS 1428.2 Clauses 17.1,17.2,17.3,17.4 BCA 2008 D3.6	Unisex toilets to have international symbol of access and symbols of both sexes. Symbols and lettering in raised tactile and Grade 1 Braille. Symbols do not have to be white on blue. Wheelchair figure to face the right.
WC doors	DSAPT Clause 12.2 AS 1428.2 Clause 11 Queensland Rail standard	Doorway width 850mm min. Options hinged or sliding. Manual or power. Outward opening doors to have door closer. Inward opening or sliding doors must be able to be opened outwards or removed from the outside. Outside bolt or catch to be fitted. 'In Use' indicator required. Door frame to be painted safety yellow (Y14).
WC door controls	DSAPT Clause 21.1 AS 1428.2 Clauses 23.1, 23.2, 23.3	Lever handle and D pull grab rail on inside face of door. Located 900mm – 1100mm above floor. Clearance between centre of lever handle and door face 35mm – 45mm. Grab rail diameter 30mm – 40mm with 5mm min radius at exposed edges and corners. Wall clearance 50mm – 60mm.
WC door Circulation space	DSAPT Clause 3.1 AS 1428.1 Clause 7.3	Circulation space as per 1428.1 chart. Differs with approach direction and sliding or hinged door.
WC Circulation space – without washbasin	AS 1428.1 Clause 10.2.9 & Figure 22	Min 1600mm x 2000mm
WC Circulation space – with washbasin	AS 1428.2 Figure 9, 11 & 30.	Min 1900mm x 2300mm
WC Circulation space – with baby change table	Queensland Rail standard	Min 2100mm x 2300mm.
Floor gradient	AS 1428.1 Clause 10.1	If floor waste outlet, gradient 1:70 – 1:80. Must be self draining.
Floor surface	AS 1428.1 Clause 12	Slip resistant.
R/L WC hand position	AS 1428.1 Clause 10.2.1a	When 2 or > unisex toilets provided, 1 to be accessible from right side and the other from left side.
Cistern specifications	AS 1428.1 Clauses 10.2.4, 10.2.9, Figure 18, Figure 19 AS 1172.1	Cisterns may be either recessed or surface mounted. Located 600mm min above floor. Depth 210mm max, width 600mm max, height 1100mm max if flushing control mounted on top. Flushing control to be hand operated and located 600mm – 1100mm above floor either behind or to the side of the pan. Control zone 500mm x 500mm and not within area required for any grab rails.
Pan specifications	AS 1428.1 Clauses 10.2.2, 10.2.3, Figure 18 AS 1172.1	Pan 400mm max wide and 600mm min deep. Seats to be full-round, not open fronted. Lid, if provided, to remain in raised position (100° - 105°) when fully open.
Pan and cistern position	AS 1428.1	Centre line of pan to near-side wall – 450mm – 460mm. Centre line of pan to far sidewall – 1150mm min. Back wall to front edge of pan 800mm +/- 10mm. Seat 460mm – 480mm above floor level and no longer than the pan.
Washbasin specification	AS 1428.1 Clause 10.3, Figure 18, 23 & 24	Water supply pipes and waste outlet pipes not to encroach into clear space under basin. Exposed hot water supply pipes to be insulated or located above the knee clearance under the basin. Taps to be lever, capstan handle or sensor plate control. Capstan handles 50mm or > from adjacent surface for hand movement. Hot water provided via a mixing spout.

ITEM	STANDARDS	REQUIREMENTS
Washbasin dimensions	AS 1428.1 Figure 23	Height of front edge of basin (datum point) 770mm – 800mm. Sloped free space under basin 490mm – 500mm. Includes 290mm x 190mm to 200mm w/chair footplate space and 300mm x 640mm to 650mm knee space. Distance plug is from front of basin is 300 max. Water supply and waste outlet pipes not to extend into clear space under washbasin.
Washbasin position	AS 1428.1 Clause 10.6, Figure 24 & 28	Hand basin facilities either inside or outside cubicle. Located 1100mm from front centre line of pan. Circulation space 800mm x 1300mm. This space can overlap with the WC circulation space.
Mirror	AS 1428.1 Clause 10.4.1	Optional. Mirror glass to above floor level 900mm-1850mm (1st) & 780mm-1850mm (2nd). Mirror width 350mm or >.
Shelf	AS 1428.1 Clause 10.4.2 BCA 2005 Clause F2.3 & Table F2.4	BCA requirement. Located 900mm-1100mm above floor level. Best located close to wash basin.
Toilet paper dispenser	AS 1428.1 Clause 10.2.7, Figure 20	Placed in a zone 300mm max forward of the front centreline of pan and 700mm max height above floor level.
Soap dispenser	AS 1428.1 Clause 10.4.3	Optional. Located 900mm-1100mm above floor level.
Sharps container	AS 1428.1 Clause 10.4.3	Optional. Located 900mm-1100mm above floor level.
Hand dryer	AS 1428.1 Clause 10.4.3	Optional. Located 900mm-1100mm above floor level. Sensor and air outlet to be with easy reach of user at the washbasin. Unit to be concealed hard-wired.
Clothes hanger	AS 1428.1 Clause 10.4.4	1200mm – 1350mm above floor level. 500mm or > from any internal corner.
Sanitary disposal unit	AS 1428.1 Clause 10.4.5	Optional. Operative component located 900mm-1100mm above floor level.
Baby change table	Queensland Rail Standard	Short edge of table attached to wall. Top of extended table 800mm - 810mm above floor level. Clearance from side walls 300mm min and 1300mm clear space in front of the wall to which change table is attached. Shared circulation space with pedestal.
Switches and power outlets	AS 1428.1 Clause 11.2 & Figure 31 AS 3000	Lights to be sensor operated with 10 to 15 minute ON time.
Emergency alarm	DSAPT Clause 19.1 AS 1428.1 Clauses 18.2.2 & 18.2.3 AS 2200.1 & 2200.2	Optional. To produce audible and visual signal. Located in the reach range 230mm – 1350mm above floor level and not obstructing the toilet roll holder. Button to have 30% luminance contrast with background.

Grabrail location	AS 1428.1 Clause 10.2.8, Figure 21	Where a concealed or high level cistern used, a continuous grabrail to be located across rear wall and side wall nearest WC pan. Where low level cistern, grabrail to end at each side of cistern. Horizontal rail on nearside wall 800mm- 810mm above floor level and extends 100mm-150mm from front of pan then bends upwards. Bent angle begins 900mm-960mm from back wall. If 450, extend rail upwards for 700mm min length. If 900, extend rail vertically 400mm-500 mm min. Wall to grabrail clearance 50mm – 60mm.
Grabrail profile	AS 1428.1 Clause 6.2a&b Figure 21	Diameter 30mm – 40mm. 5mm min radius at exposed edges and corners.
Wall-grabrail gap	AS 1428.1 Clause 6.2a&b	50mm – 60mm.



13.0 Staff areas

Station Offices must be sized to accommodate the required number of staff at each station. Queensland Rail will provide furniture to meet station staff clerical requirements such as chairs, stools, safe, bar fridge and microwave.

13.1 GENERAL

The main staff areas at a railway station are:

- Ticket office,
- Store,
- Communications room.

Other areas required at some stations may include:

- Station/district office
- First aid room
- Control room
- Various managerial offices
- Train crew amenities

Each has specific requirements

All are required to have washable finishes to walls and ceilings (and to floors where applicable).

All are required to be “accessible” by staff with disabilities.

Maximise personal safety for staff moving from office to toilets to store and to platform.

Lease sites (kiosks, etc), though fitted out by others will have similar demands for services and access.

13.2 STATION OFFICE

Station Offices must be air-conditioned and must accommodate the Station Staff and contain space for the ticket selling work station, counter, work bench space, under bench cupboards, draw units, lockers (not visible from ticket counters), staff room, toilet (with air lock and sensor activated exhaust ventilation) and store/cleaning space (to have positive, sensor activated, ventilation).

Station office ceilings must be constructed using drop in ceiling tiles to allow for future service works. Station walls inside the ticket office & staff room areas should be vinyl to plasterboard to a height of 1200mm.

Station Offices must be sized to accommodate the required number of staff at each station. Queensland Rail will provide furniture to meet station staff clerical requirements such as chairs, stools, safe, bar fridge and microwave. However liaise with Queensland Rail to determine the exact requirements for each station fit out. The smallest station office (1-2 person capacity) should be of sufficient size to house the ticket counter and stool, office chair, filing cabinet and storage shelves – approximately 20m². Diagram 24 illustrates the preferred general arrangement of staff and public facilities.

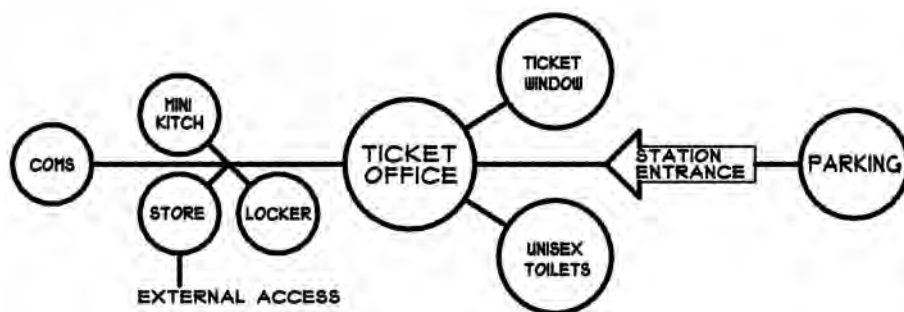
13.2.1 STAFF ROOM FACILITIES

Where applicable a DSAPT compliant staff room facility must be provided within the Ticket Office and will incorporate the following:

1. Laminated bench top complete with stainless steel kitchen sink and drainer (cold water reticulation only).
2. Laminate finished overhead cupboards and under bench cupboards.
3. A large upright, or small bar type refrigerator located under bench. (Size to be confirmed by Queensland Rail for each station).
4. Automatic boiling/chilled water sink top unit with timer program, located under the bench.
5. Microwave oven on shelf.
6. Roller blinds on any external windows.

Note: power points must be provided above and under kitchen bench.

Stations designated as “one person” stations do not require a separate staff room, however, a bench, sink and fridge must generally be positioned in such a manner as to be screened from public view.



STAFF AREA RELATIONSHIPS

Diagram 24

13.2.2 STAFF LOCKERS AND TOILET

An “accessible” toilet must be available for the station staff. Only one unisex toilet will be required (except at large stations) near the Ticket Office. The toilet must be mechanically ventilated via sensor control. A hand basin as well as a sanitary bin must also be included.

Sufficient lockers (one per person) must be provided in a location not visible from the ticket counter.

13.2.3 FLOOR FINISHES

Ticket Office floors must generally be finished in heavy duty, commercial grade, slip resistant, cushioned vinyl with welded seams and a 100mm high skirting extension above the floor and sealed to the floor. Commercial grade carpets may be accepted by Queensland Rail dependant on the station.

Recess door mats at entrance to Station Office from platform. Locate the mats inside the door. Ensure that there is no step at junction of ticket office doors and platforms.

Ensure there is no steps or ramps within the station building and between floor finishes eg vinyl to tiles.

13.2.4 OTHER ITEMS IN THE WORK STATION

The following items are required over and above the Station staff’s normal office furniture:

Lighting Controls

Light switches are required to control direct lighting to the ticket counter, general office lighting and an override switch for platform and waiting area in front of ticket counter. Refer to section 20, Electrical Design, for additional information.

External Noticeboards

External noticeboards displaying timetable information must be installed in an approved location in close proximity to the ticket counter. External noticeboards should not be placed in areas where passenger flow will be obstructed. Refer to Queensland Rail for approved cases and required sizes.

Public Address Equipment

If a CER is located within the station building then the PA equipment rack is to be located within it. However if not the PA equipment must be accommodated in the ticket office and be built into counter joinery.

Note: The communication Room needs to have external wall earthing.

Telecommunications

If specified by Queensland Rail, a telephone should be mounted in close proximity to the ticket counter and, if required, an additional phone point must be made available to the Station Supervisor’s desk.

Sign-On Facility

A sign on Facility should be included for stations incorporating crew rooms.

Safe

A safe is to be provided in close proximity to the money counting area (or desk). The safe is to be out of sight from the general public (for security) and installed at bench height.

Electric Roller Shutter Controls

One switch is to be located within the ticket window unit for the ticket window roller shutter. For other roller shutters an external key switch is to be located next to the entry roller shutter and an internal two way switch to be located inside the ticket office entry door. The other ticket office roller shutter switches to be on one labelled switch plate within the ticket office. An external key switch is also required for the CER room entry door.

White boards / Pin boards

Provision shall be made within the office for at least a white board and a pin board, with Queensland Rail to determine detailed requirements on a station specific basis.

13.2.5 SECURITY

Entry and exit doors to Ticket offices must be of a solid core construction, minimum 40 mm thick and sheeted with stainless steel which may require a laminate sheeting over the top if it is subject to direct sun. Any doors facing a platform should be low glare. All doors to the station office must be self locking and fitted with an approved door closer. The door is preferred to open inwards into the station, however if it is a fire door and needs to open outwards the door should be recessed so that when it opens it does not hit customers or staff. The door should have a glass panel to allow staff vision out (one way vision so that customers can’t see in), however this must be small and durable enough not to compromise security. The door frame must be of steel and the hinges must not have removable pins. All ticket office doors must be fitted with approved locks and door hardware.

All locks (suitable for master keying) and door hardware must be fully specified 6 pin and approved prior to installation. Refer to 13.8 for examples of locking systems and their applications.

All windows within the Ticket Office must be fitted with external electrically operated roller shutters with manual override.

To promote vision from the ticket office, additional glazed panels may be provided beside Station Supervisor doors. The combined door and window assembly must be secured with externally operated roller shutters. Provide vertical louver blinds to station office.

CCTV monitors inside station buildings (in particular those stations with an adjoining stabling yard) should be in clear view of station staff at or near the ticket counter. This would allow for greater surveillance of cameras when only one staff member is operating the station.

Overhead roof lights (if applicable) must also be of an approved anti-vandal construction.

External opening to cleaner’s room, switch rooms or stores must be secured by way of manually operated roller shutters to match other station roller shutters, complete with guides, security latches and locks. All padlocks to roller shutters etc., must be keyed to the station master key.

Entry doors to Communication Equipment Rooms (CER) must be of a solid core flush panel type clad both side with stainless steel sheet.

13.2.6 ACOUSTICS

The level of background noise at and around stations can exceed acceptable levels. Noise generated by trains, particularly freight trains, is the principal contributor to unwanted background noise. Care should be taken in the location and design of station buildings and associated spaces to recognise and limit background noise. Design of platform buildings should also take into account the relevant requirements from the Workplace Health and Safety Regulation, when assessing what noise levels can be tolerated in individual spaces. Office areas must be insulated to achieve maximum sound levels of 70dBa.

13.3 STORE

Every station, which is staffed, must be provided with a small store and cleaner's room. Room size must be dependant on the long-term implementation of mobile cleaning gangs and any specific requirements at each station, but generally 20m². Additional storage may be required for stations that require a scrubber for cleaning purposes or other large plant equipment.

Items likely to be stored include:

1. Step ladders
2. Cleaning equipment (hoses, buckets, mops, brooms etc.) and detergent
3. "Dead" stationery stores
4. Lost property

Provision should also be made for shelving and hanging space in all stores. A cleaner's sink with hose cock must also be provided at designated stations.

The cleaner's stores must be accessible directly from the office AND from external space (fitted with SS sheeted door) with the ability to be accessed at all hours and without the need to enter the nearby station/ticket offices.

Permanent natural ventilation is preferred for stores.

13.4 LEASE SPACE

The provision of leased space on a station or within a station complex is considered a service to the travelling public and a source of revenue to Queensland Rail.

Any proposed leasing or incorporation of retail outlets (predominantly newsagents) at stations can be included, but only after consultation with Queensland Rail as well as a receipt of an appropriate brief specifying the design and space requirements.

Where space is made available for lease purposes at stations, shop fronts, signage and the general presentation must be controlled in accordance with the following standards:

1. No new shop fronts or bulkheads must be installed without the prior approval of Queensland Rail and agreed space incorporated in the design.
2. Shop openings must be secured by manually operated roller shutters similar in design and construction to other shutters installed elsewhere at the given station.
3. Any advertising above lease space must be standardised so that it is consistent with the commercial thrust of the station and any architectural detailing.
4. Where retail or mixed use development surrounding a station building incorporates a station entry, this entry must be accentuated visually and architecturally in accordance with Queensland Rail recommendations.
5. Where it is agreed that Vending Machines be installed on selected new stations, a recess complete with power provision should be considered.
6. Sub metering required for leased areas.
7. The Lease space should not impact on the pedestrian traffic flow
8. In some Stations a Newsagent and/ or Kiosk may be provided within the building design. Most Kiosk spaces must be secured by way of lockable roller shutters. In some cases Kiosk spaces must be provided complete with sink, bench and power.

13.5 FIRE PROTECTION

Fire protection at all suburban station must be provided usually in the form of dry powder fire extinguishers and signage. Chubb are Queensland Rail's nominated subcontractor for design, supply and ongoing maintenance of fire protection systems. For major station refurbishments or new stations this shall be included in the contractors responsibilities to coordinate, and maintain for 12 months.

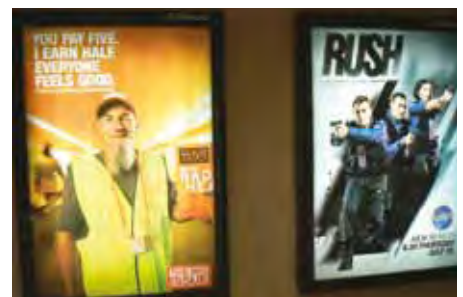
All new station building designs must comply with the BCA and with statutory regulations concerning exit paths and signs.

13.6 COMMUNICATION ROOM

A room to accommodate the various communications equipment racks is required within the station precinct. This room must be air-conditioned. It is usually located near the station office but with external access. A 6 x 3 metre space is generally considered adequate. This will be confirmed by Queensland Rail for each station.

The communication room needs to have external wall earthing.

It is important to note that the above information is a guide only and that each site needs to be assessed on its individual requirements. Generally a separate specification will be produced to cover such details.



13.7 SUMMARY OF DDA REQUIREMENTS FOR STATION BUILDINGS

This table is a summary of the minimum requirements under the regulations. These will need adjusting to accommodate anticipated patronage at many stations

ITEM	STANDARD	REQUIREMENTS
Ticket counter dimensions	DSAPT Clause 22.1 AS 1428.2 Figure 25 & 26	
Ticket counter grabrails	DSAPT Clause 11.6 AS 1428.2 Clause 10.2	
Notice boards	DSAPT Clause 17.1 AS 1428.2 Figure 30	Refer to TransLink Rail Station Signage Manual
Station building Access	DSAPT Clause 2.1 AS 1428.2 Clause 8.1	Entrances to be protected from weather. Door along access path must not create a barrier to use. Thresholds to have 1:8 step ramp. Doorway 850mm wide. Suitable doors are power operated, rising butt hinges, sliding and free swing. Door closer not to be provided unless required by local codes. Circulation space as per 1428.1 chart. Differs with approach direction.
Station building Door glass	AS 1428.2 Clause 11.6.1 & 11.6.2	Fully glazed door – for safety, 75mm wide contrasting line 30% luminance contrast colour 900mm-1000mm from floor. Viewing panels between 300mm-1000mm high to 1600mm or > high. Glazing 150mm or > wide and 200mm or > from latch edge. Wheelchair push plate 300mm up from bottom edge of door.
Station building Door furniture and controls	DSAPT Clause 21.1 AS 1428.2 Clauses 23.1, 23.2, 23.3	Doors must be able to be unlocked and opened with 1 hand. Lever/D handles preferred. 35mm – 45mm clearance between centre of lever handle and door face. Handles that need to be grasped or turned 900mm – 1100mm above floor and pushed 900mm – 1200mm. Controls that are touched eg power operated doors 900mm – 1250mm above floor. Handles for sliding doors 60mm or > from doorjamb lining. Manual controls to power operated doors 1000mm or > from arc of hinged door or clear of a sliding door.
Station building Door forces	AS 1428.1 Clause 11	If pressure pad used must detect 15kg. If sensors, place 500mm above floor. Swing doors require force to open 19.5N; to swing 6N and hold open 7.5N.
Station building Floor surface	DSAPT Clause 10.1 AS 1428.2 Clause 9 AS 1428.1 Clause 12	Ceramic tiles, vinyl floor cover or short pile carpets 6mm max high. Exposed edges fastened with trim. Trims to create no lip or ridge > 3mm above floor surface.
Station building Seats	DSAPT Clause 23.1 AS 1428.2 Clause 27.2 & Figure 32	Higher seats with straight backs preferred as per platform seat dimensions. Note special chair for use at standard ticket window.

13.8 DOOR FURNITURE & LOCKING SCHEDULE

Station Doors (Timber Solid Core)	
LW 3572 SC Primary Vest Lock and Storeroom Locking latch	3572 X - R (Right Hand)
	3572 X - L (Left Hand)
Door Furniture	LW1801/70 SC
Door Furniture	LW 1905/70 SC
Deadbolt	LW 303 SC
Door Closer	Dorma TS73V
Station Doors (Aluminium)	
LW 3582 SC Primary Vest Lock and Storeroom Locking Latch	3582 X - R (Right Hand)
	3582 X - L (Left Hand)
Door Furniture	LW 4905/70 SC
Door Furniture	LW 4801/70 SC
Door Closer	Dorma TS73V
Main Security Doors Into Stations	
LW 3582 SC Primary Vest Lock	3582 X - R (Right Hand)
	3582 X - L (Left Hand)
Door Furniture	LW 4905/70 SC
Door Furniture	LW 4801/70 SC
Security Alarm Switch	
Security Switch	LW 201 Rim Cyl. 6pin
Toilet Doors	
Single Cubicle (External Door)	LW 3572ZSC Mortice Lock
	LW 1801/70 SC Furniture
	LW 1905/70 SC Furniture
	LW 801 SCP Toilet Indicator Bolt
Multiple Cubicles (External Door)	LW 3572SC Mortice Lock
	LW 1801/70 SC Furniture
	LW 1905/70 SC Furniture
Internal cubicles	Standard Indicator Bolt as used throughout the network at present
Push Plate	Dalco 300mm Push Plate
Door Closer (Old Designs)	Dorma TS73V
Rising Butt Hinges (New Designs)	STANCO 100mm
Cubicles	Indicator Privacy Bolts
	Push and Kick Plates
External Doors	
Add weather strips to the bottom of all external doors	

Accessible Unisex Toilets	
Outside Lock	1 x LW 3574 EALSC or LW 3574 EARSC Emergency Anti-Lockout Privacy Lock, 1 x LW 1814/70 SC External Furniture & 1 x LW 1939 SC Internal furniture (bottom lock fitted at 1000mm from floor to centre of latch)
LW 3571 SC Single Cylinder Mortice Lock, 1 x 1376 Series Escutcheon Plate (Top lock fitted at 1400mm from floor to centre of latch)	
Pull Handle	Dalco 300mm 'D' Pull
Push Plate	Dalco 300mm Push Plate
Door Closer (Old Designs)	Dorma TS83V
Rising Butt Hinges (New Designs)	STANCO 100mm
Cubicles	Indicator Privacy Bolts
	Push and Kick Plates
Security Doors Into Toilet Areas On Stations	
Short Basket Mortice Lock Double Cyl.	LW 590 Series
Station Bins	
Queensland Rail Embossed Padlock	Abus 83/45
Switchboards	
Door Lock	Selectlok Swing Handle 1107SCCU3-45
Gates on the end of the platforms	
Gate Lock	LW 590F-1082-90 SC Short Backset Mortice Lock
Rear Corridor Gates	
Gate Lock	LW 590-1082-90 SC Short Backset Mortice Lock
Stairway Access Gates	
Gate Lock	LW 3572 XRSC - Primary Vest Lock

Note: Fit approved door stops to all doors that open against walls.

13.9 RECOMMENDED FINISHES

GENERAL

Queensland Rail requires a minimum standard of finishes for stations with a view to minimising graffiti, vandalism, damage, attract low maintenance, etc.

WALL SURFACES

Wall surfaces should be designed to reduce maintenance costs, to facilitate easy removal of graffiti and be vandal-resistant against impact damage. Where Fibre Cement wall panels are proposed in public areas they shall be Compressed Fibre Cement panels approx 9 - 10mm thick in order to withstand vandalism.

General Wall Surfaces

The preferred treatment for wall surfaces accessible to the public is a glazed wall tile (with flush Epoxy grouting) extending from floor to soffit (or to 3000mm above ground). Note all external wall tiles & grout are to be non-porous, polished tiles are not recommended for their porous quality.

Painted wall surfaces may be considered for high level areas which are not prone to vandalism. These painted surfaces should be finished in a semi-gloss acrylic paint.

Internal Wall Surfaces

Offices

Wall surfaces of Ticket Offices must be easily cleaned and abrasive resistant. These walls must generally be constructed from flushed plasterboard or FC with a semi gloss acrylic paint finish or painted flush blockwork. Vinyl to 1200mm high is preferred to avoid FC damage from chairs, but not required for block walls.

Toilets

Toilet walls must be fully tiled floor to ceiling in a selected ceramic tile with flush grouting. Staff toilet areas require ceramic skirtings and vanity splash backs.

Tile Size (Internal or external)

Queensland Rail prefers all tiles to be 150x150mm or larger.

Spare Tiles

Spare tiles are required at the rate of one square metre for each type and colour used on the site.

Floor Finishes

Floor finishes for offices and toilets are covered in those sections. Platforms, concourse, stairwells, subways and pathways are preferred to be fine grade asphaltic concrete or broom finished concrete for Commuter & Local Stations unless stated otherwise in the Brief. Slip resistant tiles are necessary for Premium Stations & may be appropriate for stations requiring a higher degree of finish. Alternatively hardeners should be added to the concrete to reduce long term wear. Note that bevel edge pavers are not acceptable.

