CODE OF PRACTICE FOR CITY INFRASTRUCTURE
& LAND DEVELOPMENT

ENGINEERING STANDARDS MANUAL

Section 3

Transportation

Transportation

Contents

3. TRANSPORT DESIGN GUIDELINES

3.1. Scope and Organisation

Section 3 Transportation of Waitakere City Council's Code of Practice is intended to assist in the interpretation of the District Plan in relation to transport and help with the design and decisions regarding the functions and layout of the transport network. This section is to be applied to new transport infrastructure and/or to improvements to existing transport infrastructure. Section 3 Transportation applies to the private sector and the Council.

External references such as Austroads and New Zealand Transport Agency (NZTA) documents are cited in a box at the beginning of each section, although some council standards are included in these boxes for completeness. As Austroads and the Manual of Traffic Signs and Markings are under revision in 2009, users will need to check the relevant websites for currency. The site references are provided in Section 3.11 Bibliography.

3.2. Design Issues

“Better designed roads contribute significantly to the quality of the built environment and play a key role in the creation of sustainable, inclusive, mixed communities.” (Manual for Streets)

Growing recognition and understanding of the adverse effects of motor vehicle use is leading to an increasing awareness of the need to better provide for all road users. Adverse effects of the motor vehicle include decreasing standards of air quality, poor road safety record and negative impact on public health.

Retrofitting of roads can be a difficult and expensive process. It is important to ‘get it right’ first time so that all road users can use the city’s road network. Encouraging and supporting active and sustainable modes of transport must be at the forefront of the designers’ thinking.

3.2.1. Statement of Philosophy

Section 3 Transportation contributes to achieving the vision for transport of “A sustainable multi-modal transport system that is integrated with land use and contributes to Waitakere as an eco city”.

3.2.2. Integrated Planning and Urban Design

The decisions made relating to a subdivision or other major development should place a high priority on managing demand for travel and promoting use of sustainable transport modes. Integrating planning for land use and transport promotes the efficiency and productivity of the transport network. The 2008 New Zealand Transport Strategy noted the contribution of integrated planning to reducing climate change, energy security, transport affordability, minimising the adverse effects of transport activity, assisting accessibility for an ageing population and minimising the impact of land use development on transport demand.

Integrated planning considers each function and the interaction between them. For example a green field subdivision will generate additional travel unless it includes some employment and essential retail services. The new dwellings may be better located as a higher density development within more built up areas, where access to work could be by an existing passenger transport service and a walk to the local Superette could provide the milk and bread. Much of the thinking behind the city’s Growth Management Strategy supports this integrated approach.

Urban Design goes beyond the aesthetics of individual buildings and considers the form and function of urban areas. Good urban design may well be aesthetically pleasing, but it can also improve urban viability, vitality for the future of our towns and cities and, at the same time, it allows us to celebrate our heritage as well. Waitakere City Council signed up to the New Zealand Urban Design Protocol prior to its March 2005 launch and is progressively including urban design issues as part of the rules and assessment criteria in the City’s District Plan.

The Urban Design Protocol identifies seven ‘essential design qualities’ or the seven ‘Cs’. These are:

- Context: each project must be considered as a part of the whole city, in its social, historical, economic and physical context, including how the incremental changes from the project(s) alter and influence that context;
- Character: quality urban design reflects and enhances the distinctive character and culture of our cities. Character is not static but dynamic and evolving;
- Choice: a choice of dwelling styles, building types and attractive transport options are all part of good urban design;
- Connections: a vital transport issue, places with good connections encourage sustainable transport choices that might be healthier for both the user and the City;
- Creativity: new ways of thinking and exploring connections between activities add richness to our cities. New possibilities open up for people to experiment with alternative transport options;
- Custodianship: recognises opportunities for environmentally sustainable options, in part through identifying the lifecycle costs of buildings and infrastructure and ensuring that resources are managed well; and
- Collaboration: working together ensures the integration of design for our cities and that all the design solutions don’t come from a single discipline. Collaboration ensures that all viewpoints are taken into account and reconciled.

Integration of planning and design can deliver better outcomes for the city. Again, once put in place, urban infrastructure can take a long time to change, getting it right from Day One is a crucial challenge.

3.2.3. Link and Place Functions

Traditional road design hierarchies focus on the vehicular function of a road, marginalising other users and neglecting the fact that the beginning and end are integral parts of any trip. This guide applies to roads within the jurisdiction of Waitakere City and does not apply to motorways. These roads are primarily providing access to the adjoining properties.

Where the road has a *link* function the emphasis is on the movement of people as part of the transport network. This movement may be by any mode, from on foot through to driving or riding a bus.

The *place* function relates strongly to the activities along the road corridor that attract people - shopping, businesses, parks and schools.

Link and place functions are both present on any segment of road and will influence how it works, but each function will tend to be stronger in some areas than others. A major urban arterial like Great North Road has a strong link element, but has differing degrees of place emphasis along its length, at Henderson, for example. Consequently, the treatment of the road is quite different here from other sections where it has a cross section maximising short stay parking and safe crossing places for pedestrians, from sidewalk projections through landscaped central refuges.

Roads are designed to fulfil functions. The design process identifies this function to the user, most often a driver, which sets the behaviour patterns that they exhibit. These behaviours are reflected in issues such as vehicle speeds and regard or disregard for other users, especially pedestrians and cyclists.

3.2.4. User Hierarchy

When considering new works in the road corridor, the needs of users should be considered in the following order:

consider first	Pedestrians
	Cyclists
	Public transport users
	Specialist service vehicles (emergency services, waste and recycling vehicles etc.)
consider last	Other motor traffic

Table 3.1 User Hierarchy[1]

This hierarchy does not mean that the needs of pedestrians always come before the needs of other road users. The needs of, and possible design options for each transport mode should be identified. To achieve this a balance of service levels across all transport modes encourages the use of sustainable modes of travel.

Therefore, if the decision is taken that an extra lane of traffic is not required for buses or cycles, it will be on the basis of objective need, not because it couldn’t be made to work.

The needs of each user group should not be construed as uniform. The term pedestrian includes all footpath users of all abilities - pedestrians, wheelchair users, prams and pushchairs, walkers, runners, dog walkers etc. Cyclists can be children cycling to school or experienced commuter cyclists. Refer to the various sources for the issues surrounding each mode.

Another part of the design challenge is to identify the interaction between road users. In large part, this response comes from the cues they are given.

3.2.5. Design Context

When preparing scheme designs, designers need to consider the purpose of the transport links they provide and the role of a range of movement activities, which then need to be provided for in an attractive and inviting manner. Designers must also recognise and be sensitive to the land use context within which transport functions and that it also serves.

This context may change along the route being considered. A regional arterial might travel through industrial and residential areas, then through a town centre. In each area the priorities and the relationships between street elements change.

[1] source: Manual for Streets, DfT, UK p28

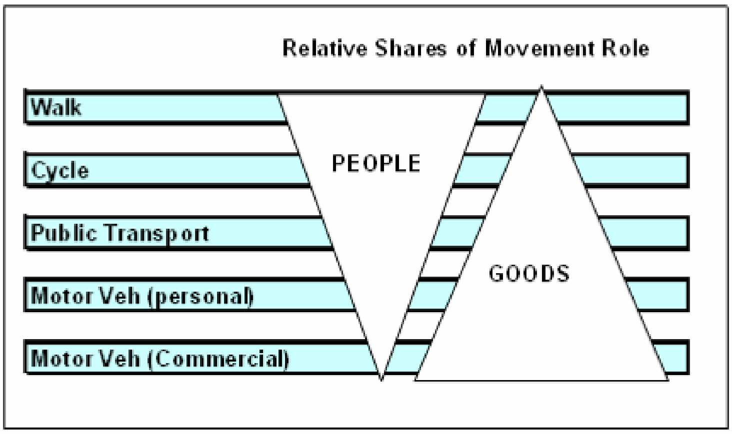


Figure 3.1 - Shares of Movement Role for People and Goods among Movement Modes

Another context layer is in the various routes identified in existing regional and city policy context embodied in documents such as the Waitakere City Transport Strategy 2009-2040, Waitakere City Freight Plan 2010-2040, Regional Arterial Road Plan 2009, the Regional Public Transport Plan 2010, regional and city cycle networks and streets identified as part of the freight network, public transport network and cycle network.

3.2.6. Design Choices

Developments should not only have good internal connectivity, but should also connect to adjacent developments in as many places as is practical. Refer to the WCC Developers Design Guide, Section A Subdivision Design for more detail.

These principles apply to all new road proposals, as well as to retro-fitting or redevelopment of existing roads, slow roads (traffic calming) or when adding cycle or bus lanes.

The design should achieve a balance between movement and access controls. The following factors are to be considered:

- Roadway function and environment;
- Traffic volume and levels of service;
- Turning volumes and patterns;
- Frequent stop and slow moving vehicles (agriculture, buses);
- Weaving, speed and queues;
- Crash types and patterns;
- Pedestrian and bicycle activity;
- Right-of-way availability, cost, and land availability; and
- Availability of alternative routes.

The design guide matrix in Appendix A should be employed to give the designer the initial appreciation of the specific details and service provision to be included in the design.

3.2.7. Low Impact Design

The conventional approach to stormwater management aims to drain runoff from the site as quickly as possible to prevent flooding, and then convey it to downstream end of pipe devices. Low impact design presents a major conceptual shift from the conventional approach to stormwater management, which often does not explicitly attempt to retain predevelopment conditions. Refer to 2009 ‘Waitakere City Council Interim Low Impact Design Code of Practice.’

Appendix A – Design Guideline Matrix

Design Guidelines Matrix v03		Project Name:				Author:				Date:	
Waitakere City Council 2009	Version 03	STATIC FUNCTIONS				MOVEMENT FUNCTIONS (Consider in order, left to right)					
		Property Access	Parking	Loading	Bus Stops	Pedestrians[1]	Cycles	Buses	HOV	Heavy Commercial Vehicles	General Traffic
	Primary Design Guidelines references >	3.6.2	3.4.1.4		3.9.1; 3.9.2	3.5.1; 3.5.2; 3.5.4	3.10.1; 3.10.2	3.9.3			3.4.1
DEMAND LEVEL	INPUT Value or Range >										
SUPPLY GUIDE	High	Single access per property	Angle parking on-street	Frequent loading zones, one or two per block, depending on block size	Frequent bus stops, bus boarders or clear entry/exit, only if on a bus lane consider bays at stops high amenity shelters	2500mm footpath widths, both sides of the road frequent crossing opportunities	Dedicated cycle lanes, consider physical segregation within the carriageway	24/7 bus lane, peak period bus lanes	Bus/HOV lane	Possible dedicated freight lane, 3.5 metre lanes, generous corner radii	Multi lane access controlled road, divided carriageways, clearways
	Medium / 'Normal'	Mix of single and shared driveways	Parallel parking on-street, possible parking bays	Occasional loading zones, one every other block	Stops every 400-500 metres shelters at high boarding stops	1800mm footpaths both side of the road	Isolated cyclist facilities such as advanced stop boxes, generous lane widths	Isolated priority treatments at pinch points	No specific provision	No specific provision	Single lane road, possible clearways
	Low	Controlled access/shared driveways	Off peak parking only on-street	Time controlled delivery	Stops every 400-500 metres shelters at high boarding stops	1800mm footpath both sides or (in special cases) one side of the road only	Generous kerbside traffic lane widths (Specific engineering design advise required)	Buses in traffic	No specific provision	Time controls on access	Single lane road
	None	Service lanes frontage roads	No stopping at all times	On site loading only	No stops	No specific provision - pedestrians use road verge	No specific provision	No buses	No specific provision	Truck ban	Traffic ban
MODIFIERS											
Policy	NZTS > Regional Land Transport Strategy, Waitakere City Transport Strategy	Waitakere City Council Operative District Plan	Auckland Regional Parking Strategy	Waitakere City Freight Policy, Regional Freight Strategy	Passenger Transport Network Plan, Regional Public Transport Plan, Waitakere City Transport Strategy	Waitakere City Transport Strategy, Waitakere Disability Strategic Plan	Waitakere City Transport Strategy	Passenger Transport Network Plan, Regional Public Transport Plan,	Auckland Regional Land Transport Strategy, Waitakere City Transport Strategy	Waitakere City Freight Plan, Auckland Regional Freight Strategy	Auckland Regional Land Transport Strategy, Waitakere City Transport Strategy
	Policy notes										
Network Context[2]	Town centre	Low/medium	Medium/high	High	High	High	Medium/high	Medium/high	None	Medium/low	Medium/low
	Local shopping centre	Low/medium	Medium/high	High	High	High	Medium/high	Medium/high	None	Medium/low	Medium/low
	Passenger transport route	Varies	Varies	Varies	High	Medium/high	Varies	High	None	Medium	Medium/low
	Cycle route	Varies	Varies	Varies	Varies	Varies	High	Varies	None	Medium	Low
	Freight route	Medium/high	Low/medium	Medium/none	Varies	Low	None/high	Medium/none	None	Medium/high	Medium/low
	Over dimension route	Varies	Varies	Medium/none	Varies	Varies	Varies	Varies	None	Medium/high	Varies
	Strategic arterial[3]	Low/none	None	None	None	Varies	Discretion*	None/high	None/high	Medium/high	High
	Regional arterial	Low	Low/none	Low/none	Medium	Medium	Medium/high	None/high	None/high	Medium/high	High
	District arterial	Low/medium	Low	Low/none	Medium	Medium	High	None/high	None/high	Medium	Medium/high
	Collector	Medium/high	Low/medium	Medium/none	Medium	Medium	High	Medium	None	Medium	Medium/low
	Local road	High	Medium	Medium/none	Medium	Medium	Medium	Medium	None	Medium	Low
	Local street	High	Medium	Medium/none	Medium	Medium	Medium	Medium	None	Medium	Low
	Access place	High	Medium	None	None	Medium	None	None	None	Medium	Low
	*If it is part of the Regional Cycle Network then consideration should be given for cycle route along the corridor.										
Notes: 1	Pedestrian includes all abilities, walkers, wheelchair users, prams and pushchairs, runners, dog walkers etc.										
2	It is unlikely that a major road will have a consistent context along its length. Many arterials pass through local shopping centres and town centres, that context should modify or determine the character of the road accordingly.										
3	See District Plan Appendix M: Roading Hierarchy Description for definitions of these roads										

Transportation

3.4.2.1 Shared Spaces

'Shared space' is a relatively new name for a concept emerging across Europe, and more recently in New Zealand. It encapsulates a new philosophy and set of principles for the design, management and maintenance of streets and public spaces, based on the integration of traffic with other forms of human activity. The most recognizable characteristic of shared space is the absence of conventional traffic signals, signs, road markings, humps and barriers - all the clutter essential to the highway. The driver in shared space becomes an integral part of the social and cultural context, and behaviour (such as speed) is controlled by everyday norms of behaviour.

