3 TRANSPORTATION

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3.1 SCOPE

This Section sets out the requirements for the design and construction of transportation corridors within the city/district that are, or will be, managed by or vested to Council. It is also to be used for maintenance of existing infrastructure, including asset renewal, unless the standards are not compatible with the existing assets.

3.2 GENERAL

3.2.1 Objective

The objective is to provide a hierarchical network of transportation corridors that respond to land use and land form, provide safe and convenient transport for all road user modes, provide access to adjacent property, travel choices, are well connected, safe to use and provide corridors for utility services. They must be consistent in their design standards to provide uniform guidance to users and be designed and built to provide the least whole of life cost to the community, consistent with the desired level of service.

3.2.2 Reference Documents

Details of documents referenced in this Section are as follows:

Table 3-1: List of Referenced Documents

STANDARD/LEGISLATION	TITLE
AS 1141.32.2008	Methods for sampling and testing aggregates - Weak particles (including clay lumps, soft and friable particles) in coarse aggregates
AS 2144:2014	Traffic Signal Lanterns
AS 2353:1999	Pedestrian Push-button Assemblies
AS 289.5-1993	Parking Facilities – On-street parking
AS/NZS 1158 Set	Lighting for Roads and Public Spaces Set
AS/NZS 2276.1:2004	Cables for traffic signal installations - Multicore power cables
AS/NZS 2276.2:1998	Cables for traffic signal installations - Feeder Cable for Vehicle Detectors
AS/NZS 2276.3:2002	Cables for traffic signal installations - Loop Cables for Vehicle Detectors
AS/NZS 2312:1:2014	Guide to the Protection of Structural Steel Against Atmospheric Corrosion by the Use of Protective Coatings with 2004 Amendments - Part 1: Paint coatings
AS/NZS 2312.2:014	Guide to the Protection of Structural Steel Against Atmospheric Corrosion by the Use of Protective Coatings with 2004 Amendments - Part 2 : Hot dip galvanising
AS/NZS 3000: 2007	Electrical Installations (known as Australian/New Zealand Wiring Rules)
AS/NZS 3845.1:2015	Road safety barrier systems and devices
AS/NZS 4819:2011	Rural and urban addressing
ASTM C309:2011	Specification for liquid membrane–forming compounds for curing concrete
BS 381C	Colour chart for paints
S 812–114:1989	Testing aggregates. Method for determination of the polished-stone value
NZS 3104 : 2003	Specification for Concrete Production

STANDARD/LEGISLATION	TITLE
NZS 3109 : 1997	Concrete construction
NZS 3116:2002	Concrete segmental and flagstone paving
NZS 3910:2013	Conditions of Contract for Building and Civil Engineering Construction
NZS 4121: 2001	Design for Access and Mobility – Buildings and Associated Facilities
NZS 4402.4.1.1:1986	Test 4.1.1 NZ Standard Compaction Test
NZS 4402.4.1.3:1986	Test 4.1.3 NZ Vibrating Hammer Compaction Test
NZS 4404:2010	Land development and subdivision infrastructure
NZS 4407:2015	Methods of sampling and testing road aggregates
NZS/AS 1657: 1992	Fixed platforms, walkways, stairways and ladders - design, construction and installation

NZ Transport Agency (NZTA) Standards, Specifications and Guidelines

NZTA	Code of Practice for Temporary Traffic Management
NZTA	Guidelines for Public Transport and Infrastructure and Facilities
NZTA	Infrastructure Risk Rating (IRR) Manual
NZTA	Land Transport (Road User) Rule 2004
NZTA	Land Transport Rule - Traffic Control Devices 2004 (with amendments)
NZTA	Manual of Traffic Signs and Markings (MOTSAM) – Part 1 : Traffic Signs - Part 2 : Markings
NZTA	Road Safety Audit Procedures for Projects (Transfund 2004); interim update 2013
NZTA	Supplement to 2004 Austroads Pavement Design Guide (2007)
NZTA	Traffic Control Devices Manuals

NZ Transport Agency (NZTA) Guides

NZTA	Pedestrian Planning and Design Guide (2009)
NZTA	Cycling Network Guidance – planning and design
NZTA	Making Roads Motorcycle Friendly
NZTA	Speed Management Guide Speed Management Toolbox and Appendices

NZ Transport Agency (NZTA) Traffic Notes

NZTA Traffic Note 48	Light Vehicle Sizes and Dimensions : street survey results and parking space requirements

NZ Transport Agency (NZTA) Manuals

NZTA	Bridge Manual SP/M/022 (2013)
NZTA RTS 4	Guidelines for Flush Medians (1991)
NZTA RTS 6	Guidelines for Visibility at Driveways (1993)
NZTA RTS 11	Urban Roadside Barriers and Alternative Treatments (1995)

NZTA RTS 14	Guidelines for Facilities for Blind and Vision Impaired pedestrians (2015)
NZTA RTS 18	NZ On Road Tracking Curves for Heavy Vehicles (2007)

NZ Transport Agency (NZTA) Specifications

NZTA B/2	Construction of Unbound Granular Pavement Layers
NZTA B/5	In-Situ Stabilisation of Modified Pavement Layers
NZTA C/20	Erection and Maintenance of Traffic Signs Chevrons Markers and Sight Rails
NZTA F/1	Earthworks Construction
NZTA F/2	Pipe Subsoil Drain Construction
NZTA F/5	Corrugated Plastic Pipe Subsoil Drain Construction
NZTA M/1	Roading Bitumens
NZTA M/4	Basecourse Aggregate
NZTA M/6	Sealing Chip
NZTA M/7	Line Marking Paint
MZTA M/7	Notes to Line marking Paint Specification (M/7)
NZTA M/10	Asphaltic Concrete
NZTA M/12	Raised Pavement Markers specification
NZTA M/14	Edge Marker Posts
NZTA M/17	W-Section Bridge Guardrail Specification
NZTA M/20	Long Life Line Marking Materials Specification
NZTA M/20	Notes to Long Life Line Marking Materials Specification (M/20)
NZTA M/23	Bridge Approaches and Specification for Road Safety Barrier Systems
	Appendix A - List of Compliant Road Safety Hardware for Accepted Products (with interim acceptances)
NZTA M/24	Audio Tactile Profiled Road Markings Specification
NZTA M/26	Specification for Lighting Columns
	Appendix A – Type Approved Passively Safe Lighting Columns
NZTA M30	Specification and guidelines for Road Lighting design
NZTA P/3	First Coat Sealing
NZTA P/4	Resealing
NZTA P/9	Asphaltic Concrete Paving Construction
NZTA P/11	Open Grade Porous Asphalt
NZTA P/12	Pavement Marking Specification
NZTA P/12 Notes	Notes to Pavement Marking Specification (P/12)
NZTA P/14	Specification for Installation of Raised Pavement Markers
NZTA P/15P	Fabrication and Assembly of Standard Guardrails and Handrails for Highway Bridges
NZTA P/22	Reflectorised Pavement Marking Specification
NZTA P/43	Specification for Traffic Signals
NZTA T/1	Benkelman Beam Deflection Measurements

NZTA T/8	Road marking Applicator Testing Specification
NZTA T/12	Long-Life Pavement Marking Material Applicator Testing

Austroads Guides

Austroads Guide to Road Design	Part 3: Geometric Design
Austroads Guides to Road Design	Part 4: Intersections and Crossings
Austroads Guides to Road Design	Part 4A: Unsignalised and Signalised Intersections
Austroads Guide to Road Design	Part 4B : Roundabouts
Austroads Guides to Road Design	Part 4C: Interchanges
Austroads Guide to Road Design	Part 6A: Pedestrian and cyclist paths
Austroads Guide to Pavement Technology	Part 2 : Pavement Structural Design
Austroads Guide to Traffic Management	Part 10 : Traffic Control and Communication Devices
Austroads Pavement Design for Light Traffic	

Other Documents

Thick Brick Australia	Clay Paving Design
Ministry for the Environment (MfE)	Crime Prevention through Environmental Design (CPTED)
Health and Safety at Work Act 2015	
Manual for Streets (UK Dept for Transport) 2007	
New Zealand Building Code	
NZ Roadmarkers Federation (NZRF)	Manuals Industry 'Best Practice'
Road Safety Manufacturers Association (RSMA)	Compliance Standard for Traffic Signs (2010)
Electricity Regulations 2010	
Electricity (Safety) Regulations 2010	
NZ Electrical Code of Practice for Electrical Safe Distances (NZECP 34:2001)	
The Electricity Act 1992	

3.2.3 Guidelines

In designing the layout of a Transportation Corridor the following issues must be considered:

a) Zoning and likely use of the adjacent land

b) Land form and geological and cultural features

c) Connections to existing transport corridors

d) Linkages to other developments and amenities

e) Relationship to the concept for the total area

f) Recognition of the One Network Road Classification hierarchy [2]

g) The relevant Council's District Plan

h) Public transport requirements

i) Service/utility corridors and the impact the development will have on the capacity of the utilities in the adjacent areas

j) Protection of unique features

k) Pedestrian needs

l) Cyclist needs

m) Needs of mobility or visually impaired persons

n) Stormwater collection, treatment and disposal

o) Access by vehicles needing to service the area e.g. refuse collection, street cleaning

p) Risk, reliability and redundancy

q) Green space and vegetation

r) Whole of life costs for the operation and maintenance of the asset including ease of cleaning, procurement and replacement of infrastructure when vandalised, damaged or at the end of its design life.

s) Mitigation of adverse effects of traffic:

(i) Volume

(ii) Speed

(iii) Manoeuvrability

(iv) Function

(v) Parking

(vi) Safety

(vii) Noise, air and water pollution

3.2.4 Functions of a Transportation Corridor

*A Transportation Corridor provides a space for interaction between people for a range of purposes and access to lan*d uses so that movement between places can occur.

Refer to the relevant District Plan for the transportation functional classification.

The three key functions of a Transportation Corridor are movement, place context and utility corridor.

3.2.4.1 **Movement**

Linking places with transportation infrastructure that provides for a range of transport modes to move people and goods efficiently.

[2] The RITS is based on the HCC ITS, and that document had many roading heirachy statements similar but slightly diferrent to ONRC. As a result, users need to be aware that this is an area of work that is still to be done late in 2018.

3.2.4.2 Place Context

Creating public spaces for people to interact, exercise and enjoy where appropriate. There are some transportation corridors where such activities would create health and safety issues. The place function would be limited in such situations e.g. arterials and expressways.

3.2.4.3 Utility Corridor

Providing corridors that network utility operators can use to service the city (e.g. telecommunication, fibre, electricity, three waters, and gas networks).

3.2.4.4 Transportation Corridor Hierarchy

Each Council currently has their own transportation corridor hierarchy. These can be found in the relevant District Plan.

3.2.4.5 Network Connectivity

Well-connected urban networks (roads and other links) are achieved with smaller block sizes and regular connections. Network connectivity shall be designed to achieve:

a) Shorter travel distances

b) An increased number of alternative routes for all types of users (noting that this is not the case with arterials and expressways).

c) Increased opportunity for communities to interact, e.g. socialise, play together, etc.

d) Improved access to; public transport, cycling and walking networks, access to destinations such as schools, amenities and employment

Development design shall ensure connectivity to properties and roads that have been developed, or that have the potential to be developed in the future. The design shall ensure the maximum walking distances in the following Table 3-2 from a lot to a collector or arterial road.

Table 3-2: Maximum Walking Distances from a Lot to a Collector or Arterial Road

Rural road	No maximum distance. The design should maximise future connectivity to a suburban network.
Suburban	400m. A shorter distance shall be considered near centres and major public transport routes
Urban	300m
Centre	200m

Provision of safe and accessible crossing points across collectors and arterials will also be necessary to ensure that Network connectivity between blocks is maintained.

3.2.5 Road Safety Audit

Proposals for new roads, intersections or facilities/features that will be vested in Council shall generally be subject to the NZTA Road Safety Audit Procedures for Projects at detailed design and post construction stages, unless Council decides that these are not required. The 'exemption declaration' shall be submitted as part of the

application process to be considered by Council. An 'exemption declaration' may be completed for any or all stages of the project if in the opinion of a suitably qualified road safety auditor an audit is not necessary and Council will then consider and decide whether to accept it or not.

Safety audits must address the needs of all road users, including the needs of pedestrians, cyclists, motorcyclists and disabled/elderly users. Where appropriate, the requirements of these groups may demand specific audit procedures.

Recommendations from the audit report(s) shall be implemented before the 224 certificate is issued or the contract works accepted for practical completion.

3.2.6 Design and Access Statement

A design and access statement shall be submitted with the application for design approval. The statement shall cover all relevant aspects of this Specification and specifically address:

a) Road dimensions and layout;

b) Link and place functions;

c) Connectivity and how it will be achieved for all road user types;

d) How safe and appropriate speeds will be achieved and managed through design (in accordance with NZTA Speed Management Guide) and the design speed environment;

e) How any 'serious and critical' issues identified in the road safety audit have been addressed;

f) Parking, passing and loading provisions;

g) Criteria used in determining visibility distances and splays;

h) Safety barrier requirements and considerations that have been made for alternative treatments;

i) Impact on existing street features such as street furniture, pedestrian refuge facilities, bus stops & shelters, for visual consistency and also potential increase in usage;

j) Any new parking restriction that will be required in order for the proposed design to operate safely, eg no stopping.

3.3 ENGINEERING DESIGN

3.3.1 General

Roads shall be designed with reference to the transportation functional classification table contained in the relevant District Plan and NZS 4404 Section 3.3. However all references within Section 3.3 (NZS 4404) to Table 3.2 (NZS 4404), shall be taken instead to refer to the table in the relevant district plan.

3.3.1.1 Design Speed Environment

The relationship between carriageway width, forward visibility and the design speed environment for various road types is illustrated in Fig 3.2 of NZS 4404.

Traffic management facilities shall be included in the road design to ensure that the design speed environment shown is achieved.

Design speed environments can be managed by physical and psychological devices such as narrowed movement lanes, reduced forward visibility, parking, slow points, build outs, chicanes, planting and landscaping, and street furniture and art works.

The Austroads Guide to Road Design - Part 3 : Geometric Design provides suitable guidance for designing to a design speed. Reference can also be made to the Manual for Streets (UK Department for Transport) and the NZTA Speed Management Guide Toolbox and Appendices.

3.3.1.2 Special Character Zones or Specific TLA Requirements

Where Special Character Zones (residential, heritage, natural, etc) are identified in the relevant district plan, or specific requirements relating to street furniture etc exist, there may be associated local variations to the RITS.

3.3.2 Corridor Alignment, Width and Cross Section components

Horizontal alignment of transport corridors shall be based on terrain and the design speed applicable to the road function. Vertical alignment of residential roads should ensure that inclines can be negotiated during all weather conditions and sight distances are adequate for safety. The gradient shall be considered as a planning factor when selecting locations for shopping centres, service centres, or footpaths.

The minimum centreline radius for industrial roads, residential collector and sub-collector roads is 80m. The minimum centreline radius for local residential roads is 15m. Reverse curves are to be separated by an adequate length of straight in metres of 0.7 times the posted speed limit.

3.3.2.1 Lane Widening

Where the centreline radius is 80m or greater, extra widening on curves is not required. Where curves are less than 80m radius, extra widening may be applied to the carriageway to ensure that heavy vehicles are able to negotiate the curve wholly within their lane. In such cases, the minimum berm width shall not be reduced.

Table 3-3: Design Vehicle for Curve Widening

ROAD CLASSIFICATION	DESIGN VEHICLE
Arterial Collector and Industrial roads*	19m Semi-Trailer
Local roads and lanes (excl industrial zones)	11.5m Rigid

*** As defined in the relevant District Plan**

3.3.2.2 Visibility

The road centre line radius and the road width also affect the visibility along the road, particularly on the inside road boundary of the curve.

As such, in addition to carriageway widening, there is a need to also check that horizontal visibility meets the road design speeds both on the inside of the curve and also at vehicle entrances and access way. Achieving this may result in a need to increase the berm width by adjusting property boundaries.

3.3.2.3 Carriageway Crossfall

Minimum crossfall is 1:33 for chip seal surfaces, 1:50 for asphaltic concrete surfaces and 1:25 for unsealed surfaces.

Maximum crossfall is 1:25, with the exception of where vehicles and pedestrians operate in shared zone environments. In shared zone environment, carriageway crossfall shall comply with footpath requirements.

Single crossfall will be considered on carriageways up to 7.0m where normal crossfall is unobtainable.

3.3.2.4 Super Elevation

Maximum super elevation is 1:17.

Super elevation should be used on short radius curves on roads with operating speeds of greater than 40km/h.

3.3.2.5 Gradients

a) Minimum gradient is 1:250

b) Maximum gradient (on arterial, collector and industrial roads) is 1: 12

c) Maximum gradient (on residential roads) is 1:8

Steeper gradients may be acceptable for shorter lengths of road in hilly country or low overall speed environments, subject to approval by Council in accordance with Part 329 (road gradients) of the Local Government Act 1974. However, consideration of these steep grades is to be taken into account in the design of adjacent footpaths.

3.3.2.6 Vertical Curves

Vertical curves shall comply with the requirements of Austroads Guide to Road Design Part 3: Geometric Design, section 8.6 Vertical Curves. For areas where the design speed is ≤ 50 km/h, vertical curves shall have a minimum length of 20m, except where the grade change is ≤ 1:100 where the minimum vertical curve length is 10m for centre lines. Kerb and channel grades should not be flatter than 1: 300 within the vertical curve.

3.3.2.7 Cross-section

Typical road widths are provided in the relevant district plan. Preservation or capitalisation of some natural feature of a landscape or existing specimen tree(s) may dictate an irregular shaped road width.

Certain carriageway and berm geometrics, utility services and stormwater swales, may require that the road width be increased, but usually just locally.

3.3.2.8 Road Reserve

In some circumstances an increased overall road reserve may be necessary for utilities provision or increased amenity, stormwater treatment and drainage, landscape or urban design element. In other circumstances, reserve widths may be reduced if development is only on one side of the road or the road is only one way.

All rural road reserve boundaries shall be fenced. Livestock fencing requirements are contained in Section 7 - Clause 7.3.12.2.

3.3.2.9 **Movement Lanes**

One movement lane in each direction is typical but the requirements vary according to the nature and function of the road. Refer to the relevant district plan.

3.3.2.10 **Parking, Passing and Loading**

Allowance for parking, passing and loading activities shall be provided in accordance with the relevant district plan and section 3.3.6 of NZS 4404.

3.3.2.11 **Cycle Facilities**

Cycle facilities shall be provided in accordance with the requirements set out in the relevant district plan and/or cycle/biking plan and shall be marked in accordance with the Traffic Control Devices Manual and the drawings contained in this document.

3.3.2.12 **Shoulder Widths**

Shoulder widths on rural roads need to be assessed for each project, based on the speed environment of the area, terrain and activities. For high speed environments where high non-motorised use is expected, shoulder widths may need to be increased to optimise overall road safety. Refer to the relevant Council's District Plan.

3.3.3 Formation Width

Formation width shall be sufficient to contain the functions described in 3.3.2.8 above. Where topography dictates, the formation width should extend beyond the carriageway edge by 500mm, with batters providing a smooth and safe transition to the adjacent building lot grades. Refer to Drawing D3.1.1.

3.3.4 Structures

Where structures retaining private lots are required, these shall be fully located on the lot, not within the road reserve.

3.3.5 Visibility

The driver sight distance requirements relate to the road classification function and vehicle speeds. Refer to NZTA RTS 6.

Visibility splays and envelopes may require the road boundary to be set back (refer to Drawing D3.1.5). Trees shall not be planted in the visibility splay; only road lighting columns and road signs shall be considered. More detail on requirements for planting within visibility splays is given in the landscape section.

Horizontal and vertical sight distances along a road shall be designed in accordance with Austroads Guide to Road Design Part 3: Geometric Design, considering the wet surface coefficient. The stopping sight distance measured round a curve shall be along a line 1.5m into the lane width from the inside kerb.