Roofing, etc

Generally use zincalume metal deck roofing (colorbond may be approved where exposed to view).

Use stainless steel for box gutters (but minimise the use of box gutters) and difficult-to-access eaves gutters.

Downpipes, etc within 2400mm above floor level in pedestrian areas are to be stainless steel. Note all galvanising is to be superior quality, reflect locality and be in accordance with the code.

COLOUR SCHEMES

Station buildings should be bright, clean and attractive. Colour schemes should be designed to complement the building and be sympathetic to the corporate theme and signage colour scheme. A limited palette of colours is recommended to reduce maintenance costs during the life cycle of buildings. Heritage approved colours may be used on older style buildings. Touches of colour may be used to accentuate design features and add interest to the station environment. It should be noted that the use of reds, greens and yellows near signals for drivers must be avoided.

Wherever possible, the colour contrast requirements of the DSAPT should be achieved through creative, general colour schemes rather than by retrofitting Y14 yellow.

The use of white should aid in the perception of a bright clean image and be used on the underside of shelters and as a background for signs.

High quality finishes are to be used to extend life cycle without affecting presentation and to facilitate easy removal of graffiti. Proposed paint types, colours and finishes for particular stations must be submitted to Queensland Rail for approval prior to work commencing. If walkway surfaces need to be painted, a non-slip paint must be used.

Each Premium & Heritage Stations are to have their own colour scheme. Interchange, Commuter and Local Stations are to have 3 standard colour schemes. Queensland Rail is investigating.

Queensland Rail is investigating having 3 standard colour schemes for interchange, commuter and local stations. Refer to Queensland Rail for further information.

Building elements should generally be finished in accordance with the building finishes guide on the following page.

13.10 BUILDING FINISHES GUIDE

Building Element	Paint/Coating Type
Compressed Fibre Cement Wall Panels	Sealer coat and two finish coats – semi gloss acrylic
Painted Brickwork/render	Base primer and two finish coats – semi gloss acrylic (approved textured finishers e.g. “Acratex” may be considered)
Window and Door Frames/sashes	Gloss Enamel (Primer, undercoat, 2 finish coats)
Timber Door Jams	Gloss Enamel (Primer, undercoat, 2 finish coats)
Steel Door Jams	Gloss Enamel (Primer, undercoat, 2 finish coats)
Timber Shelter Posts	Gloss Enamel (Primer, undercoat, 2 finish coats)
Steel Shelter Posts	Etch primer and two gloss finish coats on galvanised metal base
Timber Roof Purlins and Support Structures	Gloss Enamel (Primer, undercoat, 2 finish coats)
Steel Roof Purlins and Support Structures	Etch primer and two gloss finish coats on galvanised metal base
Face Brickwork *	Steam clean thoroughly and coat with approved clear coating
Stainless Steel	Brushed finish to discourage etching of the surface
Face Stonework *	Steam clean thoroughly and coat with approved clear coating

* Note: In areas which are prone to vandalism, face brickwork and stonework may be painted with an approved clear, non-sacrificial, graffiti shield.

Note: Galvanising to be superior quality to take into consideration locality and in accordance with the code.

14.0 Pedestrian paths

Generally provide direct and safe access paths to and from the station precinct facilities. This would involve well-lit, wide, open-fenced and straight pathways with CCTV camera coverage.

14.1 GENERAL

The pedestrian paths are an integral component of the “journey” mentioned in Section 4 of this document.

Queensland Rail prefers paths of travel to be as wide as is required by the anticipated patronage (at least 1800mm wide clear of obstructions – but 2400mm is preferred - from ground surface to 2000mm high). Wider paths will be required in areas of increased pedestrian density. These paths widths are in addition to circulation spaces required at lift, stair and ramp entries and at free standing equipment (except SACID’s).

Generally provide direct and safe access paths to and from the station precinct facilities. This would involve well-lit, wide, open-fenced and straight pathways with CCTV camera coverage. Use as few paths as is absolutely necessary to link patrons from the platform entry (lift, stair, gate or ramp) to the following:

- DDA compliant parking bays,
- taxi bay,
- passenger set-down bay,
- bus stop(s),
- public footpath (Queensland Rail prefers only one path from each station entry to each adjoining street).

Paths of travel must be “legible” – as short and as uncomplicated as possible and easy to conceptualise in advance. This is also a critical safety issue for those with limited comprehension skills.

14.2 TECHNICAL REQUIREMENTS

For new stations and major works at existing stations, every publicly accessible path on a Queensland Rail site must comply with the DSAPT. At existing sites the paths designated as “primary” paths by Queensland Rail must comply with DSAPT.

- This controls gradients and cross-falls.
- All surface elements (pits, lids, grates, markings) must be non-slip.
- Changes of level must be seamless (less than 3mm)
- Minimise the number of objects (buildings, shelter posts, light & camera poles, bins, signs, etc) adjacent to the path. Ensure that they are easily visible through a combination of sight-lines and colour scheme.
- Locating/designing projections such as hose-cocks, electrical and communications cabinets, planters, gate latches, down-pipe bases, etc within or near required paths of travel must be avoided so that they do not become hazardous.
- Ensure that all directional and facility signs are fully “accessible”.
- Provide public address system and notice-boards to each station for timetable and information on train arrivals/departures. Train Information Public System (TIPS) could also be used.
- Ensure that the circulation space for functional items such as ticket counters, AVVM, etc does not protrude into the platform edge path of travel and does not block use of other paths.
- Ensure that the space required for servicing machines is clear of any designated path of travel.

14.3 SITE LEGIBILITY

Way-finding is an integral part of competent, legible site planning. When well done, it enables people of all levels of ability to know where they are in relation to where they want to go and to easily identify how to get from here to there. Appendix A1 to DR 04020 of AS 1428.4 succinctly summarises the major elements of a way-finding strategy.

Queensland Rail is currently developing a station Way-finding Guide and will advise when this goes into effect.

14.4 GENERAL AND ACCESSIBLE SIGNAGE

Refer to the TransLink Rail Station Signage Manual for required general station signage. Refer to the Queensland Rail Accessible Station Signage guide for accessible signage. Note this guide can be adapted to reflect the TransLink Guide colour scheme and style of signage.

Note for construction phase of projects; Queensland Rail in conjunction with TransLink and QT has an approved style guide for temporary signage.

14.5 SUMMARY OF DDA REQUIREMENTS FOR PEDESTRIAN AREAS

The following is a summary of the minimum requirements under the regulations. These will need adjusting to accommodate anticipated patronage at many stations.

ITEM	STANDARD	REQUIREMENTS
Walkway to entrance	DSAPT Clause 2 AS 1428.2 Clauses 6 & 8	1200mm min wide. Every 60m resting area. Resting area to contain seating.
Gradient	DSAPT Clause 2.1 AS 1428.2 Clause 8.1 AS 1428.1 Clause 5.2	1:20 or less with 1:40 maximum cross fall.
Walkway sides	AS 1428.1 Clause 5.2d	When walkway is open without kerb/wall and handrails, the abutting surface to follow grade and extend on both sides horizontally 600mm.
Obstructions	Queensland Rail standard	On existing platforms only, poles and masts in the access path to be painted safety yellow (Y14) from ground up to 1500mm.
Passing areas	DSAPT Clause 4.1 AS 1428.2 Clause 6.5 & Figure 3	Every 6m a passing width of 1800mm. Space on 1 side 1600mm long x 600mm wide or space 2000 mm long x 300mm on both sides.
Surface	DSAPT Clause 10.1 AS 1428.2 Clause 9 BCA 2008 DP2	Slip resistant. No lip joints >5mm. Grating spaces max 13mm wide x 150mm long
Entrance Width	DSAPT Clause 2.4 AS 1428.2 Clause 6.4 BCA 2008 Clauses DP7 and D3.3	1200mm min for open area and 850mm for gate or door.
Entrance point	AS 1428.1 Clause 5.1.2	A landing or circulation space to be provided at every doorway, gate or similar on the access path into the station.

15.0 Track crossings & mazes

Pedestrian level crossings and associated “mazes” are not to be **relied upon** for track crossing purposes in Queensland Rail stations. However, as they are capable of quickly moving large numbers of people, Queensland Rail will permit their use at some sites. Permission will only be given where a fully compliant crossing method is also provided.

Where Queensland Rail requires the installation/upgrade of a pedestrian track crossing, the following details will apply:

- Drawings 2642 & 2643 for “passive” protection maze.
- Drawings 2644 & 2645 for “active” gated enclosures.



16.0 Planting design

Planting within the station precinct is seen as a means of softening the environment and adding brightness and colour through careful selection of plant species and accompanying elements such as planter boxes.

The use of plants on railway property requires careful design to promote passenger safety, at the same time reducing the potential for incurring excessive ongoing maintenance. Good design of plants and planters will increase community pride and reduce the risk of plant damage by vandalism, foot traffic or excessive littering.

Planting within the station precinct is seen as a means of softening the environment and adding brightness and colour through careful selection of plant species and accompanying elements such as planter boxes. If planter boxes are used, they must be heavy enough to prevent them from being lifted.

Planting of trees on platforms within the electrified traction area is not permitted. Any planting on platforms generates excessive maintenance problems and is not permitted without the approval of Queensland Rail. On some stations it may be appropriate to plant along the rear of wide side platforms (well removed from tracks and behind fencing) to provide colour and shade.

Additional items to be considered when designing a planting layout for a station are security concerns created by blocking CCTV and providing enclosed spaces as well as restricting lighting.

All trees must be bag stock (or larger), single stem, mature specimens with a clear trunk to at least 1800mm high. Shrubs and groundcovers must not exceed 600mm high. Clear sightlines must be maintained between 600mm and 1800mm high.

Mulches, edgings and tree grates must not become potential trip hazards. Inorganic mulches are not permitted.

Suitable planting design and associated irrigation (if applicable) must be evaluated on a "station by station" basis, to the approval of Queensland Rail.

Use environmentally responsible plants that are drought resistant, suited to the local region and are appropriate for areas with water restrictions. Avoid species that require excessive water, fertilizer, etc.



All planting areas must be:

- Fitted with a water wise sub-surface drainage system
- Of minimum horizontal dimension of 2000mm
- Designed with chamfered or rounded corners.
- Densely planted with hardy ground covers.

If irrigation is required it must be:

- Multi-station automatic timer controlled (with the control station in the store room)
- Fitted with a backflow prevention device satisfactory to the Local Authority
- Fitted with lockable, in-ground, solenoid boxes
- Fitted with vandal resistant reticulation, risers and sprinkler heads dependant on selected method
- Fitted with a rain sensor
- Wherever possible, supplied by tank or recycled water.
- Comply with any water restrictions in place

Avoid planting trees in locations that could result in slip hazards caused by excessive leaf litter or flower fall onto pedestrian pavements.



17.0 Parking and Vehicular Circulation

For the design of car parking, entry points and associated facilities there are a number of publications available to aid in design.

17.1 GENERAL

At every station the following minimum parking must be considered:

- Two bays for persons with disabilities (one to be designated as "set-down").
- Queensland Rail staff parking as instructed.
- Additional bays as instructed by Queensland Rail.

17.2 REFERENCES

For the design of car parking, entry points and associated facilities there are a number of publications available to aid in design.

- Disability Standards for Accessible Public Transport
- Guide to traffic Engineering Practice – Roundabouts – Part 6 Austroads
- Guide to traffic Engineering Practice – Pedestrians – Part 13 Austroads
- Guide to traffic Engineering Practice – Bicycles – Part 14 Austroads
- Guide to traffic Engineering Practice – Motorcycle Safety – Part 15 Austroads
- Guide to traffic Engineering Practice – Parking, Part 11 NAASRA
- Guide to traffic Engineering Practice – Traffic Control Devices, Part 8 NAASRA
- Guide to traffic Engineering Practice – Intersections at Grade, Part 5 Austroads
- Guide to Geometric Design of rural Roads – Austroads
- Guide to geometric Design of Major Urban Roads – Austroads
- Main Roads – Road Planning Design Manuals
- Guide to Traffic Engineering Practice – Bicycles – Part 14 Austroads
- Cycle Note C3 – Bicycle Parking Facilities – QLD Dept Transport and Main Roads
- Main Roads – Road Drainage Design Manuals
- Main Roads – Manual of Uniform Traffic Control Devices: All Parts

- Pavement Design Manual – Queensland Transport
- Queensland Urban Design Manual – Volumes 1 and 2
- Australian Rainfall and Runoff – IE Australia – Volumes 1 and 2
- Local Council Guidelines

17.3 DESIGN ISSUES / CRITERIA

Determine design standards

- Circulation Road & Isle Widths - AS 2890. Parking Part 11 NAASRA
- Bus Bays - Parking Part 11 NAASRA, D.O.T. & BCC Standard Drawings
- Car and Motorcycle Bays - AS 2890.1 Parking Part 11 NAASRA
- Parking for persons with disabilities – AS/NZS 2890.6 Off-street parking for people with disabilities.
- Pedestrian circulation – Disability Standards for Accessible Public Transport.
- Bicycle Facilities - AS 1742.9 & Queensland Rail Standard Drawings
- Parking Facilities Part 3: bicycle Parking Facilities – AS 2890.3

- Pedestrian Crossing Controls - AS 1742.10
- Traffic Control - Traffic Control Devices Part 8 NAASRA, Main Roads. Manual of Uniform Traffic Control Devices, AS 1742 (All Parts)
- Carpark Security Requirements - D.O.T. Current Stds/Client Requirements.
- General Road Design
- Rural Road Design - Austroads
- Intersections at Grade - NAASRA
- Main Roads Road Planning Design Manual
- Roundabouts - A Design Guide NAASRA
- Local Council Design Standards – particularly as applies to garbage collection
- M.R.D., D.O.T. AND Local Council Standard Drawings
- Queensland Urban Drainage Design Manual Volumes 1 & 2
- Pavement Design Manual - Queensland Transport



17.4 DESIGN PROCESSES

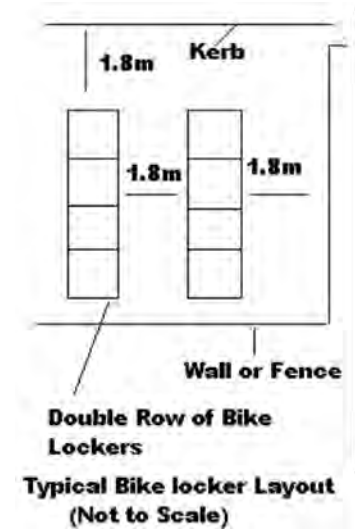
The principles of legible circulation design described in Part 1 of this document apply to vehicular circulation as well as to pedestrian circulation. The vehicular circulation is of EQUAL IMPORTANCE to the pedestrian circulation – they must be designed together.

- Consider placing car parks in areas where visibility from passing motorists, pedestrians, staff and passengers is maximised.
- Consider placing car parks as close to the station as possible to maximise surveillance. Avoid placing car parks in isolated locations.
- Position and place car parks so that they are not convenient thoroughfares for pedestrians to access this station, as pedestrian access increases the risk of theft from vehicles.
- Consider using signage or other psychological barriers at entrances to car parks to minimise general pedestrian access. It may also assist to designate these as “Restricted Access” car parks.
- Use Queensland Rail standard fencing (preferably black) unless otherwise approved by Queensland Rail.
- Consider a one-way circulatory design to facilitate patrols by police and/or private security personnel.
- Trees should not be placed inside or outside of the car park in a way that will obscure surveillance or facilitate climbing the perimeter fence. Car parks should use straight lines with consistent grading to maximise surveillance.
- Nooks where people can loiter should be avoided.
- Consider instituting a part of the parking area as a “lock-up” car park where all gates to the car park area locked by station staff or contractors between commuting hours (e.g. 9:30 to 2:30). This will assist to minimise thefts of and from the car parks during these high risk times.
- Consider using signage for large car parks. This will help passengers to find their vehicles quickly but also assist in the identification of hotspots (i.e. if this information is recorded in rail and police crime reports) and assist CCTV analysts to identify appropriate cameras to view. Consider dividing large car parks into smaller ones to facilitate this.

- Consider placing signage in car parks to remind passengers to secure their vehicles and remove their valuables.
- Consider the use of an access control system (e.g. boom gates or manned check point) to minimise unauthorised access or theft of vehicles from the car park.
- Bike Parking facilities may comprise any combination of Class 1,2 or 3 facilities as defined by AS 2890.3. These may include Bike Lockers, secure compounds, or open bike racks.
- Bike Parking Facilities should be conveniently located as close to the station as possible, and in preference to carparking spaces.
- Bike Facilities should be positioned in a way that does not create nooks or otherwise interfere with sightlines. They should not unnecessarily restrict pedestrian movement or impede opening of the doors of parked cars. They should not be placed in a way that obscures surveillance or facilitate the climbing of fences and other structures.
- Consider lighting and surveillance of the facility. Passive surveillance is always desirable and may be complemented with the use of CCTV systems.
- Consider including artworks on Bike Parking Facilities if they are likely to be subject to graffiti.
- Avoid use of wheel-stops. Widen pedestrian paths, shorten parking bays and mark vehicle “overhang” space.

17.5 EMERGENCY AND SERVICE VEHICLES

The vehicular circulation must facilitate reasonable access by emergency and other service vehicles. Note this may include provision for buses in the event of a track closure.



17.6 CONFIGURATION

Queensland Rail requires taxi bays, passenger set-down bays and DDA parking bays to be close to each other and along the same pedestrian path.

Diagram 25 illustrates a parking/path layout that has been found to be acceptable. Note: It is not desirable to encourage pedestrians to transit behind vehicles or within vehicular movement spaces.



18.0 Bus stops

18.1 REQUIREMENTS

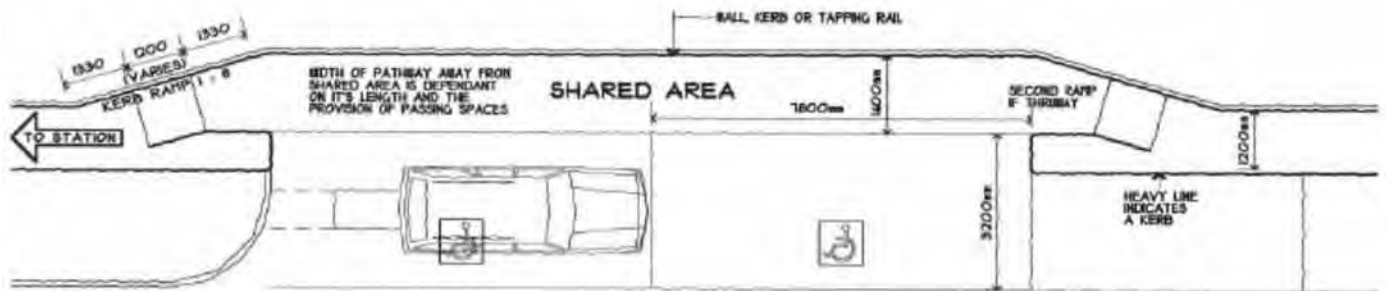
The number of bus stops (if any) will be stated in the project brief.

At each bus stop there must be:

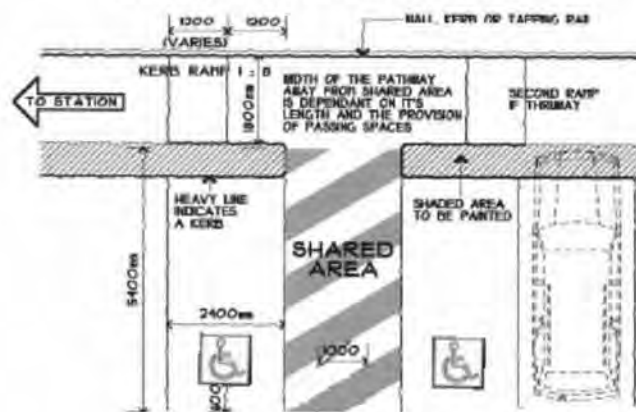
- Seats as per drawing 2487. The total number of seats will be determined by Queensland Rail. At least one seat is to be designated as reserved for persons with disabilities. Locate seats with front edge at least 500mm from the side of any path of travel for leg clearance.
- Two wheelchair waiting spaces (WCWS) – each to be 1300mm x 800mm and identified by an accessible sign or a Queensland Rail supplied mat. In an existing interchange, where there are two or more bus stops adjacent to each other the number of WCWS may be reduced to one per bus stop if approved by Queensland Rail.

- Waiting space for persons standing of adequate size for the anticipated patronage.
- Shelter to seats and waiting spaces.
- Path of travel to and past the bus stop of sufficient width to accommodate the anticipated patronage. The minimum width is 1800mm free of all obstacles such as signs, etc. No sign, pole, or other object is permitted within the path of travel.
- Illumination to the same level as for a railway platform.
- Directional and warning TGSI's as per Drawing CM2149.

Queensland Rail will determine if an emergency assistance 'phone (EDAP) is required in close proximity to the bus stop(s). If so a person travelling to the bus stop from the station platform entry must cross the directional TGSI's denoting the EDAP location.



EG. PARALLEL PARKING SPACES



PARKING AND RELATED PATHS FOR PERSONS WITH DISABILITIES EG. ANGLE PARKING SPACES

Diagram 25

19.0 Taxi & set-down areas

The number of taxi and passenger set-down bays (if any) to be provided will be identified in the brief. However, if any are provided, at least one of each must be suitable for use by persons with disabilities.

19.1 GENERAL

The number of taxi and passenger set-down bays (if any) to be provided will be identified in the brief. However, if any are provided, at least one of each must be suitable for use by persons with disabilities.

19.2 CONFIGURATION

Each taxi and/or set-down bay is to conform to the requirements of AS/NZS 2890.6 Off-street parking for people with disabilities for both parallel and angled parking bay.

19.3 REQUIREMENTS

At each taxi area and set-down area there must be:

- Seats as per drawing 2487. The total number of seats will be determined by Queensland Rail. At least one seat is to be designated as reserved for persons with disabilities. Locate seats with nose at least 500mm from the side of any path of travel.
- Two wheelchair waiting spaces (WCWS) – each to be 1300mm x 800mm and identified by an accessible sign or a Queensland Rail supplied mat.
- Standing waiting space of adequate size for the anticipated patronage.
- Shelter to seats and waiting spaces.
- Path of travel to and past the bay of sufficient width to accommodate the anticipated patronage. The minimum width is 1800mm free of all obstacles such as signs, etc. No sign, pole, or other object is permitted within the path of travel.
- Illumination to the same level as for a railway platform unless instructed otherwise by Queensland Rail.

20.1 General electrical and lighting

All publicly accessible parts of Queensland Rail sites must be illuminated to achieve basic levels of public and staff safety and security.

20.1 GENERAL

All publicly accessible parts of Queensland Rail sites must be illuminated to achieve basic levels of public and staff safety and security.

Some components require higher illumination levels for compliance with DSAPT or AS1158.3

Queensland Rail also requires electrical consultants to survey and record existing installations and to upgrade power supply and earthing and bonding as a part of the lighting work.

Switchboards and meters must be able to be accessed at all times.

Appendix E defines the technical requirements for lighting and electrical design.

20.2 PATHWAY CLASSIFICATION

On existing sites with multiple pedestrian paths Queensland Rail classifies paths into two categories.

- Primary paths – connecting entry to DDA parking, bus stops, taxi, etc and ONE path to the street.
- Secondary paths – any other path.

Primary paths, platforms, work spaces, stairs, ramps, footbridges, subways, etc are to be upgraded to comply with the Webb Report; secondary paths and parking areas are to be in accordance with AS1158.3.

20.3 EMERGENCY EVACUATION

Each site shall be assessed to determine if an alarm system is required. Where required it must comply with the requirements of the Building Act, the Building Code of Australia and other relevant Acts and Codes and it must also comply with the DSAPT which references section 18.2 of AS1428.2 as follows:

- Must include both audible and visual alarms
- Audible alarms
 - Alarm signals as per AS2200.2
 - Sound level at least 15dB(A) above noisiest background averaged over 60 seconds with a minimum of 75 dB(A)
- Visual alarms
 - As per AS2220.1
 - To flash in conjunction with audible alarms at a frequency of approximately 1Hz
- Auxiliary alarms for the hearing impaired
 - Must be connected to the building emergency system.

Note: The above is a summary of the current Federal Regulations. However the referenced Standards have been superseded. Queensland Rail will advise whether the current regulation or the new Standards (AS1603 & AS1670) are to apply.

20.4 INFORMATION SYSTEMS

Unless instructed otherwise by Queensland Rail the following are required.

Public Address System. An effective PA system is required at each site.

An effective PA system must cover:

- All areas on the platforms
- All enclosed spaces at concourse level except storage spaces and lease tenancies

- External spaces to the extent determined by Queensland Rail – note that the system must be capable of extension to cover all designated waiting spaces
- A hearing aid loop, connected to the PA system, must effectively cover the area at platform level to the extent stated in Section 1 of Part 1.

Final connections and commissioning of PA systems and Hearing Aid Loops is usually by specialist Queensland Rail personnel. Queensland Rail will advise the precise sub-division of roles at each site.

Emergency call. An emergency call system is required in the toilet for persons with disabilities. Queensland Rail will advise whether the following is required in full, or alternatively, the degree to which provision is to be made for future installation.

- Operate by a push button
 - Minimum 50mm diameter
 - Gloss Y14 yellow colour
 - Maximum 6N operating force
 - Provision for one 450mm above floor & one at 1200mm above the floor
 - At least 500mm from an internal corner
 - Within reach of the pan
 - Compliant with AS2999.
- “Ring” as an audible tone within the station office.

Train Information Passenger Services (TIPS). The supply and installation of LED / LCD information units may be the subject of another contract. Queensland Rail will advise.

20.5 APPROVALS

In addition to approvals listed in Appendix E, submit signage layout plans and lighting/lux level plans to Queensland Rail for final review.

20.6 TECHNICAL REQUIREMENTS

Refer to Appendix E

21.0 Environmentally responsible design

21.1 GENERAL

Queensland Rail is committed to environmentally responsible design. Elements that are to be considered and include are:

Water

Aim to minimise potable water consumption associated with operations.