As every shared space project is specific to its context, it is not possible to prescribe and these projects will be done in partnership with the Council. Any project of shared spaces will require the Council's involvement from the earlier stages, and the approval from Council transport and urban design representatives.

3.4.2.2 Slow Streets

Refer to the 'Slow Street Guidelines'

All speed control devices shall be subject to specific design and approval. Design principles and typical layouts are included in the standard details.

Slow streets should be designed in such a way that speed is not encouraged, but rather the design of the slower streets encourages a driver behaviour change. This change can be achieved with a combination of traffic calming measures, which include:

- raised tables or raised intersections;
- narrower travel lanes;
- fewer traffic lanes;
- tighter kerb radii;
- not providing for free left turns;
- change in the street landscape;
- strong tree alignment and landscaping;
- parallel parking (alternating side to side when provided on one side of the road only);
- kerb extensions;
- no long straight lines;
- speed humps (should not be the only way to reduce speed);
- angled slow points (should not be the only way to reduce speed); and
- speed cushions.

These traffic calming design tools need to be chosen on a case by case basis.

The table below summarises cases where the various tools are more likely to be suitable or not likely to be appropriate.

	Situations where it is likely to be suitable	Situations where it is not appropriate
raised tables/raised intersections	Residential areas town centres	Use with care on bus routes
Narrower traffic lanes	Auxiliary lane between closely spaced intersections / work zones	High turning volume
Road diet	Traffic calming	
Tighter kerb radii	Urban built up areas	Sharpness of bend may also reduce forward vision
Not providing for free left turn	High pedestrian use	
Change in the street landscape/materials	Change in speed environment	
Kerb extensions	Traffic calming	High cycle count routes, unless design provides for cyclists
No long straight lines		Industrial areas
Speed humps	Slow streets	Industrial areas on bus routes
Angled slow points	Traffic calming	Emergency vehicles
speed cushions	On bus routes	

3.3. Performance Criteria

Roads are to be designed to fit their context and their purpose and to meet the needs of all users, not merely drafted from standard templates. The design process shall take into account the vision, objectives and desired outcomes of the 'Waitakere City Transport Strategy 2006-2040' and consider and respond to the place function, as well as the movement function.

The City's roads are to be designed to accommodate all users, motorised and non-motorised. To encourage pedestrians and cyclists, we expect integrated solutions to be developed for our roads that take into account the needs of these users and provide appropriate facilities for them. On high traffic routes, the needs of pedestrians must be given thorough consideration to ensure their safety and wellbeing.

As appropriate for its location and position in the road hierarchy the layout and structure of a road network and its associated amenities shall meet all relevant standards and criteria of the District Plan.

3.4. Design Requirements - Roads

3.4.1. Layout

3.4.1.1 General layout

Residential subdivisions and medium density housing developments should be designed according to the principles outlined in WCC's 'Developers Design Guide for Residential Subdivision and Medium Density Housing'. Where these design layout principles cannot be applied, alternative layouts should be discussed with council officers prior to committing to a final proposal.

3.4.1.2 Consideration of the City Movement Networks

Within Waitakere City there are a number of networks that have been identified to accommodate freight, public transport, cyclists, and pedestrians:

- cycle network;
- public transport network; and
- freight, over dimension and overweight network – identified streets must accommodate major truck movements.

Please confirm the networks and relevant specifications with a council officer before commencing design of the street.

3.4.1.3 Lane Widths

For footpath widths refer to Section 3.5.1.1.1; for cycle lane widths refer to Section 3.9.

The legal minimum lane width of 2.5m may be acceptable for the minor roads of residential subdivisions (refer to the WCC Developers Design Guide for Residential Subdivision and Medium Density Housing), and other low speed and/or low volume environments.

Elsewhere in urban areas:

- parallel-parking lanes should be generally at least 2.1m wide, but 2.7m wide where turnover is high and there is substantial through traffic in the adjacent traffic lane.
- a kerbside traffic lane should be no more than 3.3m wide (channel included).
- other traffic lanes should generally be no more than 3.0m wide.
- designated freight routes and bus routes having a high volume of heavy vehicles should have at least one through lane 3.5m wide. Where the volume of heavy vehicles is lower, 3.2m wide lanes are acceptable. The 3.2m wide lanes may also be acceptable if adjacent to a flush median or cycle lane.
- flush median lanes should be 3.0m, 2.5m and 2.0m wide where respectively heavy vehicles including buses turn frequently, infrequently, and rarely, but as approved by the Council on a case by case basis.
- a 2.0m median width is also the minimum where central pedestrian refuges are planned.

Lane widths should be widened on horizontal curves to allow for heavy vehicle off-tracking in accordance with Austroads 'Urban Road Design': in special cases lesser widening may be able to be justified technically.

In rural areas, for other than access roads, traffic lanes should be 3.6m wide. Rural areas are here taken to be areas having or to have a speed limit of 70km/hour or greater.

For footpath widths refer to Section 3.5.1.1.1; for cycle lane widths refer to Section 3.9.1.

3.4.1.4 On-Street Parking

For the width of parallel parking lanes refer to Section 3.4.1.3.

Parallel parking spaces should be generally adjacent and 6.0m long,

Where it is vital for traffic operations, the length of spaces at the end of a sequence of 6m long spaces can be reduced to 5m where the kerb line is clear for 2.0m beyond the parking sequence. Where turnover is high and there is substantial through traffic in the adjacent traffic lane, the reverse movements required to access sequential 6.0m long parking spaces may unacceptably escalate hazard, and disruption to orderly traffic movement. In such cases it may be vital to establish 5.0m long parallel spaces delineated by white 'hockey stick" markings, and separated by 1.5m long no parking zones delineated by yellow "crossed box" markings. For a sequence of boxed parallel parking, the end zones abutting projecting planters can be reduced to 2.0m long.

Boxed parallel parking controls appropriately applied are appreciated and well observed by users but have the disadvantage of a reduction in parking space amounting to 4 spaces per 100 m of kerb line (20%).

The markings for the parallel parking alternatives are given in SD 31.01. In both cases, when parking is time limited, parking signs are required only at each end of a continuous sequence of spaces; where parking sequences are long intermediate parking signs may be required: refer to the Manual of Traffic and Signs and Markings.

Allowance for open car doors extending 500mm across the kerb line should be made to ensure off-road including pedestrian activity is not compromised.

The Council's Parking and Driveway Guideline provides setting out dimensions for off-road angled parking areas where the isles serve very low-speed, low-volume traffic movement.

On minor urban roads an additional 2.0m 'visibility strip' is required; the space depth must be increased by 2.0m and delineated with a continuous edge line. This is to ensure drivers can reverse sufficiently from the parked position to assess whether the adjacent traffic lane is clear for the completion of the un-parking manoeuvre in that lane.

On urban collector roads the entire back out manoeuvre must be provided for clear of the adjacent traffic lane. The Council will not approve new angle parking on urban arterial roads or rural roads unless separated from the carriageway by a physical traffic island...

The markings for the alternatives are given in SD 31.01. In both cases, when parking is time limited, parking signs are required only at each end of a continuous sequence of spaces; where parking sequences are long intermediate parking signs may be required: refer to the Manual of Traffic and Signs and Markings.

Allowance for open car doors extending 500mm across the kerb line should be made to ensure off-road including pedestrian activity is not compromised.

The Council's Parking and Driveway Guidelines provides setting out dimensions for off-road angled parking areas; in this context the isles serve low-speed low volume traffic.

On minor urban roads an additional 2.0m 'visibility strip' is required; the space depth must be increased by 2.0m and delineated with a continuous edge line. This is to ensure drivers can reverse sufficiently from the parked position to assess whether the adjacent traffic lane is clear for the completion of the un-parking manoeuvre in that lane.

On urban collector roads the entire back out manoeuvre must be provided for clear of the adjacent traffic lane. The Council will not approve new angle parking on urban arterial roads or rural roads unless separated form the carriageway by a physical traffic island.

On-street parking can provide a buffer for pedestrians from traffic activity and needs to be carefully considered as part of the overall streetscape. Parking bays interspersed with street planting can provide a high amenity environment.

3.4.1.5 Longitudinal Gradients

Reference:

Austroads Urban Road Design - Sight Distance and Vertical Alignment.

3.4.1.6 Vertical Curves

Reference

Austroads Urban Road Design, Sight Distance and Vertical Alignment.

3.4.1.7 Super Elevation

References:

Austroads Urban Road Design, Sight Distance and Vertical Alignment; and

Austroads Rural Road Design – Guide to the Geometric Design of Rural Roads.

These references will remain current until Austroads Guide to Road Design, Geometric Design becomes available.

3.4.1.8 Horizontal Curves

> Reference:
>
> Austroads Urban Road Design, Sight Distance and Horizontal Alignment

Refer to the Council's Parking and Driveway Guideline for access visibility requirements on horizontal curves.

3.4.1.9 Carriageway Crossfall

Shall normally be 3% in both directions at right angles to the centreline, with a short vertical curve 1 metre either side of centre line. Crossfalls between 2% and 4% may be permitted where terrain or existing roads dictate.

In cases where rain gardens or other Low Impact Design devices are located on the side of the road to treat or retain the stormwater from the carriageway, inversed crossfalls will be considered to direct the water to these devices.

Careful attention shall be given to the transition between usual crossfalls and inversed crossfalls, especially at intersections.

3.4.1.10 Intersections and Roundabouts

> References:
>
> Guide to Traffic Engineering Practice Intersections at Grade: Austroads;
>
> Guide to Traffic Engineering Practice Roundabouts: Austroads;
>
> Manual of Traffic Signs and Markings, NZTA - Intersection pavement markings;
>
> Land Transport Rule 54002, Traffic Control Devices - Traffic Signs Intersections; and
>
> Waitakere City Council's Parking and Driveway Guidelines;
>
> The Austroads documents will remain the accepted standard until they are superseded by the publication of Austroads Guide to Road Design: Intersections and Crossings and Guide to Traffic Management: Intersections, Interchanges and Crossings.

Intersections and roundabouts shall be designed in accordance with the references cited above.

Kerb radii at intersections shall be kept to a minimum in consistency with pedestrian requirements and turning vehicle movement requirements. A detailed design of all intersections shall be required showing levels and dimensions and turning paths of chosen design and vehicles. Major intersections will require specific design.

Pedestrian crossing facilities are to be provided on each leg of a non-signalised intersection in town centres and should be provided on each leg in other situations. If a free left turn is required on any of the legs then it must be designed with provision for a zebra crossing to give priority to pedestrians. A raised table to emphasise the crossing may be provided.

3.4.1.11 Signalised Intersections

> References:
>
> Austroads Guide to Traffic Engineering Practice: Traffic Signals, until superseded by the following Austroads publications:
>
> Guide to Traffic Management: Intersections, Interchanges and Crossings;
>
> Guide to Traffic Management: Traffic Operations;
>
> Guide to Traffic Management: Traffic Control and Communications Devices;
>
> Manual of Traffic Signs and Markings, NZTA, Intersection Pavement Markings; and
>
> Land Transport Rule 54002, Traffic Control Devices, Traffic Signals.

Signalised intersections should be designed in accordance with the documents referred to above. Pedestrian crossing facilities are to be provided on each leg of a signalised intersection in all situations.

3.4.1.12 Mid-block Pedestrian Crossings

> References:
>
> Land Transport Rule 54002, Traffic Control Devices, Pedestrian Crossings, School Crossing Points, School Patrols and other Pedestrian Facilities;
>
> Manual of Traffic Signs and Markings, NZTA, Miscellaneous pavement markings; and
>
> Pedestrian Planning and Design Guide, Land Transport NZ.

The process for determining whether a pedestrian crossing is the best option can be found in the Pedestrian Planning and Design Guide. This section guides determination of the appropriate type of pedestrian crossing facility whether a 'pedestrians give way" crossing, a zebra "traffic gives way" crossing, or a signal controlled pedestrian crossing. In cases of a signal controlled pedestrian crossing on a heavily trafficked arterial route Council may require pedestrians to cross in 2 stages. In such cases the signal phasing and timing will be designed to minimise pedestrian delays on the central refuge.

Kerb extensions can usefully slow vehicles on the carriageway and safely bring pedestrians into the driver's field of vision. Extensions can be combined with central pedestrian refuges to provide a safe resting place in the centre of the road, see SD3.30 for detail.

Speed tables at pedestrian crossings may be used in situations where it is desirable to bring vehicle speeds down to provide greater safety for pedestrians. In some environments isolated speed platforms can be surprising in off-peak times and dangerous. Appropriate warning signs and markings must be provided for drivers, and preferably the crossing platform should be included in an extended and integrated zone of speed restraint suitable to the locality.

Examples are adjacent to schools, retirement villages or other areas with a high proportion of young or elderly pedestrians. It can be advantageous to combine speed tables with kerb extensions.

3.4.1.13 Cul-de-sacs

Cul-de-sacs should be avoided when designing for the road network. In situations where cul-de-sacs are to be included, pedestrian and cyclist accessways shall be considered and included where possible to improve the permeability of the transport network.