The developer shall submit with the engineering plans the criteria used in determining the visibility distances.

3.3.6 Berms

Berms shall be provided between the edge of the formed carriageway and the road legal boundary to accommodate footpaths, road signs, road lighting, underground services, landscaping, stormwater treatment and control and grass areas. (Refer Drawing D3.1.3)

Berms shall be of adequate width to:

a) Achieve safe clearances between the carriageway edge and any obstacle (minimum 600mm for urban and 1500mm for rural areas).

b) Allow running of utility services and placing of street lighting poles within the berm

c) Provide adequate space between the road reserve boundary and the carriageway edge to enable residents to safely enter the road traffic

d) Allow room for efficient road edge and edge drain maintenance

e) Allow adequate space for the effective operation and maintenance of any form of stormwater management device

f) Allow sufficient width to allow for adequate growth of the plants/ trees and ease of their maintenance.

g) Allow for use of a lawnmower for general maintenance - narrow grass strips less than 650mm wide should be avoided

h) Allow for the safe kerbside collection of rubbish and recycling (minimum 2500mm x 1000mm space for presentation and collection of rubbish and recycling)

The minimum width of berm shall be in accordance with the relevant District Plan except for private ways (Refer Drawing D3.1.6) and shared environments.

Berm crossfall shall typically be 1:25, however localised grass berm cross falls may range between 1:50 and 1:10 but must be able to be easily mown by the adjacent property owner. Engineering drawings should identify any variances from the typical crossfalls. The berm crossfall (maximum 1:10) and the footpath cannotbe negatively impacted by the veicle crossing which has a maximum grade of 1:6. (Refer Drawing D3.1.4)

On rural roads berm crossfall to be a maximum of 1:4 starting at the edge of the carriageway shoulder or surface water channel.

3.3.7 Survey Marks

Survey marks shall be installed in a separate, purpose built concrete slab, clear of vehicle and pedestrian facilities.

3.3.8 Cut / Fill Batters

To be read in conjunction with Earthworks Section 2.

3.3.8.1 Urban Roads

Cut and fill batters for roads shall generally be constructed outside the Transportation Corridor (refer clause 3.2.6 for berms).

a) With a maximum grade of 1:5 starting at the road boundary. Where circumstances dictate a steeper grade is necessary, and it is longer than 10

metres, a geotechnical assessment of the slope shall be provided together with specific access design (Refer to Earthworks Section 2).

b) Any retaining wall designed to support the road or footpath shall be constructed within the transportation corridor and will likely require a building consent

c) Where Council consider the stability of any planned embankment is in doubt, a stability analysis of the slope under saturated conditions may be required

3.3.8.2 Rural Roads

a) Rural batters for cuttings and embankments shall usually be constructed inside the Transportation Corridor

b) Batters less than 750mm high shall be cut at 1:4 and shall be topsoiled and grassed. (Refer to Landscape Section 7, Clauses 7.3.4 and 7.3.6)

c) Batters 750mm high and above shall be cut at 1:2 and shall be protected from face erosion by hydro-seeding or similar (refer to Landscape Section)

d) Batters 4.5m high and above shall be assessed by a Geotechnical Professional. In undertaking this check and determining the appropriate erosion protection the Geotechnical Professional shall take into account:

(i) The type of soils present in the cutting

(ii) The degree of possible erosion and its effect on long term stability, the safety of road users, and adjacent property owners

3.3.9 Intersections

3.3.9.1 Intersection and Alignment Design

All intersections shall be designed in accordance with Austroads Guides to Road Design parts 4 and 4A.

Generally, in urban areas, roads should intersect only with roads in the same class or those immediately above or below in classification. T-junctions are preferred to cross intersections particularly for local roads. The angle of intersection should be 90^{o}, although a minimum angle of 70^{o} can be used when justified by other constraints. Multi-leg intersections may require control by roundabouts. Intersections on curves, particularly on the inside of curves, other than large radius curves, are to be avoided.

All road intersections in residential areas should have a kerb radius at intersections of 4m to 6m. An alternative and reduced kerb radius may be considered to enhance pedestrian facility in low speed environments, and shall be subject to the approval of Council.

All intersections in industrial areas should have a minimum kerb radius of 13.5m with corner splays of 6m, or subject to specific design.

Intersections in all other 50 km/h or lower speed environments shall have the lot corners splayed by a minimum of 4m along both boundaries, although these may be dispensed with in low design speed environments provided that there is adequate provision for pedestrians and utility services.

Corner boundary splays shall be subject to specific design in higher speed environments, to ensure safe visibility at intersections.

3.3.9.2 Arterial Road Intersections

For intersections with arterial roads, the engineering plans shall show the sight distance provided at each intersection, plus the following information:

a) Design Speed

b) Design Vehicle

c) Distance from limit lines to viewpoint (LV)

d) Approach Sight Distance (ASD)

e) Safe Intersection Sight Distance (SISD)

f) All radii

The SISD shall be determined with an object of height 0.6m.

Reference can also be made to Austroads Guides to Road Design Parts 4, 4A and 4C.

3.3.9.3 Intersections with State Highways

In the case of roads intersecting or joining State Highways, consultation must be undertaken with the NZTA with regard to appropriate standards prior to commencing design.

3.3.9.4 Grades at Intersections

Gradients within 30m of intersections shall be:

a) For Local Roads - less than 1:33 where practicable and not greater than 1:10

b) For Collector and Arterial Roads - less than 1:50

A plateau with minimum grades, of at least 10m is to be provided at any intersection where a vehicle may be expected to stop and give way to other vehicles e.g. at a Give Way control.

3.3.9.5 Channelisation at Intersections

All side roads that have direct access to a collector or arterial road (existing or proposed as defined by the relevant District Plan and/or Structure Plan) shall be channelised using either kerb extensions and / or a central throat island at the intersection with the collector or arterial road. Such treatments are to be designed and constructed in accordance with this specification. Side roads expected to carry less than 120 v.p.d (12 dwellings) and have a carriageway width of 8m or less do not require channelisation.

3.3.9.6 Priority Controls

All priority intersections must fulfil the requirements of the Land Transport Rule: Traffic Control Devices 2004, associated NZTA Traffic Control Devices Manuals, and the NZTA Pedestrian Planning and Design Guide.

3.3.9.7 Intersection Spacing

Minimum permitted spacing between adjacent intersections on different categories of road are set out in Table 3-4 below. All distances are measured along the centreline of the major road between the centrelines of the intersecting roads.

Table 3-4: Minimum Intersection Spacing

	LOCAL ROADS	COLLECTOR OR ARTERIAL ROADS	INDUSTRIAL ROADS
Same Side	60m	90m	200m
Opposite Side	30m	45m	100m

In all cases a right/left stagger is preferred. If cross roads are unavoidable a roundabout is required for all but low volume local roads.

3.3.9.8 **Road Rail Intersections**

Road rail level crossings shall be designed in accordance with the NZTA Traffic Control Devices Manual; Part 9 Level Crossings.

3.3.10 Roundabouts

Roundabouts may be required at intersections where Stop or Give Way controls do not provide adequate capacity or Level of Service, or to provide traffic calming. Roundabouts are not permitted where their prime purpose is to provide a landscaping opportunity.

Roundabouts shall be designed in accordance with Austroads Guide to Road Design Part 4B: Roundabouts. The size of a roundabout has a significant role in the performance for capacity, traffic safety and turning movements of vehicles. The minimum design criteria outlined in Table 3-5 shall be applied. Refer Drawing D3.10.1

Table 3-5: Minimum Roundabout Design Criteria

ROAD TYPE	CENTRAL ISLAND DIAMETER	CIRCULATING WIDTH	LV DISTANCE*
Local (Access) road	16m including a 2m concrete collar	Single lane – 7.0m	5.0m
Collector (Primary and Secondary) road	20m including a 2m concrete collar	Single Lane – 7.0m Dual lane – 10.5m	9.0m
Arterial (Primary and Secondary) or Industrial road	24m including a 2m concrete collar	Single Lane – 7.0m Dual lane – 10.5m	9.0m

(*LV distance is defined as the minimum distance from limit lines to point of view)

Visibility is an important factor to ensure safety standards are met, Austroads Guide to Road Design Part 4B, Criteria 1 and 2 for sight distance are both mandatory requirements. Achievement of Criterion 3 is desirable.

Minimum criterion may be reduced if:

a) Physical constraints such as a building/structure prevent practical implementation of minimum design criterion

b) Roundabout can be shown to form a traffic control device as part of a Local Area Traffic Management scheme

Any roundabout below the desirable design criteria requires approval by Council.

Supporting evidence to show that the design will meet capacity, safety and turning movements of intended vehicles, including motorcycles (refer NZTA Guide 'Making Roads Motorcycle Friendly' shall be supplied.

Traffic modelling shall be provided to show that the design can mitigate the effects of traffic generation due to the development. Where applicable, consideration shall be given for future network growth and development. This could include intersection modelling using software such as SIDRA.

The engineering plans shall show, the visibility splays for each approach of each roundabout, landscaping details, signage, road marking, and state the:

a) Design Speed – both approach and circulating

b) Design Vehicle and Turning Path

c) LV Distance

d) Central Island Diameter

e) Circulating Width

f) Level of Service

g) Provisions for pedestrians and cyclists to ensure their safety when negotiating the roundabout

A copy of the Safety Audit and evidence of compliance with recommendations must be included.

3.3.11 No-exit roads, Cul-de-sacs, Service Lanes and Private ways

3.3.11.1 No Exit Roads

'No-exit' roads should not be provided where through roads and connected networks can be designed. Where no-exit roads cannot be avoided, they should ensure connectivity for pedestrians and cyclists and have no-exit signage.

Public no-exit roads and lanes shall provide for road turning at the end of the road for an appropriate vehicle as described in NZTA standard RTS 18. No Exit roads shorter than 60m may provide reduced turning facilities but must cater for 11m rigid trucks (e.g. rubbish collection). The design of turning facilities for light vehicles in urban areas shall be in accordance with AS 2890.5. See Figures 3.3 and 3.4 for acceptable solutions.

Turning heads will be required at the end of all rural no exit roads in accordance with Austroads Rural Road Design.

An on-road turning area may provide for parking or landscaping/hard standing in the centre of the turning area. The minimum kerb gradient around turning heads shall be 1:200. Appropriate drainage shall be provided.

3.3.11.2 Cul-de-sac Design

The design of cul-de-sac turning areas shall be in accordance with Drawing D3.1.7 or NZS4404 except in commercial and industrial areas where the minimum radius shall be 15m to accommodate the turning movements of service vehicles.

The maximum long or cross section slope in turning heads is 1:17, with the desirable matching normal camber.

All urban roads shall have kerb and channel with associated stormwater collection and disposal systems provided on all cul-de-sac heads to the tangent point.

Staged road construction will require temporary cul-de-sacs to be built.

For rural roads, Council may require kerb and channel with associated stormwater collection and disposal systems to be provided on cul-de-sac heads where conventional shoulder/berm surface runoff is unable to be achieved to Council's satisfaction.

3.3.11.3 Service Lanes

The minimum carriageway width permitted is 3.5m. Service Lanes are to have concrete edging both sides and stormwater is to be collected and disposed of. Specific geometric and pavement design is required, as covered in clause 3.3.12 and the relevant council's formation requirements as set out in their district plan. Carriageway surfacing is to be asphalt conforming to the specifications in clauses 3.3.13.2 and 3.4.9.8.

3.3.11.4 Private ways

General

Kerb and channel for Urban Residential and Industrial private ways is to be in accordance with Drawings D3.3.1, D3.3.2 and D3.3.3.

Stormwater shall not discharge across the vehicle crossing from the private way to the road.

Vehicle crossings to private ways shall be designed and constructed in accordance with Clause 3.3.19 and Drawing D3.1.6 (Urban Residential).

Surfacing requirements shall be in accordance with clauses 3.2.13.2, 3.4.9.8 and 3.4.10.

Urban Residential Private ways

Urban residential private ways are to be in accordance with the relevant District Plan (see Appendix 3A: Transportation Corridor Hierarchy Tables).

The minimum permitted inside radius of curves shall be 9.0 m. The gradient shall not exceed 1:6. Where the gradient exceeds 1:6, any safety provisions required by Council shall be provided. A passing bay shall be provided at every 75m of private ways.

Industrial Private ways

a) The minimum carriageway width for an industrial private way serving a single lot is 4m. For an industrial private way serving two or more lots the minimum carriageway width is 6.4m. Berm widths each side are to be 1.8m minimum. The minimum permitted inside radius of curves is 12m.

Rural Residential Private ways

a) For rural residential private ways serving ≤ 4 lots and ≤ 250m in length, the total minimum permitted sealed carriageway width is 3.5m, with the total width of the private way a minimum of 7.0m.

b) For rural residential private ways serving ≥ 5 lots or ≥ 250m length, the total minimum permitted sealed carriageway width is 4.0m, with the total width of the

private way a minimum of 7.5m. The crossfall shall be 1:25. A passing bay should be considered.

3.3.12 Road Pavement

Pavements shall be provided to all roads such that vehicle loads may be carried without distress, in all weathers, for at least the design life with only normal routine maintenance and periodic re-surfacing. Pavements shall generally be flexible granular pavements with thin surfacing layers, however where this is not sufficient or a more innovative solution can be implemented, it may be approved by Council.

Stabilisation additives are not permitted in new pavement construction, unless specifically agreed to by Council.

3.3.12.1 Pavement Design

A pavement design may be carried out by one of the following methods:

Sealed Pavement - Specific Design

This method shall be used for all industrial and high volume (over 3000 vpd) residential roads. It may be used for roads of lower classification.

Pavement design shall use the methodology of Austroads Guide to Pavement Technology, Part 2 and the NZ Supplement to the Austroads Pavement Design Guide.

Designs for local roads may also use Austroads Pavement Design for Light Traffic.

Use of alternative materials such as recycled aggregates or the treatment of lower grade material is encouraged. The use of stabilisation agents may be considered by Council for subgrade and sub-base improvement, but not basecourse stabilisation.

Factors to be included in the design are:

a) Design Period - 25 years

b) Trips generated per household per day - 10

c) Annual HCV growth factor - 3 % minimum unless otherwise outlined by Council

d) Load factor the Presumptive ESA/HCV of 1.44 shall be used for design purposes unless otherwise outlined by Council.

e) % HCV 1.5% local residential road/3.5% collector and higher classification/10% industrial and 9% rural roads

The design report shall provide the following information as a minimum.

- Results of soils investigations
- Design assumptions and figures
- Material specifications
- Engineering Drawings
- QA measures for construction

Sealed Pavement - Default Design

This method may be used for local residential roads only. Using this design does not exempt the construction from any tests nor compliance with any targets and does not provide any guarantee that the resulting pavement will comply with all testing requirements. Pavements shall comply with the depth and aggregate specified in the following table.

Table 3-6: Pavement Layer Thickness for Local Residential Roads

ROAD TYPE	SUBBASE	BASECOURSE	NOTES
Cul de sac	N/A	150mm GAP 40	(ESAs 100,000)
Local Road (< 800 vpd)	125mm GAP 40	100mm NZTA M/4 AP40	(ESAs 250,000)
Local Road (800 – 3000 vpd)	125mm GAP 40	125mm NZTA M/4 AP40	(ESAs 500,000)

These typical designs are based on an insitu subgrade having a soaked CBR of 15 over the full depth. If the insitu subgrade does not achieve this strength then it may be improved by undercutting to a minimum depth of 600mm and replacing with an imported subgrade of pit sand, brown rock or other material supplied then compacted to achieve the required CBR value.

If a subgrade of 600mm depth and CBR 15 is not practicable, a specific dkesign will be required as per 3.2.12.1 i) Specific Design.

Unsealed Pavements

Unsealed pavements shall be compacted with a minimum compacted thickness of 300mm of well graded granular material with a minimum soaked CBR of 20. The maximum particle size shall be no greater than 100mm. This pavement material shall have sufficient fines to ensure that it does not unravel under the action of traffic. A material typically used on district unsealed roads is a high grade granular rock but will vary depending on locality. A 50mm minimum compacted thickness wearing course shall then be constructed using GAP20. The standard camber of unsealed pavements shall be 1:20-1:17.

3.3.13 Road Surfacing

All carriageways must be surfaced with either a chip seal or asphaltic concrete, but must be consistent with adjoining surfaces. Interlocking block paving or concrete will be considered on a case by case basis, the final surfacing type to be approved by Council.

Asphaltic concrete (type to be approved by Council) is required on industrial roads, roundabouts, urban arterial roads, all cul-de-sac turning circles and any other site subject to high turning movements. On cul-de-sac heads, asphalt shall be applied until the carriageway becomes a constant width.

3.3.13.1 Chip Seal Surfacing

The first coat shall be a two coat 3/5 chip seal for most residential roads. A further coat of chip seal must be applied between 3 and 18 months later as part of the project cost. If the second coat seal is going to be applied more than 12 months later, the defects liability period will need to be extended. Other chip seal designs may be considered and approved by Council.

3.3.13.2 Asphaltic Concrete Surfacing.

Asphaltic Concrete may be used as an alternative surfacing to Chip Seal. There are stricter requirements for pavement stiffness if asphalt is to be used. Selection of an appropriate mix for arterial and industrial sites is to be agreed with Council. For further details and requirements see clause 3.4.7.4.

Alternative asphaltic concrete products, such as Stone Mastic Asphalt (SMA) or Open Graded Porous Asphalt (OGPA), may be used with Council approval.

3.3.13.3 Concrete Block Paving

Concrete block pavers shall not be used without specific approval from Council. The concrete block pavers shall comply, and laying shall be in accordance with, NZS 3116 'Concrete segmental and flagstone paving'.

Pavements in NZS 3116 titled 'Light vehicular' are not acceptable for road surfacing.

3.3.14 Road Drainage

3.3.14.1 General

All roads shall be provided with facilities for the collection and disposal of both stormwater and subsoil water suitable to cope with the stormwater level of service for the area. Refer Stormwater Section 4 Table 4.7. Designs shall consider the following factors:

a) Groundwater recharge through soakage systems

b) Quality of water discharged to receiving environments either directly or via connection to an existing piped network

c) Requirements of the Waikato Regional Council

d) Overland flow paths. Generally urban and industrial roads should be lower than adjoining land and rural roads higher than surrounding farmland.

e) Water discharged from adjoining land (including current and future land use)

f) Public safety

g) Minimising of future maintenance requirements

h) Capacity of any existing piped network

i) Cyclists

j) Reduction of peak discharge rate

k) The depth of water in secondary flow paths should not exceed the flotation depth of vehicles of 150mm (see Clause 3.2.14.8).

3.3.14.2 Kerb and Channel, Vertical Kerb and Island Kerb

All profiles are to be founded on the subgrade with a CBR of at least 15. Where pavement depth is greater than 150mm, the profile shall be laid on a minimum of 75mm of compacted GAP40. For kerbs with tight radii (<5 metres), or carriageway narrower than standard, 'Heavy Duty Kerb and Channel' shall be used. Refer to Drawing D3.3.3.

Urban Roads

a) Kerb and channel shall be provided on both sides of the carriageway in all urban areas unless swales and raingardens are proposed. Refer Clause 3.3.14.11. Kerb and channel will only be required on one side of the road with a single crossfall.

b) Mountable kerb and channel is not permitted in built up areas

c) Subsoil under-channel drains shall be provided along kerb lines including medians, roundabouts and traffic control islands as shown on the Drawing D3.4.1 except where it can demonstrated that they are not necessary (e.g. where the underlying soil has a high porosity or at high points in the topography)

d) Additional subgrade drainage may be required

Industrial Roads

Any road, street or lane constructed within an industrial zone (as specified in the relevant District Plan) shall be designed to meet the geometric standards for arterial roads, and incorporate industrial kerb and channel in accordance with Drawing D3.3.3.