- Selection and use of drought tolerant plants to avoid or minimise irrigation needs – preference for native species .
- Installation of minimum 4 star WELS rated water efficient fittings and fixtures e.g. taps, showers, toilets and urinals. Note such devices must be compliant with current water restrictions.
- Water irrigation systems, where proposed, are to comprise a subsoil drip system and automatic timers with rain/moisture sensors to aid efficiency
- Installation of rainwater tanks or other non-potable water harvesting infrastructure (refer Appendix C for details) - consider rainwater, stormwater, greywater where applicable. Note this water should be available for on-site uses such as: irrigation, toilet flushing, cleaning of platforms areas when required.
- Water submeters to be installed for all significant water uses within the site to facilitate water consumption monitoring.
- Stormwater is to be diverted around contaminated or potentially contaminated areas
- Flow and discharge of stormwater considers receiving environment (integrate Water Sensitive Urban Design)

Energy

Aim to minimise greenhouse gas emissions associated with operational energy consumption and maximise operational energy efficiency.

- Install solar hot water systems with remote storage tanks or heat pump style hot water systems where hot water systems have been requested.
- Select electrical appliances in consideration of energy star rating

Lighting

- Lighting design to consider flexibility and automation of light switching to minimise over lighting in areas where it is not required. E.g. zoning areas such as platforms to enable lighting of in-use areas only.
- Installation and utilisation of alternative energy supplies for lighting such as solar panels where applicable
- Inclusion of photoelectric (PE) light
- Install energy efficient light fittings
- Install motion activated lighting in areas where high use lighting is not required e.g toilets, store rooms
- Maximise natural lighting where possible through fixtures such as skylights and windows in accordance with safety and security requirements
- Smart lighting control utilising DSI/DALI dimmable lighting in undercover areas interfacing with PE, light levels and motion detector controls.

Heating, Ventilation and Air Conditioning (HVAC)

- Maximise natural ventilation
- Energy efficient techniques such as heat activated ventilation and air-conditioning.
- Selection of air conditioners will consider their energy rating – minimum 4 star energy rating..
- Consider placement of HVAC device to minimise heating/cooling of low use areas
- Consider other site responsive design features to minimise heating/cooling requirements such as glazing, insulation, awnings.
- Required maintenance techniques and products required for designed environment.

Waste

Aim to minimise waste generation throughout whole of life

- Maximise reuse of existing building materials
- Design to facilitate repair, replacement and/or disassembly
- Utilise materials that have a recycled content where practicable and fit for purpose e.g. E-wood, and that have potential to be reused or recycled
- Select materials and products in consideration of their maintenance costs, life expectancy, ability for repair
- Ensure facilities are in place that encourages waste segregation and recycling for use in operations.

The following section identifies some corporate initiatives that are currently being explored within Queensland Rail.

21.2 POSSIBLE CLIMATE SMART INITIATIVES

QUEENSLAND RAIL IDENTIFIED BUSINESS GROUP POSSIBLE CLIMATE SMART INITIATIVES		
Short-term	Medium-term	Long-term
Motion detectors on lighting and air conditioning	Instantaneous boilers instead of zip	5 star rating for all appliances
Replace light bulbs with more energy efficient ones	Install time delay bypass switches	Investigate green power/partnerships
LED exit and advertising signs	PE control in advertising	Investigate compressed air instead of electricity for power tools
Monitor regenerative braking	Power factor correction	Considerations for specs for upgrades: Insulation Blinds Colours Double glazed windows Window tinting Smaller sections of lighting Paper towel dispensers instead of hand dryers Invertor style air-conditioners Lap-tops instead of pc's Investigate viability of solar panels/windfarms Lift efficiency Investigate options for natural lighting
Energy audit/assessment with Ergon	Investigate alternative security options for stations other than lighting	Visual display of energy consumption on stations
Staff competition for energy reduction	Timers on air conditioners and lights	
Staff education and awareness campaign	Replacement of energy inefficient lighting systems	
Energy monitoring system (ie SAP environmental compliance module)	Guidelines for appliance (minimum energy efficiency level)	
Install future switches (www.futurerange.com.au)	Adjust temperature on thermostat	
Rollout Ecobiz to other locations	Variable speed for motors in buildings	
ISD Green IT programs	Develop energy efficient specification for admin/depots/stations	
Install smart meters	Add an energy efficient clause in contracts	
	Investigate eco-vision	
	Investigate the viability of using gas as an energy source on stations	
	Install sub-metering on sites	

22.0 Emergency egress

Care shall be taken to ensure that muster areas and other emergency exits do not expose public to other risks such as hit by a train, electrocution etc.

22.1 GENERAL

Each station shall be assessed on an individual basis to determine the requirements for a suitable emergency exit and muster area. Such areas are required to be clearly identified. Note all stations must comply with the relevant sections of the BCA.

As a general guide the following applies:

Enclosed station within commercial development:

- An emergency marshalling area and a safe egress from the platform to be established.
- Clearly visible direction signs to be posted at strategic points at the station.
- The above to be incorporated in the commercial centre's emergency alarm system.
- A visual and audible alarm system to be provided.
- Station and centre staff to be trained on evacuation procedure of station and centre.

Enclosed stations:

- An emergency marshalling area and a safe egress from the platform to be established.
- Clearly visible direction signs to be posted at strategic points at the station.
- A visual and audible alarm system to be provided.
- Station and centre staff to be trained on evacuation procedure of the station.

Open station platform which may contain station office building, lifts, stairs & ramps.

- An emergency muster area and safe egress from the platform to be established. Particularly for island platforms where the platform is locked in between tracks.
- Clearly visible direction signs to be posted at strategic points at the station to signify direction of emergency exit. If possible, egress, not requiring the use of the ramps / stairs and lifts to also be identified.

Care shall be taken to ensure that muster areas and other emergency exits do not expose public to other risks such as hit by a train, electrocution etc.



23.0 Wayfinding and TGSI's

Wayfinding is the process of using as much information as possible from the environment to assist passengers with a range of abilities to successfully find their way from the station entrance to boarding the train. Wayfinding is provided as a system of inter-related forms of information.

23.1 GENERAL

A railway station is an important node within many journeys. Commuters change their form of transportation at this node and expect to do so with minimal difficulty. The essence of a railway station is the circulation patterns of these commuters in transit and a clear wayfinding strategy that they can use to navigate their way with the station environment.

Wayfinding is the process of using as much information as possible from the environment to assist passengers with a range of abilities to successfully find their way from the station entrance to boarding the train. Wayfinding is provided as a system of inter-related forms of information.

They include:

- Static signs – general and accessible
- Electronic signs – LED and LCD displays and timetable consoles
- TGSI's – warning and directional
- Audio – public address system, hearing aid loop and lift announcements
- Architectural features – walls, kerbs, handrails and buildings

An effective wayfinding system involves not only the placing of the most appropriate form of information in the best location to achieve a high degree of legibility, but also avoiding cluttering up the station. Its design can be complex as each station is different and requires consideration of the station architecture, existing sight lines, installed equipment, the way the station operates and the number and type of passengers using the facility. Using a wayfinding specialist architect or designer is recommended.

The TRANSLink train station signage manual, Queensland Rail accessible station signage guide and the Queensland Rail civil engineering standard drawing for TGSI layouts 2531 must be used. Site visits to Queensland Rail stations will provide examples of wayfinding systems in use.

23.2 OTHER TGSI'S

Refer to 1.3.3 for TGSI's at EDAP's and to Section 3 for TGSI's at ramps and stairs and 2.8 for platform edge TGSI's.

A new Queensland Rail policy on Wayfinding is currently under development, refer to Queensland Rail's DDA Community Engagement Co-ordinator Nalalie Billings for specific requirements.



Appendix A

A1 GUIDE TO PREPARATION OF THE DESIGN BRIEF

A1.0 Introduction

A1.1 General

The intent of a Design Brief is to clearly communicate to the consultant:

- The client's project specific needs (objectives, time constraints, budget, etc)
- The extent of work expected of the Consultant
- Items of work to be supplied by others
- Other work that may occur in parallel with the project
- Additional information (eg. measured drawings, previous investigations, standards, procedures) of relevance to the consultant
- The conditions of the consultant's contract
- Tendering/pricing requirements.

A1.2 The Brief

While all of the above is required, the "core" of the brief is the design objective. A functional design brief defines DESIGN OBJECTIVES in as much detail as is possible at the time. The objectives must use precise language in order to fully and correctly define the Queensland Rail requirements for the particular project. Objectives perform two major roles:

1. They establish the challenges which the designer must overcome.
2. They facilitate checking of designs.

Design objectives are performance statements. They are not "solutions" or designs in their own right. They might, however, contain required or preferred details that must be assembled or incorporated into the design. The key skill in brief writing is the ability to strike a balance between the performance statement and the prescriptive outcome that is appropriate to the particular project.

A1.3 Outline

The balance of this Appendix is divided into two parts. A2 summarises the work that is necessary before the brief can be prepared. A3 identifies the key elements of the brief.

A2 PRE-BRIEF ACTIVITY

A2.1 DDA Audit

DDA audits for most stations in the SEQ network were prepared as a part of the APT2007 project. That document is a logical starting point for upgrading of existing stations.

A2.2 Pre-design Requirements

Identify the following items as required prior to the preparation of the design brief

- Obtain agreement on general and specific goals for this project.
- Identify area of land required
- Make approach to Queensland Rail property division to make preliminary investigations into ownership of land/possible land acquisition process
- Native Title
- Cultural heritage
- Planning compliance requirements
- Locality and Topography
- Any study of requirements to determine the number of car parks, bus bays, standing, taxi, People with disabilities (PWD) car parks, long and short term car parks (secured and unsecured), bicycles and motorbike parking requirements.
- Road , pedestrian, Bicycle Access
- Location of existing services – Water, Sewage, storm-water, Electricity, Telecommunications, Closed Circuit Television Security (CCTV)
- Track Position and clearances
- Platform location, station buildings & footbridge location and layout
- Existing surface drainage patterns
- Local Authority Requirements
- Examine any environmental assessments, or other documentation as applicable, to identify key environmental constraints and opportunities (i.e. vegetation, contamination, stormwater, community) – request more information if required.

- Examine existing survey data – request more information if required
- Existing landscaping and established trees
- Site context—confirm any legislative protection afforded to vegetation (request further information if required)
- Notable external links (transport, educational, commercial, retail, residential and public nodes)
- Impact of new buildings, shelters and other infrastructure (CCTV, lighting) on existing pedestrian access points
- Proximity of station facilities to proposed bike storage areas etc.
- Existing and forecast Passenger numbers
- Existing Car Parks
- Local area characteristics and themes
- The Local Authority Planning Scheme

A2.3 Preliminary Studies

In some cases it may be necessary to have the results from preliminary studies prior to preparation of the brief. The preliminary studies could include:

- Pedestrian flow predictions
- Traffic studies
- Signal sighting determinations
- Heritage assessments
- Environmental assessments

A2.4 Consultation

Decide what is required, when it is best done and who is responsible. Some examples include:

- Public participation/consultation
- Stakeholder consultation
- Negotiations with adjoining owners
- Road issues
- Footpath issues
- Electricity supply

A2.5 Concept

Queensland Rail is to determine if the project complexity justifies the preparation of a preferred concept for inclusion into the brief. If a concept is required Queensland Rail then needs to determine its degree of resolution. Two levels of concept resolution have been used:

1. Circulation planning. The design is resolved only to the extent of identifying, sizing and locating critical elements such as lifts, stairs, footbridge, subway, parking, site access, ticket office, toilets, shelter, etc.
2. Schematic Design. The design is resolved three dimensionally to the extent possible within the time constraints. The outputs are in the form of plans, artist's impressions, 3D models, PowerPoint presentations and the like. This level of detail is generally not required for most projects. However, it will be necessary where stakeholder and public consultation is required.

A3 CONTENT OF THE BRIEF

A3.1 Introduction

Write a project specific introduction for the reader of the brief.

A3.2 Consultant tendering process

The detail of this section will vary with project type, complexity, location, etc. It will need to include at least:

- A clear description of each element of work to be priced
- A description of the tender assessment process
- Copies of the tender form(s)
- The examples on pages 4, 5 & 6 are from the Alderley Station Upgrade Brief.

A3.3 Major Goals

Define the major Queensland Rail goal(s) for the specific project.

A3.4 Regulations

Reference documents such as:

- Relevant legislation such as DSAPT, BCA, etc
- The Queensland Rail station design guide
- The relevant Queensland Rail civil engineering standards
- Summarise those deviations from normal regulations approved by Queensland Rail for this project.

A3.5 Existing Conditions

Site owners must disclose to consultants and contractors all that they know, relevant to the project, about the site and its context. For example, if a recent survey exists, attach it as an appendix. If not, identify procedure for obtaining/providing survey information.

A3.6 Work by Consultant

The detail of this section will vary with project type, complexity, location, etc.

This example is based on the provision of estimates. Queensland Rail will advise if a Bill of Quantities is required.

EXAMPLE : Fee Proposal

Y.1 General

The Consultancy fee proposal must address this design brief and the evaluation criteria identified in W.3 and must be forwarded to the following address prior to the time indicated in the letter of invitation:

Manager Civil Engineering Services,
Queensland Rail,
c/- Tender Box,
Despatch Office,
Ground Floor, Rail Centre 1,
305 Edward Street, Brisbane , Qld.,
4000.

Submit three copies of the proposal in a sealed envelope clearly labelled:

ALDERLEY STATION UPGRADE
CONSULTANCY PROPOSAL

Y.2 Consultancy Proposal

The Consultancy must include:

1. Total Lump Sum Price offer for the whole of the consultancy work required to achieve the objectives defined in this brief and those able to be reasonably inferred from it. Submit the Lump Sum Price on the attached Consultancy Fee Proposal Form
2. A breakdown of the total price into a price for each discipline for each of the following phases:
 - (a) Layout plan for approval
 - (b) Final tender package
 - (c) Complete tender package
 - (d) Construction inspections and reports
 - (e) As-constructed documents reviewThe work for each is defined in section 2.4 above. Submit the Breakdown of the Fee on the attached Consultancy Fee Breakdown Schedule Form.
3. A price per site inspection and report by the Consultant and each sub-consultant. These prices will be used for adjustment to the Lump Sum Fee in the event that the required number of inspections differs from that defined in 2.4.7 above.
4. A time and progress schedule in bar-chart format for
 - (a) Layout plan for approval
 - (b) Queensland Rail review
 - (c) Resubmission and re-review if required
 - (d) Final tender package
 - (e) Queensland Rail review
 - (f) Resubmission and re-review if required
 - (g) Complete tender packageNo additional fee or extension of time will be approved for corrections or revisions to documents at any time throughout the project if Queensland Rail is of the opinion that such requirements have resulted from deficiencies for which the Consultant is responsible.

5. A list of all sub-consultants proposed to be used and the scope of work for each.
6. A list of the key staff (including qualifications) of the consultant and each sub-consultant proposed for this project.
7. A pricing schedule nominating hourly rates for staff of the consultant and each sub-consultant.
8. Response to the Evaluation criteria.
9. Refer to the letter of invitation for details of site visits during pricing period.

Y.3 PROPOSAL EVALUATION CRITERIA

The proposals received will be evaluated by Queensland Rail using the following parameters/criteria:

1. Experience in similar projects
2. The time and progress schedule
3. Lump Sum Price and hourly rates where applicable
4. Methodology for the integration of the work of the various disciplines throughout design and documentation (design management)
5. Quality system processes and procedures proposed to be used for this project Third Party QA certification, for the duration of the contract, that complies with AS/NZS/ISO9000 “Quality Management Systems – Requirements”. When a quality system is offered based on a different Quality System Standard to that specified, it is the responsibility of the applicant to prove to Queensland Rail that it also complies with the specified Quality System. This requirement also applies to sub-consultants.
6. Proposed construction methodology for the buildings and other structures having regard to:
 - Ease of construction and minimisation of disruption to rail services
 - Construction safety and maintenance safety
 - Visual amenity

Note: It is preferred that structures within 5 metres of overhead electrical line equipment be prefabricated off-site.

Evaluation of proposals will be undertaken on a “value selection” basis. The details of the evaluation will not be made available.

Y.4 CONTRACT CONDITIONS

The successful consultant is required to enter into a contract with Queensland Rail. The following comprise the contract:

1. The Consultant’s offer.
2. The letter of acceptance.
3. The conditions defined in the Queensland Rail “Long Form Contract for Consultancy Services”. A copy of that document will be issued with the letter of invitation.
4. This Design Consultancy Brief.
5. Any subsequent relevant correspondence.

Y.5 CLAIMS FOR PAYMENT OF FEES

The obligation of Queensland Rail to pay fees to the consultant is subject to certification, by the Queensland Rail nominated Project Officer, that the consultancy service to which the invoice relates have been rendered in accordance with the contract and that satisfactory progress has occurred in the performance of the consultancy services.

For the non-construction phases of the work, progress payments will occur at the completion of each phase as follows

1. Layout plan for approval – 20% of the net fee
2. Final tender package – 60% of the net fee
3. Complete tender package – 20% of the net fee.

The “net fee” is the Lump Sum Fee less the fees for work defined above.

Y.6 DIRECT PAYMENT

Note that direct payment of fees to each sub-consultant by Queensland Rail may be considered or negotiated subject to the sub-consultant entering into a contract with Queensland Rail similar to the contract between the Consultant and Queensland Rail.

FEE PROPOSAL FOR DESIGN, DOCUMENTATION AND CONSTRUCTION PHASE CONSULTANCY SERVICES FOR STATION UPGRADE WORKS AT ALDERLEY STATION

To: Queensland Rail
 c/- Tender Box, Despatch Office, Ground Floor,
 Railcentre 1,
 305 Edward Street, Brisbane, Qld., 4000.

I/We			
	(FULL NAME – BLOCK LETTERS)		
Australian Business Number			
of			
	(Address)	(Postcode)	
Hereby tender to perform the services described in the Consultancy Brief Documents, at or for the Total Lump Sum Price of:-			
\$			
TENDERERS ARE TO NOTE THAT THE PRICE TENDERED IS TO BE EXCLUSIVE OF GST			
The price tendered is "FIRM" for the duration of the Consultancy			
The Fee Breakdown Schedule and a Schedule of Hourly Rates is attached:-			Yes / No
I/We agree that if our tender is accepted, I/We agree to undertake to perform the Services strictly in accordance with the documentation contained in the Consultancy Brief Documents.			
Tenderer:			
Signature:		Phone:	
Printed name:		Fax:	
Email address:			
Witness:		Witness name:	
Date:			

SEGMENT OF WORK	ALDERLEY STATION UPGRADE CONSULTANT DISCIPLINE FEE BREAKDOWN SCHEDULE										TOTAL FEE
	Principal Consultant (co-ordinator) Name:-										
	Identify Individual Discipline eg. Architecture, Structural, Civil, DDA, etc and name of sub-consultant										
Pre-construction:											
Layout plan for approval											
Presentation to Queensland Rail stakeholders											
Final tender package											
Complete tender package											
Construction phase:											
Construction inspections and reports (refer 3.5.8, b)											
Shop drawings & test results reviews & reports (refer 3.5.8, c)											
BCA compliance certification (refer 3.5.8, d)											
Evaluate and report on claims by contractor for payments and extensions of time (refer 3.5.8, e)											
As-constructed documents review (refer 3.5.9)											
TOTALS											
OTHER PRICES											
Price per site inspection and report											
Hourly rates (Add schedule if necessary)											

EXAMPLE: WORK BY CONSULTANT

Z.1 Team

Assemble a team containing all of the skills and capabilities required to enable Queensland Rail to achieve the goals and objectives stated within this brief or able to be derived from it.

Z.2 Fee Proposal

Submit a fee proposal complete with Time and Progress Schedule and other material as defined in Section 2.5 of this document.

Z.3 Layout Plan for Approval

Develop the Concept Design up to a degree of detail appropriate to the needs of all stakeholders.

During this phase assist Queensland Rail in negotiations with BCC regarding traffic and pedestrian issues

At the end of this phase, submit to Queensland Rail plans, sections and elevations from every discipline in the team, dimensioned and noted and supported by details and calculations as necessary including, but not limited to:-

1. Documents that clearly define:
 - (a) Nature/extent of work
 - (b) Form of all components
 - (c) Texture of major components
 - (d) Materials
 - (e) Colour scheme
 - (f) Spatial sizes
 - (g) Critical dimensions
 - (h) Levels
 - (i) Structural strategies including footings
 - (j) All Services
 - (k) Construction sequence and methodology
 - (l) Signage layout
2. Provide to Queensland Rail three dimensional images or reports required for heritage approval of:
 - (a) Ticket Counter Module
 - (b) Removal of footbridge
 - (c) Any other alterations to the station building or the two listed shelters (eg. Toilets, colours, etc)

3. Provide to Queensland Rail three dimensional images and PowerPoint presentations required for project promotion
4. Estimates of construction cost to $\pm 25\%$ accuracy. To the extent possible, these estimates are to be expressed in an elemental breakdown form compatible with the Standard Method of Measurement .

Allow five working days for Queensland Rail review and response.

Z.4 Final Tender Package

Submit to Queensland Rail for approval tender/construction documentation that:-

1. Accurately and completely defines the design
2. Complies with both Queensland Rail standards and industry best practice
3. Includes but is not limited to:-
 - (a) Drawings
 - (b) Details
 - (c) Specifications
4. Incorporates tendering and contract material supplied by Queensland Rail.
5. Includes estimates of construction cost to $\pm 10\%$ accuracy. These estimates are to be expressed in an elemental breakdown form compatible with the Standard Method of Measurement.

Allow five working days for Queensland Rail review and response.

Z.5 Complete Tender Package

1. Revise the material defined in X.4 as per Queensland Rail response.
2. Submit all documents (including drawings on film) for Queensland Rail signature. Allow five working days for Queensland Rail review and response.
3. Resubmit complete tender package electronically, including electronic signed drawings.

Z.6 Tendering

Tendering will be undertaken by Queensland Rail.

Z.7 Construction Phase

Contract Administration will be by Queensland Rail.

The Consultant is required to carry out 30 construction phase inspections at times nominated by Queensland Rail.

Within two working days of each inspection the consultant must submit to Queensland Rail a report containing, but not limited to, the following:

- Clear and detailed descriptions of items of non-compliance with the tender documents
- Clear and detailed descriptions of items of non-compliance with DSAPT or any other applicable law.

Z.8 As-constructed documents

Review as-constructed documents and provide written report within five working days of receipt of those documents from Queensland Rail.

Z.9 Other Requirements

The Consultant is to comply with the Conditions of Consultancy and relevant Queensland Rail Standards and policies including:

- Production of drawings
- Technical specifications

All consultancy personnel who visit site must be in possession of current Queensland Rail "grey card". All costs associated with the obtaining of these safety certifications are the responsibility of the Consultant.

Design, materials and installation are to comply with all relevant standards current at the time of acceptance of the consultancy services.

A Registered Architect of Queensland, or where relevant, a Registered Professional Engineer of Queensland (together with reference to relevant design standards) shall sign all design drawings.

A3.7 SITE SPECIFIC ISSUES

Clearly define any technical details, assumptions, property issues and critical dimensions relied upon in the formulation of the brief/concept. These may include, but not be limited to:

- deviations from the requirements of the station design guide
- sections of surfaces with critical grading requirements
- land acquisition.

A3.8 SPECIAL REQUIREMENTS

Clearly define the site or project specific requirements. These may include, but not be limited to design issues such as:

- unusual priorities such as “Signature” sites, community partnerships, etc
 - visual character
 - site context issues
 - adjoining site issues
- or construct phase issues such as:

- access by the public during construction – extent, times, conditions
- staging of work
- out-of-hours work
- temporary facilities – what and who by
- access for construction vehicles
- temporary track crossings
- alarm systems

A3.9 PRE-EXISTING WORK

Pre-existing work may be available for some projects. If relevant this work could be incorporated into the larger project. Examples have included:

- ticket counter installation drawings
- images for heritage applications
- conduit drawings
- electrical upgrade drawings
- core area upgrade drawings

A3.10 WORK BY OTHERS

Clearly define any related work that will be excluded from this contract. This may include specialist installation/commissioning (TIPS, ticketing equipment, signage, boarding point mats, train stop marks) or parallel work (track upgrade, building refit). Allocate responsibility for co-ordination.

A3.11 NOMINATED SUB-CONSULTANTS

If there are to be any nominated sub-consultants, identify them, define the extent of their responsibilities and state payment methods.

Identify any special conditions relating to other sub-consultants. Eg. pre-approved by specific sections of Queensland Rail.

A3.12 SPECIALIST SKILLS

Clearly define any specialist skills required within the design team. This could include, but not be limited to:

- public consultation
- marketing
- special certifications
- special time and cost management

A3.13 FORMAT OF DESIGN OBJECTIVES AND TECHNICAL REQUIREMENTS

For convenience of use it is desirable to sub-divide these requirements into manageable “parcels” of related work. The detail will vary with:

- project type
- nature of site
- extent/complexity of required work
- nature/extent of previous studies

Briefs for larger projects usually define requirements in groups of geographical units (eg. east entry and parking, platform 1, station building, etc).

Use language that clearly describes the required performance of the completed design. Avoid prescriptive outcomes as far as possible.

The following describe in greater detail issues commonly requiring definition in the brief.

A3.13.1 Platforms

Clearly define all work required on each platform.

- For existing platforms this may include regrading, TGSI's, new surfaces, removal of pits, rectification of trip hazards, relocation or colour contrast painting of obstacles and adjacencies, critical dimensions and clearances, required extensions.
- For new platforms confirm required height.

- Clarify conditions relating to existing or proposed signals or repeaters.
- Some work may need to be designed to suit a future platform (eg. west side of Strathpine) or part of a future platform may be constructed as part of this project (eg. east side of Petrie).
- The type of surface finish, TGSI, coping, etc must be defined.
- For existing sites only, site specific deviations from normal practice must be clarified.

A3.13.2 Ramps and Stairs

This section may include materials, construction, nosings, widths, clearances, preferred configurations and, in some cases, special issues generated by existing site constraints.