However, if cul-de-sacs are provided they shall be provided in accordance with SD3.03 and shall provide for landscaping and car parking as required by any resource consent. All cul-de-sac heads shall require a detailed design showing levels and dimensions and shall include pedestrians and cyclist accessways.

3.4.2. Pavement Design

3.4.2.1 Pavement Types

a) Rigid pavement – This type of pavement is rarely used but if required a design method is available from TNZ. This type of pavement will require specific approval of the Manager Traffic Services.

b) Pavement units – Cobbles and paving blocks shall be of an approved inter-locking type and shall be designed in accordance with the flexible pavement requirements.

Note: *1. Deflections as listed in Table 3.3 shall be achieved prior to the final surfacing for types b) and c).*

Note: *2. Other surfaces such as bitumen macadam may also be approved under specific circumstances.*

c) Flexible pavements – Most carriageways are built as flexible pavements consisting of compacted aggregate layers covered by a thin waterproofing and wearing layer of bituminised chip seal or hotmix.

d) Permeable pavement.

3.4.2.2 Flexible Pavement Design

Major roads (E.D.A. > 1 x 10^6) shall be designed in accordance with Austroads Pavement Design – A Guide to the Structural Design of Road Pavements and TNZ supplements where applicable, using a 30 year design life.

Other flexible pavements (E.D.A. < 1 x 10^6) shall be designed using one of the following methods and a 30 year design life.

3.4.2.2.1 Method 1 CBR Methods

This method is best suited to new roads in softer sub grades with CBRs below 15.

The pavement thickness shall be determined from the Pavement Design Chart (Fig 3.03) using the weakest 10 percentile CBR encountered down to 1metre below the sub grade level, under equilibrium moisture conditions.

Fig 3.06 gives a field method for determining checking sub grade CBRs.

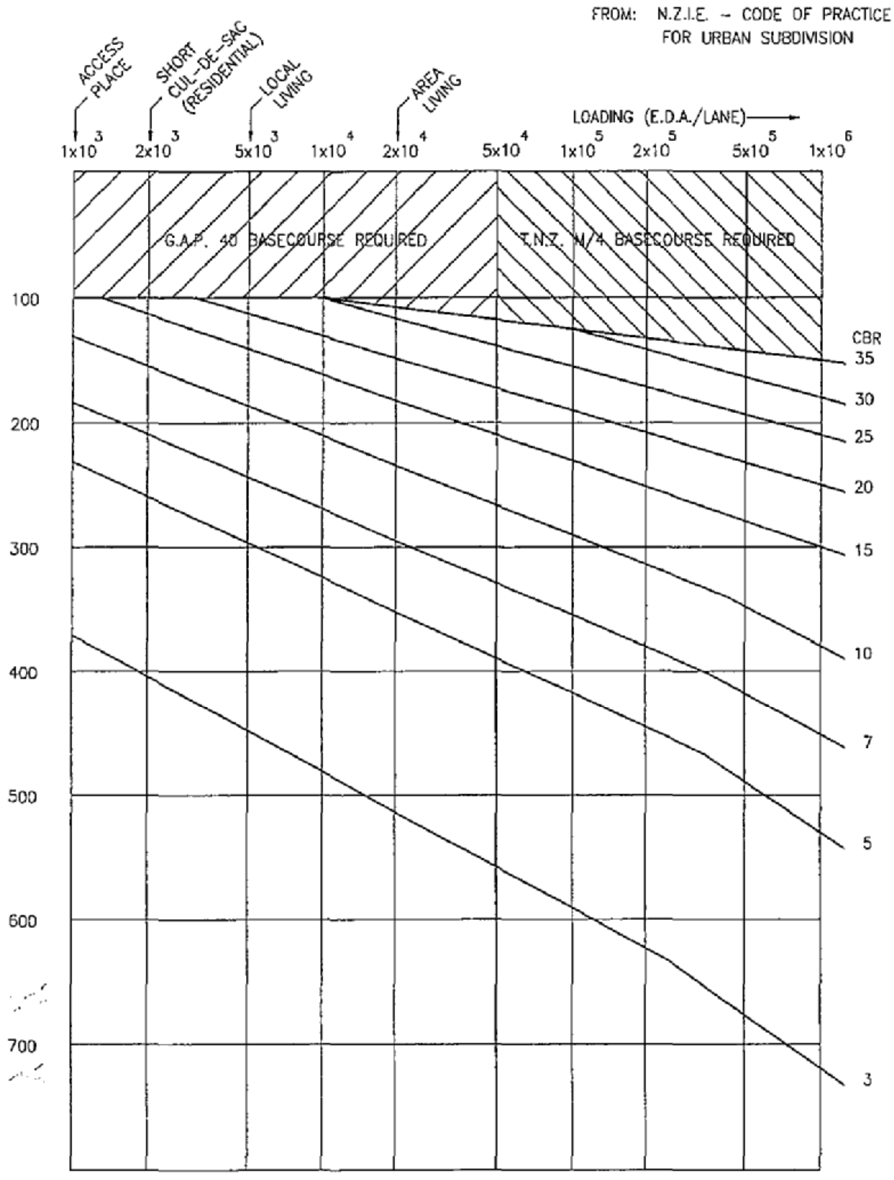
3.4.2.2.1 Method 2 – Deflection Method

This method is best suited to road improvements or stabilised sub grades or hard sub grades over CBR 15. The pavement thickness shall be determined from the Pavement Design Chart in Fig 3.04 using the weakest 10 percentile deflection encountered on the sub grade. The minimum basecourse for any road shall be 350mm.

CODE OF PRACTICE FOR CITY INFRASTRUCTURE AND LAND DEVELOPMENT

Waitakere City Council
Te Taiao o Waitakere

FROM: N.Z.I.E. – CODE OF PRACTICE FOR URBAN SUBDIVISION



NOTES:

1. Principal, arterial and industrial roads shall be the subject of specific design based upon an estimate of their e.d.a. loading.
2. The material requirements shown are minimum requirements and greater depths of higher quality materials may be used if economical to do so, but the total depth shall not be reduced.
3. The minimum pavement depth for roads shall be 200mm and privateways 150mm.

ENGINEERING STANDARDS MANUAL ISSUE 3.0 OCTOBER 1999	PAVEMENT DESIGN CHART (CBR METHOD)	STANDARD DETAIL Fig.3.03

Transportation

CODE OF PRACTICE FOR CITY INFRASTRUCTURE AND LAND DEVELOPMENT

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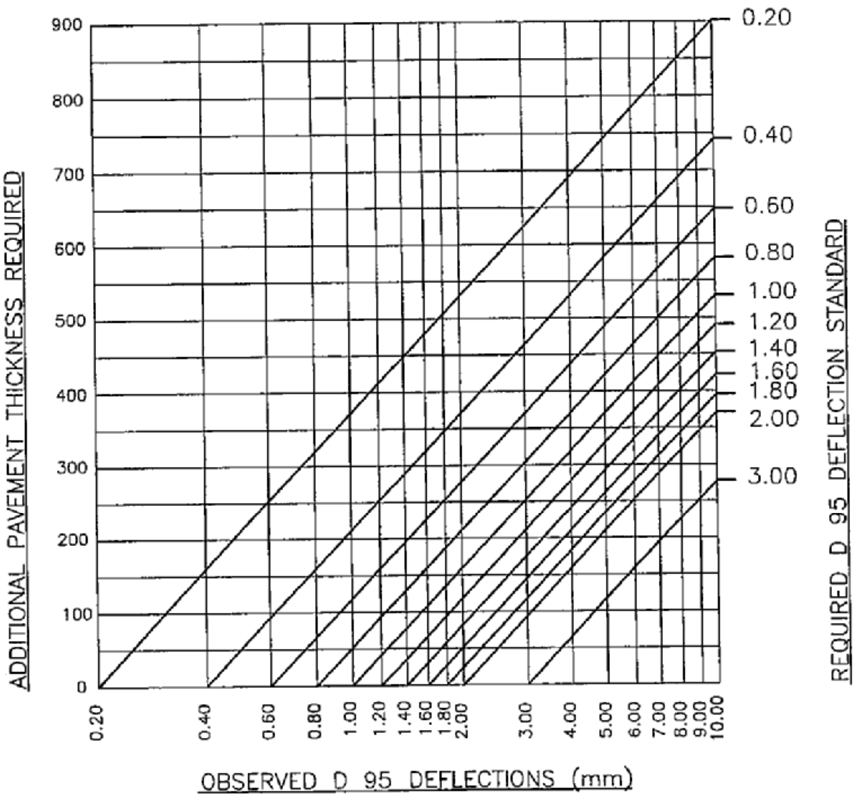

NOTES:

1. The minimum overlay shall be 200mm.
2. This chart is to be used only upon specific approval.
3. This chart is derived from a paper presented by T. Belshaw at the New Zealand Roading Symposium 1971.

ENGINEERING STANDARDS MANUAL ISSUE 3.0 OCTOBER 1999	PAVEMENT DESIGN CHART (DEFLECTION METHOD)	STANDARD DETAIL Fig.3.04

Transportation

3.4.2.3 Design Information

The following information shall be submitted in conjunction with the engineering design drawings for approval:

- all soil test information obtained to provide a basis for pavement design, with a reference to origin of design method. Where substantial cuts and fills are anticipated, the range of CBRs are to be aligned with the Geotechnical Investigation Report;
- copy of design calculations used to determine pavement thickness; and
- if a stabilising agent is to be used, the designer shall submit a range of relevant test results and calculations, including the percentage use of the stabilising agent and an indication of the likely CBR value to be achieved by the stabilisation.

3.4.2.4 Pavement Aggregate

3.4.2.4.1 Sub Base Courses – 100mm and 65mm

This can be Waitakere Andesite aggregate from the Waitakere Quarry, or alternative all in crushed aggregate from an approved source. The aggregates shall comply with Fig 3.09 for AO65 and Fig 3.10 for AP100.

3.4.2.4.2 Basecourse – 40mm

Two AP40 basecourse qualities are acceptable. These are represented in Fig 3.07 and Fig 3.08.

TNZM4 AP40 may be used on all roads. A lower quality AP40 meeting the specifications set out in Fig 3.08 may be used only on roads with a carriageway width of 8.0 metres or less.

3.4.2.4.3 Stabilised Sub Grades and Sub Bases

Where the designer wishes to use stabilisation as a method of design or where the existing sub grade is of a low bearing value and the designer wishes to strengthen it, it may be advantageous to stabilise the sub grade or the sub base, (or both) with cement, lime, KOBM or bitumen.

Laboratory compaction and strength tests shall be carried out to determine the most effective agent and the optimum application rates to achieve the desired improvements. Calcium oxide or calcium hydroxide may also be used subject to specific approval.

- Cement shall be Portland cement to NZS 3122L 1990.
- Lime shall be hydrated lime or quicklime to TNZ M/15. The minimum grade shall be 60 and shall have a grading complying with the following table:

BS Test Sieve Size	**Percentage Passing for Quicklime**	**Percentage Passing for Hydrated Lime**
26.5mm	100	-
4.75mm	N/A	100
2.36mm	Less than 70	N/A

Table 3.1

- Water shall be free of detrimental contaminants, especially salt.
- KOBM, a steel making slag formed by the fusion of limestone ash and other fluxes with siliceous, aluminous and titanium components, is a by-product of the conversion of iron into steel. Calcium oxides shall exist between 7% and 15% in the free form.
- The minimum depth of stabilising shall not be less than 200mm.
- The thickness of overlying pavement aggregate shall be determined from Fig 3.03 or Fig 3.04 as appropriate and using Fig 3.05 to determine the equivalent CBR that should be used to design overlay thickness.
- Protective curing coats and or running courses shall be applied as directed.

3.4.2.5 Undercutting

The designer may wish to improve the sub grade by undercutting and replacement with a better quality selected material. The underchannel drains shall be protected with geofabric if sand is used. A geofabric may also be required to separate the sub grade from the selected layer if the sub grade is likely to contaminate it. Fig 3.05 shall be used to determine the effective sub grade CBR. The sand layer thickness shall not be less than 150mm and shall be from an approved source.

Where undercutting takes place or extensive wet areas are found during construction, suitable drainage shall be installed connecting to the underchannel drains.

3.4.2.6 Geotextiles

If the designer wishes to improve the design CBR of the sub grade by use of a geotextile, then a full geotechnical design report complete with supporting information is to be submitted.

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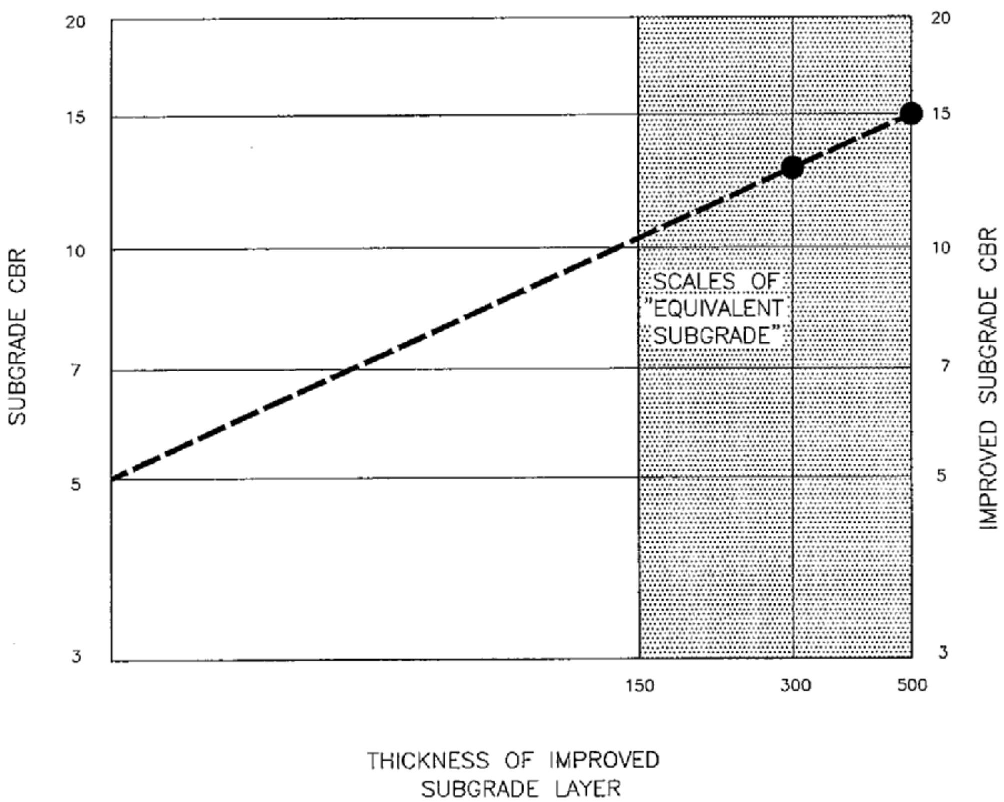
EXAMPLE: Subgrade of CBR 5 will be overlaid by 300mm layer of CBR 15 material. What equivalent CBR should be used for design of the pavement overlay CBR 15 material?