Rural Roads

a) Kerb and channel shall be required where necessary to control stormwater runoff. Generally it may be considered for construction adjoining cut and fill batters to control potential scouring of the water tables and embankments.

b) Subsoil drains shall be installed adjoining all cut batters.

Refer to Drawing D3.4.1.

3.3.14.3 Dish Channels and Depressed Kerb and Channel

Dish channels are not to be used in carriageways. Where drainage is required for bus or parking bays a depressed kerb and channel should be used. The design profile should be the same as Commercial Channel Crossings, shown on Drawing D3.3.2.

For dish channels within footpaths or accessways, these are to be founded on subgrade with a CBR not less than 7. Refer to profiles in Drawing D3.3.3.

3.3.14.4 Slot Drains

Slot drains are not to be used in greenfield developments. However they may be accepted for use in brownfield areas. The use of surface channels and catchpits is more desirable. Slot drains can be used to cater for vehicle break over angles. Refer to Drawing D3.3.7.

3.3.14.5 Catchpits

Catchpit spacing and location shall be designed to the following criteria:

a) Catchpit spacing is to have a:

(i) Maximum gross area drained (carriageway, berm and footpath) = 900m²

(ii) Maximum area of carriageway drained = 450m²

(iii) Maximum of = 90m

(iv) Maximum where stormwater from private houses connect to kerb and channel = 60m

b) Preferred location of catchpits:

(i) At intersections, at the kerb line tangent point

(ii) Upstream of pedestrian crossing points or cycle crossing cutdowns

(iii) At changes of gradient on steep roads

(iv) Cul-de-sac heads

(v) Mid lot, to avoid vehicle and pedestrian crossing points or cycle crossing cutdowns.

c) A double catchpit is required:

(i) At the lowest point in a sag vertical curve

(ii) At the ends of a cul-de-sac where water falls to the end

(iii) On all channels where the gradient is steeper than 1:20.

d) Catchpits in swales require a specific design

e) Catchpit grates will be cycle-friendly designs as per Drawing D4.8.

Catchpits shall be of the type referred to in the Stormwater Section 4 (Clause 4.2.10).

3.3.14.6 Batter Drains

Batter drains shall be located outside of the transport corridor. Refer to Drawing D3.4.1.

3.3.14.7 Subsoil Drains

Unless specified otherwise or agreed to by Council, piped subsoil drainage shall be provided to protect road formations from deterioration or loss of strength caused by a high water table and as part of swale stormwater systems. Design shall be in accordance with NZTA specifications F/2 and F/5. Refer to section 3.3.19.3 of NZS4404 for more details.

All piped subsoil drains shall discharge by gravity into a suitable component of the public stormwater system or approved discharge point.

For typical details of subsoil drains see Drawing D3.4.1.

3.3.14.8 Sub Drain Outlet

Subsoil and batter drain outlets shall be to catchpits or manholes.

In rural situations, where no catchpit is available, the outlet shall be anchored.

3.3.14.9 Side Drains and Water Tables

Rural roads shall have normal crossfall to side drains/water tables formed on each side of the carriageway except where the road is on embankment above adjacent land without available formed drains. In such cases, the road may be designed so as to provide for sheet run-off to the adjacent land surface provided natural pre-existing drainage patterns are not altered.

For all situations where side drains are required they shall be sized to suit the flows discharging to them. Side drains shall be intercepted at regular intervals and discharge via open drains or pipes to an appropriate discharge point. All discharge points shall

have outlets protected from scour and shall be located to minimise the risk of slope instability.

The discharge of stormwater shall not be allowed to cause damage to the receiving property. The discharge of concentrated stormwater shall be in a 'secondary flow path' easement and be subject to the approval of affected properly owners. Natural or non-concentrated stormwater shall be shown to be neither diverting catchments nor significantly changing peak flows or flow patterns.

Where side drains and water tables can't safely channel the stormwater flows, kerbs will be required.

3.3.14.10 Secondary Flow Provisions

At all points where sump blockage may occur or where design capacity may be exceeded, which could lead to overflow into private property, the provision of designed secondary flow paths protected by public ownership or easement shall be made. Refer to Stormwater Section.

The design of roads that facilitate stormwater overland flow within the carriageway require a design methodology that does not result in ponding areas greater than 150mm deep in a 2% ARI. For more information on overland flow path design, refer to Stormwater Section, clause 4.2.3.4.

The stormwater design for developments may use the road as a secondary flow path and therefore requires to be designed for 1% ARI.

3.3.14.11 Swales and Stormwater Sensitive Discharge Techniques

Berms, swales, rain gardens, and other low impact stormwater sensitive discharge shall be of a sufficient width to allow for adequate growth any plants and ease of maintenance, refer to Stormwater Section for specific guidance on stormwater devices

Stormwater devices are to be located in the berm area. The berm must be of sufficient width to accommodate the devices, utility services (if needed), plant growth and to allow for maintenance. Unless specifically approved by Council, swales shall not be located in the centre of the road.

It is essential that swales in urban areas are carefully designed so that they do not detract from amenity values and can be readily maintained.

Vehicle, pedestrian and cycle crossing points need to be defined and provided for as part of the swale design and construction. Consideration should be given to provision of traversable side slopes for safe passage of errant vehicles in the event of a crash.

3.3.14.12 Road Culverts

Catchment discharge shall be designed in accordance with the Stormwater Section and any applicable Regional Council rules and consent conditions.

Refer to the NZTA's Bridge Manual (SP/M/022) for waterway design at bridges and culverts.
All culverts parallel to the road shall have compliant traversable culvert safety ends installed to eliminate culvert end and headwall snagging hazards. Refer to NZTA Specification M23 : Road Safety Hardware (including interim acceptances).

3.3.15 Parking

3.3.15.1 General

The transportation corridor should be designed to accommodate the parking requirements contained in the relevant district plan. Alternative widths and layouts may be suitable where provision for parking in defined areas is clear of the through traffic.

Where on-road cycle lanes are immediately adjacent to this parking/passing area, additional width shall be provided in accordance with the NZTA Cycling Network Guidance – planning and design.

Parking bay pavement shall be constructed to the same standard as the road. Crossfall requirements are the same as for the carriageway.

3.3.15.2 On Road Parking - Transportation Corridor

The provision of on road parking is valued by motorists. For the parking requirements of a given road corridor, refer to the relevant district plan.

See Drawing D3.1.8 for the layout of road parking areas. Parking provisions for motorcycles shall be considered in areas where activities in adjacent properties are likely to generate high on-street parking demand for this type of vehicle.

For inset parking bays, the minimum radius for the kerblines in the parking area shall be 5m.

3.3.15.3 Cul-de-sac Parking

To facilitate a clear movement lane, indented parking bays and parking in the middle of cul-de-sac heads may be considered.

3.3.15.4 Mobility Parking

Mobility parking spaces shall be designed according to NZS 4121: Design for Access and Mobility – Buildings and Associated Facilities.

A pedestrian cut down immediately adjacent to the mobility parking space shall be provided to facilitate safe and easy egress to and from the footpath.

Mobility spaces shall have a blue coloured surface and have the required line marking to define the space in accordance with the specifications set out in section 3.3.22 and in Drawing D3.9.4.

3.3.16 Footpaths, Pedestrian Accessways and Walkways

Footpath provisions are contained in the relevant district plan or in the absence of detail refer to Table 3.2 NZS 4404.

3.3.16.1 Location, Width, Crossfall and Grade

Except where otherwise allowed for in the relevant District Plan, footpaths shall be provided on both sides of the road and located in the centre of the berm. See Drawing D3.1.3.

Footpaths shall have the minimum clear width between obstructions such as signs and service poles.

In locations with high concentrations of pedestrians (e.g. shopping areas, outside schools and leading to schools, hospitals, halls or other places of public assembly) footpath widths require specific design in consultation with Council. Additional width may be required where angle parking adjacent to the footpath is anticipated.

Footpath crossfall shall typically be 1:100 sloping towards the kerb and channel. Localised footpath crossfall in the range of 1:50 to 1:33 may be permitted where levels make the typical crossfall impractical. Crossfall on footpaths in high pedestrian use areas such as shopping centres should be 1:100 or less.

Where footpath gradients are steeper than 1:12, a non-skid surface shall be provided. The maximum gradient for any footpath shall be 1:8; otherwise alternatives such as a "zig zag" will need to be used. Where gradients are between 1:12 and 1: 8 and exceed 9 m in length, then a 1.2 m square flat section shall be provided at 9 m (maximum) intervals.

Footpaths shall not be depressed or raised by vehicular crossings[3] unless adjacent to the kerb – refer D3.1.4. Footpaths shall have a continuous surfacing treatment across the vehicle crossing.

New footpaths shall be constructed in concrete unless specified otherwise in a plan, strategy, policy or other document endorsed by Council.

No coloured additives shall be used.

3.3.16.2 Pedestrian Cut-downs

Pedestrian cut-downs shall be provided at all road intersections and pedestrian crossing facilities. The crossings shall be sited to facilitate desirable pedestrian, wheelchair and mobility scooter movements across the road and where possible drainage facilities shall be sited to reduce the flow of stormwater in the channel at the crossing entrance.

Pedestrian cut downs shall satisfy the NZTA Pedestrian Planning and Design Guide with particular care taken to ensure:

a) There is no vertical up stand at the face of the kerb and channel within the pedestrian cut down

b) Longitudinal and transverse gradients of the footpath and road adjacent to the pedestrian cut down are minimised in order to facilitate ease of access by users – especially for those in wheelchairs

c) Break over angles for mobility devices through the crossing point do not create facilities that are unsafe for or not traversable by these devices. Refer to Drawings D3.3.2 and D3.6.2

3.3.16.3 Pedestrian Accessways

Accessways may be provided to link one road to another in order to improve pedestrian and cyclist access. These are to be provided as a last resort where they cannot be eliminated through revised road layouts. They are not a substitute for good design.

[3] The crossing area must be built to the appropriate crossing specification.

Pedestrian accessways shall be designed in accordance with NZS 4404 Section 3.3.11.1. In addition, they shall also include:

a) A sealed shared footpath/cycleway that is a minimum of 3.0 m wide

b) If it is necessary to incorporate steps into the access way, a ramp shall also be provided that is suitable for use by wheelchairs, mobility scooters and cyclists. Refer 3.3.16.1 for grades appropriate to these users.

c) Barriers may be required to manage speeds and potential conflict points.

3.3.16.4 **Walkways**

Rural residential subdivisions should make provision for pedestrian access along grass berms.

3.3.17 Facilities for Vision Impaired Pedestrians

Facilities for visually-impaired pedestrians (i.e. TGSI - tactile pavers) shall be installed in accordance with the NZTA Specification RTS14 : Guidelines for Facilities for Blind and Vision–Impaired pedestrians at:

a) Crossing points at Arterial or Collector Roads, including pedestrian throat islands, refuge islands and median islands

b) Other points where significant numbers of pedestrians cross an access way or side road

c) Railway crossings

d) Signalised intersections and signalised pedestrian crossings

e) Zebra crossings

f) Other areas of high pedestrian activity such as shared zones, pedestrian malls, shopping centres and bus stops

Refer Drawing D3.6.3 for minimum requirements.

3.3.18 Cycle Facilities

Cycling facilities shall be provided in accordance with the relevant district plan, and on any other route identified in a structure or other cycling plan as part of a primary or secondary cycling route. Such facilities may be a marked on-road cycle lane, a shared off-road cycleway/footway or a dedicated cycleway.

Provision for cyclists should be in line with Austroads Guide to Road Design, Part 6a: Pedestrian and Cycle Paths and the NZTA Cycling Network Guidance.

Off-road facilities designed for use by cyclists, either exclusively or shared with pedestrians shall have a minimum width in accordance with the relevant district plan, if appropriate. Off road cycle ways or shared paths shall have a maximum gradient of 1:8, and have a minimum lateral clearance of 700mm and minimum overhead clearance of 2.5m from any fixed object (including trees).

Cycle lanes or cycleways shall be surfaced with either concrete or asphaltic concrete. Interlocking block pavers are not suitable for cycling except as entry treatments or similar short lengths.

On road cycle lanes shall be marked to NZTA's Traffic Control Devices Manual and Drawings D3.9.1 and D3.9.2.

3.3.19 Vehicle Crossings/Entrances

3.3.19.1 General

The vehicle crossing design must allow vehicles to use the crossing without scraping while preventing stormwater entering the vehicle crossing/driveway from the street.

3.3.19.2 Residential Vehicle Crossings

The crossing shall be shaped to prevent stormwater from the road running down the driveway onto private property. No water from an adjacent property shall be allowed to discharge across the berm to the carriageway. A freeboard of 200mm shall be provided (i.e. height above the channel or pavement edge) to contain stormwater on the road unless it can be shown that such a condition is impractical and stormwater will not enter property vehicle crossings/driveways as a result.

Vehicle crossings shall be provided between the edge of the carriageway and the road boundary at the entrance to all private ways, lanes and to any lot at the subdivision or development stage.

Where there are multiple access points at the subdivision or development stage, crossings shall be left to be constructed at the building consent stage.

The number and location of vehicle crossings shall be in accordance with the requirements of the relevant District Plan.

Vehicle crossings shall be designed to enable the 99th percentile car to use them to ensure break over angle does not cause grounding any part of the vehicle. Refer NZTA Traffic Note 48 Light Vehicle Sizes and Dimensions - street survey results and parking space requirements. Also refer to Drawing D3.3.1.

Pavement design shall be adequate to carry the expected load over its design life, including heavy vehicles during construction. Refer Drawings D3.3.2 and D3.3.5.

Vehicle crossings shall be designed in accordance with the NZTA's Pedestrian Planning and Design Guide to accommodate the needs of pedestrians such that the footpath is continuous through the site (Refer to Drawing D3.3.1). Vehicle crossings shall not interfere with the profile of the footpath or the berm except that minor filling may be permitted between the property boundary and the footpath. Retaining walls or structures are NOT permitted to encroach onto the berm and no lowering of the berm is permitted.

Vehicle crossings shall be surfaced with concrete or asphalt to match the adjacent footpath surfacing. Where there is no existing footpath the crossing may be surfaced with either concrete or asphalt. In all cases, a construction joint shall be provided at the property boundary.

The crossfall of the vehicle crossing shall be towards the kerb and channel.

Any redundant vehicle crossing to a property will be removed at the time of contructing a new entrance into that property.

3.3.19.3 Commercial and Industrial Vehicle Crossings

All lots in areas zoned for commercial or industrial activity and all developments in other zones for commercial or industrial activities must have an industrial standard crossing. Dimensions and construction details are provided in Drawing D3.3.2 and D3.3.5

For wide commercial vehicle crossings in areas of moderate to high pedestrian use, consideration shall be given to reinforcing the priority of the footpath over the crossing. Use of different surfacing types and colours or other measures may be appropriate.

3.3.19.4 Rural Vehicle Crossings/Entrances

Vehicle crossings shall be provided between the surfaced road edge and the lot boundary at a defined and formed access point to every rural lot. The design should ensure that uphill entrances are not graded towards the edge of seal and flush debris on to the road and create a danger to cyclists and motorcyclists. The crossing shall be sealed to the road boundary and to a standard not less than that of the adjacent road surface. If the access slopes up from the road the crossing shall be sealed to a minimum distance of 10m from the edge of the carriageway.

The design, including visibility and sight lines, shall be in accordance with NZTA Guidelines RTS 6. If traffic volumes entering or exiting the driveway exceed 40 HCV per day, or HCV's represent more than 1:5 of the vehicle manoeuvres, or the location of the driveway is affected by vertical geometry (i.e. located near the crest of a curve), then specific design will be required to demonstrate that the driveway is located such that the safe operation of the adjacent road is not affected. See Drawing 3.3.4 for dimension and construction details

The crossing shall not obstruct any drainage facilities within the berm. Where the drain is shallow and only carries low rain flow, the crossing may pass through the drain. Where the drain is of an unsuitable shape or carries significant rain flow the drain shall be piped under the crossing.

Pipes and end treatments shall be sized appropriately for the catchment intercepted but shall be a minimum of 300mm diameter with compliant traversable culvert safety ends to minimise safety risk eliminate culvert end and headwall snagging hazards. Refer to NZTA Specification M23: Specification for Road Safety Hardware (including interim acceptances). The drain may be moved closer to the boundary to allow the vehicle crossing to be shaped as necessary to ease access into and out of the adjacent property. Rural crossings shall be designed so that access is available for the largest vehicle that is likely to access the site and for the control of stormwater and debris run-off.

3.3.19.5 Bus Stops and Shelters

Bus stops shall be provided on all bus routes, both existing and planned. The bus routes are determined by the Waikato Regional Council, Public Transport Unit. During the design phase, the location and design criteria for bus stops shall be confirmed with the relevant Council and the Waikato Regional Council Public Transport Operations Manager.

Bus stops and shelters shall be designed to NZTA Guidelines for Public Transport and Infrastructure and Facilities, with the following amendments or emphases.

Numbering refers to clause numbers in the ARTA document.

Table 3-7: NZTA Guideline amendmetns or emphases

2.1.2	Bus bays shall cater for 13.5m buses. Articulated buses are not currently in use in the Waikato. Appropriate road use controls shall be applied to allow buses to move safely and conveniently into and out of the stop such that the bus can stop parallel to and close to the kerb.
2.2	All bus stops shall be fully accessible. New bus stops shall have a kerb height between 150mm to 180mm at lip of channel above the road surface, over the full length of the bus stop. The kerb height shall allow the ramp from the bus to sit at a grade of 1:12 (max). Existing bus stops shall be progressively improved to meet the requirement.
3.2	New bus stops shall be sited such that houses along the route are within 400m of a bus stop.
4.1	Litter bins are required only at 'signature' stops
	Real time information displays are to be mounted on a separate pole.
	'Standard' type bus stops shall be used on the outward journey where there is no Orbiter route transfer or stop.
	'Regular' type bus stops shall be used on the inward journey and where there is an Orbiter route transfer or stop.
	'Signature' bus stops shall be used at very high usage locations as determined by Council
4.4	The bus stop sign shall be attached to a standalone pole with the RP-5 parallel to the road and a supplementary sign perpendicular to road (facing the pedestrian).
	If a bus stop pole is being installed on the Orbiter route, a 2.4m pole shall be installed to cater for the Orbiter sign (supplied by WRC).
	Signs must be located sufficiently back from the kerb line to avoid being hit by a bus and in a location to avoid nuisance to footpath users and bus patrons.
4.4	Bus shelters shall be installed at all inward bus stops and all Orbiter journey bus stops. Priority for installation of shelters at existing bus stops includes:
	Number of users per day.
	Use by vulnerable users (school children, elderly or those with wheelchairs or mobility scooters).
	Exposure to weather elements (rain, wind, sun).
	The shelter design including size, shape, location and materials shall be as agreed with Council. Generally, shelter colour shall be consistent with existing shelters. See Drawings D3.8.13, D3.8.14 and D3.8.15.
4.4	Seats and leaners shall be provided where appropriate at the direction of Council.
5	Bus stops shall have a suitable bus tracking path into and out of the bus stop. Desirably, an 18m entry taper and 9m exit taper. These areas cannot have vehicles parked in them at any time, but can consist of intersections, driveways, crossings and cycle lanes.
5	Bus boarders (half and full) should be considered in circumstances where parking is in high demand, speed limit is at or below 50km/h or where traffic calming measures are deemed desirable.

3.3.20 Road Lighting Design

3.3.20.1 Introduction

This section sets out the requirements for the design, construction, approval, auditing, upgrade and maintenance of the Council's road lighting network.

The Council recognises that the correct level of road lighting is important for the safety and well-being of the community and this document provides the guidelines to achieve the following elements of good lighting design:

- Enable safe and convenient movement of vehicles, pedestrian and cyclists
- Minimise glare, spill lighting and sky glow
- Reduce likelihood of criminal activity at night using CPTED principles
- Reduce energy consumption
- Reduce maintenance cost

This document represents the minimum standards that are acceptable to Council. It is a requirement that any new lighting installations shall:

- Meet the minimum performance standards referred to in this document
- Provide lighting to meet the requirements of AS/NZS 1158 Series.
- Recognise the need to maintain the level of lighting within design levels at minimum cost.
- Utilise equipment that will be available for the foreseeable future such that replacements and spares will be readily available.