A3.13.3 Lifts (cars & shafts)

- preferred types
- special sizes
- site constraints
- clearances
- character

A3.13.4 Underpass

- width, height
- spatial character
- CPTED
- Provision for TIPS and security cameras
- Pumps and generators

A3.13.5 Overpass

- Width, height
- Spatial character
- CPTED
- Electrical sub-mains and risers
- Provision for TIPS and security cameras
- Electrical safety (onto wires)
- Clearances for stairs opposite lifts
- Provision for ticketing equipment, SACID's, NTI/EDAP, etc

A3.13.6 Security and CPTED

Clearly define any special requirements or concerns to be addressed.

A3.13.7 Lighting

Define the extent of the upgrade to the various standards. Clearly identify treatment of areas such as “secondary” paths, parking areas, etc.

A3.13.8 Shelter

- Clearly define the required extent of cover.
- Specify use of “Standard” shelters if required/appropriate
- Clear height
- Provision for TIPS and security cameras

A3.13.9 Ticket Counters

- New ticket counter modules or upgrade existing
- Number required
- High/low level
- Check if already documented

A3.13.10 Street Furniture

- On existing sites clearly define extent of new vs existing.
- For new sites list standard elements to be used.
- Define extent of seating along paths and at bus stops, taxi stands, set-down bays, etc.

A3.13.11 Signage

State who supplies/installs hearing augmentation and priority seating signs.

Define other responsibilities. The following example is from Alderley:
*All carpark & traffic signs are to comply with the MUTCD.
All signs required under the BCA are part of this contract.
While all other signs will be supplied and installed as part of another contract, the Consultant is required to:*

- *Submit to Queensland Rail a layout plan of required signs. Select from and be guided by the TransLink Rail Station Signage Manual. Wherever possible mount signs on building structures instead of poles.*
- *Include in documents for this project, all necessary structural support for the proposed signs.*
- *Include in this project all necessary electrical circuits and conduits for illuminated signs.*
- *Ensure that the lighting design is adequate for non-illuminated signs.*

A3.13.12 Free-Standing Equipment

For items such as AVVM, SACID, NTI/EDAP, vending machines, telephones, etc define:

- Relocation or retention of existing
- Provision for new
- Electrical supply
- Cc
- Communications cabling
- Water supply
- Drainage point
- Other service connections.

A3.13.13 Lease Spaces

For existing sites incorporate a summary of any existing agreements and resultant design work. For new sites list requirements/provisions.

A3.13.14 Toilets

- Number of male, female and accessible facilities required
- Extent of facilities for ambulant disabled
- New or upgrade
- Identify CPTED issues

A3.13.15 Staff Areas

- List required facilities
- Identify extent of full DDA compliance.
- Floor finishes

A3.13.16 Mechanical

- Extent of air-conditioning
- Ventilation to covered platforms and enclosed spaces.

A3.13.17 Hydraulic

- Hot water reticulation
- Water Sensitive Urban Design issues such as:
 - Use of tanks
 - Irrigation
 - Recycled water
 - Grey water reticulation

A3.13.18 Electrical

- New supply, negotiations, applications, origin, restrictions
- Existing conduits
- Extent of hearing aid loops

A3.13.19 Pedestrian Areas

- Entry plaza(s)
- Adjacent footpaths
- Limitations
- Minor paths
- Surface finishes

A3.13.20 Parking

Clearly define:

- Number of bays required for cars and motorcycles
- Number of parking bays to be configured for persons with disabilities
- Access paths strategies

A3.13.21 Other Issues

Clearly define any specific requirements in relation to:

- Track crossings
- Planting design
- Irrigation
- Water sensitive urban design
- Set-down areas
- Bus stops
- Taxi zones
- Lighting
- Corporate or other colour issues.
- Waste Management
- Sustainability outcomes

Appendix B: Station operations

B1 GENERAL

SEQ Passenger stations are busy and active areas for commuters. Train schedules and pedestrian traffic are prime consideration when new works are being carried out in and around each station. Station operations must at no time be adversely disrupted by site work. The staging of works therefore must be planned in consultation with Queensland Rail to minimise disruption.

B2 WORKPLACE HEALTH AND SAFETY

Construction sites must be totally fenced from public platform areas and feature sufficient signage to deter unauthorised entry. The safety fencing must be positioned to allow clear passage for trains. Sites must be fenced using 2m high steel chain mesh fencing or similar. Access to fenced construction sites must be clearly identified and located away from main pedestrian traffic areas. Suitable signage must be installed to promote commuter safety and awareness.

B3 PLATFORM CLEARANCES

All construction work being carried out on station platforms must conform to relevant clearances in accordance with Structural Gauge Requirements as indicated in the following Queensland Rail standard drawings:

No. 2754 – Standard Clearances for Proposed Structures

No. 2234 – Structural Gauge Electrified Lines

No. 2235 – Table of Structure Gauge Co-Ordinates for Electrified Lines

Distances specified are to be strictly adhered to and must not be deviated from without prior written approval from Queensland Rail.

All persons working on a site must comply with:

- Instructions of the Queensland Rail Protection Officer;
- The Queensland Rail Track and Trackside Safety Manual;
- The Queensland Rail Electrification Safety Manual.
- The Queensland Rail Major Building and Construction Contract – Special Conditions – Work Adjacent to Operating Railway.

B4 TEMPORARY FACILITIES

Existing SEQ Stations which require substantial refurbishment, alteration and/or demolition of facilities necessitate the installation of temporary facilities including, but not limited to:

- Ticket Office,
- Amenities,
- Stairs,
- Pedestrian overpass,

The Building Contractor must allow for the providing of temporary facilities and services for the duration of the station works or until such time as permanent office facilities are re-instated. Builders costs must also include all labour involved in relocation of Queensland Rail staff, furniture and equipment to temporary premises and transfer to new premises upon completion.

Temporary Ticket Offices must be air conditioned and complete with sufficient awning provision to allow patrons to purchase tickets under shelter. Adequate signage should be provided to direct passengers to the temporary facilities.

Temporary Ticket Offices should also be fitted with security screens to all windows and vandal resistant locks and latches to doors.

Additional secure storage compartments must be provided if required for staff and temporary storage of office furniture, cabinets, files etc. Temporary power, data, communications and phone provision must be provided to temporary buildings for the duration of new building work.

B5 TRACKSIDE SAFETY INDUCTION

All personnel (including consultants, contractors and their staff) entering a railway station for work purposes must have approval from Queensland Rail & have carried out the appropriate training, (liaise with Queensland Rail for these requirements) & everyone must follow the 5 Trackside Rules.

The 5 Trackside Lifesaving Rules are fundamental to the protecting people while working on the rail corridor. The rules are:

- Track Protection Officers (TPO) must supervise all entry to the rail corridor
- Corridor Access Safety Forms and Safety Briefings must be completed before any work begins
- Hierarchy of Safety Controls must be identified for all work
- Safety Barriers from live track must be in place
- Three-metre exclusion zone from Overhead Electrics must be maintained

Appendix C: Hydraulic items

C1 DESIGN CONSIDERATIONS

All new station building designs or major refurbishments requiring new water supply, sanitary and stormwater services must be in accordance with current building regulations.

Layouts for hydraulic design must be submitted to the local authority by an approved hydraulic consultant with approved drawings made available on site for construction.

Queensland Rail requires a set of approved, work as executed drawings to be submitted for approval. After written acceptance, two prints, an electronic copy and one transparency must be provided.

Building Contractors engaged must allow for the inspection of all existing sanitary and stormwater drainage, and certifying that existing drainage is completely operational. Queensland Rail will organise the rectification of any defective existing drainage during the period of new hydraulic works being undertaken under contract works.

The water meter and site stopcock is to be located at the site boundary.

In locations where sub metres are required these are to be placed in a position that allows easy access for maintenance and reading purposes. Sub meters are to be capable of having a Data Logger attached if required.

The Contractor must also be required to pressure test existing water supply pipework from mains connection point to station outlets and certify that adequate pressure is evident.

The Contractors water supplies must have a testable RPZD installed where the supply branches from Queensland Rail's water service. Test certificates must be given to Queensland Rail.

Damaged or obstructed water service pipework must be replaced as required as part of contract building works.

A QWC water compliance certificate must be submitted to Queensland Rail and be completed by a licensed plumber from the Contractors party.

Stopcocks and hose points are not to be located on platforms without written Queensland Rail approval. If approval is given, they must be located under platform level and installed in approved concrete sump/pit complete with non return valves as well as hinged heavy duty, highly slip resistant lockable metal covers.

All other external hose cocks are to be vandal proof.

All isolating cocks must be marked and signage visible for maintenance purposes.

All under track crossings for water services must have an isolating cock either side of the under track crossing.

Stormwater gratings on platforms must be hinged, highly slip resistant built-in types with 5mm spaces and maximum 150mm slot length.

C2 HYDRAULIC FITTINGS

Standard fixtures and fittings must be installed for all new and refurbished stations. Note genuine equivalent products will be considered but must be approved by Queensland Rail prior to installation. All tapware / fittings / fixtures must comply with the WELS code. A Queensland Rail inspector must sight these labels. No labels, no install.

Each fixture or fitting must be able to be isolated without affecting water service to the rest of the site.

An indicative schedule of fixtures and tapware is detailed. Generally Queensland Rail prefers tapware to be Ram or Caroma and sanitary fixtures Caroma or Fowler. Basin taps are to be self closing or sensor.

Urban Fountains + Furniture Apollo 900 Drinking Fountain or Queensland Rail approved equivalent must be used. A stop valve will need to be installed inside the unit.

The colours noted may need to be varied in order to achieve appropriate colour and luminance contrast against a specific background. Refer to Section 12 of Part 2 of this document.

C3 TOILET FITTINGS – ACCESSIBLE TOILETS

Fittings & Fixtures	Type	Model Product Code	QTY	Position	Legend	Notes	AS1428
Water Closet Pan-Option 1	Caroma	Trident Care Pan	1	800mm+/_ 10 from back wall.			
450-460 to side wall	WC	Disabled pan 608310 Colour white					
Water Closet Pan-Option 2	Stoddard	STP-02	1	800mm+/_ 10 from back wall.			
450-460 to side wall	WC	Stainless steel-vandal resistant commercial Pan- used for stations with high incidences of vandalism					
Seat	Caroma	Pedigre or Colani	1	460-480 to top of seat/ffi			
Cistern-Option 1	Caroma	Sovereign Care 2000 duel Flush	1	Flushing controls 600-1100mmabove floor		Wall mounted cistern 727120,with vandal resistant lid fixing Kit 413276. Colour White, Raised Tactile Button 405067	
Cistern-Option 2	Stoddard	SSB01	1	Flushing controls 600-1100mmabove floor		Stainless steel –vandal resistant commercial Cistern-used for stations with high incidences of vandalism	
Cistern-Option 3	Caroma	Care Leda 2000 618330	1	Flushing controls 600-110mm above floor		Colani disabled single flap care seat (813000), Mk3 disabled button kit (227129st), Water wafer Mk3 4.5/3L flush – for use with disabled toilet (227018) with vandal resistant cover.	
Toilet paper dispenser 1	Bobrick	B686 Dual Toilet Roll Holder	1	In specified zone	TPD		
Toilet paper dispenser 2	J D MacDonald	0715	1	In specified zone	TPD		
Grab rails	J D MacDonald	GRC53 Stainless steel/ powder coated		800mm high critical	GR	Powdercoat Matt Golden Yellow heavy Duty Vandal proof fixing.	
Washbasin	Caroma	Concord 500 with Shroud	1	Critical fixing height	BSN	Taphole centred, colour white	
Washbasin	Caroma	Integra 500 648210	1	Critical fixing height	BSN	Taphole centre, colour white	

Taps and Valves	Zip sensor tap	42220:deck mounted, 240V GPO connection required	1			All connections and power are to be recessed into wall cavity with an access door for maintenance.	
Mirror	J D MacDonald	Fixed Angle Tilt Stainless Steel Framed Mirror:0535-2438	1	M		Top of Mirror 1850mm+from finished floor level.	Clause10.4.1
Shelf stainless steel Utility	J D MacDonald	0692(200mm wide,305mm long)	1	SHF		Powdercoat Matt Golden Yellow heavy Duty Vandal proof fixing.	
Soap dispenser	Zip sensor	Touch free, SS model no. 29013	1	SD		Battery operated	
Electric hand dryer	J D MacDonald	Auto Beam with Satin Chrome Nozzle.					
AUTOBEAM-SC	1	Critical height 900-1100mm	HD				
Entry door (920mm wide door)		850mm minimum clear width-prefer 920mm wide door		D		Flush panel, Solid core, Clad Stainless Steel externally and Zinc Anneal internally, opening width measured is between door in open position and door stop.	
Steel Door Frame			1			Painted Bold Matt Golden Yellow	
Door Hinges	EFCO	EF10075FPSSS	3				
Door Lock - Accessible	Lockwood	LW3574-SC Emergency Mortice Lock	1			1 x LW 1814/70 SC External Furniture & 1 x LW 1939 SC Internal Furniture	
Door Lock - Accessible	Lockwood	LW3572.EAL.SC Single Cylinder Mortice Lock	1			1 x LW 570 Oval Cylinder & 1 x LW 1376 Series Escutcheon Plate	
Indicator bolt	Lockwood	L547-54548CDP	1			Priv. Lock .W/-EMERG/TURN, Critical fixing height between 900 &1100mm	
Door Furniture	Lockwood	LW1801/70.SC	1			Priv. Lock .W/-EMERG/TURN, Critical fixing height between 900 &1100mm.	
Door Furniture	Lockwood	LW1804/70.SC	1			LEVER/PLATE F/TURE.	

Door Stop	Lockwood	LWA350.SC	1				Wall –Door Stop (Fixed to wall).	
Door Closer (if fitted)	Dorma	TS 83 V					Delay on hold open.	
Clothes hanging Hook	JD MacDonald	0751	1	Critical Height	CH		Height Requirement 1200-1350 above floor, 500mm min from internal corner.	
Contrast panel to Door Furniture				Queensland Rail requirement			To provide background visual contrast to furniture.	
Fittings & Fixtures	Type	Model Product Code	QTY	Position	Legend		Notes	AS1428
Entry Door sign (DDA Compliant)	Pitt&Co.	BT014ab						
Pictogram type with Braille								
Unisex Accessible toilet and baby Change (330-190mm)	1	Beside Door		40mm space between architrave and the edge of the sign				
Assistance call button 1-hard wired	Future use	Provide wiring for future use	1		ACB		Cover plate only-450mm above floor –below paper dispenser.	
Colour to suit								
Assistance call button 2-hard wired	Future use	Provide wiring for future use	1		ACB		Cover plate only-1200mm above floor –below paper dispenser.	
Colour to suit								
Baby Change table	JD MacDonald	A BCV-JDM	1	1300 mm clear circulation space	BCT		800-810mm to top of change table when it is in the open position.	
Sharps Container	Queensland Rail Contract			Critical Height 900-1100mm	SC		Queensland Rail Supply Division Contract	
Sanitary Disposal Unit	Queensland Rail Contract						Queensland Rail Supply Division Contract	
Ceramic Floor Tiles	Granito	R11-slip Resistance rating. OASIS RIO 200x200mm						

Ceramic Wall Tiles	Johnson Tiles	Glazed ceramic wall tiles.147x147mm. Colour options-Tomato, Mimosa, Pistachio, Barley, Bluebelle						
Assistance Call Light			Colour contrast to aide the visually impaired.					
Motion sensor light	Clipsal	Provide wiring for future use Clipsal 751	High on external wall or under soffit High on internal walls or in ceiling					Above disabled toilet door externally, actuated by Assistance Call Button

C4 WATER TANKS

In line with commercial water saving requirements all new stations are to have a minimum 5000ltr rainwater tank for on site storage. Recycled water should be used where possible including hose taps, irrigation and toilet cisterns.

Tanks are not to be placed in a position that allows access to overhead masts, overhead wires, access to station buildings and footbridge roofs.

Further to this the following technical requirements shall be achieved:

- First flush diverters must be installed.
- Debris screens must be installed.
- Overflow must be discharged above a stormwater grate. There must be a physical air gap between the grate and the pipe to allow for visual inspection.
- Tanks are to be of a poly material.
- Pumps are to be Davey brand or equivalent as approved by Queensland Rail.
- The Davey rain tank is preferred when wanting an auto switch over device. Note genuinely equal products must be submitted to Queensland Rail prior to installation for approval.
- A pump cover must be installed to protect pump.
- Pump must be matched to site conditions eg Required head, pressure, application etc.
- Tanks are to be placed on engineered slab.
- All tapware to comply with WELS act.
- Ball valves are to be installed either side of pump to allow for servicing.

C5 PIPE WORK

All pipe work is to be installed as per AS3500.

All water service pipe work in buildings / above ground to be copper.

All below ground pipe work is to be marked with marker tape in accordance with AS3500.

All redundant pipe work, above and below ground, is to be completely removed.

Appendix D: Mechanical design

All toilet areas can be provided with natural ventilation, a vented skylight with security grille inside is an option. If natural ventilation is unavailable, then mechanical ventilation must be provided, in the form of exhaust fans usually sensor operated.

D1 GENERAL

All toilet areas can be provided with natural ventilation, a vented skylight with security grille inside is an option. If natural ventilation is unavailable, then mechanical ventilation must be provided, in the form of exhaust fans usually sensor operated.

Provide ventilation and exhaust extraction to covered platforms and enclosed spaces.

Station offices, equipment rooms and crew rooms must be air conditioned.

The following design requirements should be incorporated for all new stations:

Stations with a minimum sized ticket office and staff area require Split type wall mounted reverse cycle inverter style air conditioner of sufficient capacity to keep the temperature to 24°C when occupied and operating, as determined by Queensland Rail. External sections of air conditioning units must require protective shrouds and sufficient shielding to deter acts of vandalism. Any additional loading from computer and comms equipment should be taken into account when choosing an air conditioner.

All Station Offices require one split reverse cycle inverter style air-cooled air conditioning unit “commercial” type featuring the following components:

- Pipework for interconnecting refrigerant, discharge, liquid lines and condensate drains (to be concealed).
- All electrical wiring, controls and control switchboards necessary for the correct operation of the system beyond the isolation switch.
- Condensers are not to be roof mounted without approval of Queensland Rail. Locate them in a recessed area and provide vandal resistant screens that are designed such to be lockable and allow easy access / for repair / replacement.

- Condenser mounting frame is required to have suitable anti-vibration mounts, in a maintainable position which is protected from vandalism.
- Condenser – must be mounted at least 3 metres from any existing overhead line equipment in accordance with Drawing 2461. Unit must be positioned to be accessible without isolation.
- Fan Coil Unit – The fan coil unit must be complete with swing flow or adjustable louvres for uniform air distribution.
- If communications racks are located in the station building, the space must be ensured not to reach above 30 degrees at all hours including hours when the station is closed. This is generally completed by installing thermostat controlled exhaust fan/fans directly above the racks.
- Refrigerant Compressors – Equipment must operate on R22 refrigerant. Compressor must be a hermetic unit direct driven by single phase motors.
- Refrigerant Piping – Suction piping must be insulated (15mm thickness) and externally sheeted with galvanised material where exposed to mechanical and weather damage.
- Condensate Piping – All condensate piping enclosed in ceiling space and/or wall cavities to be externally insulated and vapour sealed.
- Controls—The system must be arranged to operate unattended, being brought into operation by individual hard wired remote controllers. The compressor must not operate until the supply air fan/s are operating. The system is to be controlled through the 12V challenger security panel via security operation key switch located at the station office entrance and combination with motion control, be it separate motion detection or within head end assembly.
- External components – external sections of the AC unit(s) must be fixed in a position that minimises the risk of vandalism (out of reach & out of sight).
- Air conditioners shall be self restarting to ensure they remain operational in normal arrangement after power loss.

D2 DESIGN INFORMATION:

- Ambient design conditions :The local ambient conditions
- Internal Design conditions : 24 C Dry Bulb
- Noise Levels—must not exceed NR 45 within air conditioned space.
- Crew Lunch Rooms—may require individual air conditioning unit depending on final design.

Note: A standard pipe size is preferable to allow easy replacement.

Appendix E: Electrical design

E1 GENERAL

Consultants are required to ensure that their electrical design conforms to all requirements and intentions of this appendix and supporting brief, and contains sufficient detail to ensure that it is constructed to the same. This electrical design guide is not exhaustive and some additional specific information and detail for each individual project may also be included in the individual project brief or determined in consultation with Queensland Rail electrical personal.

Design, materials and installation are to comply with all relevant standards current at the time of acceptance of the commission.

Contract works must not interfere with safe operation of the installation.

Where the project work is an alteration or addition to an existing installation care must be taken to ensure that the works integrate with the existing arrangement.

Queensland Rail is to be given the option to recover any obsolete equipment from the site.

This appendix caters mainly for Queensland Rail's low voltage electrical requirements but the designers will also need to meet the requirements of Queensland Rail's Telecommunication Division for communications and security systems installation.

Design drawings and as-constructed drawings must comply with Clauses 5.04 and 5.05 of Part 1 of this document.

All design drawings must include certification by a Registered Professional Engineer Queensland together with reference to relevant design standards.

Where the project work constitutes a major change in the existing installation the as-constructed drawings are required to incorporate all details of the existing installation.

Where a project relates to a new installation or a major load increase in an existing installation the design should incorporate an assessment of the most economical energy tariff for the electricity supply.

If an upgraded electricity supply is needed for the project the consultant is required to co-ordinate this with the local supply authority and provide copies of approvals received.

Supplied design information should include the designed maximum demand, voltage drop and fault loop impedance at each switchboard and a complete wiring diagram including circuit loading and individual schematically detailed control. Cable sizing must be included for all mains, submains and circuits.

Lighting designs will require approval of the luminaires proposed and the supply of isolux plots and tabulated results together with the design criteria prior to the production of tender drawings.

The construction drawings should also have recommended maintenance schedule shown for each luminaire / electrical asset to ensure the design criteria is adhered through lifespan of asset.

E2 WIRING & SWITCHBOARDS.

E2.1 General

All new mains and sub-mains and switchboards must allow for a minimum of 30% additional load above the original design and any known future requirements.

E2.2 Switchboards

All switchboards that supply public area services are required to be located in an area accessible only to maintenance staff (eg. station vestibule) Switchboards must be designed to be vandal resistant either by position or construction.

Any switchboard located in an external location shall be minimum IP56 316 Stainless steel non modular construction with breather louvers or similar to prevent condensation build up within and come provided with rain hood. If plinth mounted, switchboards shall be located on galvanised steel plinth.

Any switchboards located internally or within weatherproof cupboard access will need to be rated min IP54 and can be powder coated mild steel type enclosures.

Switchboards and meter boxes are required to be secured with a three point latching system and locked with a recessed Queensland Rail standard "B2" lock.

All switchboards are to be fitted with a single overall main switch for isolation of the switchboard. This main switch operation is not to be interlocked with the door / escutcheon to restrict access to the bus bars or switchboard chassis when energised. All escutcheons are required to be removable hinged panels that are held in place by knurled / slotted screws that are retained on the escutcheon.

All switchboards unless otherwise approved are to be circuit breaker style boards with a rated fault level to suit the installation.

Miniature din style circuit breakers/bus assemblies shall be Schneider Isobar style or equivalent.

Primary surge protection shall be provided on all main switchboards and secondary filtering shall be provided on any sensitive electrical equipment as nominated by Queensland Rail.

The switchboard must have ample wiring space so that there is unrestricted access to all terminals.

All switchboards are to have an amount of spare pole capacity that is determined by the switchboard size. Switchboards of 24 poles or less should have 50% spare poles and switchboards greater than 24 poles should have 30% spare poles.

All switchboards are to be supplied with earth and neutral bars of a size to match the circuit breaker capacity and must be wired such that the switchboard pole number matches the corresponding earth and neutral number for that circuit.

The neutral and earth bars within the switchboard must be located so they are not obscured by internal wiring. The wiring of the switchboard should not impede access to the bars. In switchboards with centrally located chassis separate earth and neutral bars are required on either side of the board.

Any control equipment including contactors, PLC's, bypass switches, submetering etc needs to be located in a segregated section of the switchboard with a hinged separate escutcheon panel that does not require circuit breakers and bus bars to be exposed to access.

Supply authority meters / equipment and isolators are required to be located in public access areas and shall be located in a separate enclosure that is keyed to Local authority access requirements.

“Smart type” remote monitorable“ Sub-meters are generally required to meter power usage consumed by both the entire site and also parties external to Queensland Rail. Meters shall be pre approved by Queensland Rail and be accompanied by Software and associated communication devices suitable to remotely monitor both electrical usage but also any solar generated supply and accumulated water usage saved by the use of tank water. Electrical sub-metering shall include but not limited to Communication Equipment Rooms “CER”, Signal Equipment rooms, Translink Equipment Switchboards, Advertising signage and any leased areas being supplied power from the station supply It shall also be included in special cases where Queensland Rail is inconvenienced by an external party’s development or installation “for example air space developments and subsequent need to install ventilation and daytime lighting”

Additional sub-metering / monitoring of all other power / lighting circuits at stations are commonly being installed at present to elevate Queensland Rail power consumption throughout sites. If not requested in the scope of works, the consultant is to request prior to tendering if Queensland Rail wish for additional monitoring to be supplied.

Penetrations into external switchboards must not be made on the top horizontal face of the enclosure.

All lighting, equipment accessible to the public, and general power sub-circuits must be protected with 30mA safety switches.

The switchboard must have a circuit legend and capability to mount laminated electrical site drawings located mounted inside or fitted adjacent in a lockable enclosure. The legend shall include details of the location of the supply point for the switchboard, all earthing and bonding connection locations, circuit breaker number, circuit description and associated earth & neutral number. Apart from the required circuit and neutral information switchboard legends must include details of the size & point of origin of the incoming sub-main as well as main earth stake and traction bond locations and date/ details of company whom completed installation. The as built legend details shall also be provided in electronic format to Queensland Rail

in a standard Microsoft program format (MS Excel / MS Word) and shall be supplied in maintenance manuals.