NOMOGRAPH FOR DETERMINING THE EFFECT OF SUBGRADE IMPROVEMENT LAYERS

ENGINEERING STANDARDS MANUAL ISSUE 3.0 OCTOBER 1999	STABILISED SUBGRADE ZONE DESIGN CHART	STANDARD DETAIL Fig.3.05

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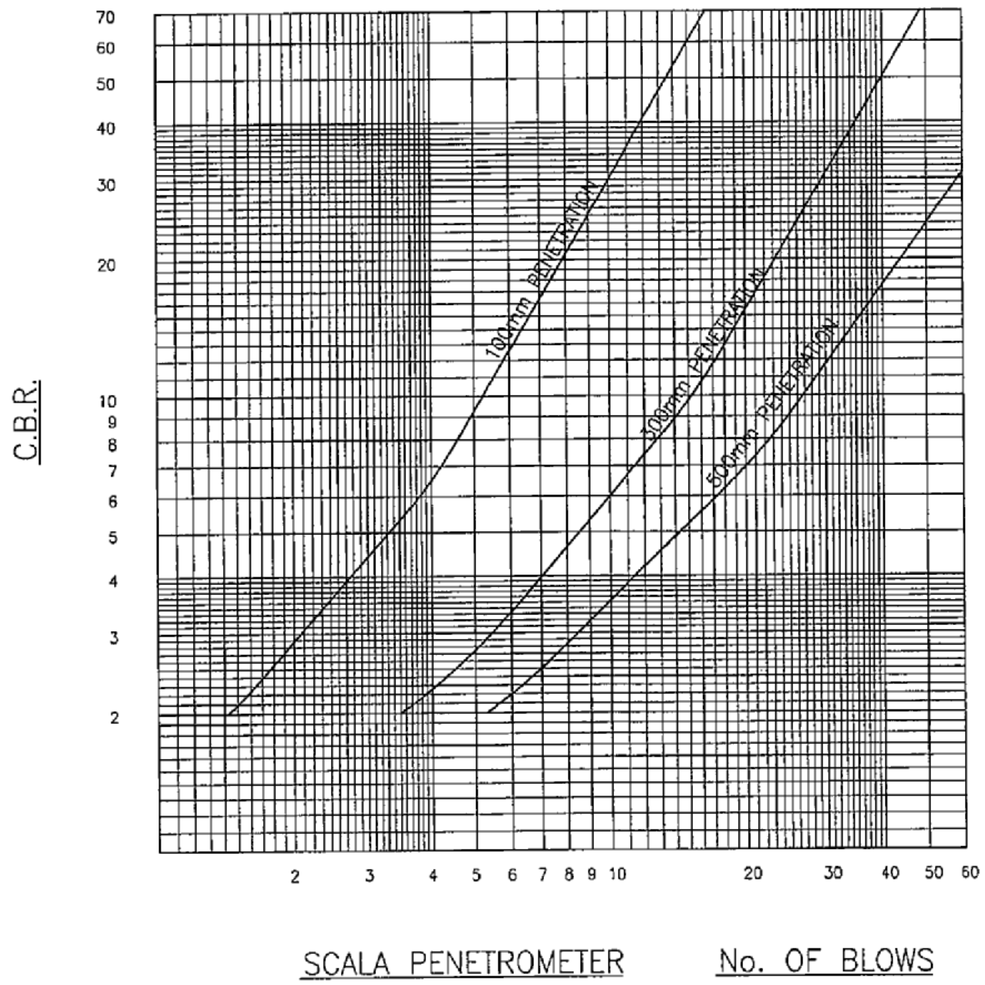

ENGINEERING STANDARDS MANUAL ISSUE 3.6 AUGUST 2002	CBR vs SCALA CORRELATION	STANDARD DETAIL Fig. 3.06

Transportation

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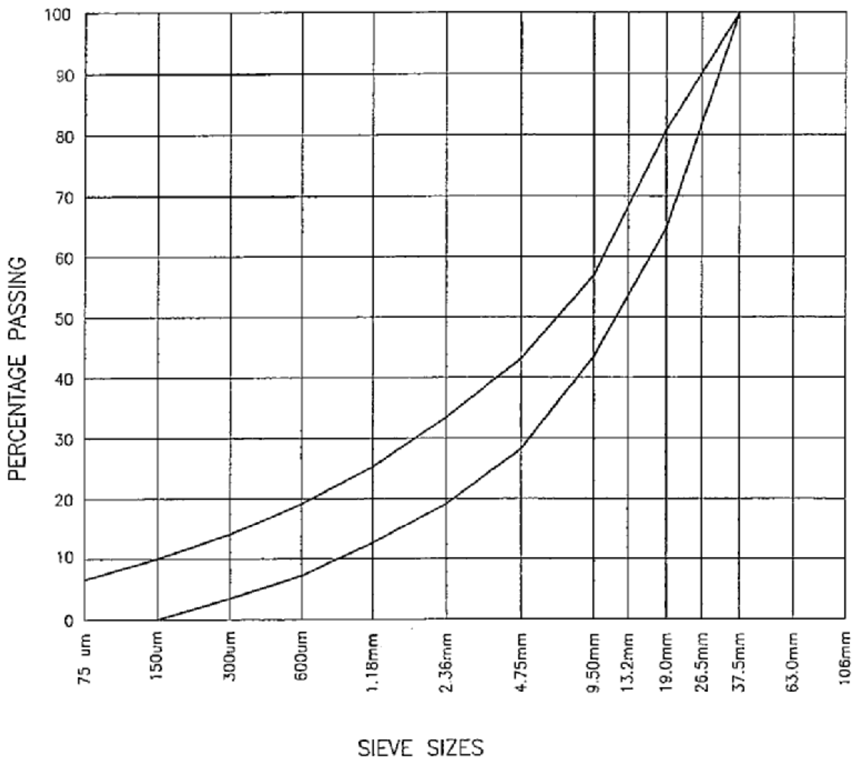

C.R. min. 13 TONNES
S.E. min. 40
P.I. max. 5

GRADING ENVELOPE

NOTES:

1. For use as basecourse on roads greater than 8.0 metres wide.

ENGINEERING STANDARDS MANUAL ISSUE 3.0 OCTOBER 1999	A.P.40 BASECOURSE TNZ M/4 1995	STANDARD DETAIL Fig.3.07

Transportation

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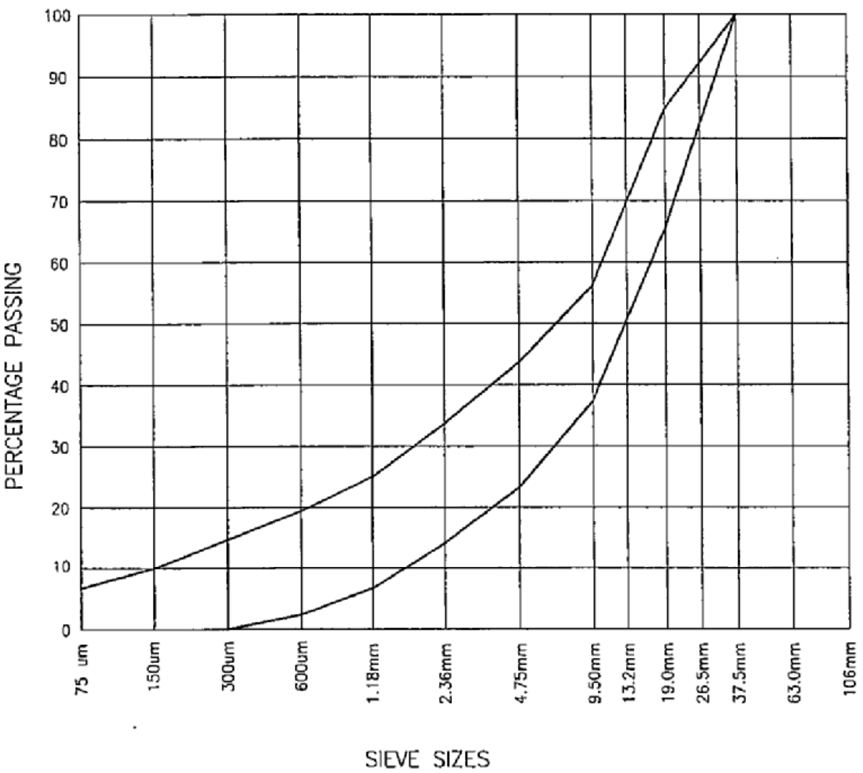

C.R. min.	13 TONNES
W.R.	CB OR BETTER
P.I. max.	8
L.L. max.	30

GRADING ENVELOPE

NOTES:

1. For use as basecourse on carriageways of 8.0m width or less.
2. For use as sub-basecourse on all roads.

ENGINEERING STANDARDS MANUAL ISSUE 3.0 OCTOBER 1999	A.P. 40 BASECOURSE	STANDARD DETAIL Fig.3.08

Transportation

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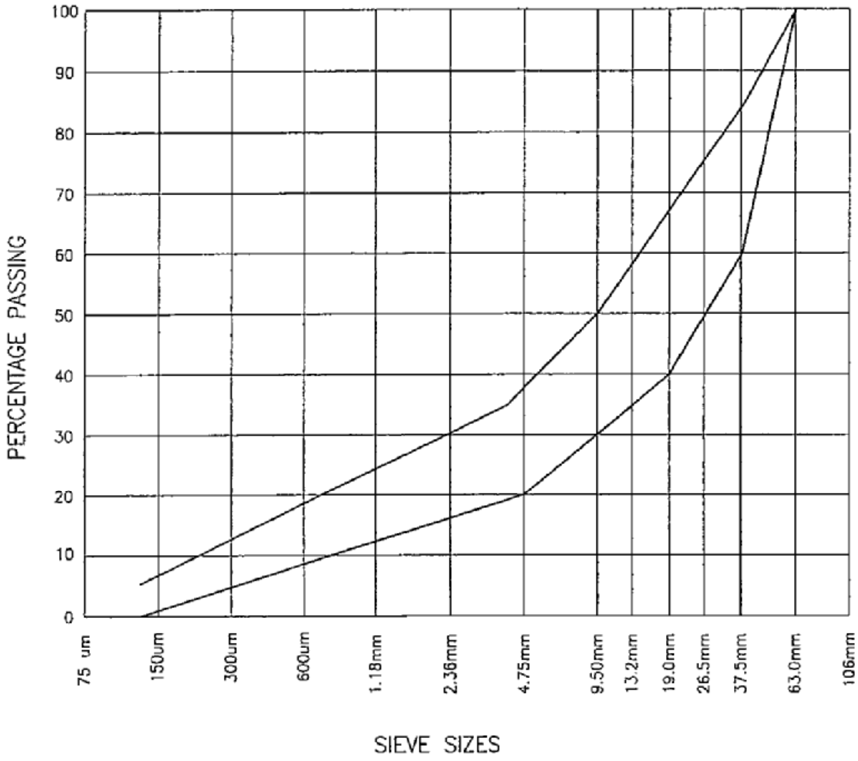

GRADING ENVELOPE

NOTES:

1. Grading envelope for 65mm sub-base course aggregate from Waitakere City Council's andesite quarry.
   LA abrasion test – 45 % max. loss.
   PI – 8 max.
   LL – 30 max.

ENGINEERING STANDARDS MANUAL ISSUE 3.0 OCTOBER 1999	65mm SUB–BASE COURSE	STANDARD DETAIL Fig.3.09

Transportation

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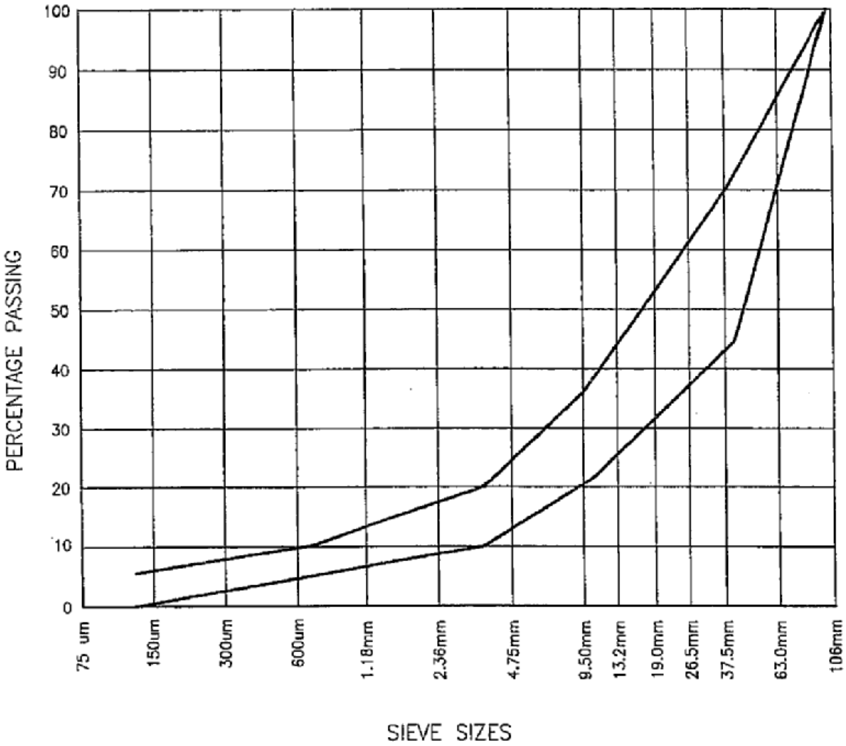


GRADING ENVELOPE

NOTES:

1. Grading envelope for 100mm sub-base course aggregate from Waitakere City Council's andesite quarry.
   L.A. abrasion test – 45 % max. loss..
   PI – 8 max.
   LL – 30 max.