These guidelines are not meant to provide a template for the physical road lighting design, but rather to identify and help to meet the design objectives related to the implementation of energy efficient lighting and effective maintenance processes. They are supplementary to the standard AS/NZS 1158 : Lighting for Roads and Public Spaces. Where a conflict exists between any Standard and the specific requirements outlined in this document, the Designer shall seek clarification from the Council.

All new lighting will be LED.

3.3.20.2 Specifications, Regulations and Codes of Practice

The work shall be undertaken in compliance with all statutory requirements including and not limited to the relevant standards and other documents listed in Clause 3.1.2.

3.3.20.3 Scope

Road lighting shall be provided on all urban roads (walkways/cycleways) and service lanes that are, or will be, under the control of the Council. See 3.3.20.18 for walkway/cycleways.

All lighting shall be designed and installed in accordance with AS/NZS 1158.

Designs shall use equipment and materials as noted in this document to ensure whole of life costs for Council are kept to a minimum.

3.3.20.4 Design Brief

In general new lighting shall blend in with adjacent road lighting, complement the neighbourhood character and, as far as is reasonably practicable, minimise the impact on the neighbouring properties and environment with regard to aesthetics, glare and spill light.
In rural areas where design speeds are greater than 80 kph, slip-base frangible approved lighting columns shall be used.

3.3.20.5 Designer

The lighting design must be carried out by qualified and experienced professionals.

The Designer must:

- be conversant with AS NZS 1158 standard and this document
- have at least $1m professional indemnity insurance
- provide a Design Statement

3.3.20.6 Lighting categories

Refer to the Council's roading hierarchy in the District Plan (see Appendix A) has been correctly determined before proceeding with any lighting designs.

Category V (vehicles) is applicable to arterial roads (high volume of vehicular traffic) on which the visual requirements of motorist are dominant. It should also provide a safe environment for pedestrians/cycle traffic at night and discourage criminal acts. The lighting category shall be selected using the charts in AS/NZS 1158.1.1.

Category P (pedestrian area lighting) is applicable to:

- collector and local roads (road reserves)
- walkways
- cycle ways
- public activity areas
- outdoor carparks

The major purpose of Category P lighting is to assist pedestrians to orientate themselves and detect potential hazards. The lighting may also be used to discourage crime and the principles of "Crime Prevention through Environmental Design" (CPTED) should be considered. For example, the layout and design of urban areas can either discourage or encourage feelings of safety for users. Discouraging designs include poor lighting or dark narrow alleyways. Encouraging designs include well-lit footpaths and bus/train stops, open parks (observable from surrounding streets) etc.

The following table provides an informative guide to determine the road hierarchy. It shall be read in conjunction with AS/NZS 1158.1.1 and AS/NZS 1158.3.1 in order to determine the appropriate lighting category:

Table 3-8: Road hierarchy

ROAD HIERARCHY	TRAFFIC COUNT / ADT	LIGHTING CATEGORY
Arterial (Primary and Secondary)	>6,000	V1, V2, V3
Collector (Primary and Secondary)	3,000 - 6,000	V4

ROAD HIERARCHY	TRAFFIC COUNT / ADT	LIGHTING CATEGORY
Collector (Primary and Secondary), Industrial, Local (Access)	1,000 – 3,000	P3
Local (Access), Cul-de-sac	<1,000	P4

3.3.20.7 Energy Efficiency

The lighting design must maximise the spacing between columns by optimising mounting height, luminaire type and lamp output.

The following are guidelines for typical lighting schemes with satisfactory energy efficiency outcome. It is Council's expectation that the lighting designer will evaluate other elements of installation geometry and select the most energy efficient option.

Table 3-9: Guidelines for typical lighting schemes

LIGHTING CATEGORY	MOUNTING HEIGHT (M)	LED (W)	WATTAGE	WIDTH (M)
Cat P	6-8	20-60		18-24 (road reserve width)
Cat V	8-12	60-180		10-20 (carriageway width)

3.3.20.8 Column Location

Column location is subject to vehicle speed limit.

For residential areas, columns shall be located generally in accordance with the following criteria:

a) Columns should be positioned in the grass berm, a minimum of 1m behind the front face of the kerb. All columns in a section of road shall have the same offset from the kerb

b) Columns shall be sited on the boundary line between two properties and at least 1m clear of any driveway or accessways.

c) In new subdivisions and developments, lighting column positions must be located first to provide the correct lighting levels in accordance with AS/NZS 1158. Only then should trees be located. Trees shall not be within 8m of any lighting column. This measurement is taken from the trunk of the tree.

d) Column offset and location for intersections, bends, road humps and roundabouts is to comply with relevant requirements of AS/NZS 1158.

e) Pole clearances from overhead low/high voltage conductors shall comply with requirements of NZECP 34.

3.3.20.9 Traffic Management Devices

Design the lighting of traffic management devices to support the purpose of the device and to meet the requirements of the relevant AS/NZS 1158 Standard for Category V or Category P lighting.

3.3.20.10 Pedestrian Refuge Islands

All mid-block pedestrian refuge islands are to be lit by dedicated lights if the current road lighting levels are not providing the required lux levels of the selected lighting category as specified in AS/NZS 1158.

Dedicated lighting for pedestrian refuge islands is shown on Drawings D3.11.1 and D3.11.2 and D3.6.4.

3.3.20.11 Pedestrian Underpasses

Pedestrian Underpasses shall be lit to an appropriate 'P' lighting category. All luminaries shall be resistant to vandalism with an impact rating of IK08 or better. All wiring shall be concealed with no cabling in surface mounted conduits. Circuits shall be designed so that the underpass lighting provides a 24hour power supply independent of the street light circuit. LED lighting must be used.

3.3.20.12 Pedestrian Crossings

Pedestrian crossing lighting shall be designed to AS/NZS 1158, Part 4. Luminaires with specific photometric distribution must be used.

Belisha beacons or reflective orange discs and white supplementary floodlighting are required at all crossings.

The general layout of lighting for pedestrian facilities is shown on Drawings D3.11.1 and D3.11.2.

All pedestrian lighting poles specified to be 'fold-down' poles shall have the following:

a) Hinge located 150mm from existing ground level

b) Be electrically safe whilst folded.

c) Latches and safety catch in accordance with Drawing D3.12.2 (as for traffic signals)

A lockable switch to enable the lights to be operated during day time may be specified when school patrols are likely to operate at the pedestrian crossing.

3.3.20.13 Flag Lighting

Lighting of an isolated intersection on an otherwise unlit route with an AADT of >1000, shall be evaluated/designed in accordance with AS/NZS 1158 Parts 1.1 and 1.3, and NZTA Specification M30 Road Lighting guidelines. Additional consideration shall be given to roads that are designated for traffic detours from main highways.

3.3.20.14 Amenity lighting

Lighting for decorative purposes (e.g. up-lights, feature lights) is not permitted in new subdivisions.

3.3.20.15 Under verandah lighting

Where under-verandah lighting is a Council asset, the impact on such lighting shall be considered during any demolition or development work on the building shall be carried out in such way that existing under verandah lighting in the vicinity shall remain connected and operational.

As built drawings of new or altered connections shall be submitted to the Council. Any replacement of under verandah lighting will use LED fittings.

3.3.20.16 Private road lighting

Lighting on private roads or ROW is preferred, however will only be permitted if the luminaires are on a separate metered circuit and a charging agreement is set up with owners and a power supply company.

These lights will not be the Council's asset and the maintenance of these lights will be the owner's responsibility.

The installation of privately owned road lights will not be permitted on public road reserves.

3.3.20.17 Carpark lighting

For pedestrian safety and security, all outdoor public carparks must be illuminated in accordance with AS/NZS 1158 requirements for Category P.

3.3.20.18 Walkway/Cycleway lighting

The minimum requirement is a light at each end of the walkway/cycleway to illuminate the end sections. These lights can be located in the adjacent road reserves provided that they:

a) Operate as a 'good neighbour';

b) Are mounted at a sufficient height to prevent vandalism.

For walkways/cycleways that are not straight or fail to meet CPTED requirements, additional lighting will be required.

3.3.20.19 Design Drawings and records.

In order to demonstrate compliance and to allow accurate construction all engineering drawings and documents must show the following information:

a) The extent of the works showing existing and proposed roads and pedestrian areas.

b) Proposed and existing significant road features (e.g. kerbs, property boundaries, planting, trees, traffic management devices, bus stops, pedestrian refuge islands and driveway locations).

c) The road lighting layout showing the following:

   (i) Luminaire manufacturer, model and optic

   (ii) Outreach length and tilt angle

   (iii) Column manufacturer and type

   (iv) Luminaire mounting height

   (v) Column spacing

   (vi) Column to kerb offset

d) The lighting design details including:

   (i) Design Statement

   (ii) Computer calculations (LTP analysis information required by AS/NZS 1158)

   (iii) Luminaire photometric data (in IES or CIE format) including their origin and maintenance factor

(iv) If applicable, site visit records / notes regarding the vicinity of HV/LV overhead conductors

(v) Manufacturers' warranty period

3.3.20.20 Design Life

Lighting equipment, including columns, outreach arms, luminaires, LED lamps and coatings, shall be new and shall have the minimum design lives as set out in NZTA Specifications M26 and M30.

3.3.20.21 Manufacturer's Warranty Period

Minimum required manufactures warranty period from the date of on-site installation shall be as set out in NZTA Specifications M26 and M30.

The warranty must be transferable to the Council upon vesting.

3.3.20.22 Approved Columns

For V (Arterial / Collector) *category roads, all columns shall have the following:*

- Galvanised, non-painted steel octagonal columns, compliant with NZTA Specification M26 and M26A.
- Either curved or elliptical outreach arms.
- A corrosion protective coating in ground sections, extending 100mm above the finished ground level.
- Be ground planted unless shear base installation is specifically requested by the Council.

For P category (Local roads), *all columns shall have the following:*

- A steel column; finish can be galvanised, black or Brunswick green.
- Comply with the relevant NZTA specification M26.
- Cost of the proposed column to be no greater than 2.5 times cost of equivalent galvanised steel octagonal column
- A lead- in time that is no greater than 6 weeks
- Have either curved or elliptical outreach arm. Arch type are not permitted (bracket attached to top of luminaire).
- An opening for access to control gear no smaller than 100x150 mm fitted with a suitable waterproof cover or door. The opening shall be positioned 500-1200mm above ground level. The cover shall be secured by tamper proof bolts.
- A corrosion protective coating in ground sections, extending 100mm above the finished ground level.
- Be ground planted unless shear base installation is specifically requested by the Council.

3.3.20.23 Approved Luminaires

Luminaires shall be of the LED type and shall comply with the requirements of NZTA Specification M30.

The Council will accept only luminaire units from the NZTA Specification M30 approved list which meet the following criteria:

- Lead-in time for luminaire is no greater than 6 weeks
- Lead-in time for spare parts is no greater than 3 weeks
- Maximum total weight is no greater than 12 kg
- Initial Lumen to system wattage ratio is 90 or greater
- Power factor shall be 0.9 or greater
- An adjustable tilt/mechanism of +5° or -10° in incremental steps of 5° is desirable
- 3000 Kelvin luminaires to be used on both P and V category roads. Note that this deviates from that specified in NZTA specification M30 but approval has been given by the NZ Transport Agency for their use.

Refer to M30 for the latest list of accepted luminaires.

3.3.21 Special Vehicle Lanes

Where special vehicle lanes are required, they shall have appropriate signage, road markings and coloured surfacing.

Special Vehicle Lanes include the following:

a) Bus and electric vehicle lanes

b) Transit lanes - urban

c) High Occupancy Vehicle (HOV) Lanes

d) Cycle lanes

3.3.22 Traffic Control Devices – Line Marking and Signs

The design shall incorporate all required road marking, signs, and other facilities appropriate to the place and link context. Local roads should be designed to minimise the need for traffic signs and marking.

Designs shall satisfy the Land Transport (Road User) Rule, Land Transport Rule: Traffic Control Devices 2004, associated NZTA Traffic Control Devices Manuals, NZTA Pedestrian Planning and Design Guide and NZTA Cycling Network Guidance – Planning & Design Guide.

All proposed road markings, signs and other traffic control devices shall be shown on the plans and approved by Council.

3.3.23 Feature Entrance Walls, Berm and Street Furniture

The designer is to ensure that the resulting visual impact of walls, structures, street art, street furniture etc achieve good urban design visual outcomes. Refer to the relevant District Plan and any relevant policy and structure plan documents; early consultation with Council is encouraged.

3.3.23.1 Street Furniture

Seats, litterbins and other street furniture shall be designed and placed in accordance with any requirements of Appendix C or D.

Furniture used shall be compatible with existing street furniture, unless an alternative is specifically accepted by Council.

3.3.23.2 Feature Walls

Feature Walls are not permitted within the transportation corridor.

3.3.23.3 Berm Furniture

With the exception of approved litter bins, seats, fences and bollards, structures or features which are not part of signage or traffic control are not permitted in the Transportation Corridor, unless as part of a structure plan or in accordance with any relevant Council arts or other policy. Prior to installation and design, consultation is required with Council to ensure safety of road users is not compromised.

3.3.24 Safety Barriers

3.3.24.1 Pedestrian and Cycle Barriers

Where a footpath or other public access bounds or is adjacent to a steep bank, wall, culvert or other such feature, safety barriers for pedestrian and cyclists are necessary. All barriers shall comply with the design requirements of NZS/AS 1657 : Fixed Platforms, Walkways, Stairways and Ladders - Design, Construction and Installation and, where relevant, the New Zealand Building Code, Clause F4.

3.3.24.2 Vehicle Barriers

Alternative engineering measures that improve the information that road users receive from the road environment shall be considered prior to the installation of a roadside barrier include, but are not limited to:

a) Relocation or modification of hazardous objects

b) Marking of hazardous objects

c) Road geometry and pavement surface

d) Pavement markings

e) Reflective raised pavement markers

f) Street lighting

g) Permanent warning signs

h) Chevron sight boards

i) Frangible sight rails

j) Ground modelling and planting

Where safety barriers for vehicles in urban areas are necessary, they shall comply with the design requirements of NZTA RTS 11: Urban Roadside Barriers and Alternative Treatments.

Where safety barriers for vehicles in rural areas are necessary, they shall comply with the design requirements in AS/NZS 3845 : Road Safety Barrier Systems.

3.3.25 Fencing

Refer to Clause 3.4.12 or Landscape Section 7 for fencing requirement styles.

3.3.26 Trees and Landscaping

Refer to Landscape Section for details on trees and landscaping in transport corridor.

3.3.27 Structures and Underpasses

3.3.27.1 Bridges and Large Culverts

For any project where a bridge is proposed, the bridge concept plan must be discussed and agreed with Council before detailed design commences.

Bridges and culverts may require separate resource and building consents. All bridges and culverts shall be designed in accordance with the NZTA Bridge Manual (SP/M/022).

Particular features that are to be considered/covered in the design shall include, but are not limited to:

a) **Widths/lengths**

All bridges and culverts shall be designed with a width to accommodate movement lanes, cycle, and pedestrian needs of the road, in accordance with the relevant District Plan.

b) **Safety barriers**

The design of the structure shall provide for the installation and fixing of all suitable barriers to cater for the needs of pedestrians, cyclists and vehicles, including the interaction between the various modes.

c) **Batter slope protection**

All culverts shall have anti-scour structures to protect batter slopes, berms, and carriageways.

d) **Clearance over traffic lanes**

Where passing above traffic lanes, bridges shall have a full clearance height of 5.2m. The bridge shall be signed to highlight the maximum safe design vehicle height.

e) **Foundations**

All bridges and culverts shall be founded to resist settlement or scour. Abutments shall be designed to ensure bank stability and provide erosion or scour protection as applicable.

f) **Provision for services**

The provision of the structure for use as a service corridor shall be included in the design. This shall include consultation with utility providers to ascertain their current and future needs.

g) **Waterway design**

Refer to the Stormwater Section.

h) **Inspection and maintenance**

The design shall include provision of any necessary access facilities to and within the structure in order to undertaken inspection and maintenance activities.

i) **Provision for lighting**

All of the above features shall be documented in the Design and Access Statement submitted at the time of the Engineering plans.

3.3.27.2 Pedestrian Underpasses

Pedestrian underpasses may be required in locations where high traffic and risks to pedestrian safety has been identified and maybe required as part of a structure plan walking/cycling strategy/policy. Underpasses will be required to have adequate width and height and access provisions which allow full use of pedestrians, mobility scooters, wheelchair access, visually impaired pedestrians and cyclists. The Underpass is to have minimum internal dimensions of width 4m, and height 2.5m.

Underpasses will provide sufficient natural and artificial lighting so as not to create un-desirable dark places, designs must take into account stormwater disposal, and pumping stations are not permitted due to on-going maintenance issues.

Careful consideration to visual design outcomes is required; the design of wing walls, underpass structure, stairs, ramps etc., is to result in good urban design visual outcomes and compliance with CPTED principles.

Pedestrian underpass walls to be painted in 'Hit Grey' or other colour required by the relevant Council, and lighting shall be in accordance with the requirements set out in clause 3.2.20.11 above.

3.3.27.3 Retaining Walls

Retaining walls which are located within the Transportation Corridor will likely require a building consent; retaining wall designs which have been undertaken by a suitably qualified engineer will be required.

3.3.28 Traffic Signals

Traffic signal installations are to be designed in accordance with Austroads Guide to Traffic Management Part 10: Traffic Control and Communication Devices.

Refer also to Section 3.7 Traffic Signals.

3.3.29 Traffic Calming Devices

In order to achieve the desired design speed environment, traffic calming devices may be required within the transportation corridor. The Austroads Guide to Traffic and The Traffic Control Devices Manual and NZTA Speed Management Guide – Toolbox and Appendices should be used to guide development of these devices.

Standard details are provided for the following devices:

- Roundabouts – mini asphaltic concrete D3.10.1
- Raised pedestrian ramp D3.10.5 and D3.10.6

3.3.30 Over-Dimensional Vehicle Routes

The Council may specify over-dimensional vehicle routes in its transportation/traffic bylaws.

When completing any improvements or changes to infrastructure the clearance requirements for over-dimensional vehicles (and their loads) shall be taken into account. Reference shall be made to applicable standard and consultation undertaken with the Heavy Haulage Association to confirm appropriate provisions are provided.

3.4 CONSTRUCTION

This section covers the methods, specifications and materials to be used when constructing transportation assets.

3.4.1 Pavement Materials

Councils may have differing aggregate requirements and these will need to be confirmed prior to design.

All materials shall be approved by Council prior to their use.

3.4.1.1 Pit Sand

Imported sand used in the formation of the lower sub-base pavement, footpaths, shared paths and paved areas, shall be 'run of pit' sand, free of organic matter and well graded. It shall be made up of clean particles of silica or hard stone containing minimal silts, clays, and pumices. This also applies to the pit sand if used as imported subgrade for concrete work.

3.4.1.2 GAP Aggregates

The GAP aggregate shall comprise crushed aggregate and must be free of all non-mineral matter.

The crushing resistance shall be not less than 100 kN when the aggregate is tested according to NZS 4407 Test 3.10 'The Crushing Resistance of Coarse Aggregate under a Specified Load'. An aggregate shall be considered to have met the requirement if the sample produces less than 10 percent fines when loaded so that the specified peak load is reached in 10 minutes.

In this case, the test shall follow the standard method in all other respects. If the aggregate passes the test, it shall be reported as having a crushing resistance 'greater than (the load specified)'.

The aggregate shall have a quality index of AA, AB, AC, BA, BB, CA or CB when tested according to NZS 4407 Test 3.11 'The Weathering Quality Index of Coarse Aggregates'.