All internal wiring connections (actives, neutrals & earths) should be identified using permanent cable marking (PVC sleeve type wire markers or equal) linked to the appropriate circuit number. Any control wiring should be identified similarly in accordance with the As Built wiring diagram.

Queensland Rail approval of all switchboards and switchgear used on stations is required prior to installation. With Shop drawings provided for Queensland Rail’s comment and approval prior to manufacture. As constructed shop drawings shall be provided in Autocad DWG format within Maintenance Manuals.

E2.3 Cables

All power cables to be sized for the connected load, voltage drop, earth loop impedance and meet all requirements of AS3000 and AS3008..

The following are standard cables to be used in conjunction with station wiring.

1. All power cables to be stranded with a minimum cross sectional area of 2.5mm².
2. CCTV Power: - Figure 8, 24/0.20, 300VAC.
3. CCTV Video: 310-A20SGGRG6.
4. PA: Hartland, HCX030 1mm², 2 core flex black.
5. Emergency Disability Assistance Phone & TVM: 10 pair 0.64mm underground rated data cable. Olex TAP796PP10.
6. Hearing Augmentation- Normally Olex GFGR05AA004 2.5mm² core black flex. Size may change for longer run lengths. Final size will be determined by Queensland Rail Telecommunications.
7. Need to confirm From The Network Support Manager (Dave Millers) at Queensland Rail on all of these items

All cable or conduit entries into equipment must be bushed or glanded using proprietary equipment.

Gland plates shall be neatly fitted and any holes cut for glands shall be cut with the correct size hole saw.

All cables into a switch board that enter via a gland plate shall be fitted with cable glands. When bringing larger conduits into switchboards where gland plates are not available, it is necessary to use fire proof pillows to fill excess voids in conduits, tinned foam fill fireproofing will not be accepted.

No cables are to be run horizontally through walls but must be dropped down from the ceiling space at the appropriate location.

E2.4 Exposed Conduits

All cabling shall be concealed where possible and any exposed conduiting will require approval from Queensland Rail. All structures shall incorporate accessible cable routes & access panels with allowance for future capacity. Any approved above ground conduit in a public area within 3.0M of ground or floor level must be galvanized steel or suitably protected with a metal cover.

Access panels shall be lockable by key or security screw and shall be sized to allow reasonable access for specific location and situation.

Conduits are to be run aligned and parallel, vertically or horizontally to surfaces. Straight runs are to be installed using rigid conduit. Changes of direction can be achieved using rigid conduit bent to suit, threaded conduit fittings, or “anaconda” flexible steel conduit. Any conduit terminations must use proprietary fittings.

Any installed unused conduit is to be fitted with a draw rope. Cables and conduits are not permitted to be installed above the overhead traction system unless they can be installed in such a manner as to eliminate the possibility of accidental contact with the overhead aerials.

Conduits in public areas must be secured using double sided saddles fitted at a spacing of not less than 300mm and fixed with galvanized screws.

E2.5 Installation

All wiring is to be concealed where possible.

All cables should be continuous in length with joints allowed only at equipment terminals. In ground cable joints should be avoided where possible and would require Queensland Rail’s approval prior to installation. Any in ground joints would also be required shown on As Built drawings.

All material used must be new, of first class quality and be fit for purpose.

E2.6 Switchgear

All socket outlets and light switches must include circuit / switchboard identification they are fed from in the form of IPA studs or approved equal. All non public accessible GPO’s and localised light switches shall be

Clipsal Classic series with all lighting switch mechs rated minimum 15A.

E2.7 Inspections

Incorporate the following into the tender documents:

A Queensland Rail Electrical representative will carry out electrical inspections both during construction and prior to granting “practical completion” of the contract works. To facilitate this the contractor is to supply details of their own tests which should include insulation, conductivity, fault loop impedance and earth leakage levels on all installed cables and measured maximum demands on each switchboard.

Hold point inspections will also be required for connection of bonding and commissioning of switchboards.

A minimum of two days notice will be required to program any inspections.

Refer to the table to the right for typical inspections and hold points.

E2.8 Testing

All wiring installed under this specification must be fully tested prior to commissioning. A full written report detailing individual circuit results for continuity, insulation resistance, RCD operation times and circuit fault loop impedance must be

ACTIVITY	INSPECTION POINT	REFERENCE CLAUSE / STANDARD	LEVEL OF INSPECTION	RESPONSIBILITY FOR INSPECTION
Program of Works and a Work Method Statement for any work being carried out within 10m of track centre line	10 working days after acceptance of the tender and prior to the commencement of site works.	Work programming	Hold point	Contractor
Installation of conduits in concrete slabs or other concealed spaces	2 working days prior to concrete slab being poured.	Conduits	Witness Point	Contractor and principals Electrical representative
Backfilling of service trenches	2 working days prior to backfilling.	Conduits	Hold point	Contractor and principals Electrical representative
Traction bonding connection (where traction overhead is located in works area)	Completion of traction bonding and final connection to Queensland Rail bonding point		Hold point	Contractor and principals Electrical representative
Tests – Insulation & Earth Continuity	10 working days prior to tests being carried out.	AS/NZS 3017	Witness point	Contractor
Final Commissioning & Testing	5 working days prior to Practical completion handover	Certificate of Test	Witness point	Contractor

prepared and provided with the as-installed information prior to practical completion.

E2.9 Emergency Back Up Power Supply

In larger use stations, it may be required for a generator backed up power supply to be made available and designed within station upgrade or other similar works. If not clarified in scope of works provided with original documentation, the designer / developer is responsible for requesting clarification from Queensland Rail prior to submitting tender pricing or proposals.

E2.10 Solar Power / Photo Voltaic Panels

Grid Connected Photovoltaic systems are becoming a familiar component in Queensland Rail stations and may be required in consultants design works depending on size /type of works being completed. In instances where PV are installed, allowances should be included for monitoring power savings and also public displays nominating this live information. If not clarified in scope of works provided with original documentation, the designer / developer is responsible for requesting clarification from Queensland Rail prior to submitting tender pricing or proposals.

E3 EARTHING & BONDING

E3.1 Structure Bonds

If any exposed metal work of an installation has the possibility of coming into contact with the 25KV overhead traction system a structure bond is required. This bond is a 19/3.25 PVC insulated, aluminium conductor connected to the structure and the traction earthing system (traction rail).

E3.2 Switchboard Bonds

If any parts of a low voltage installation have the possibility of coming into contact with the 25KV overhead traction system the low voltage system is required to be bonded to the traction system. This bond is to be an appropriately sized, PVC insulated, earthing conductor (16mm² minimum) connected from the earth bar of the switchboard to the traction earthing system (overhead mast or traction rail). A submain protected by a S Type "Selective Curve " residual current device must also be added.

E3.3 System Separation

Traction bonded switchboards are required to be separated from the external supply system at times of overhead fault. There are multiple approved methods of achieving this of which. Queensland Rail document SAF/STD/0142/ELE/NET Electrical Separation of Earthing Systems assists has been correlated to assist in this design. However, generally with stations there would be two methods, these being:

1. Preferred method: To supply the switchboard in the traction area through an appropriately sized isolating transformer. In this method a MEN earthing system is used on all down stream equipment. (This is the preferred option). Refer to drawing A1-E-0.510 or A1-E-0.521 depending on proposed location of isolation transformer..
2. Non preferred method: To supply the switchboard in the traction area through a submain protected by 300mA to 500mA residual current device. This device must break all active and neutral conductors when operated. In this method a direct earthing system must be used on all down stream equipment. Refer to drawing A1-E-0.511.

In both cases the supply point must be outside the traction area and the design is to provide a clear line of demarcation between the two systems. As part of this philosophy the designer must ensure that any un-bonded low voltage equipment has a minimum of 2 metres horizontal separation (to a height of 2.4 metres) from any overhead traction structure or continuous metal work (fences, awnings, water pipes etc) extending from the traction area. This separation can also be achieved by insulation of either structure.

Important Note: It may be required for the architectural and structural design to include isolation within the building structure to create the separation of the earthing systems.

E3.4 Installation of Bonds

At an installation all switchboard and structure bonds must be brought back to a common point for final connection to track. This track connection needs to be made up of two separate connections to rail at an appropriate physical separation and included on the bonding plan as part of the overhead traction design.

Take into account the Queensland Rail earthing and bonding requirements. Queensland Rail requirements vary from site to site. The electrical designer must contact Queensland Rail to obtain the relevant requirements. (Contact: Senior Engineer Electrical Services 3235 1211).

Bonding cables and conduits are to be installed by the contractor, ready for connection to the traction system generally by Queensland Rail. The contractor must give Queensland Rail at least 4 weeks notice prior to the work being ready for Queensland Rail installation.

Where a number of bonds originate from one vicinity these bonds must be terminated on a common bracket. A single 100mm conduit is required to link this bracket to track.

The switchboard bonding point and the earth stake location needs to be marked at the appropriate switchboard. The switchboard must not be energised until the required bonding has been installed. Refer to drawing A1-E-0.512.

E4 LIGHTING

E4.1 Design

All lighting is to be designed to the requirements of the relevant Australian Standards or Queensland Rail's Lighting Standard for Railway Stations (including recent revisions to meet the Disability Standards for Accessible Public Transport requirements). Where standards conflict the higher light technical parameters are to be adopted.

The lighting designer is to design such to utilise motion / light sensing and locality control using DSI/DALI or similar control systems, providing options based on cost Vs efficiency.

For open platform areas the preferred lighting solution consists of utilising dimmable dual driver LED luminaires "Rudd Ledway/Edge or similar approved equivalent." connected to Queensland Rail's standard 5 metre mid-hinged columns. Refer drawing A1-E-0.513.

All luminaires in public areas are to be vandal resistant (either by construction or mounting position). The design must also address the glare requirements of the "Obtrusive Lighting Code". Luminaire locations must take into account the relative positions of signals, overhead equipment (mast structures and aerial conductors) and CCTV cameras and access for maintenance.

The lighting design must be provided for approval by Queensland Rail prior to documenting construction drawings, in the format of an iso lux plot with luminaire details and mounting positions and a statistical analysis of the critical design areas. The design must allow for shadowing caused by structures or buildings and the supplementary effect of existing or additional new lighting in adjoining areas. All lighting designs must ensure minimum average horizontal levels are exceeded by more than 25% of the required standard.

The designer should also provide documentation nominating the power consumed / square metre "Watts / sqm" based on their lighting design at its highest non-dimed status. This shall be classified into the following areas and can be provided on lighting isopleth calculation sheets.

- External Platform Lighting
- Undercover Platform Lighting
- Carpark Lighting
- Remaining undercover Lighting
- Remaining External Lighting
- Pathway Lighting

E4.2 Luminaires

Where possible post mounted luminaires should not be mounted below 3.5m. However, for luminaires fixed to structures at less than 3.5m mounting height a recessed or low profile vandal resistant fixture is required. At less than 2.7m mounting height fixtures are to be metal bodied, with screw fixed diffusers (note diffuser clips with tamper proof screws will not be accepted).

Note for maintenance purposes most luminaires will be maintained from a 2.4m ladder which allows a serviceable height of 3.5m. Any higher mounting positions will require the installation of a structurally approved safety harness securing point.

Lighting above stairways and stair landings, foot bridges or similar can not always be maintained by traditional step ladder method due to size of landing and potential fall of 2m+. Therefore if consultant can not allow for maintenance of luminaires in another method, all luminaires in these areas shall be installed on walls at maximum 2m above step height. Recommended maintenance utilising Scaffolding is not acceptable due to high costs for hiring and also the lack availability in after hour emergency circumstances. Maintenance can also be restricted by proximity to the overhead traction wiring. To alleviate this, all luminaires shall be mounted such that neither persons nor items shall come within 3m from any overhead wiring during maintenance procedures.

In ground up lights are not to be allowed for in Queensland Rail designs due to high vandalism environment. Above ground mounted uplighting / cove lighting / any indirect lighting shall be predominantly catered for as aesthetic lighting only and not be used for lighting calculations.

A number of luminaires are currently in use at station, they are as follows:-

- Open platforms – "Rudd Edge / Ledway LED luminaires"
- Shelters and awnings – Surface fluorescent Pierlite Vandaguard; Recessed fluorescent Frennd VPBS, Pierlite VPBF.

Preferred lamp types are:-

- Linear Fluorescent - T5 or T8 selected to suit application (T5 preferred)
- Compact Fluorescent:
- LED luminaires "running at 350mA or dimmable to 350mA or less with lamp life 80,000 hrs plus.
- Metal Halide - 70w, 100w, 150w, 250w & 400w.

The variety of lamp types used on a site is to be kept to a minimum. When using discharge lamps timed ignitors need to be specified to limit damage through lamp failures.

All fluorescent luminaires shall be HPF and fitted with electronic ballasts and fused terminal blocks.

All specified luminaires are to be supplied with low loss control gear, fused terminal blocks and power factor correction capacitors.

Any ignitor driven discharge lamps must be fitted with a timed ignitor (or equal) to limit the number of re-strikes onto a failed lamp.

Information on all specified luminaires must be submitted for approval prior to commencement of design with full details shown on design drawings. Details should include make, model, lamp type, and trade price and installation details.

Where existing luminaires are reused they should be cleaned and re-lamped.

E4.3 Circuit Arrangement

Control of the luminaires in public access areas must be wired in such a way that loss of a single circuit will not put an area into darkness (circuits need to be staggered through an area). However, the design shall minimize the total number of circuits required. To allow for the installation of loop-in loop-out wiring the column lights with switched terminals shall be wired on a circuit separate to the structure mounted lights and signs. The normal circuit allowance for a platform would be five (2 column ccts, 2 structure ccts and 1 sign cct). All dimmable luminaires shall be utilised and shall be dimmed to from 30%-100% by operation of motion sensors subject to Queensland Rail approval.

E4.4 Security Lighting

Security lighting can be achieved with all luminaires set in dimmed status "approx 30%" and shall only be in a status when the station is not occupied. The extent of security lighting will need to be designed for the type of security for the area (CCTV or Manned Patrols).

Station name signs and similar shall be controlled such as to be also turned off when the station is not occupied.

E4.5 Switching of luminaires / Motion Control

An automatic switching control system is required for all public accessible area lighting, incorporating daylight switching in conjunction with motion detection. Motion detection shall be completed through interaction of the lighting control system with existing Queensland Rail Digital CCTV system via ELV switching at the CCTV panel.

The motion detection should be set up to have lights in the security mode at all times of darkness and raised to full level when motion is detected on approach to, or within similar station precinct. High level lighting will remain in place for 10 minutes after the last motion detection and then return to security levels until the next motion is detected. To endeavour to save more power, the station should also be set up with varying lighting control areas with motion control for each individual area. These areas will need to be determined on a site by site basis, however they would generally be for individual platforms and the concourse area.

The lighting control system utilise a Telemecanique Zelio Smart relay in conjunction with a motion detection and PE control. A similar control system / PLC that shows status of all inputs / outputs with all of the control being voltage dependant and not communications dependant may be approved after submission to Queensland Rail. All Zelio input / output designations shall be shown on front escutcheon of the light panel nearest to the zelio relay.

All contactors used within the lighting control are to be single pole 20A min contactors / solid state relays and not combined contactor units.

A 1 hour time delay off Platform lighting Bypass Switch is required to be located in the station office to allow site staff to test/override external automatically controlled lights and should be marked "LTS BYPASS".

Additional switching in the lighting control panel within station switchboard are to include but not limited to –

- Overall Bypass switch
- 1 Hr lighting run – labelled Test / Reset
- PE Bypass
- Motion detector bypass – to represent motion detectors always being in occupied mode
- Time clock bypass
- 100hr run on timer labelled "bulk change timer" of which is required for running T5 lamps at full capacity prior to dimming to ensure longer life span of lamps by over 500%. This timer setting is to make lights only run during normal operating times and not 100hrs of continuous daytime.

The additional switching can be completed via labelled separate push buttons on the switchboard or on push buttons within the Zelio relay.

If there is any requirement to run a control wire or similar from one switchboard into another, it will be necessary to install a label with white writing on red background on the escutcheon of the affected switchboard "Warning – 2 sources of supply within". It will also be necessary to label the actual cable within similarly with wording "Warning Cable Fed from DB XXX"

A single circuit only must run into each light column. If separate switching is required extra switch wires should be run off that one circuit.

Public toilet lighting & any internal rooms shall be controlled via local Motion sensor set up such to pick up door entrance and the remainder of the room and set at 10 minutes delay off. The sensor shall be slimline and installed such to be as least vandal prone as possible.

E4.6 Emergency Luminaires

Emergency lighting should be installed in accordance with the Building Code of Australia and AS2293.1. 1. If BCA requires emergency lighting then a monitored Stanilite hardwired Nexus system including necessary Routers, Etherlon and commissioning with existing Queensland Rail system shall be provided. If not required through BCA, an equivalent lighting system Queensland Rail classifies as "Reassurance Lighting" must also be provided to waiting shelters, footbridges, under building awnings, toilets and in the station office. This lighting should take the form of battery packs in at least 25% of the luminaires installed plus a controlling test facility linked to lighting control panel.

E4.7 Temporary Construction Lighting

In any instance during construction within Queensland Rail property requires the removal, shadowing or shielding of existing lighting over a public accessible area, the contractor is entirely responsible for installing temporary lighting to Queensland Rail's acceptance, that is equal or better than what was installed previous. If works involves the rerouting of public / passengers via new entrances, pathways, carparks etc then the contractor is also responsible for installing temporary lighting to the current standard of lighting of which will also need to be preapproved by Queensland Rail prior to opening. The contractor shall also assist in allowing for temporary cable routes for CCTV equipment that may be affected by same scenarios.

E5 STATION BUILDINGS

In addition to normal lighting and power, include the following:

E5.1 Ticket Window Module

Refer to section 9.0 of Part 2 of this Guide.

Each ticket window is required to have a double GPO and allowance for hard wired connection for roller door located within bulkhead of ticket window of which can be on similar power circuit. There should also be an allowance for 2 double GPO's under bench on their own circuit and a single light switch / associated wiring to control 2x Queensland Rail supplied ticket window lights above ticket window bench that shall be connected to an unswitched local internal lighting circuit.

The alcove above the ticket window shall include a double GPO for the ticket window loop amplifier, and a wall switch near bench level (conducted up to the alcove) to switch the glass-mounted Hearing Aid loop on/off.

E5.2 Toilets

Refer to section 12.2 of Part 2 of this Guide

There shall be an allowance for a lockable recessed panel below vanity for locating a double GPO and necessary hydraulic control equipment for installation of ZIP 240V sensor tap.

Reassurance lighting is to be provided in the toilet/s.

E6 PLATFORM WORKS

E6.1 Platform Light Columns

Lighting on the platform has to be accessible for maintenance and installation without isolation of the overhead traction system.

To facilitate this Queensland Rail has an agreement for the supply of a 5 metre mid-hinged, hinged base light column for use on all platforms in the electrified areas. These columns are to be a Principal supplied item for all contracts and are available for pickup from the Queensland Rail store at Tufnell Rd, Banyo. Note Queensland Rail requires 6 weeks notice of required items (including numbers) to be supplied. These columns are supplied with a foundation strut (if required but without a reo cage), and din rail. The columns are designed for use with Queensland Rail standard 7 metre column bases to allow reuse of existing footings. Where new columns are to be installed on existing footings the stub and bottom hinge plate is to be exposed to footing level cleaned with a wire brush and inspected to ensure suitability for reuse. If existing column footings are found to be too low for reuse extension adaptors should be installed. These adaptors are made to order and quantities and sizes need to be provided at least 6 weeks prior to the required installation New column footings are to be constructed in accordance with Queensland Rail Standard Drawing A1-E-0.477 and A1-E-0.513.

Care needs to be taken during the column installation process to ensure that column lowering operation is not restricted by other structures.

Clearance requirements for lowering are approximately 2 metres one way and 3 metres the other but the column has the ability to be turned 180° on the footing.

All electrical connections to luminaires must be made in the column using the loop in-loop out method of wiring. Cable connections must be made using the "Wago" style Disconnect/Test Terminal Blocks with isolation on the switch wire and neutral conductors to each luminaire.

A standard kit for a single light column has been produced by NHP with Part No.282Queensland RailLIGHT and double light system using Part No. 282Queensland RailLIGHT2. Where additional lights are installed on a column an additional Test/Disconnect Terminal Block may be ordered using Part No.282860. Where twin lights off a common circuit but under separate switching control are mounted off a single column the lights should be wired with a twin and earth and an extra single core switch to minimize conduit entry requirements.

E6.2 Station Name Signs and the like

Station name signs, station identification signs, station layout signs and similar illuminated signs (other than external advertising signs) must be provided in accordance with Queensland Rail adopted signage manual. These signs should be wired onto a dedicated signage circuit that is switched with the normal hours lighting control. The station name signs also incorporate the station public address speakers. Where signs are installed PA cabling is also to be provided and connected to the station PA system. PA cables must be run using the loop in loop out method with all terminations being made in the sign box. Due to the age of some of the existing sign boxes, if still required the internal wiring will need to be inspected and rewired as required. See section on PA for wiring specifications. Refer also to Drawing 2680 and 2681.

E6.3 Platform Advertising Sign Boxes

All advertising sign boxes on the platform are to be connected to a separate dedicated advertising signage circuit that should be submetered.

E6.4 Emergency Help Point Light

The location of the EDAP is identified by a blue strobe light mounted on structure above the unit. Use a “Mechtric MECLP 1x230 2” zenon flasher wired to the security lighting circuit.

E6.5 Food and Drink Vending Machines

All vending machines must be connected to RCD protected socket outlets (Clipsal Cat No 2025RC or equal) off dedicated power circuits supplied from local switchboard for the area. The vending machine outlets must be mounted in surface mounted j-box (NHP Fibox) with two 12mm wide cut outs for the supply leads. This box must be on the left or right hand side of the machine alcove 250mm back from the face and 2100mm above floor, 1100mm wide and 1200mm deep. If the alcove is intended for three vending machines the dimensions are, 3100mm wide, 2100mm high, 1200mm deep & circulation space.

E6.6 Maintenance Power Points

15A single phase power points for maintenance are to be provided at each end of any footbridge structure and at the core area on each platform. They must be unobtrusive and not accessible to the public and would be preferably installed in a lockable / security screwed recess allowed for in architectural design. They must be connected to a dedicated circuit protected only by an over current circuit breaker. Earth leakage protection is to be integral with the socket outlet (Clipsal Cat No 2515RC or equal).

E6.7 NTI/EDAP

Provide a 25mm white conduit and a 32mm orange conduit into the machine footing. Cabling and connection will be by Queensland Rail.

E6.8 Station Awning Lighting

All station awning or shelters shall be designed such to allow ease of install of new cabling and also any future cabling (PA, Electrical, Comms and CCTV) without the need for pulling down ceiling pieces, taking off roof sheets or running of surface mounted cabling. Any columns on shelters and awnings that are to be used as cable risers shall have cable access panels with security screw restraints installed at both the bottom and top of the risers and preferably a manhole or removable recessed Luminaire nearby to assist access.

E7 UNDERGROUND CONDUITING

All underground conduits used on Queensland Rail installations shall be rigid heavy duty PVC or equivalent, and comply with the requirements of AS 2053 (power) and AS/ACIF S009 (communications). Corrugated heavy duty conduit or rigid “coreflo” shall not be used underground on Queensland Rail installations.

Only methods of installation specified in AS3000 will be accepted automatically on railway platforms. Any alternative methods will require approval.

Unless otherwise advised it will be assumed that all conduits (power and communications) will be installed at a minimum of 500mm below finished platform level. Any conduits installed above this level must be pre approved by an appropriate Queensland Rail electrical endorses and then identified on as-built drawings and have cable markers installed. The markers shall be an etched stainless steel tag riveted to the pit surround at each end of the run. The following wording and orientation arrow are to be used in 10mm high lettering.

WARNING!

↑ SHALLOW DEPTH CONDUIT ↑

All installed conduits must have a minimum of 50mm cover on all sides of coarse bedding sand. Backfill is to be placed in the trench in 150mm layers and compacted to 95% of its maximum dry density. Cable marking tape shall be installed in accordance with the requirements of AS3000. The top 50mm of the trench is to be filled with a suitable compound to ensure the area is safe for pedestrian egress until the original surface is re-instated.

Where pits are required they are to be installed in 50mm of coarse bedding sand.

Where conduits are installed into pits they are to be trimmed off and filed smooth to allow maximum use of the pit volume (maximum penetration into the pit 50mm). The lowest level conduit will penetrate further into the pit than the upper level.

All conduit entries shall be sealed to prevent ingress of debris.

All conduits installed must be fitted with draw ropes.

Where wiring is installed in underground conduit runs cables shall be installed in the lowest level conduit first leaving the upper level free as spare space.

If the scope of works requires the re-conduiting of a major portion of a platform spare capacity in the form of additional conduits may be required and specific advice is to be sought. Current policy for new main conduit runs and under track crossings is to install a minimum of 2x100mm white (Comms), 1x50mm white (LV Comms) and 2x100mm orange (Elec) of which shall be interconnected into existing trackside conduiting system at ends of platforms. All communications and PA conduit shall be marked “Communications” in accordance with AS/ACIF S009 and shall be run in separate pit systems individual from each other and also the electrical system.

All conduit runs shall have a maximum length of 40m between pits to allow for pulling of cables.

Generally the main conduit runs and under track crossings are to be a minimum of 100mm diameter. Conduits teeing off the main route should be a minimum of 50mm diameter. Any conduit routes installed must allow at least 50% spare cable capacity.

Any under track conduit crossings are required to be marked on site. The commonly approved method of marking the route is a painted position on the platform face detailing the cable depth and offset from coping edge.

New conduit routes along platforms must allow for the installation of a tactile paving. A coping stone and a tactile paver with a yellow safety line will take up 1350mm of the platform width. Any pits/trenching must be installed outside this zone.

All pits installed in a public thoroughfare (i.e. platform areas) must be installed level with adjoining surfaces. The use of Queensland Rail standard lockable lids is required. See standard drawings All pit lids (including earth stake access pits) in public access areas are required to be slip-resistant (additional slip resistant coating may be required) and lockable (requires tool to remove lid). Refer to Queensland Rail drawings 2485, 2486, 2519 to 2522 for details and arrangements to suit various pit sizes.