ENGINEERING STANDARDS MANUAL ISSUE 3.0 OCTOBER 1999	100mm SUB-BASE COURSE	STANDARD DETAIL Fig.3.10

Transportation

3.4.2.7 Testing and Acceptance

Before any metal courses are placed the sub grade will be tested to confirm the pavement design thickness. Weak sub grades may be strengthened by undercutting and replacement with either on site or imported material. Alternatively, it may be viable to stabilise the sub grade soil by adding approved materials such as cement, lime or bitumen. The designer shall check that the specific pavement thickness will be adequate before any metal courses are placed.

Where the placing and compacting of the sub basecourse layer is a distinct construction phase, further testing is recommended to check that the anticipated improvement of the sub grade has been achieved. Corrective treatment for weak areas in the pavement should be given at this stage and could be either lime or cement stabilisation or reconstruction with a greater depth of sub basecourse metal. Sub basecourse layers shall be covered by a basecourse layer with a thickness not less than that shown on Fig 3.03 for the particular class of street and design load.

On completion of the metal courses Benkelman Beam tests shall be carried out by an approved testing laboratory **in the presence of a council representative**. The cost of testing shall be met by the developer. Failure to undertake testing in the presence of WCC Roading and Traffic Subdivision Supervisors will require retesting of any or all roads at the developer's cost.

Testing shall be carried out to the following minimum layouts:

Class	**Length**	**Test Spacing* (m)**	**No. of Lanes to be Tested**
Local Roads	<100 <100	10 20	2 2
Area	<100 <100	10 20	2 2
Principal	<100 <100	10 20	4 4

Table 3.2

- Where any reading exceeds maximum allowable value by more than 50% testing shall be carried out at 5 metre intervals either side to identify extent of weak area.

A section of road will be acceptable if the deflection results comply with the following:

1. Not more than 5% of the tests shall exceed the maximum value of 1.5 mm; and
2. No single result exceeds the maximum allowable value by more than 50% except that no reading shall exceed 250×10^{-2} mm.

If the section of road fails to achieve the above required standard of deflection, the subdivider shall carry out additional tests on the sub base and basecourse and confirm that:

- the actual thickness of pavement agrees with the design thickness as determined by the CBR tests;
- the grading and quality parameters of metal conforms to specified requirements; and
- the pavement is of suitable density.

Any subsequent beam or laboratory tests shall be arranged and paid for by the developer.

If beam readings are within 25% of design criteria and all of the above conditions have been met, the Council may permit the developer to surface the road provided that agreement has first been reached on a suitable bond.

3.4.2.8 Surfacing

Is laying of durable surface material to sustain traffic? It enhances vehicle riding quality and provides waterproofing to the pavement.

All roads shall be surfaced with an approved impermeable membrane beneath a resilient wearing course unless specifically approved otherwise for minor rural roads or private ways.

The following surfaces may be used unless specifically approved otherwise.

Surfacing	**Road Type**
Concrete	Driveways and lanes
Paving Units (cobbles etc). 80mm minimum (residential)	Driveways, lanes and carriageways up to 8.0m
Asphaltic concrete (minimum 25mm thick) over prime coat of Grade 4 chip seal.	All roads
1st and 2nd coat chip seal using Grade 3 and Grade 5 chip.	All roads

The prime coat to be used as an impermeable membrane shall be a prime and chip seal (1st coat chip seal) – using 180/200 penetration grade bitumen with a Grade 4 chip to TNZ P/3 and M/1. A curing period matching current accepted practice for the volume of diluents used shall be allowed before application of the asphaltic concrete or second coat chip seal.

Note: The provision of a durable waterproof membrane to the surface of the basecourse is very important to the performance of the pavement.

An alternative system using a 70% cationic emulsion and Grade 4 chip is acceptable between 1 May and 30 September. With this system the curing period is not required, but if kerb and channel is present care must be taken to ensure bitumen does not run into the channels.

Asphaltic concrete shall be finished to 6mm proud of the lip of the channel. Where chip seal is used the basecourse shall be finished level with the lip of the channel.

3.4.3. Kerb and Channels

The primary purpose of kerbs and channels is to provide:

- stormwater control;
- an edge restraint for the pavement;
- a visual definition of the edge of the carriageway; and
- a barrier to prevent vehicles crossing onto the berm area.

Any alternatives to kerbs and channels will need to meet these criteria.

3.4.3.1. Urban Roads

Kerbs and channels/stubs shall be provided on both sides of the full length of all urban carriageways in accordance with SD 3.04 as appropriate to the function of the road.

See section 3.5.2 for pram or pedestrian crossings.

3.4.3.2. Kerb Extensions and Indentations

Kerbs will generally be parallel to the centreline of the road. However kerb extensions and bays may be formed to provide:

- pedestrian crossing points (see section 3.5.2);
- parking bays;
- amenity planting areas;
- bus kerb extensions or bays; or
- swales or other stormwater control devices.

Care needs to be taken in the design of kerb extensions so that they do not cause hazards for road users and particularly for cyclists. Particular attention must be paid to road marking, signage and lighting.

3.4.3.3. Rural Roads

Kerbs and channels will generally only be required in rural areas in the following situations:

- where grades are steeper than 1 in 8;
- in cuttings to minimise earthworks;
- in areas of potential instability;

- to direct water to suitable discharge points; or
- at signed or marked bus stops to provide a platform to assist bus passengers to board or alight from a bus.

3.4.3.4. Low Impact Stormwater Design

References:
Technical Publication no. 10; Design Guideline Manual Stormwater Treatment Devices; Auckland Regional Council;
Technical Publication no. 124; Low Impact Design Manual for the Auckland Region; Auckland Regional Council; and
Section 4.0 Stormwater Drainage, Waitakere City Code of Practice – City Infrastructure and Land Development.

Low impact stormwater designs are desirable, particularly where stormwater might otherwise discharge untreated into sensitive receiving areas. Low impact designs should be developed in accordance with the references and with council officers where design guidance is required.

3.4.3.5. Dish Channels

Dish channels shall be used in carriageways where necessary to ensure the uninterrupted flow of stormwater, in accordance with SD 3.04.

Dish channels shall be provided on the low side of footpaths that slope away from the road, footpaths in pedestrian accessways and where the run-off is likely to cause a nuisance, in accordance with SD 3.04 and shall be connected to a suitable discharge point.

3.4.4. Surface Water Channels

Surface water channels shall be provided on both sides of the full length of all rural roads in accordance with SD 3.01 unless specifically directed otherwise.

3.4.5. Catchpits

Catchpits as detailed in SD 3.06 shall be provided as follows:

- on single carriageways in such a position that the maximum run of water in any channel is not greater than 120m;
- on twin carriageways the spacing shall be reduced to 90m and on carriageways with single cross fall to 60m;
- where required at intersections, at the kerb line tangent points; and
- at changes of gradient or direction in the channel where there may be a tendency for water to leave the channel.

Where the carriageway gradients exceed 10%, the type of catchpit used shall be either a splay entry pit as shown in SD 3.06.03 or the super pit shown in SD 3.06.02. The choice shall be dictated by the position of the footpath against or away from the kerb line.

Splay pits where the path is adjacent to the kerb and super pits where the path is away from the kerb:

- where there is a sag vertical curve a double installation shall be used;
- at ends of cul-de-sacs where the water falls to that end a double pit is to be used. Note that in this instance the low point of the kerb line is sited clear of any potential vehicle crossing to preserve the back entry to the pits; or
- where double pits are installed they are to be interconnected using a 225mm-diameter Class 2 RC pipe neatly cut with no intrusion into either pit and epoxied into either wall of the pits. The void between the catchpit is to be filled with compacted GAP 40 material.

Catchpits shall be connected to a manhole on the storm water drainage system using 225mm diameter Class 3 minimum RCRRJ pipes under carriageways and Class 2 under berm areas.

The maximum length of a catch pit lead is 25m. The lead is not to intrude into the body of the pit but be neatly saw cut and expoxied into the wall of the pit.

Where the pit is to be connected to a storm water pipe of 600mm diameter or greater then the lead may be saddled into the main pipe. The saddle shall be at the soffit of the main pipe.

3.4.6. Sub Grade Drainage

Under channel drains shall be provided on both sides of all carriageways in accordance with SD 3.05 unless specifically approved otherwise. Subsoil drainage shall also be placed in permanent wet spots and other areas where groundwater is likely to affect the sub grade. Batter drains shall be provided where the topography slopes toward the road, in accordance with SD 3.05. Sub grade drains shall generally consist of a 100mm diameter perforated pipe in 20-7 drainage aggregate.

3.4.7. Overland Flow Paths

Where overland flow paths concentrate water to discharge onto road reserves, a field cesspit is required at the road boundary. This shall be piped to the nearest stormwater system. This is to prevent seepage over footpaths and berm areas creating unsafe situations for pedestrians.

3.5. Design Requirements - Footpaths

3.5.1. Footpaths

References:

Austroads Guide to Traffic Engineering Practice: Pedestrians, and subsequently to all Austroads Traffic Management and Design Guides as released;

Pedestrian Planning and Design Guide, Land Transport New Zealand;

NZS 4121, Design for Access and Mobility, particularly, Footpaths, Ramps and Landings, Accessible Outdoor Public Areas; and

Manual of Traffic Signs and Markings, NZTA, Signs for Shared Paths in particular.

Footpath standards do not cover recreational walking tracks. For further guidance on these refer to Section 7.0 Code of Practice for City Services and Land Development, the New Zealand Standards for Tracks and Outdoor Visitor Structures and the 2008 Department of Conservation Track Construction and Maintenance Guidelines

3.5.1.1. Provision of Footpaths

Footpaths shall be provided on both sides of the full length of all urban roads. In rural areas, new development shall generally require the provision of footpaths on at least one side of the road. However, areas of high pedestrian use such as bus routes, commercial centres, school routes, and those with a high public profile shall be provided with footpaths on both sides of the road.

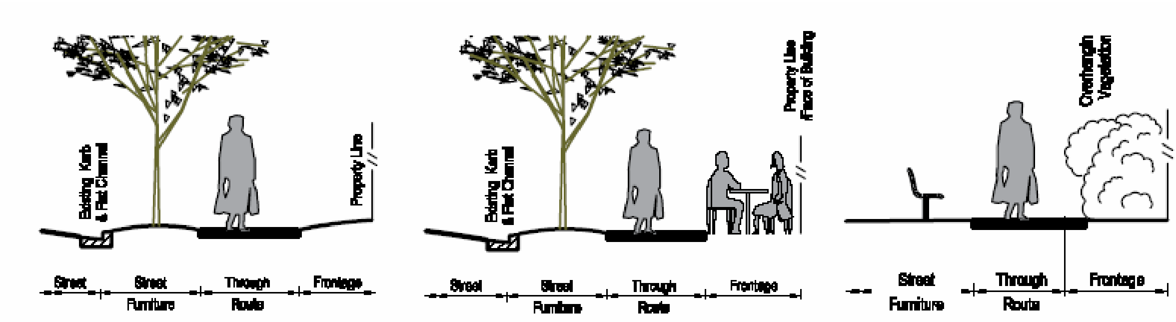
3.5.1.2. Footpath Design

Footpaths shall be located in accordance with SD 3.02 and constructed as follows:

- in rural areas, footpaths should be located and designed in sympathy with rural character and amenity;
- within the core of rural and coastal villages however, urban standards should generally apply.

3.5.1.2.1. Footpath Width

There are three distinctive zones within a footpath area, which are the street furniture zone, the through route, which is the zone used by the pedestrians, and the frontage. These zones need to be identified in the road planning stage in order to ensure there is adequate width for the through route.



Example of footpath zones (source: Pedestrian Planning and Design Guide, LTNZ pg14-2)

If the flow of pedestrians exceeds the per minute flow noted in the table below, extra width may be required. All new and improved developments should comply with the above widths.

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Location	Maximum pedestrian flow	Zone				Total
		Kerb	Street Furniture #	Through route	Frontage	
Arterial roads in pedestrian districts	80p/min	0.15m	1.2m	2.4m +	0.75m	4.5m
CBD						
Alongside parks, schools and other major pedestrian generators						
Local roads in pedestrian districts	60p/min	0.15m	1.2m	1.8m	0.45m	3.6m
Commercial/industrial areas outside the CBD						
Collector roads	60p/min	0.15m	0.9m	1.8m	0.15m	3.0m
Local roads in residential areas	50p/min	0.15m	0.9m	1.5m	0.15m	2.7m
Absolute minimum*		0.15m	0.9m	1.5m	0.0m	1.65m
# Consider increasing this distance where vehicle speeds are higher than 55km/h.						
* Only acceptable in existing constrained conditions and where it is not possible to reallocate road space.						

Minimum footpath dimensions table (source: Pedestrian Planning and Design Guide Table, LTNZ pg14-3)

The Pedestrian Planning and Design Guide gives some indications on the space required for typical street furniture, which can help with refining the street furniture width.

However in retrofitting situations, the dimensions shown may not be achievable. The frontage zone should be provided only if the minimum through route width can be provided for.

3.5.1.2.2. Footpath Cross Fall

Through route cross falls should always be between one and two percent.

Note: although a maximum of 2% is recommended on the through route zone of the footpath, stormwater drainage issues also need to be considered as well.