The sand equivalent shall not be less than 25 for carriageway pavement metal when the aggregate is tested according to NZS 4407 Test 3.6 'The Sand Equivalent'.

Where the GAP20 is to be used on the footpath the sand equivalent shall not be less than 25 when tested according to NZS 4407 Test 3.6 'The Sand Equivalent'.

Grading Limits

When tested according to NZS 4402 Test 2.8.2 'Subsidiary Method by Dry Sieving', or Test 2.8.1 'Preferred Method by Wet Sieving' where aggregates contain clay or other fine material causing aggregation of the particles, the grading of the aggregate shall fall within the respective envelope defined in Table 3-10.

Table 3-10: Gap Aggregate Grading Limits

	PERCENTAGE PASSING		
TEST SIEVE APERTURE	GAP 65	GAP 40	GAP 20
63.0mm	100		
37.5mm		100	
19.0mm	40-65	63-81	100
9.5mm		40-60	52-76
4.75mm		25-45	33-57
2.36mm		16-35	20-44
1.18mm		9-27	12-35
600 micron		5-20	7-25
300 micron	10 max	1-15	4-20
150 micron		10 max	12 max
75 micron		7 max	8 max

Grading Shape Control

The weight in each fraction shall lie within the limits defined in Table 3-11.

Table 3-11: Gap Aggregate Grading Fraction Limits

FRACTIONS	PERCENTAGE OF MATERIAL WITHIN THE GIVEN FRACTION	
	GAP 40	GAP 20
19.00 – 4.75mm	25-49	-
9.50 – 2.36mm	14.36	19.45
4.75 – 1.18mm	7-27	11-35
2.36 – 600 micron	5-22	6-26
1.18 – 300 micron	3-18	3-21
600 – 150 micron	1-13	2-18

3.4.1.3 Granular Rock Fill Material

This material is a non-specific rock aggregate intended for use as a subgrade improvement layer.

This subbase material shall have minimum soaked CBR of 20 and a nominal maximum size.

The material shall be suitably graded, moderate to highly weathered quarry rock with sufficient fines to aid compaction. A minimum of 10% by dry mass shall be unweathered (blue) material to ensure a level of durability.

The source of supply of all materials shall be nominated and the material shall be tested to ensure the CBR requirement can be achieved, and test results shall be provided.

The suitability of the material will be assessed on its grading, crushing and weathering resistance, and clay content relative to its use. Evidence of the material's suitability will be required for approval by Council prior to its use.

3.4.1.4 NZTA M/4

This material shall comply in all respects with NZTA M/4 specification.

3.4.2 New Pavement Construction

3.4.2.1 Subgrade Layer

Use of stabilisation additives in the subgrade is subject to specific design and council approval (see section 3.3.12) as follows:

a) The subgrade layer shall be constructed to meet the requirements of the pavement design and NZTA's Specification F/1 : Earthworks Construction. Wherever possible, the natural insitu material shall be used in construction of the subgrade by implementing compaction or other methods of modification to meet the required subgrade strength. Where the insitu material is unsuitable to be used as subgrade, or is otherwise excluded from use, it shall be replaced by imported subgrade material. The imported subgrade material for the pavement shall be fit for purpose and shall be subject to approval by Council before use. Options may include 'run of the pit' sand, selected quarry run rock or other material approved by Council. The suitability of alternatives will need to be demonstrated.

b) The subgrade material, whether insitu or imported, shall be compacted to a depth of not less than 600mm. It shall be placed in layers not exceeding 150mm (compacted thickness) and as close as practicable to optimum moisture content. The material shall be compacted to the specified CBR value. Measurement of CBR value shall be by CBR insitu tests or, in the case of non-cohesive material, by a suitable calibrated Scala Penetrometer test.

c) For cohesive soils, the Scala Penetrometer test may be used as a measure of uniformity. Irrespective of the CBR and Benkelman Beam results, the standard of compaction shall not be less than 95% of the optimum dry density of the material as specified in NZS 4402 Test 4.1.1 or Test 4.1.3.

d) The entire surface of the compacted subgrade shall be made smooth, firm and uniform, by blading, grading and rolling, approximating the crossfall required on the final surface. The reduced level of any point shall be within the limits 0mm above to 20mm below the designed or nominated level, as establish by stringing.

The surface shall be finished so that all points are within 15mm below a 3.0m straight edge laid at any point on the surface. See section 3.8.2 for testing requirements.

e) Compaction shall cease if the material shows signs of excessive weaving or heaving and shall not recommence until the problem has been resolved.

f) If the compaction of the subgrade layer does not meet the required criteria then the following options are available for consideration

(i) The Contractor may opt to carry out further compaction to achieve the required level of compaction, or

(ii) Council may choose to replace not less than 100mm compacted depth of the subgrade layer with subbase metal. Once compacted, the surface shall be trimmed to grade and retested to prove the required strength has been achieved, or

(iii) The Contractor may, subject to the approval of Council, opt to correct the non-compliance of the subgrade by means of one of the following remediation methods:

- the use of geogrid and/or geofabric;
- stabilisation of the subgrade;
- stabilisation of the subbase aggregate;
- stabilisation of the basecourse aggregate; or
- a combination of the above.

It should be noted that approval by Council of the application of one or more of the above options does not relieve the Developer/Contractor of responsibility for attaining the required final pavement strength.

Note: extended exposure of the subgrade to wet weather causes degradation of the subgrade's performance, the entire surface of the subgrade should be protected to ensure it is smooth, compacted, firm and uniform.

3.4.2.2 Recovered Material

Recovered material may be specified for use as the subbase layer for the construction of a new pavement, subject to prior approval by Council.

Where recovered material is to be used and there is a shortfall, the recovered material shall be placed first with the imported aggregate to make up the shortfall placed on top, subject to suitable depths of each being achievable for effective compaction.

Recovered road pavement for reuse shall have a grading curve within or close to (+/- 3% at any sieve size) the grading of the specified sub-base aggregate.

Recovered material is to be reclaimed in such a way that no contamination with clay occurs.

No seal or asphalt from the old pavement shall be included in the recovered material to be used.

Other than the recovered materials consequential characteristics, the pavement layer shall be prepared as specified.

3.4.2.3 Subbase Layer

NZTA's Specification B/2 : Construction of Unbound Granular Pavement Layers shall apply except where modified by the following:

a) The subbase layer shall be constructed to the final shape shown on the accepted Construction Drawings

b) No subbase layer material shall be placed until the subgrade has been satisfactorily completed and approved by Council

c) The reduced level of any point on the surface of the subbase layer shall be within the limits 10mm above to 10mm below the designed or nominated level as establish by stringing

d) The surface shall be finished so that all points are within 15mm below a 3m straight edge laid at any point on the surface

e) The subbase (and basecourse if applicable) beneath the kerb and channel must extend at least 400mm beyond the back of the kerb. See Drawing D3.1.1.

3.4.2.4 Basecourse Layer

NZTA's Specification B/2 : Construction of Unbound Granular Pavement Layers shall apply except where modified by the following:

a) The basecourse layer shall be constructed to the final shape shown on the accepted Construction Drawings

b) No basecourse layer material shall be placed until all previous pavement layers have been satisfactorily completed and approved by Council

c) The tolerances and testing requirements as described in section 3.8.2.

3.4.3 Ripping and Cement Stabilisation

Construction of any stabilised pavement layers shall be in accordance with NZTA Specification B/5 : In-Situ Stabilisation of Modified Pavement Layers. Council approval is required for use of stabilisation techniques, see section 3.3.12.

3.4.4 Testing

The pavement layers shall be tested and each layer approved by Council before construction of subsequent layers begins. For details of the testing and tolerances required, see section 3.8.2.

3.4.5 Concrete Works

This section covers all concrete work for footpaths, shared paths, various kerbing, kerb and channel, catchpits and vehicle crossings. These shall all be formed to the dimensions shown in the Drawings (D3.3.1, D3.3.2, D3.3.3, D3.3.5 and D3.3.7).

3.4.5.1 Formwork

Where not covered in this specification, formwork shall generally comply with the requirements of NZS 3109.

Wherever necessary, formwork shall be used to support and confine the concrete and shape it to the required dimensions. Joints and linings shall be sufficiently tight to prevent loss of water from the concrete.

All timber for formwork shall be of an approved quality and type. For kerbs and channels formwork shall be ex 40mm material provided that 15mm timber or other suitable material may be used on short radius curves.

Formwork shall be of a sufficient depth to fully support all vertical faces. Where it supports exposed surfaces, formwork shall be long lengths dressed smooth on one face and both edges.

Timber strips for chamfers shall be machined all round to be true to shape and form and they shall be kept in good order. Alternatively the chamfer or bullnose may be formed with a specific floating tool or dressed fillets.

Steel forms shall be of approved design and shall be maintained in good condition. The joints between lengths shall be secured accurately during concreting to maintain a good line in the finished work.

Forms shall be designed to be easily removable without damaging the green concrete and shall be kept thoroughly clean and oil or wax dressed to prevent adhesion of concrete or rust staining. Forms for curved kerbs shall be brought to a true curve by springing the timber evenly.

The shape, strength, rigidity, mortar tightness and surface smoothness of re-used forms shall be maintained at all times. Warped or bulged timber is not permitted. Timber which has been used shall have the surfaces which are to be in contact with the concrete thoroughly cleaned and treated before being used again.

3.4.5.2 Concrete Mix and Proportions

Concrete mixes shall be proportioned to be workable, capable of being thoroughly consolidated by the means of compaction available and to provide the specified strength of concrete. The concrete may be either ordinary grade, high grade or special grade as defined in NZS 3109.

The concrete used shall be either mixed on the site or supplied ready-mixed. In every case, the concrete production shall be in accordance with NZS 3104 : Specification for Concrete Production.

The strength of concrete as defined in NZS 3109 shall be 28-day cured in-place minimum strength 20 MPa for all the above works.

3.4.5.3 Placing Concrete

The Contractor shall give due notice to Council of the time it is intended to place any concrete and no concrete shall be placed until approval has been obtained from Council.

Concrete shall not be placed on frozen ground nor shall it be placed in unfavourable conditions, which may be detrimental to the quality and finish of the concrete. Unfavourable conditions shall be deemed to include low temperatures (below 5°C with temperature descending, or below 2°C with temperature ascending), excessively hot, dry conditions, excessively wet conditions, or any conditions making it impractical to work and finish the concrete adequately.

Immediately before placing the concrete, the foundations shall be lightly dampened, and formwork shall be cleaned out. In all cases surplus water shall be removed before concrete is placed.

The concrete shall be placed so the coarse aggregate does not separate from the fines, and it shall be thoroughly worked and consolidated into all parts of the formwork, so that no voids or cavities are left. All concrete shall be handled from the mixer, or from the agitator truck mixer, to the place of final deposit as rapidly as is practicable, by methods which prevent segregation.

Unless otherwise approved, in no case shall more than 30 minutes elapse between discharge of concrete from the mixer/agitator truck and final placement. Under no circumstances shall partially hardened concrete be placed in the work.

Where a channel is finished with a sand/cement mortar coat, the mortar shall be placed within two hours of placing the concrete, provided that when hot dry conditions are prevailing, the allowable time shall be reduced to 1 hour.

If for any reason a delay of more than 2 hours occurs, an approved PVA bonding agent shall be used to ensure the mortar is adequately bonded to the concrete.

Before fresh concrete is placed upon or against any concrete which has already hardened, the surface of the hardened concrete shall be thoroughly scabbled, cleaned and cleared of all laitance, loose or foreign material.

3.4.5.4 Reinforcement

All reinforcement other than ties and stirrups shall be deformed unless otherwise detailed. The length of lapped splices (without hooks) shall be not less than 32 bar diameters in length.

Steel reinforcement, at the time the concrete is placed, shall be free from loose flaky rust, mud, oil or other coatings that will destroy or reduce the bond.

Reinforcement shall be accurately placed, adequately supported and secured against displacement before or during concrete placement.

The minimum cover to all main reinforcing steel shall be 50mm unless otherwise specified.

3.4.5.5 Curing Of Concrete

Strict attention shall be paid to adequate curing, which is an important factor in attaining the required strength for the concrete.

Immediately after placement, concrete shall be protected from premature drying, excessively high or low temperatures and mechanical damage and shall be maintained with minimal moisture loss for the necessary curing period and hardening of the concrete. In hot dry weather sprinklers or damp covers will need to be used.

All concrete surfaces not in contact with formwork shall be cured by the application of a curing compound conforming to the specification ASTM C309 : Specification for liquid membrane - forming compounds for curing concrete.

In cold or wet weather, concrete shall be protected from the elements during the curing period by covering with sheets of PVC or alternative approved material.

3.4.5.6 Machine Laid Kerb and Channel

Contractors who intend to construct the kerbs and channels by using an extrusion machine will be required to use ready mixed concrete from a certified plant. The concrete provided shall be designed so that after placement it will accurately retain its shape and present a good surface. Certification of the concrete supplied is required. No subsequent cement washing will be permitted. The machine shall be capable of providing well compacted concrete with the absence of trapped air.

The machine shall not be used to pour curves with radii less than 5m. For these curves the Contractor shall use formwork as specified.

A properly shaped screed shall be used in forming cut downs.

3.4.5.7 Finished Work

Methods shall be used that will provide a smooth, clean and even surface on the exposed faces of all concrete work. These methods shall also put the required finish directly on the structural concrete without the use of mortar renderings, provided that, if specific prior approval of Council is obtained, the channel may be finished with a layer of separately applied mortar. In such a case, the mortar shall consist of not more than 2 parts of approved sand to 1 of cement. It shall be nominally 6mm in thickness and shall be placed before the initial set of the concrete and within 2 hours of placing the concrete.

Alternatively, a mortar layer to the above consistency may be applied in conjunction with the laying of the kerb and channel if the kerb and channel is laid by machine and the machine is designed for such use.

The top and face of the kerb and the channel surface shall be floated over with a steel tool before the mortar has finally set. No depressions which may hold water will be permitted.

The surface finishes of all kerb and channel, whether machine laid or hand laid, shall be uniform in colour, texture and shape.

3.4.5.8 Contraction/Expansion Joints

Contraction/Expansion joints shall be formed or cut along the kerb at a maximum spacing of 3.0m. The slot shall penetrate the concrete by not less than 50mm and the mortar dressed over the cut face. The contractor shall ensure that cold joints are accurately marked so that the subsequent saw cut is in the cold joint. Should cracking occur adjacent to the saw cut a minimum section of 1.5 metres of kerb and channel shall be removed and re-cast.

3.4.5.9 Backfilling against Concrete Work

Backfilling against the kerb and channel or any other concrete structure shall take place as soon as practicable after the concrete has reached sufficient strength, with particular emphasis at curves, corners, intersections and pedestrian kerb crossings but not prior to 36 hours after pouring.

Care shall be taken to ensure that no damage is done to the path, crossing, kerb and channel or other concrete structure when placing and compacting the backfill.

3.4.5.10 Surface Finish (Footpath, Shared Paths and Vehicle Crossing Areas)

All final path and vehicle crossing surfaces shall be true to the lines and levels Specified and 'broom' finished. Design considerations aside, the final surface shall not vary by more than 5mm when checked with a 3m straight edge. No finished surface shall hold water.

3.4.6 Road Stormwater Drainage (Kerb, Channel and Catchpits) Construction

3.4.6.1 Kerb and Channel in Existing Pavement

Prior to work commencing, the lengths of kerb and channel that are to be removed shall be marked on site and agreed with Council.

3.4.6.2 Saw Cutting

Prior to removal, the kerb and channel shall be cut vertically and at right angles to the alignment to ensure a clean break. The existing sealed surface shall be cut parallel to and at a distance of 500mm, or greater if required, from the existing channel lip. The seal shall also be cut perpendicular to the kerb from the vertical saw cut to the parallel seal cut.

If the kerb and channel to be removed abuts any berm seal (e.g. sealed footpath), the sealed surface shall be saw cut within 5 days, at a distance behind the kerb face suitable for reinstatement. Refer Drawing D3.3.6.

3.4.6.3 Excavation to Pavement Depth

After saw cutting, the kerb and channel and pavement shall be excavated to the proposed pavement depth or deeper if required. The sides of the excavated area shall be trimmed to be as near as possible to vertical. Care shall be taken to ensure that undermining and/or over break does not occur during excavation. All waste material including the old kerb and channel shall be removed from the site and appropriately disposed of.

3.4.6.4 Subgrade Preparation

The exposed subgrade (at the required depth), shall be tested using a standard Scala Penetrometer refer to section 3.8.3. The prepared subgrade shall be compacted to the CBR specified. If the material fails this initial test it shall either be:

a) Further compacted, if the material is suitable, to improve the CBR value, or

b) Excavated and removed from site, then backfilled with pitsand and compacted to the subgrade level.

All pitsand backfill shall be compacted in lifts of not more than 100mm. The subgrade area either insitu or imported shall be trimmed and shaped to accommodate the specified lines and levels given and compacted to provide uniform support for the pavement course.

All tree roots found in the subgrade or pavement area during excavation shall be removed (subject to Council Arborist approval) and are to be severed 0.5m behind the back or front of the kerb and be removed off site. Any root greater than 50mm in diameter shall be cleanly saw cut. No such roots shall be cut without the prior approval of Council if they are within the dripline of the tree.

Note: extended exposure of the subgrade to wet weather causes degradation of the subgrade's performance, the entire surface of the subgrade should be protected to ensure it is smooth, compacted, firm and uniform.

3.4.6.5 Kerb and Channel Foundation

After the subgrade has been approved, a compacted layer of GAP40 75mm deep shall be placed. Compaction shall be to refusal. The surface of the GAP40 shall be smooth and uniform, suitable for the placing of the kerb and channel concrete.

3.4.6.6 Kerb and Channel Placing

Refer Clause 3.3.14.2 for details on concrete placement.

3.4.6.7 Joining to Carriageway

After the kerb and channel concrete has reached sufficient strength, the carriageway shall be married into the existing carriageway (with banding) and new kerb and channel lip. If not already achieved during the kerb base construction, the carriageway shall be excavated to the existing subgrade and at least 200mm deep at the channel face. The excavation base shall be flat and level up to the edge of the saw cut seal. All excavated faces shall be vertical.

The subgrade shall be compacted to a CBR of at least 10. The basecourse metal (NZTA M/4 or GAP40) shall be placed on the prepared subgrade in layers not exceeding 150mm and compacted to refusal. The depth of basecourse is dependent on the surfacing, either asphalt or chip seal, but not less than 200mm (i.e. 25mm of asphalt surfacing).

3.4.6.8 Kerb and Channel in New Pavement

In accordance with clause 3.4.5.6, except all references to carriageway protection and reinstatement shall not be required for this activity.

3.4.6.9 Catchpits

Refer to Stormwater Section for details; the details also show a list of the permitted precast components.

The construction specification described in Stormwater Section.

Catchpits shall be accurately positioned so that the grate and kerb block fit neatly into the kerb and channel. Rectangular pits shall be oriented with the longer side parallel to the kerb. Grates are to be cycle friendly.

3.4.6.10 Subgrade Drainage

Refer to Drawing D3.4.1 for details. NZTA specifications F/2 : Pipe Subsoil Drain Construction and F/5 : Corrugated Plastic Pipe Subsoil Drain Construction shall apply.

Where subsoil drains are required, as shown on the Drawing or directed by Council, they shall be placed behind the kerb unless shown or directed to be in front of the kerb.

The subsoil drains shall consist of an approved filter drainpipe, 100mm to 150mm diameter, or equivalent, in a trench backfilled with an approved filter material around the conduit. The conduit shall have a grade not less than 1:200 to discharge into the catchpit.

3.4.6.11 Additional Subsoil Drainage

Where directed, any permanent wet spot in the subgrade shall be drained to the subsoil drain. Where the wet area is below the level of the subsoil drain, it shall be drained by connecting to the nearest stormwater system.