Where the standard pit sizes do not suit the electrical design other proprietary pit can be used subject to Queensland Rail approval.

Pits are required at changes of direction and at tee-off points on the conduit run. Minimise the number of pits required on platforms and other pedestrian areas by sharing pits for equipment.

When upgrading existing stations ensure that surplus and/or redundant pits are removed. Similarly all redundant cabling should be disconnected and removed from site or have both ends labelled with engraved traffolyte cable markers indicating the cable is redundant and isolated from supply. Any effected pavements is to be made good.

All earth stake access pits located on platforms and walkways will be required to have a slip-resistant, lockable, metal access lid.

E8 FOOTBRIDGES AND LIFTS

E8.1 Lifts

In general lift equipment should be designed and installed in accordance with Queensland Rail standard lift drawings and specifications. This will have to be modified to suit the particular building or bridge arrangement. Note all lifts shafts shall be designed to allow for a minimum 300mm cable risers for electrical and communication services. This riser must interconnect between the footbridge structures and each platform main route and must be fully accessible throughout for future installs including access panels at ground and footbridge levels. The Queensland Rail standard lift is an electric machine roomless type lift.

E8.2 Footbridges

Segregated cross track services routes, for both power and communications via a footbridge must allow for regular maintenance to be performed from within the footbridge and with minimal disruption to pedestrian movement. These services must link to risers on all platforms. The services must be protected from unwanted interference while allowing maintenance access. If a protective hat section is used over the risers it must be removable for maintenance and needs to be designed to address the issues of manual handling and working in proximity to the 25KV traction system. The size of the services routes and risers must allow 100% spare capacity for future cabling. As a minimum the risers should be 1x100mm orange conduit for power, 2x100mm white conduits for communications and 1x50mm white conduit for PA. Cross track access should comprise the equivalent of at least 1 x 300mm cable tray (power) and 1 x 450mm cable tray (communications & PA).

The footbridge must include lighting to the appropriate Queensland Rail standard. Care should be taken not to position luminaires over stair risers to ensure easy maintenance access. The lighting design should also consider lighting on the platform where the bridge structure causes shadowing.

The footbridge and any other structure within Queensland Rail shall be designed such to prevent need for any surface mounted conduiting to services "Luminaires, CCTV, speakers, signage etc" and the architect shall allow for accessible cable access pathways to be installed throughout that is including down stairways.

The footbridge design must allow for the installation of both security cameras and train information displays (TIPS LED panels) on the structure.

If footbridge requires external shaft lighting, the designer shall ensure that any luminaires are mounted such to not require maintenance personnel to have to go within 3m of overhead lines or be mounted above 3.5m without installation of fall arrest system.

Refer also to E4.6 and E6.6

E9 STATION PA AND HEARING AUGMENTATION

The station PA and Hearing Augmentation system is generally designed by Queensland Rail Telecommunications area. The consultant is required to allow in the design for the cabling and conduiting for both systems.

The station PA system incorporates speakers in the Station Name Signs on the platform or in some cases surface mounted horn speakers. As the PA system runs at 100V AC the connecting cable was previously installed in the power conduit. As of July 01, 2006, Public Address wiring is classified by the ACMA as a Low Voltage Telecommunications circuit and will now need to be run in a separate 50mm conduit to ensure separation from both LV power and communications cabling. A separate cable feed is required for each platform and the footbridge with all speakers on the cable feed connected in parallel. A loop in loop out method of wiring is to be used with all connections and joints to be carried out at the speakers (no joints in ground). All cables are to be supplied and installed by the Contractor with the final connection to the PA amplifier equipment carried out by Queensland Rail.

The hearing augmentation loop generally incorporates a quad cable in PVC conduit run around just under the surface of the platform / floor slab in the area to be covered. The size of this cable is to be determined by Queensland Rail Telecommunications as part of the PA design. This loop will require a twin cable connection to the station PA system. Final connections inside the main loop pit and to the PA amplifier equipment will be by Queensland Rail.

Equipment Specifications:

Line Transformer – inbuilt in horn speaker Sign speakers – Toa SC-610M
Cable – refer to E2.3

E10 TICKETING EQUIPMENT

All ticketing equipment for stations will be supplied and installed by a nominated Translink sub-contractor. The consultant must allow for switchboard location, equipment racks, a submetered submain to this location, equipment foundations and conduit access for both the equipment and incoming services. ticketing equipment requires additional earthing bonding connection to a metal structure located within 2.5m or to a suitable alternative ,32mm conduits are to be installed from under machine to the required location to allow for this.

E11 TELSTRA PAY PHONES

Alterations or installation of pay phones are to be carried out by Telstra. However conduit connections, power supply and footings are to be designed by the consultant and installed by the contractor.

E12 AS INSTALLED INFORMATION (AS BUILT DRAWINGS) AND MAINTENANCE MANUALS

In addition all X-References need to be linked and all non-standard font files supplied. The drawings need to include any variations to the original design and details of generally specified equipment. These details must include make, model and mounting position where applicable.

A detailed referenced manual needs to be supplied prior to issue of practical completion referencing all installed equipment. It shall include all specification sheets, warranty documentation, suppliers/ agents contact details and any maintenance requirements to ensure warranties are not voided. The manual shall also include a recommended maintenance schedule for all installed items including regular bulk lamp replacement regimes as recommended by lighting engineer to ensure lighting levels remain compliant with their design

Any as-installed information needs to be provided with signed certification and detailed test certificates that includes the contractor's license details.

E12.1 Contractors Construction / defect liability Responsibilities

The contractor shall provide a 24 hour call-out service for any faults that occur during the construction period and the following 12 month maintenance/defects liability period. They will also be responsible for any regular maintenance on installed equipment as required by the relevant Australian Standard or manufacturers specifications during this period.

Service reports are to be forwarded to Queensland Rail for all maintenance or repairs carried out during this period. The report should detail the time, the nature of the work carried out and be endorsed by the Queensland Rail site representative.

If contractor is unable to perform maintenance or repairs, principle will organise repairs/ maintenance and cost shall be borne by contractor.

E13 LIGHTING OF OPEN PLATFORMS AND PATHWAYS

This is the summary from the Webb Report. The full report is available on request.

E14 CAR PARK LIGHTING

14.5 General

This section lists additional and / or car park specific requirements. This section is to be read in conjunction with E1, E2, E3, E4 & E7.

Note; car parks in addition to the car park area may also include elements such as bus interchanges, car and taxi set down areas, pedestrian paths connecting to the car parks, station or boundaries.

14.6 Design

All lighting is to be designed to the requirements of the relevant Australian Standards and to Queensland Rail's Lighting Standard for Railway Stations. Where standards conflict the higher light technical parameters are to be adopted.

Relevant Australian Standards include:-

- AS/NZS 1158 The lighting of urban roads and other public thoroughfares (known as the SAA Public Lighting Code)
- AS/NZS 1158.1.1 Part 1.1: Vehicular traffic lighting—Performance and installation design requirements.
- AS-4282 Control of the obtrusive effects of outdoor lighting. Luminaire locations should take into account the relative positions of railway signals and CCTV cameras.

All lighting system are to be designed to Queensland Rail CCTV requirements and DSAPT as follows:

- The general car park shall be lit to the requirements of AS/NZS 1158.3.1:2005 category P11a, with the additional requirements of Queensland Rail CCTV of 20 lux maintained min. average and 10 lux maintained minimum, for an equivalent of 20 lux min average horizontal, 10 lux maintained minimum and 3 lux maintained minimum vertical. It should be noted that the vertical requirement is for all orientations except those within the first 7.5 m from of the boundary. This will usually require lighting to be located on both sides of a long car park.
- Where a designated disabled parking bay is incorporated P12 category shall be used.
- Primary paths 42 lux maintained min. average horizontal, 21 lux maintained min. horizontal, 14 lux maintained min. vertical. The vertical illuminance along a narrow path is only expected to be met along the centre line in the orientations facing along the path. However, when the path is inside the car park the verticals should be met for all orientations unless specific circumstances make this impractical, which will require to be approved by Queensland Rail.
- Any shelters or covered areas located within the car park shall be illuminated to 160 lux aver horizontal with a uniformity of 0.5.
- Entry/exit from the car park to the street boundary shall be lit to 15lux vertical at 1.5 m facing back into the car park for CCTV identification shots.

- For security reasons lighting should provide reasonable colour rendering at a CRI of above 60.
- Lamps used shall be metal halide HID 400W or 250W for general car park lighting, lower wattages or fluorescent lamps may be used for lower mounting heights such as along pathways. Generally extension to car parks should match the height pole/luminaire wattages used in the existing installation.
- For carparks connected to the station supply on standard time of use tariff – LED Luminaires RUDD EDGE / LEDway or equivalent are the preferred luminaires.
- The lighting design should allow for contributions from other adjoining railway areas.
- Any addition or alteration to an existing carpark lighting arrangement shall be detailed as part of the new rate 3 lighting design drawing for submission to supply authority.

Note : The “Primary Access Path” is defined as an access from the station entry to a street frontage, disabled parking bay and set down area. This path is generally defined by Queensland Rail for each project. Queensland Rail will confirm if the design is to be completed to meet CCTV requirements (initially or in the future).

14.7 SUPPLY

Queensland Rail car parks are normally supplied off a dedicated un-metered street service (Rate 3 Tariff 71) that is separate from the station service. In some larger installations or where multiply supply’s are not available to the site, a main switchboard with metered supply will be established clear of the traction zone to supply the car park lighting, The implications of low voltage wiring in the vicinity of the overhead traction system is discussed in more detail in section E3. This will provide the designer with enough information to determine if the two electrical systems can be adequately separated. Where interaction occurs between the two systems the designer will be required to supply more detailed information to complete the electrical design & ensure electrical segregation is completed.

All new mains and sub-mains must allow for a minimum of 30% additional load above the original design. The designer shall be responsible for any communicating and preapprovals with local supply public lighting authority with Queensland Rail assisting in any completion/sign off of necessary forms.

14.8 Switchboards

Rate 3 un-metered supplies will require a switchboard mounted in or at the first column.

For larger installations or where a metered supply is required all switchboards that supply public area services are required to be located in an area accessible to maintenance staff.

Refer to section E2.2 for general switchboard requirements.

Where an un-metered supply is provided and the installation consists of typically less than fifteen (15) lighting columns not located within the traction bonded environment, the switchboard shall be generally located in the first pole of the installation behind the pole access panel. Provision shall be made for one spare circuit. The wiring diagrams for all switchboards should detail the designed voltage drop and fault level at the point of connection.

14.9 Cables

All power cables to be sized for the connected load, voltage drop, earth loop impedance and shall meet all requirements of AS/NZS 3008 Electrical installations Only multi-stranded, double insulated cable should be used. The sheathing on these cables can only be stripped back at connection terminals.

Refer to section E2.3 for general cable requirements.

14.10 Underground Conduits and Pits

A pit and conduit network for both lighting and closed circuit television (CCTV)/communications shall be supplied for each car park. The electrical network for the lighting shall consist of a 100mm orange HD UPVC conduit network running throughout the car park, connecting with a pit located adjacent to each lighting pole and a 50mm conduit running from the pit to the lighting pole foundation.

A similar 100mm white UPVC conduit sharing common trenching, pit, 50mm T Off conduit shall be installed for CCTV/comms at each lighting pole for either new use or future use. At some locations a separate 3.0 to 4.0 meter CCTV pole may also be required to complete the required CCTV coverage.

The conduit network to meet the requirements of the lighting and CCTV coverage would normally be expected to run around the perimeter of the car park and cross the car park at other locations to suit the locations of the items of the specific design and to limit cable lengths.

Concrete lid/polyethylene plastic bodied rectangular pits shall be used, of nominally 580L x 280W x 760D P4 type unless a larger or heavier duty lid is required for a specific location. Electrical pits shall have an electrical designation and CCTV/COMMS pit shall be suitably labelled with a "COMMS" designation. Pits located immediately adjacent to a station platform or in a paved pedestrian pathway shall be fitted with the standard Queensland Rail lockable lid cover; other larger pits similarly located shall have a pre Queensland Rail approved lid fitted that requires a tool to remove.

All conduits shall have cable markers and arrows to indicate the location of conduits unless the route is obvious and defined by the location of a straight alignment of the pits. Where a conduit crosses a paved area the conduit location shall be suitably marked at each end of the paved area, typically on the raised curb. Cable markers shall be located so as not to present a tripping risk and preferably should be located on a curb or paved area not in a pedestrian travel path.

14.11 Luminaires

In general the car park lighting design should utilise standard style street lighting columns and luminaires. The standard luminaires used should be Pierlite Roadspan, Rexel Optispan fixtures or approved equal.

Luminaires where obtrusive lighting is a consideration shall generally be fitted with aeroscreen "cut-off" diffusers and may require shielding fitted where located adjacent to an adjoining property. Any shields required shall be ensured designed and certified by the lighting/electrical consultant and not left for the installing contractor to take responsibility.

Refer to E4.2 for additional Luminaire requirements.

14.8 Circuit Arrangement

A minimum of two circuits shall be used in a car park. The circuiting shall be arranged to effectively and efficiently supply the installation but shall also be arranged with consideration to providing reasonable uniform illumination in the case of one circuit being out of service.

A labelled P.E. cell, bypass switch is required to allow site staff to test external automatically controlled lights.

DEFINITIONS

Platform Set Down Area

The platform set down area is the portion of the platform enclosed by a line perpendicular to the coping 6m from each end of the platform and a line parallel to the coping 4m back from the leading edge. Where a fence or building encroaches into this area, the fence or building is to form the edge of the platform set down area.

Platform Auxiliary area

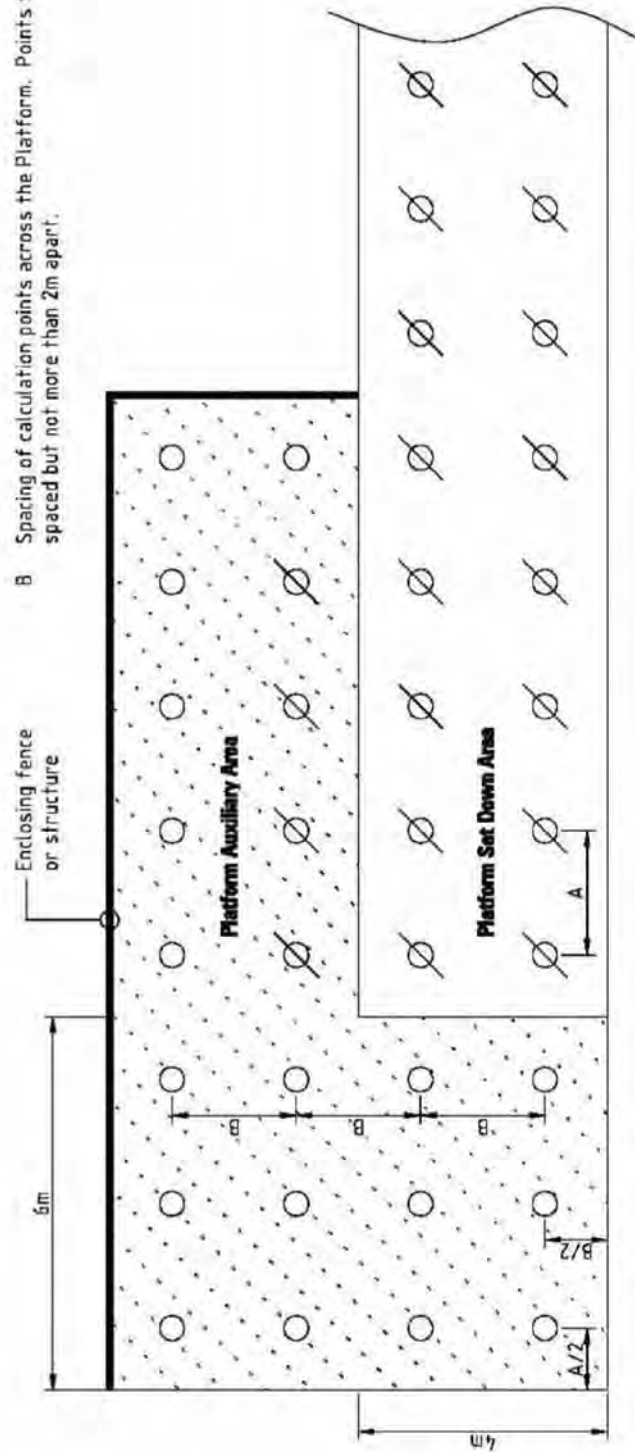
The platform auxiliary area is any part of the platform within the enclosing fence or structure but outside the platform set down area as described above.

NOTES

1. Lighting level to the Platform Set Down Area is to be in accordance with Table 1 of report (Eav 42 lux, Emin 21 lux, Ev 14 lux).
2. Lighting level to the Platform Auxiliary Area is to be in accordance with the requirements for Category P6 in AS 1158.3.1 (Eav 21 lux, Emin 7 lux, Ev 7 lux).
3. Vertical illuminance need not be calculated for points less than 6m from the end of the Platform or points within the Platform Auxiliary Area less than 3m from the side away from the enclosing fence or structure.

LEGEND

- Locations for calculations of horizontal illuminance
 - ⊘ Locations for calculations of horizontal and vertical illuminance
- A Spacing of calculation points along the Platform. Points to be equally spaced along Platform but, not more than 2m apart.
- B Spacing of calculation points across the Platform. Points to be equally spaced but not more than 2m apart.



Appendix F – Heritage listed Stations

NOTE: THE CONTENT OF THIS APPENDIX IS SUBJECT TO CHANGE. CHECK WITH QUEENSLAND RAIL FOR LATEST INFORMATION.

Count of Asset		Significance		Place of local significance	Place of Low Significance	Place of Nil Queensland Rail Heritage Significance	Place of Queensland Rail Heritage Significance	Place of State Heritage Significance or Higher	(blank)	Grand Total
Location	Structure									
80 MILE CREEK	Bridge							1		1
80 MILE CREEK Total								1		1
ACACIA RIDGE RAILYARD	Infrastructure Other						1			1
ACACIA RIDGE RAILYARD Total							1			1
ALBION	Bridge						1			1
ALBION Total							1			1
ALDERLEY	Bridge						1			1
	Platform shelter						1			1
	Station						1			1
ALDERLEY Total							3			3
ALMADEN	House						1			1
	Quarters						1			1
	Station						1			1
	Tank						1			1
ALMADEN Total							4			4
ALPHA	Goods shed						1			1
	Shed		1							1
	Station		1							1
ALPHA Total			2				1			3
ANAKIE	Infrastructure Other						1			1
	Station						1			1
ANAKIE Total							2			2
ANGELLALA	Bridge							1		1
	Shed						1			1
ANGELLALA Total							1	1		2
ANTIGUA	Bridge						1			1
ANTIGUA Total							1			1
ASCOT	Bridge							1		1
	Station							2		2

Location	Structure	Place of local significance	Place of Low Significance	Place of Nil Queensland Rail Heritage Significance	Place of Queensland Rail Heritage Significance	Place of State Heritage Significance or Higher	(blank)	Grand Total
ASCOT Total	toilet					1		1
Auchenflower	Station					4		4
Auchenflower Total					1			1
AVONDALE	Bridge							1
AVONDALE Total					1			1
BABINDA	Bridge				2			2
	Station				1			1
BABINDA Total					3			3
BALLARD	Bridge					1		1
BALLARD Total						1		1
BANYO	Bridge							1
	Platform shelter				1			1
	Station				1			1
BANYO Total					3			3
BARCALDINE	Station				1			1
BARCALDINE Total					1			1
BENARABY	Bridge				1			1
BENARABY Total					1			1
BETHANIA	Bridge				1			1
	Station				1			1
BETHANIA Total					2			2
BIBOOHRA	Bridge					1		1
BIBOOHRA Total						1		1
BIGGENDEN	Goods shed				1			1
	Shed				1			1
	Station				1			1
BIGGENDEN Total					3			3
BLACKALL	Goods shed				1			1
	Infrastructure							1
	Other				1			1
BLACKALL Total					2			2
BLACKBULL	House		1					1
	Quarters						1	1
	Shed			1				1

Location	Structure	Place of local significance	Place of Low Significance	Place of Nil Queensland Rail Heritage Significance	Place of Queensland Rail Heritage Significance	Place of State Heritage Significance or Higher	(blank)	Grand Total
Cecil Plains	Station	1						1
Cecil Plains Total		1						1
CHARLEVILLE	Goods shed				1			1
	Infrastructure Other				1			1
	Shed				1			1
	Station					1		1
	Weighbridge				1			1
CHARLEVILLE Total					4	1		5
CHARTERS TOWERS	Infrastructure Other					2		2
CHARTERS TOWERS Total						2		2
Chelmer	Station				2			2
Chelmer Total					2			2
CHERRY GULLY	Tunnel					1		1
CHERRY GULLY Total						1		1
CHILLAGOE	Bridge	1						1
	Goods shed				1			1
	Infrastructure Other				2			2
	Quarters					1		1
	Station				1			1
	Trolley shed				1			1
	(blank)					1		1
CHILLAGOE Total		1			5	2		8
CHINCHILLA	Bridge		1		1			2
	Quarters				1			1
	Shed				1			1
	Station				1			1
CHINCHILLA Total			1		4			5
Chowey	Bridge					1		1
Chowey Total						1		1
CHRISTMAS CREEK	Bridge					1		1
CHRISTMAS CREEK Total						1		1
Clarendon	Bridge					1		1

Clarendon Total								1					1
CLERMONT		Station							1				1
CLERMONT Total									1				1
CLIFTON		Shed							1				1
		Signal							1				1
		Station							1				1
CLIFTON Total									3				3
CLONCURRY		Infrastructure Other							1				1
		Land		1									1
		Quarters							1				1
CLONCURRY Total				1					2				3
COMET		Bridge							1				1
		Dam							1				1
		Station				1							1
COMET Total				1					2				3
CONDAMINE RIVER		Bridge							1				1
CONDAMINE RIVER Total									1				1
COOMINYA		Shed		2									2
		Station		1									1
COOMINYA Total				3									3
COOROY		Bridge								1			1
		Goods shed								1			1
		Station								1			1
COOROY Total										3			3
COORPAROO		Shed							1				1
		Station							1				1
COORPAROO Total									2				2
CROYDON		Infrastructure Other								3			3
		Quarters								1			1
		Station								1			1
CROYDON Total										5			5
CUNNAMULLA		Goods shed							1				1
		Station							1				1
CUNNAMULLA Total									2				2
Dagun		(blank)		1									1
Dagun Total				1									1
DALBY		Infrastructure Other							1				1

Location	Structure	Place of local significance	Place of Low Significance	Place of Nil Queensland Rail Heritage Significance	Place of Queensland Rail Heritage Significance	Place of State Heritage Significance or Higher	(blank)	Grand Total
DALBY Total	Station				1			1
DALVEEN	Tunnel				2			2
DALVEEN Total						1		1
DARADGEE	Bridge				1			1
DARADGEE Total						1		1
DEAGON	Bridge	1			2			3
	Platform shelter				1			1
	Station				1			1
DEAGON Total		1			4			5
DIMBULAH	Goods shed				1			1
DIMBULAH Total					1			1
Dinmore	Bridge				1			1
	Platform shelter				2			2
	Station				1			1
Dinmore Total					4			4
DJIRRBANDI	Goods shed				1			1
	Infrastructure				1			1
	Other				1			1
	Shed	1						1
DJIRRBANDI Total		1			2			3
DUCHESS	Tank				1			1
DUCHESS Total					1			1
Dularcha	Infrastructure	1						1
	Other							
Dularcha Total		1						1
DUTTON PARK	Platform shelter				1			1
DUTTON PARK Total					1			1
East Ipswich	Bridge				1			1
	Platform shelter				1			1
East Ipswich Total					2			2
Ebbw Vale	Bridge				1			1
	Platform shelter				1			1
	Station				1			1
Ebbw Vale Total					3			3
EIDSVOLD	Shed				1			1

Location	Structure	Place of local significance	Place of Low Significance	Place of Nil Queensland Rail Heritage Significance	Place of Queensland Rail Heritage Significance	Place of State Heritage Significance or Higher	(blank)	Grand Total
FORSYTH Total	Trolley shed					1		1
	House					8		8
FRESHWATER Total								
FRUITGROVE Total	Platform shelter				1			1
	Station				1			1
FRUITGROVE Total					2			2
	Bridge				1			1
Gailes Total	Platform shelter				1			1
					2			2
Gailes Total	Bridge				2			2
	Goods shed				1			1
Gatton Total	House	1						1
	Shed				1			1
Gatton Total	Station				1			1
	Weighbridge				2			2
Gatton Total		1			7			8
	Goods shed				1			1
GAYNDAH Total	Station				1			1
					2			2
GAYTHORNE Total	Bridge				1			1
	Platform shelter				1			1
GAYTHORNE Total					1			1
	Station				3			3
GLASSHOUSE MOUNTAINS Total	Station				1			1
					1			1
Goodna Total	Bridge				1			1
					1			1
GOOMERI Total	Station				1			1
					1			1
GOONDIWINDI Total	Infrastructure Other				1			1
	Offices				1			1
GOONDIWINDI Total	Station				1			1

GOONDIWINDI Total						3					3
GORDONVALE	House		1								1
	Shed					1					1
	Station					1					1
GORDONVALE Total			1			2					3
Gracemere	Infrastructure Other	1									1
Gracemere Total		1									1
Graceville	Offices						1				1
	Station						1				1
Graceville Total							2				2
GRANDCHESTER	Station						1				1
	Tank						1				1
	Trolley shed						1				1
GRANDCHESTER Total							1	2			3
GREENMOUNT	Shed						1				1
GREENMOUNT Total							1				1
GROVELY	Station						1				1
GROVELY Total							1				1
GUJINN PARK	Bridge							1			1
GUJINN PARK Total								1			1
GYMPIE	Goods shed									1	1
	Shed									1	1
	Station									1	1
	(blank)		1								1
GYMPIE Total			1				3				4
HELIDON	Bridge									1	1
	Shed									1	1
HELIDON Total										1	2
HERBERTON	Station	1									1
	Trolley shed	1									1
HERBERTON Total		2									2
HOME HILL	Bridge								1		1
	Station								1		1
HOME HILL Total									1	1	2
HUGHENDEN	Infrastructure Other									1	1
	Quarters									1	1
	Station									1	1
HUGHENDEN Total										3	3