3.5.1.2.3. Footpath Materials

3.5.1.2.4. Footpaths shall be constructed in accordance with SD 3.02 and as follows: 3.17

- generally in concrete;
- concrete to be 17.5 MPa;
- concrete to be 100mm thick on 30mm AP20 where footpath is against kerb;
- concrete to be 75mm thick on 30mm AP20 where footpath is separated from kerb;
- all footpaths around cul-de-sac heads shall be 100mm thick on 30mm AP20; or
- construction or expansion joints shall be established at 3m intervals to a depth of a 1/3 of the thickness of the footpath.

3.5.2. Pram Crossings and Pedestrian Crossings

3.5.2.1.. Provision for Pram Crossings

Pram crossings shall be provided at each kerb line at all intersections in accordance with SD 3.9. Pram crossings shall also be provided at other locations to suit the logical and safe movement of pedestrians.

Particularly on free left turns and where there is a large radius kerb line, pram crossings must be located to ensure adequate sight distances for both the pedestrian and road user. Pram crossings should generally be placed to provide the least crossing distance, but also in a location where visibility is not restricted by buildings, walls or hedges to allow pedestrians to assess gaps in traffic and not diminish a driver's ability to stop safely if required.

All pram and pedestrian crossings shall be lipless except where required for stormwater control, where the kerb height shall be kept to a maximum of 20mm.

3.5.3. Cross Fall and Ramps

3.5.3.1. Tactile and visual aids

References:

Guidelines for facilities for blind and vision impaired pedestrians,[2] New Zealand Transport Agency; and

AS/NZS 1428.4: Design for access and mobility - Tactile indicators.

In kerb extensions at pram or pedestrian crossings

Reference:

Pedestrian Planning and Design Guide, LTNZ, New Zealand

At crossing points (at intersections or mid blocks), kerb extensions have several benefits: reducing the crossing distance for pedestrians, increasing the visibility for both pedestrians and vehicle drivers. As the width of the footpaths is increased at these particular points, they also allow for a gentler cross fall to the kerb, which is particularly beneficial to mobility impaired people.

3.5.4. Berms

Berms are generally to be provided on both sides of all roads in accordance with SD 3.02. Provision of berms are not mandatory e.g. town centres. Berms shall be spread with first quality topsoil and compacted to a depth of 150mm. The topsoil shall be graded to kerb and footpath edges and shall be finished 15mm high to allow for settlement except on the low side of the footpath where the topsoil shall be finished to prevent water ponding. Alternative designs with modified kerb details and swales formed in the berm space can be proposed for low impact design solutions.

3.5.5. Pedestrian and Cyclist Accessways

A pedestrian and cycle connection will generally be required where it would provide a significantly shorter walking route between roads or from a road to a reserve, shopping centre, community facility or a bus route.

3.5.5.1. Accessway Locations

Pedestrian and cycle facilities should generally be an integral part of a road. Pedestrian and cyclist accessways provide links where there is no road and should be considered at:

- cul-de-sac heads to provide a link to an adjacent road;
- parks and reserves where part of that reserve has no road frontage;
- schools and other community facilities where part of that facility has no road frontage; and
- any other location where the trip by road would be considerably longer than ‘as the crow flies’.

Where a road connection would not be entirely necessary for traffic circulation, a pedestrian and cycle connection will often still be required to provide access for these active modes. Acceptance of a pedestrian and cycle only connection may be approved where the Council concludes that provision of a road is not reasonable or cannot physically be constructed.

3.5.5.2. Accessway

A pedestrian connection will generally be required where it would provide a significantly shorter walking route between roads or from a road to a reserve, shopping centre, community facility or a bus route.

Pedestrian connections should generally be provided within roads; that is, as part of a full road connection. Where a road connection would not be entirely necessary for traffic circulation, it will often still be required where a pedestrian connection is necessary.

Acceptance of a pedestrian connection only, may be approved where the Council concludes that provision of a road is not reasonable or cannot physically be constructed.

Pedestrian accessways up to a length of 25m should generally be 3.0m in width; however, an absolute minimum width of 2.5m with a splay at each end to 3m may be acceptable for special circumstances.

Pedestrian accessways longer than 25m should have a minimum width of 4m. No splays are required.

[2] in draft at time of writing, but very close to final.

All pedestrian accessways should have a straight horizontal alignment and a vertical alignment, with a desired maximum gradient of 1 in 10 and an absolute maximum gradient of 1 in 5. However, the accessway should be visible from end to end from an eye height of 1.5m. The Council will have regard to concealment, surveillance and cost in allowing gradients greater than the desired maximum.

Pedestrian accessways shall have 'security' style fencing erected both sides of the accessway to a height of 1.8m. This shall consist of galvanised steel fencing to allow full visibility and pavement graffiti (see SD 3.18).

The pedestrian accessway shall have a cross section and be constructed in accordance with SD 3.17.

The pedestrian accessway shall be lit at each end and within the accessway at lengths not exceeding 50m. The lighting shall be such that it does not glare into adjacent residential properties.

3.5.5.2.1. Shared Accessways

References:
Austroads GTEP 14, section 6.6.1 for guidance on path widths; and
Manual of Traffic Signs and Markings, NZTA - Signs.

Pedestrian and cycle accessways shall have a minimum land width of 4m. Generally with a desirable minimum 3m wide formed concrete path (4m minimum total width), however, an absolute minimum 2.5m wide formed concrete path (still 4m minimum total width) may be acceptable at special circumstances.

3.5.5.2.2. Accessway Alignments

All pedestrian and cycle accessways should have a straight horizontal alignment and a vertical alignment, with a desired maximum gradient of 1 in 10 and an absolute maximum gradient of 1 in 5. However, the accessway should be visible from end to end from an eye height of 1.5m. The Council will have regard to concealment, surveillance and cost in allowing gradients greater than the desired maximum.

3.5.5.2.3. Fencing

Pedestrian and cycle accessways shall have 'security' style fencing erected both sides of the accessway to a height of 1.8 metres. This fencing shall consist of galvanised steel fencing to allow full visibility and prevent graffiti (see SD 3.18). Alternative fencing or other barriers will be considered where there is a need for greater privacy or screening of an adjacent property or activity. In areas where crime or issues of resident security are an issue, alternative security fencing may be considered.

3.5.5.2.4. Design

The pedestrian and cycle accessways shall have a cross section and be constructed in accordance with SD 3.17, noting that the footpath can be moved within the accessway providing that stormwater can be controlled. Any entry barriers must allow for the convenient passage of mobility scooters, motorised wheelchairs, large baby buggies and bicycles, if permitted. For this reason, bollards are preferred as access control, rather than chicanes.

3.5.5.2.5. Accessway Lighting

References:
AS/NZS 1158.3.1: Road Lighting – Pedestrian area; and
Public Lighting Manual, Waitakere City Code of Practice - City Infrastructure and Land Development

3.5.6. Shared Driveways and Vehicle Crossings

3.5.6.1. Shared Driveways

These are generally formed as per SD 3.07 (urban) and SD 3.08 (rural). They shall comply with the Parking and Driveway Guidelines with respect to access visibility, gradients and safety platforms.

A standard vehicle crossing shall be provided for each residential shared driveway in accordance with the relevant Standard Detail. Provision for stormwater control shall be as shown on the vehicle crossing detail. Industrial/commercial shared drives may have a vehicle crossing in the form of a road intersection with full safety controls provided subject to specific design and approval.

Shared vehicle crossings:

1. *Up to four units use SD 3.10.*
2. *Five or more units use SD 3.13.*

Alternative designs to those shown in SD 3.07, SD 3.08 shall be permitted to assist with providing stormwater detention measures. These may take the form of concrete strips, cobblestones, turf blocks, drives sloping centrally etc. These shall require specific engineering design, and separate approval by both Roading and Traffic and EcoWater. The design may also be subject to a Title Restriction to ensure it is not altered at a later date.

Strip driveways may be constructed subject to compliance in construction with the following criteria

- thickness of strip: 175mm
- minimum width of strip: 950mm
- width of separation strip: 800-900mm

The spacing of the joints shall be dependent on the mesh size used as shown on SD 3.07.

In addition to the free joints tied joint shall be provided at quarter points along the length of each slab. These can be affected by saw cutting a minimum depth of 50mm or by use of jointers.

Stormwater control can be affected by sloping the strips to the centre and providing a shallow swale in the separation strip.

Use of permeable pavers can be considered. Good granular sand between 1-2mm with low fines passing the 75micron sieve and minimal pumice content is recommended for bedding and joining. Permeable pavers need to be laid on a suitable permeable sub base, not normal GAP type aggregate as it will fail soon as the water gets to it.

The following types of permeable sub base are recommended:

1) No Fine Concrete
   - a layer of filter cloth on top of the no fines concrete will stop the migration of bedding and jointing sand into the no fines concrete. This also reduces sediment loading of the no fines concrete sub base;
   - the water needs to be managed once it reaches the sub base. Can it permeate into the sub grade or is there a requirement for sub surface drainage to remove the water through a filter to clean the water further and then deposit it back into the storm water system; or
   - the sub base can also be used as storage tank with the water pumped out to water the garden or flush toilets.
2) Drainage Aggregate Sub Base
   - if using more than one layer of sub base ensure that the overlaying aggregate does not migrate into the one below as this will cause subsidence; and
   - this porous pavers can be laid on two types of bedding:
     i) On 20mm of a granular bedding sand as stated above. The joint sand should be the same type of provide good lock-up between the units as well as facilitating the movement of water through the joints. Filter cloth underneath the bedding sand; and
     ii) On 20mm of drainage chip i.e. 2-5mm or 5-7mm or grade 6 sealing chip. Filter cloth of top of the compacted chip to stop the migration of the joint sand.

3.6. Design Requirements – Driveways and Kerb Crossings

3.6.1 Vehicle Crossings

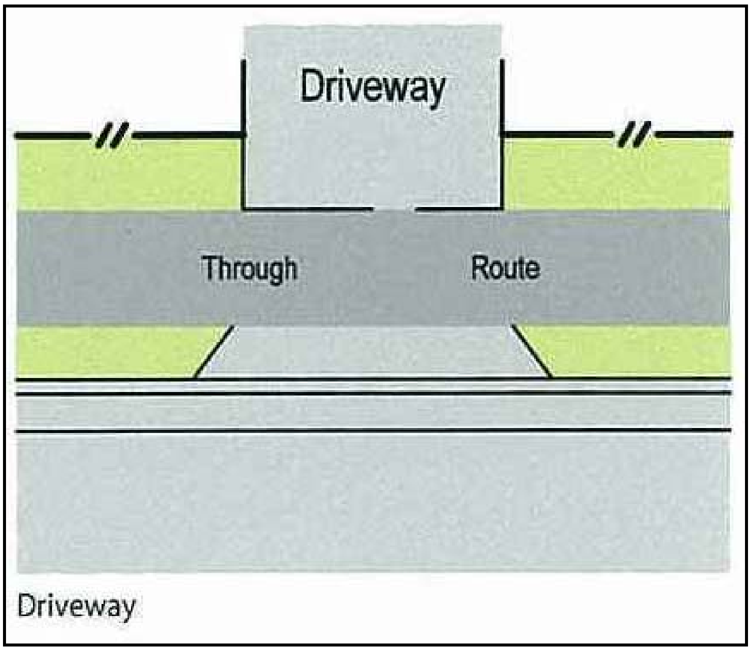
A vehicle crossing is located between the edge of the carriageway and the road boundary and crosses any footpath and berm in that location. Vehicle crossings servicing shared driveways (private ways) shall be constructed according to clauses 3.5.1.2 and 3.5.1.4. Other specific locations may also be required as part of the resource consent approval. Vehicle crossings providing access to private single dwellings are generally constructed during building construction.

References:
Waitakere City Council Parking and Driveway Guideline Part 10: Entrance and Driveway Geometry
Public Lighting Manual, Waitakere City Code of Practice - City Infrastructure and Land Development

In addition to the referenced guidelines above the following urban design principles apply.

- the crossing should be located to ensure that drivers entering and leaving have adequate sight distances to ensure safe passage.
- turning radii should be optimised to produce minimal turning speeds and swept paths that are compatible with frontage road conditions. In the case of busy commercial driveways on multilane arterial roads (e.g. Lincoln Road) tracking to and from the nearside traffic lane should be provided for". The generally acceptable designs are given in SD 3.10, SD 3.11, SD 3.13, and SD 3.14. Specific alternative designs are subject to the Council's approval.
- the driveway width at each edge of the footpath, if set back from the kerb line, should not be substantially different to its width at the property boundary.
- the driveway traffic speeds should be restrained by minimised driveway widths and by other means if necessary.
- the pedestrian path is continuous in grade, cross fall, colour and texture across the driveway, with no tactile warning tiles.
- the driveway should ramp down from the footpath across the kerb line to the channel lip; and
- the roadway kerb is continuous and cuts down to a concrete gutter crossing running straight across the driveway ramp – it does not return into the driveway.

If a driveway is to be located within a recessed on street parking bay, approval is required from the Manager Transport Services before consent can be issued. The applicant may be required to fund and establish another recessed parking bay nearby.



Transportation

3.6.1.1. Construction

Driveways shall be constructed according to the Parking and Driveway Guidelines with respect to access visibility, gradients and safety platforms. Standard designs are available for the following types:

a) residential (kerbed roads);

b) heavy commercial;

c) residential (unkerbed roads; and

d) light commercial (including residential serving five or more units).

In the rural area, alternative construction and design of vehicle crossings is encouraged where these would be in sympathy with rural character and amenity. Reference to the Countryside and Foothills Stormwater Management Code of Practice for further guidance is also encouraged.

An alternative shape for residential crossings on high volume/high speed roads is also available (see SD 3.14). Crossing profiles that indicate layouts providing stormwater control (off road), safety platforms and under vehicle clearances are available; (see SD 3.15).