3.4.6.12 Other Requirements

NZTA F/2 filter material shall not be used as a filter material in close proximity to HDPE slotted pipe. Unless otherwise designed and approved by Council, pea-metal shall be for backfilling around HDPE slotted pipe. Where backfilling a subsoil drain with filter material the minimum cover shall be 100mm. Where a strip drain is approved, backfill is to be permeable sand.

The invert of subsoil pipes at the catchpit shall not be less than 100mm above the invert of the catchpit outlet.

3.4.7 Road Surfacing Construction

The relevant NZTA specifications listed in Clause 3.2.2 shall apply to road surfacing procedures and materials.

Exceptions to the specifications include:

- All references to the basis of payment contained within the specifications are deleted;
- Reference to the Contractor's obligation with respect to the foreshortening of the maintenance requirements of the seal coat (NZTA P/3 & P/4) is deleted;

Application rates, cutback percentage and the percentage of adhesion agent is to be specified by the Developer/Contractor, and forwarded to Council with design calculations for approval at least 24 hours prior to application.

For both first and second coat chip seal, the bitumen application shall extend over the lip of the kerb and channel, but not by more than 25mm.

3.4.7.1 Waterproofing First Coat Chip Seal

A two coat chip seal shall be applied to the prepared basecourse surface but only when the air temperature is greater than 10^{o}C in the shade as detailed in the NZTA P/3.

The first layer shall consist of the supply and spraying of 180/200 penetration grade bitumen. The bitumen shall be cut back to suit, include one part per hundred (p.p.h) adhesion agent and be spread at a rate of 1.2 litres/m^2 residual (measured at 15^{o}C).

The first layer chip shall include the supply, spreading and rolling of Grade 3 chip at a spread rate of 75 m^2/m^3. It is essential that the spreading of the first chip layer is carefully controlled such that the chips are evenly spread and are no more than one layer thick over the entire surface.

The second layer shall consist of the supply and spraying of 180/200 penetration grade bitumen. The bitumen shall be cut back to suit, include one pph adhesion agent and be spread at a rate of 0.8 litres/m^2 residual (measured at 15^{o}C).

The second layer of chip shall include the supply, spreading and rolling of Grade 5 chip at a spread rate of 150 m^2/m^3.

Refer to 'Removal of Surplus Chip' in clause 3.4.7.3.

3.4.7.2 Chip Seal Resealing

This treatment shall be applied on carriageways to produce a uniform texture on surfaces that have an existing seal coat and potentially repair patches.

Prior to resealing all surfacing and pavement defects must be repaired. The resealing shall not be applied until 28 days after asphalt patching or levelling has been completed, or the basecourse repairs have been two-coat sealed.

The second coat chipseal carried out between 3 and 18 months after the waterproofing first coat shall consist of supply and spraying of 180/200 penetration grade bitumen. The bitumen shall be cut back to suit, include 1 pph adhesion agent and be applied at the rate of 1.3 litres/m^2 residual (measured at 15°C). The chip layer shall consist of the supplying, spreading and rolling of Grade 5 chip. If specified, a dry locking coat of Grade 5 or 6 chip shall then be supplied and applied at a rate of 300 m^2/m^3.

3.4.7.3 Removal of Surplus Chip

When the sealed surface is to be opened to traffic, all surplus chip shall be removed within 48 hours of the completion of rolling. For sites that are not open to normal traffic, chip sweeping may be delayed but must be completed before opening the road to normal traffic.

All surplus chips shall be removed from grass berms, driveways, parking areas and footpaths. Follow up sweeps will be required to ensure that all loose chip is collected and removed from the site for a period of one month following chip application.

3.4.7.4 Asphaltic Concrete

Where design traffic volumes in residential areas are less than 800 vehicles per day, and there are no additional turning stresses created by intersections, a single coat grade 5 membrane seal shall be used with a residual bitumen application rate of 1 L/m^2.

Where traffic volumes are higher or there are greater stresses, a waterproofing chip seal shall be applied to the prepared basecourse surface in accordance with section 3.4.7.1. The asphalt concrete shall be placed no sooner than 14 days after the application of the waterproofing chip seal.

Asphaltic concrete paving shall consist of the supply and spraying of a tack coat with a quick breaking bituminous emulsion at an application rate of 0.3 litres/m^2 and the supply, spreading and rolling of asphaltic concrete or an alternative mix as approved by Council.

For local residential roads with less than 800 vehicles per day and no additional turning stresses, the default mix is an NZTA M/10 DG10, with a minimum thickness of 25mm.

For residential roads with greater than 800 and less than 3000 design vehicles per day, or have greater stresses due to intersections the default asphalt design is an NZTA M/10 AC10, with a minimum thickness of 35mm.

For commercial/industrial roads, or those designed for greater than 3000 vpd a specific design must be approved by council.

The asphaltic concrete shall ramp to transition back to the adjacent existing surfaces as illustrated in Drawing D3.5.2.

3.4.7.5 Block Paving- Carriageway

Bedding Course for Block Paving

All bedding course shall be laid in accordance with either Clay Paving Design and Construction or NZS 3116 : Concrete Segmental and Flagstone Paving and comply with Drawing D3.3.5.

Laying of Paving Blocks

All paving blocks shall be laid in accordance with NZS 3116.

Edge Restraints

Refer to Drawing D3.6.1 for details of the type of edge restraint.

Edge restraints shall be one of the following:

a) Kerb and channel

b) Traffic island kerb

c) Concrete separating strip

d) Paving blocks on edge cast in concrete

e) Timber edging

All pavers must be cut using a power saw unless specified otherwise.

3.4.7.6 Line Marking Reinstatement

Line marking must be applied within 48 hours of applying surfacing, or in the case of chip seal within 48 hours of the surface being swept. If the road is not open to normal traffic, this may be delayed, but must be carried out before the road is opened to normal traffic.

A re-mark may be required prior to vesting depending on wear and deterioration of the markings.

3.4.8 Berms

Berms will typically be grassed, but may be landscaped if it is impracticable to maintain as grass.

All berms and landscape planting design and implementation within the road reserve shall be in accordance with D3.1.4 and Clause 7.3 and 7.4 of the Landscape Section.

Berms that are to be grassed shall:

a) Have a minimum subgrade of CBR 7

b) Have a minimum compacted depth of topsoil of 75 mm

c) Be seeded in accordance with the Landscape Section, Clause 7.3.6.

d) Be free of debris and perennial weeds

Berms are to be mown during the defects liability period as well as prior to take over by Council.

3.4.9 Footpaths, Cycle Paths and Vehicle Crossings

This section outlines the work required to construct, reinstate or repair footpaths, vehicle crossings and away-from-road cycle paths.

3.4.9.1 Alignments, Lines and Levels

The edge lines of kerbs, footpaths, shared paths and vehicle crossings shall be perfectly straight between tangent points, and on curves shall sweep round without kinks, flats or angles in a smooth, true arc to the radius shown or directed.

Design levels and alignments shall be strictly adhered to and the grade from level peg to level peg shall be even, provided always that at changes of grade the angle between the grades shall be eased so as to form a vertical curve or other form of smooth transition. The entire berm area shall fall, at an even grade where possible, from the property boundaries to the kerb and channel.

3.4.9.2 Break out, Removal and Disposal of Existing Berm Features

All existing berm features that are to be removed shall be broken up and lifted out to reduce damage to the surrounding features. The outer limits of these features shall be saw cut, except in the case of paving blocks or grass verges, before removing to provide a tidy interface between existing and replacement work.

Where salvaging of materials (e.g. catchpits, gratings, frames, stormwater piping) is specified, care shall be taken to ensure that as little damage as possible is done to materials. Such units shall be neatly stacked on the site such that they do not obstruct any footpath, vehicle crossing or roadway until they are taken off site. All materials not for reuse shall be removed from site and appropriately disposed of.

3.4.9.3 Excavation to Pavement Depth

Excavation shall be to the pavement depth as shown on Drawing D3.3.5.

The width of all excavation shall be no wider than necessary to construct or reinstate the various berm features.

Where excavation adjoins existing berm features or carriageways, care shall be taken not to undermine the existing surfacing while material is being removed. The sides of the excavated area shall be trimmed to as vertical as possible without being unstable or causing undermining.

3.4.9.4 Subgrade Preparation

The exposed subgrade (excavated to trial subgrade level or pavement depth) shall be tested by using a Scala Penetrometer for compliance with the following CBR values

a) In footpath, cycle paths and traffic island infill CBR value >10 (4 blows per 100mm)

b) In vehicle crossing and kerb and channel areas CBR value >10 (4 blows per 100mm)

If the material fails this test then:

a) The existing subgrade shall be further compacted, to improve the CBR value; or if this is not practicable

b) The unsuitable material shall be excavated, removed from site, replaced with pitsand and compacted up to the trial subgrade level

When undercutting of the subgrade is required (the second option above) the excavation depth and extent shall be instructed by Council. As a minimum, it is to extend 100mm past either side of the edge boards, or the outer limits of the construction area.

Note: Small pockets of material may require treatment rather than the entire subgrade area.

All pits and backfill shall be compacted in lifts of not more than 100mm. The subgrade area, either existing or reinstated, shall be trimmed, shaped and compacted to provide uniform support for the pavement course.

All tree roots found in the subgrade or pavement area during excavation shall be removed. They shall be severed at least 200mm outside the excavation area, removed from site and disposed of. Any root greater than 50mm in diameter is to be cleanly sawn. No such roots within the drip line of the tree shall be cut without the prior approval of Council.

Note: extended exposure of the subgrade to wet weather causes degradation of the subgrade's performance, the entire surface of the subgrade should be protected to ensure it is smooth, compacted, firm and uniform.

3.4.9.5 Timber Edging for Asphalt and Paving Block

All footpaths, cycle paths and vehicle crossing edges shall be contained by either a concrete kerb or edging, or by treated timber edge boards, which shall form part of the finished work.

Edge boards shall be held firmly in place with wooden pegs (50 x 25mm) or battens nailed to the outer edge at no greater than 1.0m centres and at every joining board. The pegs shall be a minimum length of 225mm or longer to be driven down into solid unyielding ground. Batter stakes may be used as pegs, driven down into firm ground and trimmed to the correct length. All pegs shall sit 15 to 25mm below the top level of the edge boards.

Edge boards shall be joined with 400mm long boards (either edge board offcuts or 75 x 25mm timbers) which span the joint evenly and are nailed firmly in place at the rear of the edge boards. The top of the joining boards shall sit 15 to 25mm below the top level of the edge board. The spacing of wooden pegs shall be adjusted so that a peg is positioned alongside every joining board. Refer to Drawing 3.6.1.

All timber edging shall be backfilled outside the construction area as necessary to protect the timbers from being damaged or distorted during the preparation and compaction of the pavement course. All edge boards shall be set out using string lines and shall be true and straight at the completion of the work. All edge boards and pegs will use H4 or H5 treated timber.

If directed by Council, existing timber edging in good condition shall be adjusted for level, re-pegged and incorporated in the new footpath or vehicle crossing. At all times,

excavation for timber edging replacement, installation or adjustment shall be the minimum required to provide adequate work space.

Where the path edge adjoins existing kerb, the top of the kerb shall be treated as the top of the edge board.

3.4.9.6 Pavement Basecourse

The pavement basecourse shall be constructed of bedding sand and/or GAP metal (NZTA-AP metal on occasions) and be compacted to a pavement depth conforming to the Drawing D3.3.5.

For asphalt footpaths and cycle paths, the final pavement surface shall have a tight stone mosaic surface, with no loose aggregate, suitable for the application of a tack coat and an asphalt layer. A skin of GAP 20 may need to be added to GAP 40 areas and compacted into place to achieve this. All pavement courses shall be compacted to refusal in lifts of not more than 100mm.

3.4.9.7 Concrete Surfacing

Concrete surfacing shall be carried out in accordance with clause 3.4.5. Where concrete paths are to be constructed steeper than 1:10, a permanent non-skid surface should be provided (broom finish or similar).

For cross section detail refer Drawing D3.3.5.

In concrete paths, crack control lines shall be formed or cut at vehicular crossing/footpath edges and along the path at a maximum spacing of 5.0m. All crack control lines shall be 25mm deep.

3.4.9.8 Asphalt Surfacing

The prepared pavement shall be swept to remove all loose metal and debris prior to the application of a tack coat. The tack coat shall be applied to all surfaces where the asphalt material will be placed and generally at an application rate of 0.25 litres/m^2. Asphalt Mix shall be laid to the compacted depths shown on Drawing D3.3.4. The final surface shall be flush with the top of the edge boards and graded uniformly between. Depressions or irregularities that may cause water to pond will not be accepted in the finished surface.

All asphalt shall be laid in accordance with NZTA's Specification P/9 : Asphaltic Concrete Paving Construction, except that plant appropriate to the size of the area being surfaced shall be used.

3.4.9.9 Asphalt Overlay

Where asphalt smoothing or overlay is required, the existing surface shall be swept to remove all loose metal and debris prior to the application of the tack coat. Mix 5 asphalt shall be used to smooth irregularities up to a compacted depth of 20mm. Mix 10 shall be used to smooth irregularities up to a compacted depths of 20-50mm and Mix 20 shall be used for compacted depths of 50mm and greater.

3.4.10 Private ways

3.4.10.1 Urban

Concrete

For concrete pavements:

- The minimum depth of concrete is 125 mm for private ways serving two to four household units
- The minimum depth of concrete is 150 mm for private ways serving five to ten household units

Concrete is to be placed on a subbase of 75mm of compacted GAP20 on a compacted subgrade with CBR ≥10. For subgrade criteria < 10 CBR, subgrade improvements are to be made to bring the subgrade strength up to a CBR of 10.

Other

Pavement may be interlocking block pavers. Refer to section 3.4.7.5 for specifications.

Stormwater shall not discharge across the vehicle crossing from the private way to the road. Vehicle crossings to private way shall be designed and constructed in accordance with clause 3.3.19 and Drawing D3.3.1.

3.4.10.2 **Rural**

All rural residential private ways shall have:

- Pavement GAP40 minimum depth 150mm
- Subgrade minimum CBR 15 continuous over a depth of 600mm. For subgrade criteria < 15 CBR, subgrade improvements are to be made to bring the subgrade strength up to a CBR of 15
- The pavement shall be sealed with a 3/5 two coat seal in accordance with 3.4.7.

3.4.11 Road Signs

3.4.11.1 **Scope**

This section covers the specifications for the supply and installation of all road signs.

3.4.11.2 **Standards**

All signs are to be constructed and installed in accordance with the relevant specifications detailed in Clause 3.2.2 in particular the Traffic Control Devices Manual,and the following:

a) Signs shall be Class 1 wide observation angle (VIP or equivalent) reflective sheeting

b) The face of all signs shall be rivetless.

c) The back of all signs shall be coloured ‘aircraft grey’ No. 693 as referred to in BS381C, or similar, with a semi-gloss finish, unless otherwise stated. ‘Slate grey’ (in accordance with the NZTA specifications) is an approved alternative.

d) All signs are to have an aluminium substrate.

e) Regulatory, warning, street name plates and information signs shall be Class 1 reflectorised sheeting.

f) Parking signs shall be non-reflective.

g) Where the option exists for square or radius corners, radius corners shall be supplie

3.4.11.3 Attachment

Signs shall be attached to posts or overhead gantries using Signfix or equivalent brackets as approved by Council. The Contractor shall be responsible for determining sign mounting requirements.

3.4.11.4 Poles

Steel poles are to be either NB56 or NB65 poles appropriate to the type and size of sign required and in accordance with Table 3-12. Poles are to be powder coated white. All poles are to be capped with power coated top caps to match pole.

Timber poles shall be 100 x 100mm H4 dressed framing grade 1 or 2, pre-painted using one undercoat and two topcoats of high gloss exterior white paint.

3.4.11.5 Site Installation details for posts and poles

Where installation and/or reinstatement work is required within a sealed surface, the surface must be saw cut around the perimeter of the excavation. The replacement surfacing shall be of a material and placed to match the existing surrounding surfacing.

3.4.11.6 Typical Sign Installation and Location

All signs shall be located in accordance with the NZTA's Traffic Control Devices Manual and NZTA's Manual of Traffic Signs and Markings (MOTSAM) Part 1: Traffic Signs, Additional specifications in Table 3-12 shall also apply.

Table 3-12: Additional Signage Specifications

SIGN TYPE	POLE TYPE	POLE LENGTH	HEIGHT	LOCATION
Regulatory	NB65		2.5m BOS (above a footpath) 2.0m BOS (in traffic island)	Longitudinal Offset: a) 5m (± 1m)* from tangent to intersecting road kerb line (behind kerb line) b) 3m from island nose (in traffic island) Lateral offset: a) Poles shall not be closer than 500mm from kerb line. Sign shall not be closer than 350mm from kerb face. b) In centre of traffic island with a maximum offset of 1m from island kerb face.
Warning	NB 56	3.7m	2.0m BOS 2.5m BOS when above a footpath	In centre of traffic island 500mm lateral offset between sign and kerbline
Information	NB 56	3.7m	2.0m BOS 2.5m BOS when above a footpath	
Free Turn	NB 56		250mm BOS	1.5m from traffic island nose In centre of traffic island 500mm lateral offset between sign and kerbline
Street Name	NB 56	3.7m	3.0m TOS (measured to upper blade)	Lateral offset: Minimum 500mm, maximum 1500mm between closest part of name signs and

SIGN TYPE	POLE TYPE	POLE LENGTH	HEIGHT	LOCATION
				kerb or seal edge. Part of the signs blade should be located within 1500mm of the kerb face but provide at least 500mm clearance to the kerb face or edge of seal. Where this is not possible, the signs may be reverse mounted as long as the footpath is not obstructed. Refer to Drawings D3.7.2, D3.7.3, D3.7.4, D3.7.11, D3.7.12.
Tourist sign	NB 56	3.7m	2.0m BOS 2.5m BOS when above a footpath	
Route marker	NB 56	3.7m	3.0m TOS	
Truck Bylaw	NB 56	3.7m	2.0m BOS 2.5m BOS when above a footpath	Refer Drawing D3.7.17
No stopping	NB 56	3.25m	2.0m BOS 2.5m BOS when above a footpath	
Bus Stop	NB 56	3.25m	2.7m TOS 2.4m BOS if sign is for Orbiter route	1m from end of park
Bus stop supplement sign			Aligned to the top of the associated Bus Stop sign.	Refer Drawing D3.7.16 oriented @ 90 degrees to adjacent kerb face or edge of seal such that it can be seen by approaching motorist
Taxi Stand	NB 56	3.25m	2.7m TOS	1m from end of park
Taxi stand supplement sign			Aligned to the top of the associated Taxi Stand sign.	Refer Drawing D3.7.16 oriented @ 90 degrees to adjacent kerb face or edge of seal such that it can be seen by approaching motorist
Loading Zone	NB 56	3.25m	2.7m TOS	1m from end of park
Parking	NB 56	3.25m	2.7m TOS	1m from end of park
Mobility Parking	NB 56	3.25m	2.7m TOS	1m back from front of park
Keep Left	Knock down socket	750mm	250mm BOS	1.5m from traffic island nose. Refer Drawing D3.7.1
Diverge Sign	Knock down socket	750mm	250mm BOS	1.5m from traffic island nose In centre of traffic island 500mm lateral offset between sign and kerb line.
Chevron Board	NB 56	1.1m	750mm TOS**	Refer Drawing D3.7.10

SIGN TYPE	POLE TYPE	POLE LENGTH	HEIGHT	LOCATION
Chevron in Roundabout			750mm TOS	1m from kerb face and perpendicular to sight line of approaching vehicles approximately 50m from intersection. refer Drawing D3.7.10
Route sign (in place of chevron in roundabout)			750mm TOS 100mm BOS if the area is not planted	Lateral offset – 500mm from kerb face to sign. If no kerb, ≥1.5m from the edge of seal
Median island Low level street name	NB 56	1.1m	750mm TOS.	refer Drawing D3.7.10
Route shield	NB 56	1.1m	750mm TOS	
ADS sign (on 2 poles):				Specific design required
All signs istalled adjacent to cycleways or shared paths shall have a minimum clearance to the bottom of the sign of 2.2m.				