Location	Structure	Place of local significance	Place of Low Significance	Place of Nil Queensland Rail Heritage Significance	Place of Queensland Rail Heritage Significance	Place of State Heritage Significance or Higher	(blank)	Grand Total
Humphrey	Bridge					1		1
Humphrey Total						1		1
Ideraway	Bridge					2		2
Ideraway Total						2		2
Imbil	(blank)	1						1
Imbil Total		1						1
INDOOROPILLY	Bridge				1	1		2
INDOOROPILLY Total					1	1		2
INGHAM	Shed	1						1
	Station				2			2
INGHAM Total		1			2			3
INGLEWOOD	Bridge				2			2
	House				1			1
	Offices				1			1
	Station				1			1
INGLEWOOD Total					5			5
INNISFAIL	Station				1			1
INNISFAIL Total					1			1
IPSWICH	Bridge					2		2
	Infrastructure					1		1
	Other					1		1
	Signal					1		1
	Track					1		1
	Workshop					19		19
	(blank)					1		1
IPSWICH Total						25		25
JERICO	Infrastructure				1			1
	Other							
	Tank	1						1
JERICO Total		1			1			2
Kandanga	Station	1						1
Kandanga Total		1						1
KILKIVAN	Infrastructure				2			2
	Other							
	Shed				1			1
	Station				1			1

KILKIVAN Total											4					4
KINGAROY		Station	1													1
KINGAROY Total			1													1
KOLIJO		Station									1					1
KOLIJO Total											1					1
Konupa		Shed									1					1
Konupa Total											1					1
KURANDA		Goods shed													1	1
		House													1	1
		Signal													1	1
		Station													3	3
		Trolley shed													1	1
KURANDA Total															7	7
LAIDLEY		Bridge									1					1
		Goods shed			1											1
		Platform shelter														
		Station			1						1					1
LAIDLEY Total					2						2					4
LANDBOROUGH		Infrastructure Other									1					1
		Shed													1	1
		Station									1					1
LANDBOROUGH Total											2				1	3
LAPPA		Bridge									1					1
		Station									1					1
LAPPA Total											2					2
LAWES		Signal							1							1
LAWES Total								1								1
LINVILLE		Station						1								1
LINVILLE Total								1								1
LOCKYER		Bridge													1	1
LOCKYER Total															1	1
LONGREACH		Goods shed													1	1
		Shed													1	1
		Station													2	2
LONGREACH Total															4	4
LOWOOD		Offices														1

Location	Structure	Place of local significance	Place of Low Significance	Place of Nil Queensland Rail Heritage Significance	Place of Queensland Rail Heritage Significance	Place of State Heritage Significance or Higher	(blank)	Grand Total
LOWOOD Total		1						1
LURNEA	Shed				1			1
LURNEA Total					1			1
MACROSSAN	Bridge				1	1		2
MACROSSAN Total					1	1		2
MANGALORE	Shed				1			1
MANGALORE Total					1			1
MAREEBA	Bridge				1			1
	Station	1						1
MAREEBA Total		1			1			2
MARYBOROUGH RAILYARDS	Infrastructure Other Station	1			9	1		11
					2			2
MARYBOROUGH RAILYARDS Total		1			11	1		13
Meadvale	(blank)				1			1
Meadvale Total					1			1
MEKAREE	Shed				1			1
MEKAREE Total					1			1
MILES	Bridge				1			1
	Quarters				1			1
	Shed				1			1
	Station				1			1
MILES Total					4			4
MILL HILL	Infrastructure Other Signal Station				3			3
					1			1
					1			1
MILL HILL Total					5			5
MILLMERRAN	Shed Station				1			1
					1			1
MILLMERRAN Total					2			2
Milton	Platform shelter				1			1
	Station				1			1
Milton Total					2			2
MIRIAM VALE	Station				1			1

MIRIAM VALE Total							1				1
MITCHELL							1				1
	Bridge										
	House							1			1
	Shed							2			2
	Station							1			1
	(blank)							1			1
MITCHELL Total							1	5			6
Miva	Bridge							1			1
Miva Total								1			1
Monkland	Station	1									1
Monkland Total											1
MONTO	Station						1				1
MONTO Total							1				1
MORVEN	Goods shed						1				1
	Infrastructure						1				1
	Other						1				1
	Station						1				1
	Trolley shed						1				1
MORVEN Total							4				4
MOUNT SURPRISE	Goods shed							1			1
	House							3			3
	Infrastructure							1			1
	Other							2			2
	Shed							1			1
	Station							8			8
MOUNT SURPRISE Total											
MT LARCOM	Station						1				1
MT LARCOM Total							1				1
MT PELION	Bridge						1				1
MT PELION Total							1				1
Mt Surprise	Station							1			1
Mt Surprise Total								1			1
Muckadilla	Station	1									1
Muckadilla Total											1
MUNDUBBERA	Goods shed						1				1
	Station						1				1
MUNDUBBERA Total							2				2
MURARRIE	Shed						1				1
	Station						1				1

Location	Structure	Place of local significance	Place of Low Significance	Place of Nil Queensland Rail Heritage Significance	Place of Queensland Rail Heritage Significance	Place of State Heritage Significance or Higher	(blank)	Grand Total
MURARRIE Total					2			2
MURGON	Station				1			1
MURGON Total					1			1
MURPHYS CREEK	Culvert					1		1
	Infrastructure Other					1		1
	Shed					1		1
	Signal					1		1
	Station					1		1
	Tank					1		1
MURPHYS CREEK Total						6		6
NAMBOUR	Bridge	1			1			2
NAMBOUR Total		1			1			2
NEWMARKET	Bridge				1			1
	Station				1			1
NEWMARKET Total					2			2
NORMAN PARK	Bridge				1			1
	Station				1			1
NORMAN PARK Total					2			2
NORMANTON	Bridge					2		2
	Goods shed					1		1
	Infrastructure Other					1		1
	Platform shelter					1		1
	Station					1		1
	Tank					1		1
NORMANTON Total						7		7
North Ipswich	Culvert					1		1
North Ipswich Total						1		1
NUDGENE	Bridge				1			1
NUDGENE Total					1			1
OONDANOO	Shed				1			1
OONDANOO Total					1			1
Oxley	House				1			1
	Station				1			1

Location	Structure	Place of local significance	Place of Low Significance	Place of Nil Queensland Rail Heritage Significance	Place of Queensland Rail Heritage Significance	Place of State Heritage Significance or Higher	(blank)	Grand Total
ROCKHAMPTON Total					3	3		6
ROCKLEA	Bridge				1			1
	Platform shelter				1			1
ROCKLEA Total					2			2
ROMA	Station				1			1
ROMA Total					1			1
Roma Street	Platform shelter				1			1
	Station					1		1
Roma Street Total					1	1		2
ROSENTHAL CREEK	Bridge				2			2
ROSENTHAL CREEK Total					2			2
ROSEWOOD	Bridge				1			1
	Donga				1			1
	Station				2			2
ROSEWOOD Total					4			4
RUNCORN	Platform shelter				1			1
RUNCORN Total					1			1
SADLIERS CROSSING IPSWICH	Bridge					1		1
SADLIERS CROSSING IPSWICH Total						1		1
SALISBURY	Bridge				1			1
	Station				1			1
SALISBURY Total					2			2
SALTWATER CREEK	Bridge				1			1
SALTWATER CREEK Total					1			1
SANDGATE	Bridge				1			1
	Station				1			1
SANDGATE Total					2			2
SARINA	Station				1			1
SARINA Total					1			1
SEXTON	Bridge				1			1
SEXTON Total					1			1
Sherwood	Station				1			1
Sherwood Total					1			1
SHORNCLEIFFE	Bridge				1			1
	Shed				2			2

SHORNCLEFFE Total	Station					1				1
SILVERWOOD RANGE	Dam					4				4
									1	1
SILVERWOOD RANGE Total									1	1
Six Mile Creek	Bridge					1				1
Six Mile Creek Total						1				1
SOUTH BRISBANE	Station								1	1
SOUTH BRISBANE Total									1	1
SPRING BLUFF	House								3	3
	Shed								1	1
	Signal								1	1
	Station								2	2
SPRING BLUFF Total									7	7
SPRINGSURE	Station					1				1
	Weighbridge			1						1
SPRINGSURE Total				1		1				2
STANTHORPE	gardens					1				1
	Goods shed					1				1
	Station					1				1
STANTHORPE Total						3				3
Stanwell	Infrastructure									1
	Other			1						1
Stanwell Total				1						1
STONEY CREEK	Bridge								1	1
	Shed								2	2
	Tank								1	1
STONEY CREEK Total									4	4
SUNNYBANK	Station					1				1
SUNNYBANK Total						1				1
SURPRISE CREEK	Bridge								1	1
SURPRISE CREEK Total									1	1
Taringa	Platform shelter					1				1
Taringa Total						1				1
TARVANO	Shed					2				2
TARVANO Total						2				2
THALLON	Goods shed					1				1
	Shed					1				1
THALLON Total						2				2
THE SUMMIT	Shed					1				1

Location	Structure	Place of local significance	Place of Low Significance	Place of Nil Queensland Rail Heritage Significance	Place of Queensland Rail Heritage Significance	Place of State Heritage Significance or Higher	(blank)	Grand Total
	Station				1			1
THE SUMMIT Total					2			2
Thomas Street	Platform shelter				1			1
Thomas Street Total					1			1
THULIMBAH	Quarters				1			1
	Shed				1			1
	Station				2			2
THULIMBAH Total					4			4
TOOGOOLOWAH	Station				1			1
TOOGOOLOWAH Total					1			1
Toowoomba	Infrastructure Other					1		1
Toowoomba Total						1		1
TOOWOOMBA RAILWAY STATIONS AND RAILYARDS	Bridge				1			1
	House	1						1
	Infrastructure Other	5			7	3		15
	Offices				1			1
	Platform shelter					1		1
	Quarters				2			2
	Shed	3			1			4
	Station					2		2
TOOWOOMBA RAILWAY STATIONS AND RAILYARDS Total		9			12	6		27
Townsville	Workshop					1		1
Townsville Total						1		1
TOWNSVILLE NORTH YARDS	Infrastructure Other					19		19
	Offices					1		1
	Shed					5		5
	Station					1		1
TOWNSVILLE NORTH YARDS Total						26		26
TRAVESTON	Station				1			1
	(blank)	1						1

TRAVESTON Total		1					1			2
TULLY	Station						1			1
TULLY Total							1			1
TUMOULIN	Shed	1								1
TUMOULIN Total	Station	1								1
Victoria Tunnel	Tunnel	2								2
Victoria Tunnel Total							1			1
Wacol	Bridge						1			1
Wacol Total							1			1
WALLAL	Bridge						1			1
WALLAL Total	Shed						1			1
WALLAL Total							2			2
WALLANGARRA	Infrastructure Other		1						2	3
WALLANGARRA Total	Quarters								2	2
WALLOON	Station								1	1
WALLOON Total	Weighbridge								1	1
WALLUMBILLA	Platform shelter		1						6	7
WALLOON Total	Station						1			1
WALLUMBILLA	Goods shed									1
WALLUMBILLA Total	Infrastructure Other	1					2			2
WARWICK	Shed									1
WARWICK Total	Station						2			2
Westwood	Station						1			1
WARWICK Total	Bridge						4		1	5
Westwood	Goods shed								1	1
WARWICK Total	Infrastructure Other								1	1
Westwood	Quarters								1	1
WARWICK Total	Shed								1	1
Westwood	Station								2	2
WARWICK Total	Workshop								1	1
Westwood	Infrastructure Other	1							8	8
WARWICK Total										1

Location	Structure	Place of local significance	Place of Low Significance	Place of Nil Queensland Rail Heritage Significance	Place of Queensland Rail Heritage Significance	Place of State Heritage Significance or Higher	(blank)	Grand Total
Westwood Total		1						1
WHETSTONE	Bridge				1			1
WHETSTONE Total					1			1
WILSTON	Station				1			1
WILSTON Total					1			1
WINDSOR	Bridge				1			1
WINDSOR	Station				1			1
WINDSOR Total					2			2
WINTON	Infrastructure				1			1
WINTON	Other				1			1
WINTON	Shed				1			1
WINTON Total					2			2
wirra wirra	(blank)					1		1
wirra wirra Total						1		1
WOODRIDGE	Bridge				1			1
WOODRIDGE Total					1			1
WOOLOOGA	Bridge					1		1
WOOLOOGA Total						1		1
WOOMBYE	Station				1			1
WOOMBYE Total					1			1
WYANDRA	Goods shed				1			1
WYANDRA Total					1			1
Wycarbah	Infrastructure	1						1
Wycarbah	Other							
Wycarbah Total		1						1
WYNNUM	Bridge				1			1
WYNNUM	Goods shed				1			1
WYNNUM	Signal				1			1
WYNNUM Total					3			3
WYNNUM NORTH	Bridge				1			1
WYNNUM NORTH	Platform shelter				1			1
WYNNUM NORTH Total					2			2
WYREEMA	Bridge			1				1
WYREEMA Total				1				1
YAAMBA	Bridge				1			1
YAAMBA Total					1			1

YANDINA	Goods shed						1				1
	Station						1				1
YANDINA Total							2				2
YANNA	Shed						1				1
YANNA Total							1				1
YARAKA	House						1				1
	Infrastructure						1				1
	Other						1				1
	Station						3				3
YARAKA Total							1				1
YEERONGPILLY	Quarters						1				1
	Station						2				2
YEERONGPILLY Total										1	1
YEPPOON	Station									1	1
YEPPOON Total										1	1
YERONGA	Bridge					1					1
YERONGA Total						1					1
YUKAN	Station						1				1
YUKAN Total							2				2
YULEBA	Bridge						1				1
	Station						3				3
YULEBA Total							1				1
(blank)	Culvert										
	(blank)	3					1			6	13
(blank) Total		3					3			6	14
Grand Total		59	11	5		338	204		6		623

Appendix G

The following drawings, referred to in the Stations Design Guide, are appended. Drawings are subject to revision – check currency of each drawing with Queensland Rail.

NUMBER	TITLE
2485B	Lockable Platform Pit Lids Fabrication Details
2486B	Lockable Platform Pit Lids Installation Details
2487B	Passenger Seat
2488A	Rubbish Bin
2507A	Station Name Sign
2519	Lockable Platform Pit Lids Fabrication Details For “Aco Cjp” Type 66 & 99 Pits
2520	Lockable Platform Pit Lids Installation Details For “Aco Cjp” Type 66 & 99 Pits
2521	Lockable Platform Pit Lids Typical Details For “Aco Cjp” Type 66 & 99 Pits
2524	Lockable Platform Pit Lids Fabrication Details For “Kelly Pit” Type 2 (1000Mm X 1000Mm X 1200Mm Deep)
2525	Lockable Platform Pit Lids Installation Details For “Kelly Pit” Type 2
2526	Lockable Platform Pit Lids Typical Details For “Kelly Pit” Type 1 & 2
2547	Station Fencing
2531E	Layout Of Tactile Ground Surface Indicators
2585	Ceramic & Cork/Rubber Tgsi Installation Details
2593	Standard Through Lift Car
2615	Single Ticket Counter Module
2621	Small Seat
2642	Maze For Pedestrian Track Crossing - Passive
2643	Maze For Pedestrian Track Crossing - Passive
2644C	Pedestrian Track Crossing - Active
2645C	Pedestrian Track Crossing - Active
2667	Platform Mat
Cm1994a	Concept Train Stopping & Boarding Point Location
Cm2063a	Access Paths On Platforms
Cm2081a	Sacid In Existing Fence Line
Cm2086a	Ramp With Handrails Or Kerbrails
Cm2092a	Waiting & Boarding Areas On Existing Platforms
Cm2093a	Waiting & Boarding Areas On Existing Platforms
Cm2096a	Platform Paths At Stairs & Lifts
Cm2136a	Waiting & Boarding Areas On Existing Platforms
Cm2137	Waiting & Boarding Areas On Existing Platforms
Cm2140a	Kerb Ramps
Cm2147A	Ramps & Stairs
Cm2342a	Platform Mat Circulation Requirements

Cm2343a	Layout Of Stairs & Ramps
Cm2646a	Platform Mat
Cm2147	Ramps And Stairs
Cm2148a	Core Safety Zone Strip Layout
Cm2149a	Bus Stop Options
Cm2344	Platform Mat Circulation Requirements
Cm2345	Layout Of Stairs And Ramps
S31649	Sacid Footing Details
S31650	Avvm Footing Details
S31651	Avvm+Nti/Edap Footing Details
S31652	Nti/Edap Footing Details
S31653	Edap Padestal Details
S31655	Nti/Edap Pedestal Details
A1-E-0.510	Earthing & Bonding Arrangement, Isolation Transformer Option
A1-E-0.511	Earthing & Bonding Arrangement, Rcd Option
A1-E-0.512	Traction Bonding, Typical Arrangement Bonding Cable
A1-E-0.153	Platform Lighting – Pole, Wiring & Foundation Details

Appendix H – Crime prevention through environmental design

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3. General design Guidelines
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 - 14.5 Vending machines
15. Core Zones
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1. PREFACE

This document provides protective security guidance for those involved in designing and construction of Queensland Rail facilities. This is a guide for the use of Crime Prevention Through Environmental Design (CPTED) methodology when designing and constructing passenger transport facilities for Queensland Rail.

This guide will provide design consideration that will not rely entirely on technology to provide security but will use various elements of the environment and psychology, combined with traditional physical security concepts to assist in reducing crime statistics on the Queensland Rail network.

Not every element of CPTED discussed in this document will be applicable to every station but an overall standard on these principles will reduce crime. The principles are relevant to normal operations; however consideration for heightened security posture will be mentioned throughout this document. The CPTED principles should be used in conjunction with other design requirements such as heritage and disability requirements.

One of the outcomes of CPTED is that it is a cost effective means of providing security with limited impact on operations.

2. INTRODUCTION TO CRIME PREVENTION THROUGH ENVIRONMENTAL DESIGN

Rail passengers choose to travel by train for a number of reasons, daily commuters, tourism and the occasional traveller as an alternate means of getting to their destination. All these travellers however, will be influenced by their perception of safety and security throughout their journey. Crime Prevention Through Environmental Design (CPTED) principles are used to enhance the security environment for passengers and reduce the opportunity for crime to occur by altering the perception of risk to both passenger and criminal.

CPTED is already a considered process within the security industry through the use of CCTV, lighting and structural design but is now considered as an entire methodology. CPTED is considered a cost effective means of practical crime prevention based on the psychological perceptions it creates with potential offenders and the general public. CPTED is low technology and is not reliant on continued police or law enforcement presence. It is effective in a range of situation and can be adapted to support rail operations environment with varying levels of threat from criminal and anti-social behaviour. CPTED utilises multilayered concepts to influence the potential criminal from actually committing a crime.

Although CPTED planning is best applied during the planning and design phase of a project most principles used are able to be retro-fitted to facilities. Retro-fitting CPTED application may become expensive particularly if the works require relocation or reconstruction of a site. Additionally most CPTED principles can be included in any refurbishment work.

CPTED relies heavily on input from local knowledge and general public input. These groups should be consulted early in the project life cycle as this will provide information of local patterns and trends and principles that will be effective in the area.

2.1 How does CPTED work to reduce crime?

CPTED works by changing the psychological exposure to crime. CPTED provides a positive atmosphere of safety and security for passengers while reducing areas where criminals have previously perceived there is a low chance of detection.

3. GENERAL DESIGN GUIDELINES

Existing infrastructure is unlikely to be moved or rebuilt to accommodate CPTED, however during major refurbishment or when planning a new facility there are some general considerations that should be followed include:

Clear perimeter definition, so that any reasonable person can identify the area that is controlled by Queensland Rail including Stations, car parks and corridor. This is known as controlled space,

- Clear and accessible transitional areas designed to provide access control to the controlled space.
- The location of passenger congregation areas.
- Isolation of unsafe activities from the controlled space and the promotion of safe activities within a space. Not allowing the platform to be used as a recreational area for kicking footballs, skateboarding etc.
- Use of natural barriers to direct flow without creating obstructions.
- Productive use of space will reduce the opportunity for crime by removing loiter areas created by wasted space.
- Natural surveillance and
- Overcoming isolation and distance.

These principles can be used in any number and configuration to provide better security. In a passenger railway context some examples maybe:

- Clear perimeter definition. The use of fencing to define different areas within the station boundaries. The rail corridor has 2m fences with barbed wire atop to identify the dangerous area of the track while car parks have the small “pool fence” type of barrier. Neither of

these obscures the controlled space but they provide clear definition of space and natural surveillance.

- Clear and accessible transitional areas. This is through the established station/ platform areas but should also take into consideration the “flow” of passengers to and from the station. This will include the integration with other transport services to provide a “seamless” transport system for passengers.
- The location of passenger gathering areas. If the station is seen as a safe location people will congregate at the station providing greater security (safety in numbers) If the station or its surroundings are seen as a gathering place for undesirable groups then it is likely that more opportunity for crime will occur. This is the principle that formed the basis for “core zones”
- Isolation of unsafe activities and the promotion of safe activities. This may be achieved through the use of signs and education. The establishment of “core zones” promotes an area of safe activity for passenger.
- Use of natural barriers to direct flow may include the use of plants or shrubs to direct passengers away from areas vulnerable to track crossing.
- Productive use of space. Limiting the amount, size and type of structures on a platform will decrease the amount of hidden areas and provide better natural surveillance. Within the station /platform space, productive use of space may include suitable location of AVVM and vending machines.
- Natural surveillance is the means of “opening” the defined space to observation by numerous stake holders. Observation may come via members of the public, local residence, local business, CCTV and members of station staff. By providing natural surveillance this increases the likelihood of a crime being reported and conviction occurring.

- Overcoming isolation and distance. Many of crimes that are committed on Queensland RailP property occur at the extremities of stations and platforms in dark or hidden areas. Through the use of lighting, communication and CCTV these areas of isolation can be overcome. Through the use of “core zones” the protective area is reduced ensuring that physical security assets can be focused better.

4. SURFACES AND MATERIALS

4.1 General Security

Strong consideration should be given to the type of material used in construction and the accessibility and surveillance of various surfaces within the station/platform area. The following consideration should be incorporated into the station design:

- All materials used shall take into consideration the potential for graffiti and wilful damage. Materials shall make use of vandalism and graffiti resistant materials such as sacrificial film, anti graffiti paint etc. Additionally where these materials can't be used the chosen materials should be of a standard nature to allow for easy replacement.
- In order to "open" the station/platform area and reduce the perception of being contained open fences, and barriers should be used, internally while more imposing structures (solid walls, barbed wire fences) can be used to prevent access to restricted areas.
- Wherever design has left a potential surface for graffiti to be applied the use of lighting, community murals or advertising will be used to discourage vandalism through graffiti.
- Colour schemes also need to be considered. Public areas should be painted or outfitted in lighter colours in order to allow for better natural light, reflection and reduced perception of danger. Darker colour maybe used on areas that are susceptible to graffiti to ease with paint-over repair.

4.2 Counter Terrorism considerations

Counter Terrorism considerations. In the Counter Terrorism environment (particularly where Explosive Hazards are considered a major threat) all materials should be blast resistant. The CPTED principle, natural surveillance usually incorporates extensive use of glass. If this is not blast resistant it will form secondary fragmentation that has the potential to cause greater casualties. The use of a glass that shatters in small, safe pieces instead of shards should be used in this case. Alternatively, Polyvinyl Butyral (PVB) laminate could be used as an explosive resistant material. The added benefit of using these materials is that there are reduced hazards in the event that vandals break the surface.

5. SIGNAGE

Signage is very important as a communication strategy and as a deterrent to crime. Where people are informed they are more likely to feel empowered and confident, and less likely to be fearful. Additionally, if there are signs within a space that indicate that CCTV is used, police patrol the area, that certain actions are prohibited in an area (smoking) then it is likely that some crime will be prevented. The following prohibitive signs are to be placed at each station;

- No smoking,
- No bike riding skateboarding roller-skating,
- CCTV use and do not cross tracks.

For details of numbers and positioning see Translink signage manual. There shall be sufficient signs and placed in locations as to be seen by all station users. In addition the following consideration for station signage should be incorporated to station design.

- Information signs across the network should be uniform in design and in location. They should be clear to read, have descriptive pictures and be written in brail to cater for a wide range of users. There may be a requirement to write in various target languages at certain locations e.g. Chinese at Fortitude valley, Japanese at the airport.
- Signs need to be readable in all light conditions. Signs should have their own light source or be placed in well lit areas.
- Signs should not be placed in areas that will restrict movement when someone stops to read them (at the top of a ramp or stairs).
- Prohibitive signs should be located in areas that criminal activity occurs e.g. No smoking signs near the end of the platform, no track crossing – under the opposite platform.
- Prohibitive signs should explain the consequences of disobeying the restriction.
- Signage needs to be reinforced with verbal communication methods.

6. LIGHTING

Lighting needs to be considered not only at night but also for sub-terranean access tunnels. Lighting may also be required to areas that surround the station such as walkways and car parks.

- Lights are vulnerable to vandalism and therefore are required to have vandal resistant fittings.
- Lights should be positioned so as not to create shadows and blind spots.
- The correct illumination level (lux) and colour rendition needs to be used so as to not interfere with CCTV, Stations staff observation and train driver visibility.

7. CCTV

CCTV is a critical part of the CPTED strategy. Not only does it provide evidentiary value and warning that a crime is being undertaken, the knowledge that CCTV coverage is present does prevent crimes from taking place.