3.6.1.2. Maintenance

Only standard concrete crossings constructed, checked and approved in accordance with council specifications will be accepted by the Council for maintenance. The Council does not maintain imprinted or coloured concrete, cobblestone, hotmix chip seal or metal crossings

3.6.1.3. Stormwater Control

Crossings that descend from the road shall be formed so as to prevent stormwater from the road discharging down the driveway. (see SD 3.15)

Ascending crossings (other than those with a metalled surface) that have a grade steeper than 1 in 6 and discharge a catchment greater than $60m^2$ to the road shall be constructed with a cut-off drain as per the standard details. (see SD 3.16)

3.6.1.4. Crossing Inspections

When the vehicle crossing has been excavated, the boxing formed, scoria placed and compacted, and if required, cut off drains and reinforcing placed, the Council will carry out a pre-pour inspection on request. On completion of the crossing including topsoil reinstated and the expansion cuts installed, a final inspection will be carried out.

3.6.1.5. Vehicle Crossing Structures

Where the formation of a vehicle crossing requires the erection of a retaining structure within the roading environment, such a structure requires specific approval and registration on the property title. An 'APPLICATION TO ERECT A STRUCTURE ON OR USE OF DEDICATED ROAD', must be applied for through the Transport Assets Unit. An application fee and title registration fees are payable

3.6.1.6. Alternative Surface Specifications

Cobblestones and fire clay bricks shall be a minimum thickness of 80mm. If concrete blocks are used they shall be a minimum thickness of 60mm. The base shall be a minimum of 150mm of compacted metal with a bedding layer of 25mm compacted sand. Blocks shall be interlocking through either their shape or their laying pattern. Edge restraint shall be by concrete kerb or established structure.

All work and materials shall be in compliance with NZS 3116:1991. Imprinted concrete shall conform to the appropriate type of crossing Standard Detail and have a substantially level surface with an imprinted design, the depth of the indentations being not more than 7mm and the width not more than 14mm.

3.6.1.7. Footpath Transitions

Where a vehicle crossing cannot be laid at the same level as the footpath it intersects, the transition between the two levels shall be by means of a ramp in the footpath having an incline not exceeding 1 in 12.

3.6.2 Shared Driveways and Private Ways

Shared driveways and private ways will generally be formed as per SD 3.07 (urban) and SD 3.08 (rural). They shall comply with the '"Parking and Driveway Guidelines with respect to access visibility, gradients and safety platforms.

On residential lots of 4,000 sq m or greater, or where there are more than eight co-joined lots and/or the total area to be developed is less than four ha, the council's Countryside and Foothills Stormwater Management Code of Practice should be consulted for further guidance.

In rural areas Shared driveways and Private Ways should be located and designed in sympathy with rural character and amenity. For further guidance consult Council's Rural Landscape Design Guideline.

3.6.2.1 Vehicle Crossings (Shared)

A standard vehicle crossing shall be provided for each residential shared driveway in accordance with the relevant Standard Detail. Provision for stormwater control shall be as shown on the vehicle crossing detail. For larger industrial/commercial sites, vehicle crossing in the form of a road intersection with full safety controls may be considered, although in most cases vehicle crossing type treatments are preferred to give clearer priority to pedestrians. Vehicle crossings that differ from the relevant standard detail drawings require specific design and approval.

Shared vehicle crossings:

- up to four units use SD 3.10; or
- five or more units use SD 3.13.

Alternative designs to those shown in SD 3.07 and SD 3.08 shall be permitted to assist with providing stormwater detention measures. These may take the form of concrete strips, cobblestones, turf blocks, drives sloping centrally etc. These shall require specific engineering design, and separate approval by both Roading and Traffic and EcoWater. The design may also be subject to a Title Restriction to ensure it is not altered at a later date.

3.6.2.2 Strip Driveways

Strip driveways may be constructed subject to compliance in construction with the following criteria:

- Thickness of strip: 175mm
- Minimum width of strip: 950mm
- Width of separation strip: 800-900mm

The spacing of the joints shall be dependent on the mesh size used as shown on SD 3.07. In addition to the free joints, tied joints shall be provided at quarter points along the length of each slab. Tied joints can be provided by saw cuts to a minimum depth of 50 mm or by use of jointers.

Stormwater can be controlled through cross fall on the strips into the centre and providing a shallow swale in the separation strip.

3.7. Design Requirements – Landscaping, Walls and Lighting

3.7.1. Street Landscaping

Reference:
Austroads AP-G69/02 Urban Road Design, Sight Distance

Developers are encouraged to provide street trees to enhance the amenity of any subdivision. Where street trees are proposed, consideration should be given to the use of tree pits to incorporate low impact design.

Landscaping and streetscape treatments should be designed to complement road safety objectives. Road safety considerations will determine the placement and control of roadside vegetation and any built landscape elements within the road reserve.

Landscaping should not interfere with any sight lines for vehicles approaching, entering or passing through an intersection. Furthermore, vegetation should not be placed where it will impede a driver's ability to read and safely respond to road signs.

3.7.1.1. Planting

Street planting is to enhance and strengthen the existing character and the intended future character of neighbourhood areas and unify those areas into an integrated city. The planting shall provide maximum long term benefit to the public and minimum on-going maintenance. It must not compromise the safe use of the legal road reserve, affect its structural integrity, or create poor sightlines.

Street planting provides a range of functional and aesthetic opportunities for environmental enhancement. For rain gardens refer to the Low Impact Design Guide.

FUNCTIONAL:

- *define space;*
- *provides shade shelter and privacy;*
- *screens unsightly developments;*
- *noise and pollution controls;*
- *assists driver recognition of road bends, junctions and the roading hierarchy;*
- *reduces glare and reflection;*
- *controls erosion; and*
- *creates physical barriers.*

AESTHETIC:

- *frames views;*
- *emphasises landform and landscape features;*
- *provides visual unity in the environment;*
- *reduces the visual impact of the roadway;*
- *softens hard surfaces and bleak areas;*
- *provides colour form and texture;*
- *provides visual linkage within and between regions; and*
- *provides identity and environment.*

3.7.1.2. Street Trees

Street trees may be planted on the following alignments:

- if the footpath is next to the kerb: adjacent to the footpath subject to SD 3.02;
- if the footpath is separate from the kerb: between the kerb and footpath subject to SD 3.02;
- on islands, or projections, within dedicated parking lanes; or
- other alignments subject to specific design, berm width, and Council approval.

In any case both the lateral and longitudinal positioning, and the size and shape of street trees are critical to the safety and amenity of the design. The objectives are to achieve clear driveway and intersection sight lines, and clear sightlines to traffic signs, to not interfere with the effectiveness of street lighting, to provide a cushioning barrier between the carriageway and development, and if possible roadside activity zones and footpaths.

Alignments bulleted 2 and 3 above are therefore desirable in town and neighbourhood centres and likely to be achievable in these locations owing to the relatively low frequency of driveways.

The Council's Parking and Driveway Guideline Part 10: Entrance and Driveway Geometry provides specific guidance in regard to the achievement of sustainable sight lines: trees species with clear narrow trunks are more likely to satisfy the sight line criteria on the preferred alignments.

There should generally be 10m separation between street trees and street lights. Street trees should not be located within 6m of a cess-pit.

All street trees will be planted in concrete tree pits to the approval of the Council's Parks Assets Group."

3.7.1.3. Gardens Within the Road Reserve

Decorative gardens must be designed to keep maintenance to a minimum. The Council wishes to limit garden areas to keep maintenance costs within reasonable limits.

3.7.1.4. Tree Sizes

The mature size of any tree or garden planting is to be assessed for each planting location and is to be in scale with the surrounding street environment and space available.

3.7.1.5. Planting Species

Species are to be selected with regard to overall composition, low maintenance, longevity and must comply with Council's planting policies. The Theme Species for each area has been established in the Street Tree Planting Strategy. The number of species to be used is to be limited to ensure a unified result and species choice in street gardens is to compliment the street tree planting.

3.7.1.6. Landscaping Plans

Plans are to be submitted by the subdividers representative at an appropriate scale (generally not less than 1:500 for tree planting and not greater than 1:100 for gardens) that detail both the botanical and common names, number proposed, size at planting, staking and planting date (season). The location of services and street furniture is also to be provided.

Landscape plans must be submitted and approved prior to any planting being undertaken.

3.7.1.7. Irrigation

Council approval is required prior to the installation of any irrigation system. Island gardens shall be provided with a duct for a water connection. Developers shall apply and pay for a metered water connection for irrigation purposes.

3.7.1.8. Maintenance

The developer is responsible for the routine maintenance of the planting including the removal of dead wood, weed control, mulching, replacing dead or damaged trees and watering for a period of 12 months after time of release of subdivision.

3.7.2. Street Lighting

References:
AS/NZS 1158 Set: Lighting for Roads and Public Spaces; and
Public Lighting Manual, Waitakere City Code of Practice - City Infrastructure and Land Development

Lighting of streets, service lanes, pedestrian accessways and amenity tracks shall be provided to the standard of illumination recommended in the reference above and shall be subject to specific design and approval in accordance with the standards of the District Plan.

Street lights shall be located in accordance with SD 3.02 Typical Berm cross sections, at intervals to meet the illumination requirements. Street lights shall not be located 0.6m to reduce the risk of turning vehicle impacts to any vehicle crossing.

Bus stops near signal controlled intersections should be located on the departure side to reduce the risk of passengers calling a pedestrian phase before the bus has departed.

3.7.3. Retaining Walls

This section covers the design and specification of retaining structures associated with road construction. Any necessary building or resource consents are to be obtained and provided with the design prior to approval. Structural calculations shall be provided where applicable.

3.7.3.1. Rock Walls

The rock shall be uniform in colour, nature and general appearance. It shall be of suitable quality for the particular work and to the approval of the Roading Assets Engineer. The sizes may vary, but not less than $0.01m^3$ and not greater than $0.75m^3$.

Stones shall be hard, durable and clean, free from honeycombed or fragmented sections. There shall be no dirt or adherent films. Stones shall be 150mm to 300mm wide set on edge placed compactly or irregularly to prevent scour by water. The stones shall break joints horizontally to fairly regular courses.

3.7.3.2. Crib Walls

Crib walls shall consist of a number of factory made stretchers, headers and other special units to form a bond so that adequate strength is attained to retain such material as the manufacturer specifies.

All crib walls shall be laid on a batter of 4 vertical to 1 horizontal.

In no case shall the resulting gaps between the ends of stretchers exceed 9mm on any curve.

3.7.3.3. Timber Walls

Retaining structures constructed using tanalised timber whalers and poles. The poles are installed either by concreting into bored holes or by being driven into the firm ground. Typically, this type of wall is constructed in situations where the retained height is not greater than 3.0 metres and where the firm ground below the slip zone is not at a great depth. Some significant benefits can be gained by using pairs of walls in combination with a planted slope between rather than a single very high retaining wall.

3.7.3.4. Walls with Tie-backs

As per 3.7.3.3. above, with the tie-back as an additional structural feature. Typically, a wall with tie-backs is constructed where the depth to firm ground does not allow sufficient cantilever strength to be developed by pole embedment alone. There are various types of tie-back systems and fixing mechanism that can be utilised. Some of the types of tie-back systems available are:

- tie-back with a deadman anchor
- earth screws
- anchor lock
- grouted bars

Poles may be either tanalised timber, precast concrete, driven timber or steel.

3.7.3.5. Concrete and Masonry Walls

Walls constructed using concrete and/or masonry materials, with structural bases consisting of either pile or concrete foundations, constructed in firm ground below the slip zone. Other materials such as timber can be used in conjunction with the concrete piles.

3.7.3.6. Gabion Baskets

These are galvanised wire mesh baskets filled with selected rocks. The option of plastic coated wire mesh baskets for marine and corrosive environments should be considered. Typically, the baskets come in modular (1x1x2.0m) sections, which are then stacked both horizontally and vertically to achieve the desired cross section and height.

3.7.3.7. Crib Walls (Concrete and Tanalised Timber)

These are retaining structures consisting of precast or pre-formed interlocking blocks or components, arranged in a specified formation. The spaces within the modular arrangement are filled with aggregate to provide the weight required, to support the retained mass.

3.7.3.8. Rockfill

This is a structure which involved bulk placement of large rocks (often greater than 400mm diameter) to form a mass rock wall, inclined at its natural angle of repose. This angle is typically 60 degrees to the horizontal. The base of the rock mass should be keyed into firm ground by forming a trench and placing larger rocks in and immediately above the trench.

This type of structure is typically constructed where:

- a greater than normal risk of failure is acceptable;
- where the area at the base of the slip is relatively flat i.e. a platform to site the rock mass on; or
- where firm ground is encountered within 1.5 metres of the lower platform.

The face of the rock fill should be arranged in a consistent manner to achieve a tidy appearance. The work is mainly carried out using a mechanical excavator. This is a relatively cheap method of reinstatement of slips.

3.7.3.9. Flat Faced Rock Wall

This is a wall constructed with selected rocks, arranged in a uniform manner and bound together with high strength concrete.

3.7.3.10. Reinforced Earth Structures

The technique provides insitu ground reinforcement by the installation of plastic geo grids to create a reinforced block of soil. These are constructed by compaction of geogrid and either soil or aggregate in layers. These structures are then faced using:

- grass;
- precast concrete components, e.g. keystone; or
- gabion baskets.

3.7.4. Road Markings and Signs

References:
Manual of Traffic Signs and Markings" (TNZ/LTSA): Traffic signs and Markings;
Land Transport Rule 54002, Traffic Control Devices: Traffic Signs and Markings;
Transit NZ – P/12, Specification for Pavement Marking'; and
NZS 4121, Design for Access and Mobility – Buildings and Associated Facilities.

Where road marking and signs are required as an integral part of the road network function it is the developer's responsibility to provide these facilities.

As part of the engineering plan approval, satisfactory design drawings of signs and road markings are to be prepared in accordance with current versions of the following documents: Sign posts, sockets and sleeve details as per SD 3.22 – 3.27.

Notwithstanding the spacing requirements for road markings in these references, designers should take the effect of terrain on the visibility and legibility for road users of road markings and especially of special lane road markings.

Physical works of placing signs and painting of markings are to be completed prior to the issue of the 224 Certificate.