Key:

TOS – Dimension is the clearance between the top of the sign and the top of the adjacent footpath/berm/traffic island

BOS – Dimension is the clearance between the bottom of the sign and the top of the adjacent footpath/berm/traffic island

* Tolerance to accommodate possible site constraints

** Consideration should be given to road vertical alignment when determining sign height

3.4.11.7 Parking Signs

Parking signs shall be as detailed in Traffic Control Devices Manual.

3.4.11.8 Signs on Cycleways or Shared Walkway/Cycleways

Refer Drawing D3.7.5 for signage of shared cycle path start and end points.

3.4.11.9 Street Name Signs

Design

Street name signs shall be designed in accordance with the Traffic Control Devices Manual – Part 2: Direction, service and general guide signs, and Table 3-12.

On no exit roads, a 75mm tall separate, supplement plate shall be attached (taped) to the bottom edge of the street name sign.

All signs are to be double-sided, except those on medians or at the head of ‘T’ intersections.

Repeater plates of the primary road shall be erected at every intersection.

Legend

The standard abbreviations listed in Traffic Control Devices Manual – Part 2: Direction, service and general guide signs shall be used, with the addition of the term 'Rise' (no abbreviation necessary).

These abbreviations shall have a letter height of 50mm and 75mm for secondary and primary streets respectively.

Location of Street Name Signs

Street name signs are to be located in accordance with Table 3-9 above. If there is a utility pole in the proposed location, then the signs shall be attached to it. (See Note 4 of Drawing D3.7.11).

Street name signs at signalised intersections shall be installed in accordance with Drawing D3.12.6.

Poles shall be either NB56 or NB65 steel poles, as appropriate to the type of sign required.

3.4.11.10 General Interest Signs (formerly referred to as Amenity Signs)

Refer to section in Traffic Control Devices Manual – Part 2.

Design

General Interest signs are to be in accordance with the following specification:

Table 3-13: General interest sign specification

Letter height	125mm
Letter styles	as for Street Name signs
Letter spacing	as for Street Name signs
Background depth	175mm
Blade profile	90° cuts at both ends
Colours	Blue reflectorised lettering on a white reflectorized background - all reflectorisation to be Engineering Grade
Arrows	Blue reflectorised triangular arrow at the end of sign plates. Refer to D3.7.2, D3.7.3 and D3.7.4.

Location

General Interest signs are to be located in accordance with the following specification:

Table 3-14: General interest sign locations

Height of sign blade	As for Street Name signs
Lateral offset	As for Street Name signs

Number of signs	Maximum of two General Interest signs per facility

Note: In addition to standard mounting requirements (Drawings D3.7.11 and D3.12.6), General Interest signs are to be attached below existing street name signs.

3.4.11.11 Route, Guide, Service and Tourist Signs

Destinations, routes and facilities to be used on route, guide, service and tourist signage must be as supplied by Council's Transportation team. Refer also to Traffic Control Devices Manual – Part 2.

3.4.11.12 School Patrol Signs

Signs shall be manufactured and installed in accordance with Drawing D3.7.15. Support posts shall be white and installed in accordance with Drawing D7.7 Timber Bollard Post and Chain.

3.4.11.13 Kea Crossing Flag and Pole

Kea Crossing flags and poles are to be constructed and installed in accordance with Drawings D3.7.13, D3.7.14

3.4.11.14 Overhead Gantries

Overhead gantries shall be individually designed in accordance with, and shall comply with the requirements of, NZTA's Highway Structures Design Guide.

The design shall include structural and environmental requirements and the provision of safe maintenance access to the structure, and shall meet the following additional requirements:

a) The gantry design will depend on the proposed size of sign and hence loading and ground clearance

b) Sign mounting uprights shall be spaced at no greater than 900mm centres

c) Overhead gantries may be constructed from either a single piece welded or a bolted outreach arm

d) Gantries shall be hot dipped galvanised after fabrication. All mount bolts shall be galvanised.

The layout drawings for the site locations of all structures and associated maintenance access and traffic barriers shall be submitted to a nominated Safety Auditor for a Stage 3 Design Safety Audit. The contractor shall amend the site layout design to comply with the Safety Audit recommendations or shall submit to the Engineer a proposal that has been prepared by a qualified Traffic Consultant that modifies the Safety Audits recommendations, but does not compromise the intention of the recommendations.

No work shall be undertaken on the gantry until the design is accepted in wrting by the Engineer.

3.4.11.15 Edge Marker Posts

All edge marker posts (EMP) shall be constructed in accordance with the NZTA's Specification M/14 : Edge Marker Posts.

EMPs shall be located on rural roads only and in accordance with the MOTSAM – Part 2: Markings.

3.4.11.16 **Semi - Rigid Barriers (W-Section)**

All barriers complete with reflective inserts are to be constructed in accordance with the NZTA's Specifications M/17P : W-Section Bridge Guardrail, P/15P : Fabrication and Assembly of Standard Guardrails and Handrails for Highway Bridges and Bridge Approaches, M/23 : Road Safety Barrier Systems, and with AS/NZS 3845.

Painting of barriers may also be required on a case-by-case basis and should be confirmed with the relevant Council. All painting shall consist of at least two finish coats of water based commercial grade paint (colour to be specified by Council). All dirt, grime and loose and flaky paint shall be removed from the surface prior to painting. It may be necessary to undercoat in some areas as required. All painting is to be carried out in accordance with the manufacturer's specifications. Reflective inserts are to be retained.

3.4.11.17 **Wire Rope Barriers**

To added at a later date

3.4.11.18 **Timber Sight Rails**

All painting of timber sight rails shall be completed with at least two finish coats of water based commercial grade white paint. All dirt, grime and loose and flaky paint shall be removed from the surface prior to painting. It may be necessary to undercoat in some areas. All painting shall be carried out in accordance with the manufacturer's specifications.

3.4.11.19 **Themed Street Furniture (bins, seats, specialised street lighting, etc)**

The Council may have towns or suburbs with a particular street furniture theme. For details of these themes, refer to Appendices.

3.4.11.20 **Wheel stops**

All wheel stops shall be standard pre-cast rubber units, with the top of the wheel stop being no more than 100mm above the adjacent surface.

3.4.11.21 **Wayfinding Signage**

Wayfinding signage is subject to additional specifications and requirements. See Appendices for options.

3.4.12 Pedestrian Barrier Rails and Handrails

Pedestrian barrier rails and handrails shall be constructed and installed in accordance with the following Drawings:

- D3.8.7 - CBD pedestrian barrier
- D3.8.8 - Pedestrian balustrade barrier.
- D3.8.9 - pedestrian barrier detail
- D3.8.10 - pedestrian accessway fence detail

3.4.13 Walkway Barriers and Cycle Racks

All walkway barriers and cycle racks shall be constructed and installed in accordance with Drawings D3.8.2, D3.8.3 and D3.8.11

3.4.14 Bus Stops

This section covers the supply and installation of all components necessary for a bus stop including signage, seats, raised accessible kerb lines and bus shelters.

3.4.14.1 Standards

All bus stops shall be constructed in accordance with the NZTA Guidelines for Public Transport and Infrastructure and Facilities, unless Council has requirements which will vary the above standard.

3.4.14.2 Signage

All signage shall be installed in accordance with the requirements set out in section 3.4.11: Road Signage and Street Furniture. However some locations may require supplementary bus stop signs. See Drawing D3.7.16.

3.4.14.3 Seats

Where seats are required, but there is no shelter, they shall be in accordance with Drawing D3.8.15. Materials and colour to be confirmed by the Council.

3.4.14.4 Accessible kerb lines and tactile paving

Where specified, accessible kerb lines and tactile paving shall be installed in accordance with the ARTA Bus Stop guideline and Drawing D3.6.3 and D3.3.8.

3.4.14.5 Shelters

Bus shelters shall be installed as instructed by Council and in accordance with Drawings D3.8.13 and D3.8.14.

The large size bus shelter shall be used in all locations except where an installed shelter would narrow the adjacent footpath to less than 1.2m. The mini shelter shall be installed instead.

Bus shelters shall be painted/powder coated in black semi-gloss.

3.5 LINE MARKING

This section covers all aspects of line marking, including the supply and fixing of reflective and/or non-reflective road studs and delineators, and the removal of line marking.

3.5.1 Setting Out and Timing

The proposed line marking is to be set out in accordance with the accepted drawings, and any location marking out provided by Council, with modifications as necessary to make the 'lines' pleasing to the eye.

Where there are inconsistencies between the line marking layout plans and the NZTA specifications, the line marking layout lplans shall prevail.

Council's approval of the set out is required prior to marking. In order to achieve this with the least delay, at least 48 hours' notice prior to approval being required shall be given to Council.

Incorrect line marking that has been applied without approval of the set out shall be removed at no cost to Council.

On new surfaces, marking of centreline, limit lines and other intersection markings such as Give Ways shall be completed within 48 hours of completion of the surfacing.

For roads that are not open to traffic, such as new subdivisions, these markings shall be completed before the road is opened to the public.

Other markings on new surfaces shall be completed within seven days of surfacing. For other works such as line removals or maintenance, timing will be specified by Council.

3.5.2 Paint Types

At a minimum, all paint shall at least conform to NZTA's specifications M/7 'Class A' type and P/12.

All new line markings shall generally be waterborne/acrylic.

Chlorinated rubber or alkyd is to be used for arterial and collector roads on their final surfacing.

Thermoplastics are to be used in CBD areas. Alkyd paint must be used on sites that are to be re-marked with thermoplastic paint at a later date.

3.5.2.1 Waterborne/Acrylic Paint

Waterborne paint shall be applied in accordance with NZTA Specifications P/12 and M/7, with the following amendments.

Table 3-15: Waterborne/acrylic pain specification amendments

Clause 13.1 (a) NZTA P/12 – replace with:	'The finished dry film thickness shall be 300 microns or greater as defined by the equation in NZTA P/12 '

All waterborne/acrylic markings are to be reflectorised in accordance with NZTA P/22.

3.5.2.2 Alkyd Paint

Alkyd paint shall be applied in accordance with NZTA Specifications P/12 and M/7, with the following amendments.

Table 3-16: Alkyd pain specification amendments

Clause 13.1 (a) NZTA P/12 – replace with:	'The finished dry film thickness shall be 180 microns or greater as defined by the equation in NZTA P/12'

3.5.2.3 Chlorinated Rubber

Chlorinated Rubber or similar paint shall be applied in accordance with NZTA Specifications P/12 and NZTA M/7, with the following amendments.

Table 3-17: Chlorinated rubber specification amendments

Clause 13.1 (a) NZTA P/12 – replace with:	'The finished dry film thickness shall be 220 microns or greater as defined by the equation NZTA P/12'

All chlorinated rubber markings are to be reflectorised in accordance with NZTA P/22.

3.5.2.4 Thermoplastic

Where long life or thermoplastic materials are specified they shall be supplied and applied in accordance with NZTA M/20 specification. The type of long-life material proposed to be used and details of type of approval to NZTA M/20 specification shall be submitted with any tender or proposal.

3.5.2.5 Re-markings

A re-mark will be required within 3-6 months (or prior to completion of defects period if shorter) depending on wear and deterioration of the markings. This re-mark will be with the final paint type specified in section 3.5.22 above. Approval must be obtained from Council prior to completing this re-mark to determine the paint type and final layout of the line marking.

3.5.3 Equipment Certificates and Staff Competence

All line marking equipment used for applying paint and glass beads shall have a current NZTA T/8 certification and be in a certifiable state.

All line marking equipment used for applying long life or thermoplastic materials shall have a current NZTA T/12 certification and be in a certifiable state.

The senior operator of each road marking crew must have at least a minimum qualification approved by the Industry Training Organisation (ITO). At least one person in each road marking crew shall be a qualified Traffic Controller (TC) in accordance with the NZTA COPTTM.

3.5.4 Raised Pavement Markers (RPM)

All reflectorised pavement markers are to be glass faced (long life) or equivalent with NZTA Specification M/12 type approval.

All pavement markers are to comply with NZTA M/12 (and NZTA M/12 notes). Installation of raised pavement markers shall comply with NZTA P/14, MOTSAM, and any subsequent NZTA document (e.g. RTS 4 'Guidelines for Flush Medians'). Further to this, Council may require specific RPM layouts in certain locations.

Where 'Active' RPMs are specified, these shall incorporate solar panels and LED lights so that they do not rely solely on reflected light.

3.5.5 Removal of Line marking

When redundant line markings require erasure, Council will specify the method to be used.

3.5.5.1 Removal

When 'removal' is specified, the line marking material (paint or thermoplastic) shall be removed from the road surface. Typical methods include grinding, sandblasting (wet or dry) and ultrahigh-pressure water cutting, but other methods may be considered acceptable by Council. Care shall be taken so that damage is not caused to the underlying road surface and that 'ghosting' of the marking does not occur.

Once complete, the surrounding area shall be swept clean of all sand, paint chips or other debris. This material shall be suitably disposed of with care being taken to ensure that no solid matter enters any waterway or stormwater system as a result of the removal operation. This may require the placement of filters or similar on catch pits and other drainage features.

Details of methodology, including materials to be used, equipment, staff skills and qualifications and quality assurance shall be supplied with tenders or proposals.

3.5.5.2 Cold Applied Plastic Blackout

Permanent erasure of markings may be specified to be carried out with cold applied plastic (CAP) material.

Existing long life markings or multi-layered line markings should be ground off before applying CAP Blackout. The base coat shall be a two-component cold plastic, designed and formulated for use as a road marking material and complying with NZTA specification M/20. The CAP shall be pigmented to a grey or charcoal colour that is close to the colour of the existing road surface. The product shall be mixed and applied in accordance with manufacturer's instructions.

Where the area to be blacked out abuts markings that are to remain, the edge of the blackout shall be masked off, otherwise an irregular edge to the blackout is desirable to minimise any ghosting effect. While the plastic material is still wet, crushed stone or grit shall be evenly broadcast onto the base.

The grit shall be a sound crushed mineral or synthetic aggregate with 95% passing a 6.7mm BS sieve and no more than 15% passing a 2.36mm BS sieve. The CAP material thickness and grit size shall be matched so that approximately 60% of the grit depth is embedded into the plastic material.

The aggregate shall have a maximum of 2% weak materials when tested using the Australian Weak Particles Test (AS 1141.32).

3.5.6 High Friction or Coloured Aggregate Surfacing

High friction or coloured aggregate surfacing is to be applied at locations specified by Council. Both surfacing types generally use a specialised aggregate bonded to the road surface in an epoxy or polyurethane resin so are included in the same specification.

Proprietary surfacing systems shall be applied in accordance with the manufacturer's specification and by the manufacturer's approved applicators.

Documents that relate to this section are the NZTA Specification M/6 : Sealing Chip.

All technical documentation regarding the proprietary product or system to be used shall be submitted.

3.5.6.1 Surface Preparation

The surface shall be clean of any dust, detritus or loose matter. Any oil visible on the surface shall be removed by washing with a detergent solution, followed by flushing with clean water, or other suitable system.

Care shall be taken to ensure that no solid matter enters any waterway or stormwater system as a result of the removal operation. This may require the placement of filters or similar on catch pits and other drainage features.

The surface is to be completely dry before application of the binder.

All existing line marking, pavement markers, catch pits and kerbing shall be suitably masked so that only the road surfacing is coated.

The suitability of application to the pavement at the sites specified shall be discussed with Council using the manufacturer's guidelines.

3.5.6.2 Binder

The binder shall be a suitable epoxy, polyurethane or other approved proprietary product compound. When used in conjunction with coloured aggregates the binder shall be pigmented to the same colour as the aggregate. Thermo plastic binders shall not be used.

The cured binder shall be flexible so that it does not crack or delaminate under traffic loadings on non-rigid pavements.

The binder shall be capable of holding the aggregates so they do not become embedded or dislodged under heavy braking.

3.5.6.3 High Friction Aggregate

The aggregate shall be calcined bauxite or equivalent, which has a PSV greater than 70 when tested in accordance with BS 812-Part 114.

The grading of the aggregate shall be as follows.

a) less than 5% retained on 4.75mm BS sieve

b) less than 5% passing 1.18mm BS sieve

The aggregate shall be clean and free of foreign matter. The aggregate shall comply with the NZTA specification M/6 strength, shape and weathering resistance requirements.

3.5.6.4 Coloured Aggregate

The aggregate shall be a chemically inert, semi translucent, synthetic aggregate that complies with shape, strength and weathering requirements of the NZTA specification M/6 and is coated with colouring compound(s) to produce the specified colour.

The grading of the aggregate shall be as follows.

a) less than 5% retained on 4.75mm BS sieve

b) less than 5% passing 1.18mm BS sieve

The aggregate and binder system shall be designed to achieve a high level of colour retention and resistance to both traffic abrasion and weather such that colour is intact and effective for at least five years from the initial installation. The aggregate shall have a minimum PSV value of 50 when tested in accordance with BS 812-Part 114. The surfacing must be capable of being cleaned by high pressure water jet to remove dirt, grime and debris in order to restore the colour.

3.5.6.5 Mixing, Batching and Application

The manufacturer's guidelines for the mixing, batching and application rates of product shall be followed, unless otherwise directed by Council.

3.5.6.6 Curing and Aftercare

All masking shall be removed together with the binder adhering to it. During the curing period, no disturbances or trafficking of the treated surface is permitted.

The cure time shall be to the manufacturer's recommendations required under the particular site conditions.

Before trafficking, excess chip shall be removed. Along with any subsequent chip which may have eroded off the treatment for a period of one month following opening of surface to traffic.

3.5.6.7 Performance

The minimum performance requirements are:

a) SCRIM Value – shall be at least 0.7 ESC

b) Aggregate Retention – a visual assessment of the surfacing shall be performed to assess the level of coverage and retention. Aggregate retention shall be assessed by determining coverage on any 300mm x 300mm area. The surface shall be rejected if any three locations have less than 95% chip coverage

c) Texture Depth – the surfacing shall be rejected if any three locations have a mean profile depth of 1.0 mm or less (105mm sand circle if determined in accordance with NZTA Specification T/3).

d) Cracking/Delamination/Sliding – the surfacing shall be rejected if there are any of the above conditions present at the end of the three month defect liability period.

3.5.6.8 Cleaning

When cleaning of existing high friction or coloured surfacing is required, a high-pressure water jet or other suitable means shall be used to remove all dirt, grime, debris and the like from the surface. Care shall be taken to avoid damage to the surfacing.

Care shall be taken to ensure that no solid matter enters any waterway or stormwater system as a result of the removal operation. This may require the placement of filters or similar on catch pits and other drainage features.

3.5.7 Coloured Markings

When specified, some markings may be required in colours other than white or yellow.

Typical applications are.

a) Green for cycle way markings or bus only lanes

b) Blue for disabled car park spaces

Actual colours will be specified at the time. Such markings shall use the applicable paint type specified in section 3.5.2, coloured to the specified colour. Paint application shall be in accordance with the relevant clauses of this specification.

3.5.8 Temporary Markings

When specified, temporary markings may be required that can easily be removed when no longer needed. Such markings shall be capable of withstanding normal road traffic and weather conditions for a period of at least three months, or longer if specified. When no longer required the markings shall be removed without causing damage to the underlying road surface.

Full details of materials proposed for temporary markings, their method of application and removal, and typical properties shall be supplied with any proposal for use. All materials shall be handled and applied in strict accordance with manufacturer's specifications and datasheets. In particular, all environmental precautions shall be adhered to.

Typical methods of temporary marking include 'removable paint' and self-adhesive road marking tape.

3.5.9 Non Standard Markings

3.5.9.1 Cycle Symbols

The cycle symbol shall be set out in accordance with the NZTA Traffic Control Devices Manual, but may be scaled to be 1200mm or 800mm high as directed by Council.