The following CCTV consideration should be incorporated into station design:

- Cameras are vulnerable to damage from vandalism. It is critical that all the infrastructure supporting the system is housed in vandal resistant housings.
- Cameras are required to be placed at exits and entries in order to obtain facial imagery capture.
- Cameras must be located in car parks and other passenger transition areas (walkways).
- Cameras must be covered by other cameras.
- Signs indicating the use of CCTV must be used.

For more information on detailed CCTV requirements, refer to Closed Circuit Television (CCTV) Design Guide (DRAFT) of March 2009

8. LANDSCAPING

Landscaping is very important as it provides the basis for environment that the station is located in. It should aim to provide a pleasant atmosphere in contrast to that of a fortress. Through the use of CPTED in landscaping open spaces can be accentuated and natural barriers used to provide order. The following considerations should be incorporated in the station design.

- Thorny / prickly shrubs can be used to prevent incursion into restricted space.
- Shrubs can be used to provide a barrier to graffiti prone areas.
- Maintenance of any landscaping needs to be considered, as the plants that are planted today may not achieve the same effect in 5 years.
- Landscaping may be used in vehicle access areas to provide traffic calming.

9. COMMUNICATION SYSTEMS

Communication systems are a multi layered means of applying CPTED principles. Communication acts as a deterrent to crime (Staff provide verbal warning if crime is detected) and assurance to passengers that they are not alone. It also provides information and guidance to allow passengers to make safe decisions (train delay approach information). The following considerations should be incorporated into the station design:

- The provision of “help/ emergency” phones is essential as this improves the passenger’s perception of safety. It also provides a means for reporting security incidents. These phones must be located within safe areas (core zones) and must be within CCTV coverage to deter damage.
- Public phones should also be located within core zones within station.
- The use of PA system on manned stations and automatic announcements on unmanned stations to make service information announcements, provide verbal direction to offenders and public safety announcements.
- Stations buildings must have duress alarms installed. The possibility for personal safety alarms for staff should be considered for stations that have single staff.

10. PATHWAYS

Well designed and good quality pathways are essential for safety and security of Passengers and staff. The following considerations should be incorporated into the station design:

- Pathways are to be wide and in good repair. This will allow passengers passing in opposite directions to pass at a comfortable space.
- The route should be as straight as possible in order to prevent any hiding spots.
- Paths move in a logical safe direction for all foot traffic to follow. This will reduce the desire to for people to take “short-cuts” through restricted areas.
- Paths within the immediate area of Queensland Rail property are to be well lit and where possible covered by CCTV.
- Paths must have appropriate barriers to prevent access to restricted areas and items being thrown at Queensland Rail property.
- Pathways should not be enclosed as this creates a perception of being trapped additionally there should be multiple options for passengers to use (no single entry exit points)
- Landscaping in the vicinity of pathways should be restricted to limited or low shrubbery to prevent any dark areas or hiding spots being created.

11. FOOTBRIDGES AND CROSSING POINTS

Due to the safety issues associated with crossing tracks it is the responsibility of Queensland Rail to provide safe passage across tracks. Options for this include Overpass footbridge, underpass and pedestrian crossing points. The following considerations should be incorporated into the station design:

- Where station topography permits, the use of an overpass/ footbridge is preferable. This allows for good natural surveillance. The design of the overpass is to prevent hidden corners. This can be achieved through the use of parabolic mirrors, transparent or semi transparent materials.
- The design of the footbridge is to prevent the ability to throw any sort of projectiles at trains and reduce the risk of suicide attempts.
- The use of shatter resistant glass should be used as barriers on overpasses. This will provide natural surveillance and natural lighting reducing the opportunity for loitering and crime.
- Underpasses are required to be well ventilated, and well lit in order to prevent dangerous hiding locations.
- Pedestrian crossing points are to be clearly marked, uncomplicated, and robust.
- CCTV must be incorporated into the design of all footbridges, overpasses and crossing points.
- All crossing points must be accessible to persons with disabilities through the use of ramps and lifts. These structures should be open (the use of glass lifts) to maintain visibility.

12. STATION BUILDINGS

On every station there will be some form of station building. The amount of CPTED principles that are utilised should take into account the hours of occupation by staff and the role of the work area. As mentioned in the general design guidelines the number, type and size of the buildings should be kept to a minimum in order to reduce the controlled space and hidden areas. The following considerations should be incorporated into the station design:

- Buildings will be placed in such a way to be accessible to all personnel and passengers. This will normally be central on the station. This will also designate the location of core zones.
- The use of windows and glass bricks should be used to provide natural light and good visibility however the use of these materials must not create further security issues for staff. (Unruly passengers looking into and harassing staff, identifying cash, computers or other attractive items). Glass should be intruder resistant and potentially stronger to prevent criminals breaching the space.
- Roller shutters, grills or other additional protection will be required to protect facilities while station is not manned. These should comply with AS 5039 2008 Security screen doors and Window Grills.
- Doors need to be of a standard that deters break in and meet fire safety standards. Doors should be a solid core door with an anti graffiti surface used. The use of a stainless steel or other metal façade should be considered to prevent wilful damage of the door
- The station office needs to be split into a front counter and a general work area. The front counter shall be mostly plain to prevent undue interest from criminals. There shall be a duress alarm hidden close to the counter. Individual personal alarms should be used if a station is individually manned.
- Automatic screens (similar to those used in banks) should be considered for use at the service desk. CCTV monitors need to be positioned so as to be seen under constant observation by staff in the work admin area and at the service counter. All money counting and storage areas need to be hidden from view of the general public
- The use of intruder detection systems and alarms are required at the station and are to be activated during any period that the station is unmanned. These systems are required to be centrally monitored and a response plan in place.
- An additional facility/ space is to be allocated for use by internal and external security services (QPS/ TO). The visible presence of security service will reduce crime.
- Locks should be of a type that is intruder resistant. The frequency of use should be considered e.g. an electronic access control system (swipe card) could be used for frequent use areas while a key locking system or cipher lock could be used for less frequently used areas.

13. PASSENGER TOILET FACILITY

Facilities for public use such as toilets are potential locations for many crimes to occur. The following consideration should be incorporated to the station design:

- Minimal numbers of toilet facilities should be used.
- Where multiple toilets are required, facilities should be an open space with individual cubicles. There should be no hidden corners or lobby areas to the facilities.
- Entrance to toilet facilities should be covered by CCTV.
- Toilets must be locked when station not manned.
- Anti-vandalism fittings will be used for public toilet facilities.
- A uni-sex baby change area should be located close to the station building. This promotes a family environment which may deter some forms of inappropriate behaviour.
- Provision of tamper resistant sharps bins is required. These should be located within individual cubicles to avoid accidental stick injuries and to provide privacy for legitimate use.
- Seating should not be directly outside the toilet area to prevent loitering and they should not be located directly opposite the toilets.
- Modesty doors should be used on cubicles to ensure access to emergency service and minimal surveillance.
- During times of elevated threat, toilet facilities may have to be closed.
- The use of access control/ pay for use will reduce the opportunity for crime through the heightened perception of detection and inconvenience to illegitimate users.

14. PLATFORMS

The platform is the principle gathering area for passengers; it is therefore the most susceptible area to criminal activity. The following consideration should be incorporated into station design:

- A minimum number of obstructions should be placed on platforms. This will provide the best natural surveillance and prevent hidden spaces.
- Platforms should be located at approximately the same level as the surroundings to provide the best observation by the general public. Where this can't be achieved the platform should be lower than the surroundings.
- The use of mirrors to reduce the occurrence of hidden areas and blind corners.

The Platform can be broken down into several sub sections;

14.2 Entry and Exit points

- At least two defined entry and exit points are to be available. This is a safety and a security requirement. This gives passengers options to choose a safe path; it provides reduced chance of passengers entering restricted space i.e. the tracks and it provides alternate evacuation points in the event of an emergency.
- Entry and exit points must be covered by CCTV in order to facilitate indentifying imagery.

14.3 Shelters

- Shelters are to be made of transparent or semi transparent materials in order to deduce hidden areas. Shelters should be highly visible location to deter loitering.
- If CCTV or other fitting are to be fitted to shelters they should be out of reach and vandal resistance.
- Shelters shall be designed to prevent climbing either on the structure itself or be used as an aid to climb on to other structures.

14.4 Seating

- Long bench seats are to be avoided as these encourage unsocial behaviour (skateboarding) and sleeping.
- Consider the use of resting rails in areas where space is limited and to prevent loitering.
- Seating should be spaced along the platform to discourage groups gathering.
- Seats should not be placed in areas with limited surveillance or hidden areas.
- The use of individual bucket type seats can be used to prevent overcrowding, skateboarding, and sleeping.
- Seating shall be firmly secured to the ground/ structure to prevent the seats being pulled up and thrown either at people or trains.

14.5 Fencing

- Fencing provides a visible perimeter to the controlled space.
- Fencing needs to be at least intruder evident and where applicable intruder resistant.
- Signs should be used to indicate that the crossing the perimeter is an offence.
- Solid fences in passenger areas should be avoided as these portray a harsh, closed in environment, where natural surveillance is obscured. These types of fences can be used in restricted areas as more robust barrier. These types of fences are susceptible to graffiti. The use of shrubs, community murals or advertising can be used to protect the surface from vandalism.
- Open fences should be used within the station /platform area to provide direction and separation for passengers. Open fences are not offensive and do not offer areas of hidden space.

14.5.1 Counter terrorism consideration for fencing.

- Counter terrorism consideration for fencing. Where there is an increased threat of a terrorist incident occurring, fences may be required to be more robust. This may include Anti vehicle bollards/ barriers to protect from vehicle intrusion to concourses or blast resistant fences where there is a potential explosive threat.
- 14.6 Vending machines
- Conveniences such as unattended vending machines may encourage theft and vandalism.
- The use of vending machines may lead to offences being committed through association such as eating and drinking on trains.
- These machines are required to be located in well lit areas and covered by CCTV.
- They should be part of the building construction as to reduce the ability to access vulnerable parts of the machine (power, cash).
- Ownership and maintenance contracts need to be considered when installing machines. There is potential for criminals to use vending machines for other purposes such as climbing to roof to graffiti, pushing unserviceable standalone machines onto tracks.
- The use of private vendors may provide a solution during manned hours. This will provide a more secure structure and encourage ownership of the space.
- Vending machines should be removable for times of heightened counter terrorism alert.

15. CORE ZONES

Core zones are the focal point of the passenger path of travel. All the CPTED principles shall be focused onto this area of the platform to provide the safest and most convenient passage of travel. The core zone should be located in an area that passengers would normally congregate i.e. in an area central to the platform. Core zones should also designate the location that people with disabilities could expect assistance with boarding the train, although this is a separate issue to the core zone. Core zone should aim to “centralise” all the stations facilities. At a minimum a core zone is to have:

- CCTV coverage with sufficient resolution to verify an incident and capture recognition imagery.
- An emergency phone to connect passengers with Queensland Rail staff in emergency situation.
- Enhanced lighting to support CCTV and to increase the perception of safety.
- Signage and marking (blue and white stripe) designating the extent and boundaries.
- The core zone is to be located near the guard location. It should extend no more than 1 carriage length in both directions and no less than one set of doors either side of the guard.
- AVVM is best placed in the core zone.
- Time tables and other information boards should be located in the core zone.

Other considerations for installation in a core zone are:

- Public convenience machines such as drink and food machines
- Public phone.
- Seating
- Shelters

16. CAR PARKS

The provision of car parks close to Queensland Rail Stations is an essential element of the commuter operations. The application allows for passenger safety and convenience. Car parks are a vulnerable area as they allow for crimes of opportunity to be committed.

- Car parks are to be close to the station to minimise the distance that passengers have to transit between modes of transport.
- They should be located in areas of high community observation to increase natural surveillance.
- The car park should be separate from pedestrian thoroughfare as this will reduce the opportunity for incidental crime.
- Car parks should be considered restricted area. Signage, fencing, lights and CCTV should all reflect this.
- Flow of traffic in the car park needs to be considered. A one way, circular flow is optimal. This also provides ease for police and security to conduct drive through surveillance.
- Vegetation in car parks needs to be limited as this will obscure surveillance, provide shadow from lighting and may aid criminals in climbing.
- Car parks should utilise straight and consistent rows of parking bays. This maximises surveillance and limits the number of hiding spaces within the space.
- CCTV should be located at the entry/exit of car parks in order to gain imagery of number plates. Additionally CCTV should be located at the pedestrian entry to car park.
- Where possible a lock-up or access controlled car park should be implemented. This will provide some identification of users and their vehicles. This may be in conjunction with “go card”
- Signage needs to be installed to allow passengers to navigate through the car park, notify of the use of CCTV and to remind passengers of the vulnerability and the requirement to lock cars and take valuables with them.
- The use of separate secured car parks for staff shall be considered. This will reduce the change that staff will be taken by surprised or have their property damaged.

17. BICYCLE STORAGE

Bike storage is another important element of the commuter system. Although theft or damage of property is possible, the use of these areas to store contraband is also high.

- Bicycle storage areas require high natural surveillance or coverage by CCTV.
- Storage areas should be enclosed and controlled and must be large enough to cater for the maximum potential capacity.
- The use of secure cages for the storage of bicycles is preferable to using bike lockers; this removes a vulnerable graffiti surface and allows for natural surveillance preventing this area being used for illegal activities (drug transfer).

18. COMMUNITY INITIATIVES

A central tenant of CPTED is the engagement with the local community. This commences at the planning stage and can be transferred throughout the life cycle of the project. CPTED encourages the local population to be involved and empowered to assist in reducing crime in their own area.

- Local vendors conducting business at the station (selling papers, coffee vendors etc) will help provide ownership of the area.
- Community arts projects may be used to prevent graffiti and other vandalism.
- Interaction with local groups (schools, youth groups etc) to provide education.
- The establishment of community precincts will give greater interaction with local users of the space and increase the level of positive external influence on the station.

19. CONCLUSION

CPTED is a set of principles that should be used as a guide when planning new construction or renovation of existing structures. The implementation of several layers of CPTED principles will support each application. Some applications will be vulnerable to wilful damage which increases the requirement to layer the defences of these. Community is vitally important in CPTED as they are able to provide local relevance and surveillance. The majority of CPTED applications are considered “soft” security; consideration must be given to providing more robust options within a counter terrorism environment.

Dictionary/glossary/definitions

CCTV	Closed Circuit Television
AVVM	Add Value Vending Machine
CPTED	Crime Prevention Through Environmental Design
CT	Counter Terrorism
QPS	Queensland Polices Service
Queensland Rail	Queensland Railway
Lux	Unit of measure for the brightness of light
TO	Transit officer

Reference material

Queensland Rail	
Policy	Related Document
POL 07 Safety	GEN/RD/1933/SEC Queensland Rail Security Manual
Standard	GEN/FRM/1947/SEC Threat Checklist and Report
GEN/STD/1400/RMT Risk Management	Station Design Guide PS-CS- MAN 0013 ver. 3.0 December 2008
GEN/STD1002/ADM Queensland Rail's Terminology And Definitions	Heritage Guidelines GEN/RD/1100/PTY ver. 1 2003
Gen/STD/1930/SEC Protective Security	Crime Prevention Through Environmental design – Guidelines for QLD Part A and B. 2007
PRI/0023/COR Security Management	Closed Circuit Television (CCTV) Design Guide (DRAFT) of March 2009
GEN/RD/1931/SEC Queensland Rail Limited Guide to Preparing a Security Plan	AS 5039 2008 Security screen doors and Window Grills.
International Standard ISO 16933 (2007). Explosion Resistant security Glazing	

Asset registers and schedules

Asset Type	Description	No. Of	Purchase date	Warranty period	End of Warranty date	Manufacturers Recommended routine Maintenance required	Legislative required maintenance required	Duration period Between Maintenance	Hazards for accessing / Maintaining	Expected Asset life
Fall Arrest System										
Paint										
Tiles										
Finishes										
Fixtures										
Toilets										
Air Con										
HVAC										
Hot Water Systems										
Water Boilers										
Soap Dispensors										
Hand Dryers										
Hydraulic/Sewerage pumps										
Water Tanks										
Solar PV Panel										



Glossary

Term	Definition
Abutting	To be adjacent to or have a common boundary with and, for the purposes of Part 2, applies to development located in the 25 metre wide strip of land running along each side of a surface railway corridor or the 50 metre wide strip of land running along each side of a tunnel.
Airspace development	A development that encroaches into or passes through the airspace of a railway corridor. This term includes buildings, footbridges, road-over-railway bridges and any other structures.
Assessment manager	The entity responsible for receiving and assessing a development application under the Integrated Development Assessment System (IDAS). The assessment manager is usually the local government but may be a state government agency.
Building Management Statement (BMS)	A document that contains terms and conditions that benefit and burden the land to which the BMS applies. The BMS is registered in the Titles Office and is an encumbrance on the title of each of the lots to which it applies. For a BMS to be registered, the owners of the lots to which the BMS applies must have agreed to its terms and conditions.
Cess drain	A drain that conveys waste from a railway corridor.
Concurrence agency	An entity prescribed under a regulation as a concurrence agency for a development application, or if the functions of the entity in relation to the application have been devolved or delegated to another entity, the other entity. A concurrence agency has the power to direct the outcome of an application. It can require: <ul style="list-style-type: none"> • certain conditions to be imposed on an approval • an approval to be for only part of the development or for a preliminary approval only • that an application be refused. A concurrence agency may also request an applicant for further information about an application. A concurrence agency may only exercise its powers within its defined jurisdiction.
Development	All structures including buildings, footbridges, road-over-railway bridges, and any supporting elements (for example, piers, columns etc), unless otherwise specified.
Dilapidation survey	A survey to record the pre-construction condition of properties adjoining a development site and/or which may be affected by the construction of the development. The survey records the external elements of the properties and may extend to internal conditions if deemed appropriate.
Gantry	A structure that carries signaling equipment above the railway tracks.
Grade separation	The process of aligning a junction of two or more transport corridors, each at a different height (or grade) so that the flow of traffic on one corridor does not disrupt the flow of traffic on the other corridor or corridors. Such a junction is usually characterised by an underpass or an overpass.
Hoarding	Barriers to deny access to certain areas, or to control the impact of construction activity; often with a secondary role as advertising devices.
Overhead Line Equipment (OHLE)	The overhead lines, cabling and associated structures used to supply power to electric trains.
QR	Queensland Rail Ltd and its corporate components.



Term	Definition
Railway corridor	The land on which railway infrastructure is located and which is taken to incorporate the areas affected by the definitions of 'existing or future Public Passenger Transport' under the <i>Transport Planning and Coordination Act 1994</i> and 'railways and future railways' under the <i>Transport Infrastructure Act 1994</i> .
Railway manager	The person accredited for managing the railway under Chapter 7, Part 3 of the <i>Transport Infrastructure Act 1994</i> .
Referral trigger	A matter that activates the requirement under the Sustainable Planning Regulation 2009 for an entity other than the assessment manager to have input to the assessment of a development application.
Remote telemetric monitoring	The automatic measurement and transmission of data from a remote source by wire, radio or other means.
Resource entitlement	The permission of the state to occupy or otherwise interfere with a state resource. The provision of resource entitlement for the use of state land for the purpose of a development application means that the state as owner of the land has no objection to the lodgement of the development application to the assessment manager. It does not: <ul style="list-style-type: none"> • imply approval of the development application • affect the role exercised by the assessment manager or a referral agency or the agency that provides the resource entitlement • confer a right to use and occupy land.
Resource evidence	Documentation from the state government confirming a resource entitlement.
Rock anchor	A steel rod or cable placed in a hole drilled in rock, held in position by grout, mechanical means, or both.
Soffit	The underside of a structural component, such as a beam, arch, staircase, or cornice.
Structural redundancy	The addition of structural components with the intention of increasing its reliability, usually as a backup or fail-safe mechanism in the event of an unforeseen circumstance.
Structure	A building, road/railway bridge, footbridge, retaining wall, drainage pipe and the like.
Track possession	The temporary closure of a section of the railway corridor for the purposes of carrying out construction or maintenance work.
Viaduct	A railway raised on a freestanding structure that is not a railway bridge designed to cross a specific place (for example, a water body).
Volumetric subdivision	A three-dimensional subdivision in the space above or below a place such as a railway corridor and that may accommodate a development such as a building or carpark. A volumetric subdivision is bounded in all dimensions.



References

Australian Government, *Disability Discrimination Act 1992* and the *Disability Standards for Accessible Public Transport 2002*, accessible via www.austlii.edu.au

Department of Environment and Resource Management 2005, *Government Land Policy Disposal Policy 5: Private Treaty Disposal*, can be viewed at www.nrw.qld.gov.au/about/policy

Department of Infrastructure and Planning 2006, *IDAS Guide 23 Referrals in relation to public passenger transport, and rail safety and efficiency*, can be viewed at www.dip.qld.gov.au/docs/ipa/forms/IDAS

Department of Transport and Main Roads, www.transport.qld.gov.au

Office of the Queensland Parliament Council, www.legislation.qld.gov.au

Queensland Police Service 2007, *Crime Prevention through Environmental Design – Guidelines for Queensland*, State of Queensland, Brisbane, Australia.

Acknowledgements:

Parts of this guide have been prepared utilising information from the following report:

- *GSM Information Paper No. 6: Carry out a risk assessment for dangerous goods under the Dangerous Goods Safety Management Act 2001*—Department of Community Safety, October 2003,



Contact details

This guide for developers and practitioners highlights important elements that TMR, QR (as the railway manager) and other state agencies will consider when development is proposed in or around the railway corridor in Queensland.

While this document provides high-level advice on what can be expected when embarking on such a project, it should be borne in mind that specific issues will need to be discussed in detail once a concept design for a proposed development is available.

Applicants are strongly encouraged to contact TMR at the earliest opportunity to ensure the necessary information is available prior to the commencement of design.

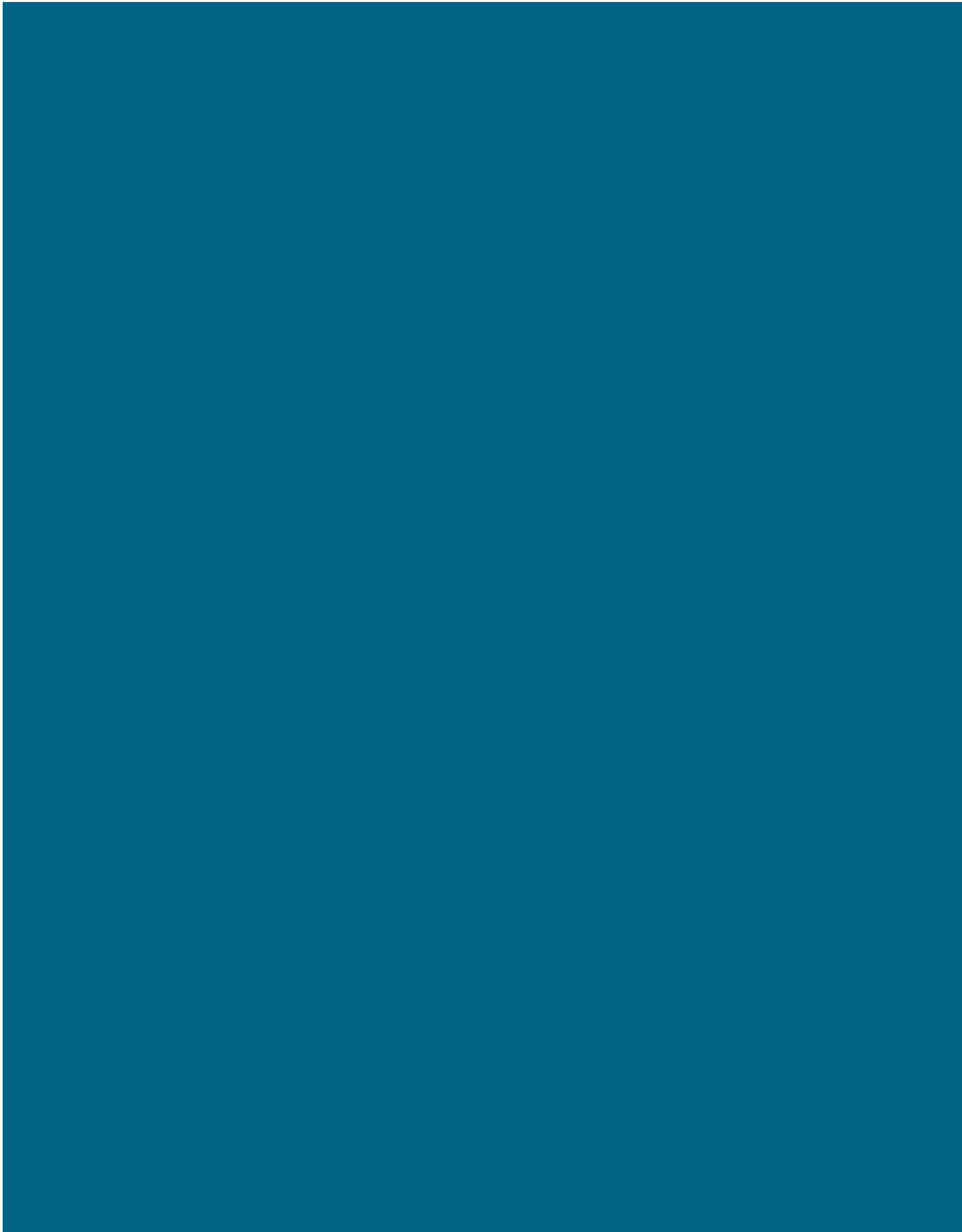
The department will also assist in determining what other specifications, standards or guidelines are applicable to a proposed development, the approvals that should be sought and how to obtain them.

As described in the previous sections, a range of stakeholders may be involved in assessing and approving a development application for building in and around the railway corridor, particularly transport agencies and the railway manager, QR. TMR is the first point of contact for those seeking to undertake development in a railway environment. The TMR contact is:

The Director
Development Leadership
Integrated Transport Planning Division
Department of Transport and Main Roads
Ph: 07 3146 1427

For those seeking advice about transit oriented development or with enquiries about the content of the *Transit oriented development: Guide for practitioners in Queensland*, contact:

Department of Infrastructure and Planning
Ph: 07 3238 8548
or visit www.dip.qld.gov.au/TOD.



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