Road Marking Contractors

All road marking contractors used must be members of the New Zealand Road Markers Federation. Council can supply these details of contractors to developers should they wish to use these contractors.

3.7.4.1. Traffic islands and roundabouts

References:
Guide to Traffic Engineering Practice, Intersections at Grade; Austroads;
Guide to Traffic Engineering Practice, Roundabouts; Austroads until superseded by;
Guide to Traffic Management: Intersections, Interchanges and Crossings;
Guide to Traffic Management: Traffic Operations and
Guide to Traffic Management: Traffic Control and Communications Devices;
Manual of Traffic Signs and Markings, NZTA Intersection Pavement Markings, Miscellaneous Pavement Markings; and
Land Transport Rule 54002, Traffic Control Devices, Traffic Signs and Markings.

New Zealand Transport Agency and Austroads design guides shall be used with particular reference to the above manuals. Traffic island and roundabout details shall be constructed according to SD 3.30.

3.7.4.2. Clearing Width and Height Requirements for Signs on the Footpaths

The location of the signs on the footpath shall be carefully considered so that the clearing width and height requirements are met, i.e. a through route is kept with the following dimensions:

- minimum width of 1.8m (or different as per the minimum requirements)
- minimum height of 2.15m (check the requirements in the Pedestrian Planning and Design Guide); and
- minimum distance of 600mm from the kerb edge

In cases where these specific requirements cannot be met, specific approval is required from a council representative.

3.7.4.3. 3.7.4.4. Sign Sizes

The size of signs should be determined according to MOTSAM Part 1 Signs, Signs Introduction, Sign Size. Attention should be given to the size of the sign relative to its visual context to ensure maximum clarity for drivers while avoiding visual clutter to the greatest extent possible.

3.7.4.4. 3.7.4.5. Temporary Signage

Guidelines for temporary signage can be found in MOTSAM, Signs, Temporary Warning Signs. Any temporary road marking should follow the appropriate MOTSAM guidelines.

3.8. Design Requirements – Bus Shelters and Infrastructure

3.8.1. Bus Shelter Infrastructure

Reference:
Bus Stop Infrastructure Design Guidelines, Auckland Regional Transport Authority

The reference guidelines should be applied to:

- bus stop location, spacing and capacity;
- bus stop infrastructure;
- bus stop layouts; and
- kerb design.

The Council may require a specific design of bus stop infrastructure which at least meets the standard of infrastructure contained in the guidelines.

The Bus Stop Infrastructure Design Guidelines are to prevail over specific requirements elsewhere in the Transport Code of Practice.

3.8.2. Bus Stop Infrastructure

Bus stops will principally be located on a continuous kerb line; however in some cases an extended or indented kerb may be advantageous at bus stops. The footpath needs to be planned so as to allow sufficient room for passengers boarding/alighting a bus and through movement of pedestrians.

An extended kerb at a bus stop is known as a bus kerb extension or bus bulb. Bus boarders are particularly useful in town centres to provide increased footpath space for shelters and other amenity items without compromising footpath space for through traffic and free space for planting or car parking as they do not require turn in or out space. They also allow the bus to stop and re-enter traffic with minimum delay and are less attractive for opportunistic car stopping or parking.

A bus bay is where the kerb line is indented and the bus moves out of the traffic lane for passengers to board and/or alight. In congested traffic, bus bays can add considerable delay to a bus journey as the driver may find re-entering the traffic difficult. Delays for the single vehicle accumulate by the number of passengers on board. Bays can also reduce footpath space and require considerable kerb length for turn in and out areas. Bus bays are generally not recommended except where required for operational or safety reasons.

Bus bays are useful on frequently used bus lanes, where a stopped bus does not delay another passing bus and can be advantageous for cyclists using the bus lane.

3.8.3. Bus Priority

References:
Standards for Special Vehicle Lanes developed by Maunsell for the Auckland Bus Priority Initiatives Steering Group; and Cycle Network and Route Planning Guide NZTA for shared bus/bike lanes.

Bus priority includes a variety of tools for minimising delay to buses. These tools vary from isolated intersection treatments to continuous peak hour or full time bus lanes.

3.9. Design Requirements – Cycle Facilities

Decisions on the nature of cycle infrastructure rely on a number of issues, including but not limited to, the number and type of cyclist[3] and the road environment and prevailing traffic.

3.9.1. Cycle Lanes

References:

Austroads Guide to Traffic Engineering Practice : Bicycles and subsequently to all Austroads Traffic Management and Design guides as released;

New Zealand Supplement to the Austroads Guide Traffic Engineering Practice: Bicycles; Transit NZ;

Cycle Network and Route Planning Guide; LTSA; and

Draft Regional Urban Cycle Design Guidelines, ARTA .

New roads likely to carry traffic volumes classifying it as a collector road or arterial (district, regional, strategic) will have dedicated cycle infrastructure. The most appropriate treatment will depend on land use and traffic speeds.

Treatment	**Speed Limit**	**Minimum Cycle Lane Width**	**Comment**
On-road cycle lane next to kerbside	50 kmph 60 kmph	1.5 m	Lane width may be decreased to no less than 1.2 m in exceptional circumstances for short distances only
On-road cycle lane next to kerbside	70 kmph 80 kmph 90 kmph	1.9 m	
On-road cycle lane next to kerbside	100 kmph	2.5 m	
On-road cycle lane next to parallel park	50 kmph	1.8 m	Desirable width of a parallel car park beside a cycle lane is 2.1m
On-road cycle lane next to parallel park	70 kmph and above	2.2 m	

Transportation

[3] see Chapter 3 – Cyclists' Needs from the Cycle Network and Route Planning Guide LTSA 2004

3.9.2. Cycle Paths and Shared Paths

References:

Austroads Guide to Traffic Engineering Practice: Guide to Road Design Part 6A: Pedestrian and Cyclists paths, Austroads and subsequently to all Austroads Traffic Management and Design guides as released;

New Zealand Supplement to the Austroads Guide Traffic Engineering Practice: Bicycles; Transit NZ ;

Cycle Network and Route Planning Guide, LTSA; and

Draft Regional Urban Cycle Design Guidelines, ARTA.

Shared paths within the road reserve must be designed very carefully to reduce conflict between pedestrians and cyclists. Ideally, property boundary lines should be sufficient to provide good visibility and pedestrian and cyclist priority across driveways should be obvious. Extra care must be taken with the design of shared paths at intersections.

Shared paths are an especially appropriate solution through reserves and green spaces, alongside rivers and in access ways (section 3.5.5.2.1.).

If it is likely that a shared path will be used by community cyclists and / or recreational cyclists, a minimum width of **3.0 m is required.** It may be necessary to reduce this width to no less than 2.0 m in exceptional circumstances for short distances only, for example due to topographical constraints.

If higher numbers of pedestrians or cyclists are likely, greater width will be required.

3.9.3. Cycle Parking

References:

Austroads Guide to Traffic Engineering Practice: Bicycles: End of Trip Facilities; and

Guidance Note for Cycle Parking Facilities, ARTA.

Waitakere City Council Parking and Driveway Guideline Part 5 Cycle Parking Space and Part 8 Cycle Parking Geometry.

Facilities for cycle parking should be given equal attention with car parking both in the public realm and private developments. On-site cycle parking includes both commuter parking for staff and readily accessible or clearly signed visitor cyclist parking.

3.10. Design Requirements – Heavy Commercial Vehicles

Planning and design for the movement, circulation and access of heavy commercial vehicles across and within a city is vital to the safe mobility of all road users.

References:

Auckland Regional Freight Strategy;

Austroads Urban Road Design: A Guide to the Geometric Design of Major Urban Roads;

Austroads A Guide to Traffic Engineering Practices: Intersection at Grade;

Austroads A Guide to Traffic Engineering Practices: Roundabouts;

Austroads A Guide to Traffic Engineering Practices: Bicycles;

Land Transport Safety Authority: New Zealand On-Road Tracking Curves; and

Waitakere City Freight Plan 2010-2040.

3.10.1. Heavy Commercial Vehicles Routes

The routes need to be attractive to heavy commercial vehicle operators to ensure that they use the routes provided and do not attempt to use roads not designed to carry large volumes of heavy traffic such as passing through small towns. The routes require parking areas adjacent to the roads so drivers can stop their vehicles to take a break and also check their vehicles for possible mechanical problems or loose loads.

3.10.2. Overweight Vehicle Routes

Waitakere City uses the following route:

- Rata Street, Great North Road, Edmonton Road, Alderman Drive, Sel Peacock Drive, Lincoln Road, Triangle Road, Don Buck Road then out to SH16, and as recommended by New Zealand Transport Agency.

References:

Transit New Zealand, Overweight Permit Route Maps

3.10.3. Over Dimension Vehicle Routes

Waitakere City uses the following route:

- Rata Street, Great North Road, Edmonton Road, Alderman Drive, Sel Peacock Drive, Lincoln Road, Triangle Road, Central Park Drive, Don Buck Road then out to SH16, and as recommended by New Zealand Transport Agency.

References:

Transit New Zealand, Over dimension Vehicle Route Maps

3.11. Bibliography

Note that both the Austroads series of guidelines and New Zealand's Manual of Traffic Signs and Markings are in transition to new formats. Practitioners are advised to refer to the following websites to ensure that their design information is current:

http://www.onlinepublications.austroads.com.au/script/home.asp

http://www.transit.govt.nz/technical/view_manual.jspcontent_type=manual&=edit&primary_key=1&action=edit

http://www.landtransport.govt.nz/rules/traffic-control-devices-2004.html#4

AUSTROADS

AGRD04/09 Guide to Road Design – Part 4: Intersections and Crossings - General

AGRD04A/09 Guide to Road Design - Part 4A: Unsignalised and Signalised Intersections

AGRD04B/09 Guide to Road Design - Part 4B: Roundabouts

AGRD04C/09 Guide to Road Design - Part 4C: Interchanges

AGAM05/09 Guide to Asset Management – Part 5: Pavement Performance

Austroads Guide to Traffic Engineering Practice part 14: Bicycles 1999 and subsequently to all Austroads Traffic Management and Design guides as released.

MOT/NZTA/NZ Standards

Manual of Traffic Signs and Markings, NZTA 2009, Section 3 Intersection pavement markings

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Waitakere City Code of Practice - City Infrastructure and Land Development

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3.12. Glossary

berm	a planted (usually grass) area between the kerb and the road reserve boundary
bus lane	a separate lane marked on the carriageway and signed for the use of buses, can also be used by cyclists and motorcyclists unless explicitly excluded, can operate full time or in peak periods
carriageway	the roadway formed for the passing of wheeled vehicles
channel/gutter	the drainage structure adjoining the kerb
cycle lane	a lane marked on the carriageway for the exclusive use of cyclists
cycle path	a path formed for the use of cyclists which is separate from the carriageway and may be within the road or on other land such as a park or reserve
driveway	a private road that connects a house, garage, or other building with the street
footpath	an area of pavement between the kerb and the road reserve boundary for the use of pedestrians
kerb	an upright stone or concrete edging marking the extent of the carriageway
pedestrian	pedestrian includes all footpath users of all abilities, walkers, wheelchair users, prams and pushchairs, runners, dog walkers etc.
road reserve	the road reserve comprises all the land on which the transport network function takes place, whether in council or private ownership, generally the land between the boundaries of adjoining properties
road	apart from its legal meaning, road is the generic term used to describe a formal transport corridor, generally providing for the movement of the public by all means of transport
shared path	a path signed and possibly marked for shared use by pedestrians and other users, including cyclists
strip driveway	a driveway formed with two hard surface strips to bear the vehicle loads with planting (usually grass) on the remaining surfaces

3.13. Standard Detail Index

SD Number	SD Title
SD 3.01	Typical cross section
SD 3.02	Typical berms
SD 3.03	Typical cul-de-sac layouts
SD 3.04	Kerbs and channel
SD 3.05	Sub grade drainage
SD 3.06	Catchpit detail
SD 3.06.01	Super catchpit plan and sections
SD 3.06.02	Super catchpit general arrangement isometric
SD 3.06.03	Super catchpit splay details single and double
SD 3.06.04	Hynds stormwater super pits
SD 3.07	Urban private way details
SD 3.08	Rural private way details
SD 3.09	Pram crossing
SD 3.10	Residential vehicle crossing (kerbed roads)
SD 3.10.01	Combination vehicle crossing (kerbed roads)
SD 3.10.02	Combination vehicle crossing (kerbed roads)
SD 3.11	Heavy commercial vehicle crossing
SD 3.12	Residential vehicle crossing/unkerbed roads)
SD 3.13	Light commercial vehicle crossing
SD 3.14	High volume/ vehicle crossing
SD 3.15	Maximum vehicle crossing profile
SD 3.16	Driveway drainage and kerb outlet
SD 3.17	Pedestrian and cyclist accessway layout
SD 3.17.01	Pedestrian and cyclist accessway alternative layouts
SD 3.18	Pedestrian and cyclist accessways fencing and barrier details
SD 3.18.01	Pedestrian and cyclist accessways bollard and barrier details
SD 3.18.02	Pedestrian and cyclist accessways bollard details
SD 3.19	Modified Watts profile speed hump speed controls
SD 3.19.01	Typical speed table
SD 3.20	Angled slow points: design principles
SD 3.21	Typical layouts for speed control devices
SD 3.22	Traffic signs 62mm socket
SD 3.23	Traffic signs 60mm dia. post details
SD 3.24	Traffic sign 100x100 post details

SD Number	SD Title
SD 3.25	Traffic sign box socket to 62mm socket conversion
SD 3.26	Street name sign 76mm post and socket detail
SD 3.27	76mm socket detail
SD 3.30	Pedestrian Refuge Island
SD 3.31	Recessed Parking Bay
SD 3.31.01	On street car parking
SD 3.32	Low Speed Impact Vehicle Barrier/Fence Detail
SD 3.33	Kerbs and Channel Mountable Aprons
SD 3.34	Pedestrian Refuge / Bridge Fence Safety Panels
SD 3.35	Recessed bus bay
SD 3.36	Typical kerb extension