3.5.9.2 Cycleway 'End'

The word 'End' shall be painted at the end of cycle lanes along with a cycleway symbol, where directed by Council. 'End' shall be 600mm high x 900mm long.

3.5.9.3 Cycleway Hold Bars

Cycleway hold bars are used at signalised intersections with advance cycle 'stop-boxes'. The cycleway hold bars shall be 100mm wide with 200mm gap. Refer to Drawing D3.9.1 for more details.

3.5.9.4 Cycleway Hook Turns

Cycleway hook turns are to be provided at signalised intersections where turning right is likely to be considered a difficult manoeuvre for cyclists. Final cyclist provisions are to be confirmed by Council.

3.5.9.5 Speed Cushions and Speed Humps

The approach faces of speed cushions and speed humps shall be painted with reflectorised white triangles to facilitate visibility. The width of the triangles shall be such that there are at least three triangles on each speed cushion and the depth shall cover the full depth of the tapered approach face of the speed cushion.

3.5.9.6 Pedestrian Platforms

The faces of raised pedestrian crossing platforms and full width speed control devices shall be marked with white reflectorised cross-hatching as dimensioned in Traffic Control Devices Rule Diagram M4-2. Unless otherwise stated, poles located within medians shall be installed with a socketed base to allow quick and easy replacement.

3.6 STREET LIGHTING CONSTRUCTION

3.6.1 Installation

Each street light position is an Installation as defined in AS/NZS3000.

All construction work to be undertaken by competent/approved contractors and in accordance with the Electricity Regulations 2010, AS/NZS3000 and the applicable Electrical Codes of Practice. The most recent amendments must be used and approved by the network company.

All installations are subject to test and provision of ESC or CoC.

3.6.2 Connection to network

All proposed street lighting connections must be approved by the relevant network company prior to commencement of the project.

The steps to follow in pre- installation and installation stages are outlined below:

- Submit proposed design/ lighting plan to the network company for verification of supply points
- Submit Application for New connections detailing additional load required for new streetlights

In order to liven new lighting installations the network company will require the following documentation:

- Approved Application for New Connection
- CoC or ESC signed by authorized person
- As builts in format approved by the network company
- Confirmation of practical completion or 224c sign off.

All parties involved in the street lighting installation shall comply with the network company's design and connections standards and procedures.

3.6.3 Installation

All Columns are to be installed in accordance with the manufacturer's specification, electrical codes and health & safety acts.

The column position in developed areas shall be pegged in advance of the work and adjacent property owners notified in writing of the works so that any issues over column location can be resolved before installation begins.

Contractor to submit Corridor Access Request and confirm underground services location prior to groundworks commencing in developed areas.

If the contractor finds underground bed rock (e.g. rhyolite) or finds underground services not allowed for, that precludes installing a column in the desired location, they are to contact the council for guidance rather than simply moving the column.

Any groundwork carried out for installation is to be re-instated to council's standard.

Access doors shall be accessible.

Any damage caused prior to the hand-over to council must be repaired as new with all warranties remaining intact.

Internal wiring, earthing and circuit protection devices to comply with the network company's Design and Construction Standard.

Luminaires shall be installed on columns in accordance with the manufacturer's recommendations. The horizontal axis shall be level and with the specified tilt angle. Where existing brackets or outreaches have a different tilt angle to that specified for new lights, new luminaire with internal tilt mechanism may be used or suitable tilt wedges shall be installed so that the existing luminaires have the same tilt angle as any new fittings.

3.6.4 Cables

Underground cable installations shall be provided to all street lighting columns except for lights specified to be installed on existing power poles. Cable route and conductor sizes shall be designed and installed in accordance with network company's requirements. Warranty period for new cables is 12 months.

All new installations shall be designed to be controlled through the Network Owner's control system.

All column installations shall be provided with approved internal termination junction boxes for terminating lighting circuits. These are to be located at the gear openings of each column.

Cables installed vertically on power poles shall be fitted and enclosed in accordance with requirements of the network company.

3.6.5 Trenching

Underground cables to be installed to the network company's requirements. In order to prevent damage to road pavement and minimise disruption to the public thrusting must be used under existing carriageways, vehicle entrances and footpaths

Location of the cables in green fields should be as detailed in Drawing D3.1.3 Location of Services in Transport Corridor.

3.6.6 Lighting Upgrades

Where lighting columns or circuits are being relocated, extended or upgraded, the existing supply, protective devices and switching control may be reused if it is in compliance with this specification.

In the event that an existing circuit is extended, the network company will confirm if the supply relays and fuses are suitably rated for the additional electrical load of the new lights. The Contractor will be responsible for any costs associated with uprating the supply point, fusing, changing relays or fitting contactor sets associated with the additional lighting load.

All additional fittings and materials used shall be new and consistent throughout the installation. If in-fill lighting or continuation of an existing system the new fittings and materials shall match the existing, if practicable.

3.6.7 Existing Luminaires, Columns and Control Gear Made Redundant

The Council's Street Light Maintenance Contractor shall be given an opportunity to acquire any surplus luminaires, columns and associated spare parts made redundant, for the purpose of utilising them as maintenance spares. The Contractor shall be responsible for disposing of any redundant 'not wanted' materials including capacitors containing PCB's.

All non-usable parts are to be disposed of correctly and certificates provided to Council to this effect.

3.6.8 Inspections and Testing

Prior to commissioning all inspections and testing required by the network company shall be carried out. Written confirmation is required from the network company that it accepts all underground cabling and circuitry and will assume responsibility for future maintenance and renewal.

A lux survey may be requested by Council at the contractors cost.

3.7 TRAFFIC SIGNALS

3.7.1 Scope

This section covers the procedure and requirements for all new or upgraded traffic signals that are to be managed by Hamilton City Council. This includes the design, supply, installation, and commissioning of new and existing traffic signal equipment.

3.7.2 Specifications

All traffic signals are to be installed in accordance with the Specifications and Standards listed in Clause 3.1.2. The following Council specifications supersede NZTA P43 requirements.

Where reference is made in any Specification to RCA or Client, this shall be read as Council.

3.7.3 Traffic Signal Equipment

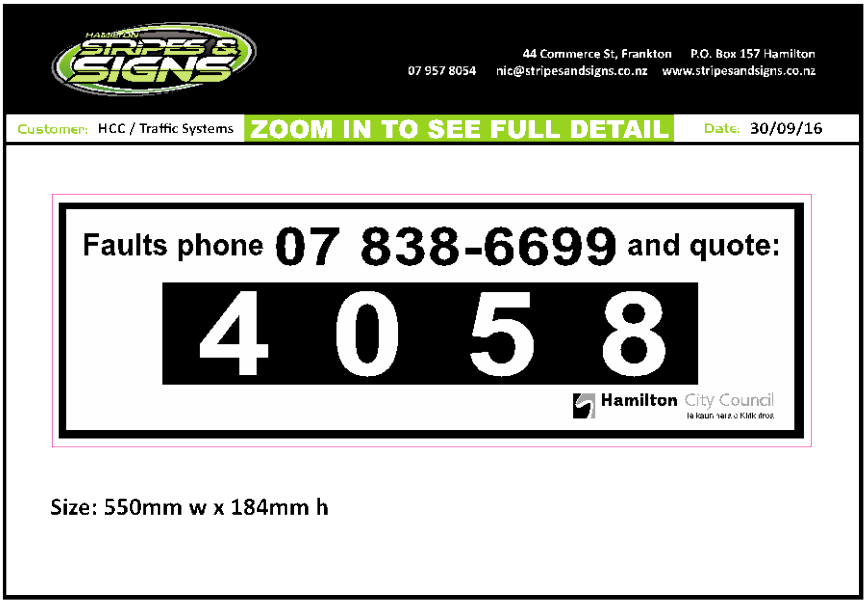
3.7.3.1 General

This section contains specific requirements for the supply and installation of the controller, detectors, junction boxes and poles.

3.7.3.2 Traffic signal controller

Unless specified, the coating colour shall the industry standard to match existing controllers in Hamilton.

A sticker shall be placed on each controller box in accordance with the following figure.



Drawing 3-1: Traffic Signal Box Sign

3.7.3.3 Detector Loop Encapsulation

The approved flexible sealant as referred to in P43 is Plasticast LQB Tixophiate, which is a two part epoxy compound formulated specifically for the encapsulating of traffic signal detector cable loops which are embedded in asphaltic road surfaces.

3.7.3.4 Kerbside Junction Boxes

Access for loop-feeder between detector loop and toby box may be obtained in two ways:

a) **Under kerb access** - to be used in all cases where new kerb and channel is to be constructed; Under kerb access shall consist of 25mm alkathene water pipe laid from the toby box under the kerb and to within 50mm of the top of the seal and within 100mm of the edge of the seal. The access hole in the pavement shall be backfilled, compacted with basecourse material, and sealed.

b) **Saw cut through kerb and channel** - may be used where existing kerb is to be retained;

A 5mm wide saw-cut may be made through the kerb and channel and sealed with Sikadur 43 epoxy resin mortar* or equivalent

3.7.3.5 Shop Verandas, Poles and Other Obstructions

Any obstructions which will interfere with the installation, visibility or operation of the signals will be removed or altered by the Contractor.

Where such obstacles originate in private property, clearance to proceed with this work shall first be obtained from Council. Some delay may occur while the property owner is contacted.

Note: All alterations to services will be undertaken by the appropriate service authority.

3.7.4 Communications

Unless otherwise specified, all new traffic signals and cameras shall be connected to the HCC City Transportation Unit's (CTU) traffic signal network. This network uses a combination of 4G wireless, fibre and point-to-point links. Either one of these methods may be appropriate for the site. Council will advise the appropriate communication method for the site and in most cases will provide pre-configured hardware for the Contractor to install, such as a router and radio.

A radio must be mounted appropriately (typically attached to a signal pole) to achieve the signal strength requirements. The router shall be housed in the traffic signal controller cabinet.

Each installation must include initial site coverage testing and scoping, power supply to the radio, and all associated ducting and cables including a shielded outdoor grade cat6 cable from the controller to the radio running inside the pole to the radio mounting location.

The traffic signal controller must achieve continuous SCATS communications for a minimum of 48 hours prior to commissioning.

3.7.5 Provision of Cameras

Unless otherwise specified by Council a traffic monitoring camera must be installed and connected at all new traffic signal installations or sites subject to major upgrade, with the exception of mid-block pedestrian crossings. All camera hardware must have a minimum warranty period of 12 months from the date of installation.

3.7.5.1 Camera Specifications

Traffic monitoring camera must meet the following technical requirements:

a) Cameras are to be digital, IP based, PTZ, outdoor units

b) Each new installation shall include the camera and PTZ unit, controller and communications interface, power feed, housing, mounting, and pole (if required)

c) Cameras must be compatible with the Milestone and DVTel management systems

d) Unless specified, the required camera viewing distance shall be assumed to be 250m

e) Minimum 12x optical zoom

f) The zoom and stability shall be such that the displayed image at the viewing distance with maximum optical zoom is no larger than the road carriageway, and image shake does not exceed 3% of the image size in any direction

g) Image sensor must be colour CCD with minimum size ¼'

h) Minimum horizontal resolution of 480 lines

i) Appropriate sensitivity and image correction for day and night observations

j) 360 degree pan rotation with image auto-flip, allowing tilt from horizontal to -90 degrees

k) Minimum of 10 pre-set PTZ positions

l) Camera and housing to provide a minimum IP66 ingress protection to IEC 60529, and include a sun shield and condensation prevention

m) Appropriate video compression to communicate over the communications network (H264 is the preferred method)

3.7.5.2 Camera Location and Mounting

The camera should be located such that:

a) Every traffic lane is visible at the intersection limit line

b) Required viewing distance is achieved down each leg

c) Viewing is optimised for legs with adjacent signalised intersections

Unless otherwise specified, mounting on a traffic signal pole such as a Joint Use Mast Arm (JUMA) is permitted where practical.

The Contractor shall supply and install a shielded outdoor grade cat6 cable from the controller to the camera location, running inside the pole to the camera mounting location.

Council must approve the final location prior to installation of pole or camera. A site assessment plan showing the location and visibility of the proposed camera must be provided to Council for approval.

3.7.6 Warrantees, Guarantees and Maintenance

All materials and equipment supplied and/or installed (including the installation) shall have guarantees and warrantees in accordance with P43.

Practical completion will not be issued until Hamilton City Council and the current signals maintenance contractor have approved the works and site operation. Hamilton City Council's Signal Maintenance Contractor will carry out regular maintenance on the intersection immediately following practical completion and if any faulty equipment or installation work is identified, then the Contractor responsible for installing the equipment will be required to fix and/or supply parts to fix the fault at no cost to the Road Controlling Authority.

During the construction and maintenance periods, the Contractor shall also be required to pay all costs incurred by Hamilton City Council's Signal Maintenance Contractor (who has been contracted to maintain the overall intersection) for isolating and making safe any reported faults which can be directly attributed to the signal installation or modification work. This includes any faults in materials, equipment or workmanship. The Contractor will be invoiced separately for this work or more commonly, the amount will be deducted from the contract price or from any maintenance retentions owing.

At the end of the maintenance/defects liability period the equipment shall be handed over in full working order with no defects. Where such defects exist, whether in control equipment, detectors, or signal hardware or in any part of the equipment supplied, these shall be made good at no expense to Hamilton City Council.

3.7.7 Design Requirements

3.7.7.1 Filter Turn Warrant

A right turn may be permitted to filter unless any of the following criteria are met:

a) The right turn movement has experienced more than five “right turn against” type injury accidents in the last five years. This requires further consideration – see below

b) Visibility is less than the safe stopping distance at the design speed, either by horizontal or vertical alignment, or where the opposite right turn hides approaching through traffic

c) There are three (or more) opposing through lanes to cross

d) The right turn movement has two (or more) right turn lanes

e) There are two (or more) opposing left turn lanes

f) There is a need to provide protection of the pedestrian crossing at all times.

g) The 85th percentile operating speed of opposing traffic is greater than 70 km/h

Where an existing filtered movement has more than five “right turn against” type injury accidents, two further aspects should be reviewed:

a) The accidents should be investigated to determine if there are any common factors such as time of day. If the accidents predominantly occur during similar periods, consideration should be given to providing a time based filter.

b) Consideration should be given to undertaking a benefit cost analysis for the filter turn, where an intersection relies on a filter movement to operate effectively during peak periods. If travel time savings gained from the filter turn sufficiently outweigh the associated accident cost, the filter turn could be retained.

The decision to allow or prohibit a movement to filter is a complex engineering decision. While the above criteria provide guidance in assessing if a filtered right turn is appropriate, good engineering judgement must still be applied during each assessment.

3.7.7.2 Pedestrian Protection

Pedestrian protection shall be provided at all new and upgraded traffic signals

Unless otherwise specified, pedestrians at intersections should be protected as follows:

- Red arrow aspects installed for left turn traffic to provide partial protection (i.e. during the pedestrian walk time)
- Red arrow aspects installed for right turn traffic to provide full protection (i.e. the red arrow remains for the walk and clearance time)

At intersections with low pedestrian and vehicle volumes, protection may be provided using a delayed start for the conflicting vehicle movements

Protection is typically provided during part or all of the walk time, determined on a site by site basis as appropriate for the number of vehicle-pedestrian conflicts. At intersections with high pedestrian volumes where there is greater concern for pedestrian vulnerability, protection should be provided for the walk time and some or all of the clearance time for conflicting vehicles.

Full pedestrian protection should be considered at sites where an unusual layout causes vehicles to interact dangerously with pedestrians, and consideration needs to be given to conflicting movements to ensure capacity is not overly compromised.

Where a priority pedestrian crossing has no conflicting vehicle movements and is adjacent to a main vehicle movement, the pedestrian phase should allow late introduction of the pedestrian phase if sufficient time is available to complete the crossing within the associated vehicle phase.

3.7.7.3 Advanced vehicle detectors

Advanced detectors can be costly to install and maintain but typically provide efficiency and safety benefits. The suitability, number of detectors and their location shall be assessed on a site by site basis.

At new intersections, advanced detectors should generally be provided on arterial roads and any road with a posted speed limit above 50 km/h.

3.7.7.4 Network Operating Plan

The Hamilton Network Operating Plan covers day to day operation of the network in a way that seeks to optimise the existing infrastructure and reflects the strategic priorities that have been assigned to each of the user modes by location and time of day.

Any new or modified traffic signal site shall be assessed against the strategic intentions discussed in the Network Operating Plan to ensure that they will reflect the defined road user hierarchy and priorities.

3.7.8 Traffic Signal Procedure

The procedure set out in the table below applies to all Traffic signals that are to be managed by CTU, including traffic signals that are installed on other RCA networks such as the local State Highway network, Waipa District Council and Waikato District Council.

The table provides an overview of the entire process including the approvals and deliverables required to enable the traffic signals to be managed by CTU.

Table 3-18: Procedures: Signal Plans, Software and Commissioning

TASK	SUPPLY	DESCRIPTION / REQUIREMENTS	CREATED BY	APPROVED BY
Brief	Design brief	Design brief given to the signals consultant describing the traffic signal and civil works required	Client	Signals Consultant
Justification	Justification Report	Report justifying the need for traffic signal control	Signals consultant	Client
Design	Report, plan and traffic modelling	Design plans and design report in accordance with relevant standards. Level of service and 95%ile queue lengths for morning and evening peaks A site plan with the preliminary design superimposed showing:	Signals consultant	Client and City Transportation

TASK	SUPPLY	DESCRIPTION / REQUIREMENTS	CREATED BY	APPROVED BY
		- Posts, lanterns, Street lighting - Detectors - Controller - Road marking, signage and cycle facilities - Phasing diagram and cabling diagram - 5 Year CAS data		
Peer review	Review report	Peer review audit by external competent traffic signal designer, of design plan and design report Reviewer to supply letter of approval/memorandum with plan number once any amendments have been discussed and noted	External design reviewer	Signals consultant and City Transportation
Final design	Drawings and estimate	Final design plans including cable diagrams and phasing Schedule of quantities including cable charts Cost estimate Final design report Pre-construction Safety Audit covering Traffic Signals	Signals consultant	Client Copy of Plans and Safety audit to City Transportation HCC for approval
Tender		Tender documents, schedule, equipment and installation specification City Transportation to check technical documents. Appropriate references to the HCC ITS.		
Controller	Controller Information Sheets (CIS)	Controller Information Sheets (CIS) includes: - Controller type - Lane layout - Detectors - Phasing - Signal group numbering - Timing details both vehicle and pedestrian - Pedestrian crossing distances - Flexilink details - Special facility requirements	Signals consultant or council approved signal consultant	City Transportation for review
Controller	Controller software	Controller Software including independent WinTraff test of PROM Bench testing of software must be carried out by the contractor prior to commissioning and	Signals consultant or City Transportation nominated consultant Contractor for bench testing	City Transportation

TASK	SUPPLY	DESCRIPTION / REQUIREMENTS	CREATED BY	APPROVED BY
		completed bench form supplied (refer P43)		
Supervision	Supervision	Construction supervision / MSQA		Client or nominated rep
Connections	Connection for communications, cameras and power	Communications: See Clause 3.6.4. The traffic signal controller must achieve continuous SCATS communications for a minimum of 48 hours prior to commissioning. Power: For sites within Hamilton a Wel networks connection form (www.wel.co.nz) must be filled in and a sent to newconnections@vircom-ems.co.nz (Contact energy) at least six weeks prior to commissioning. A copy must also be sent to the energy manager at Hamilton City Council for creation of new accounts. WEL Networks will provide an ICP and physical connection and return to Contact for the completion of the new connection	Signals Contractor	City Transportation
SCATS	System set up and testing	SCATS graphics, related data and linking setup in accordance with HCC Traffic Signals Operational Standards Document	City Transportation	City Transportation
Pre commission checks	Completed site acceptance test (SAT)	Signals contractor shall complete the SAT (refer P43) in the presence of the RCA traffic signal representative (City Transportation)	Signals contractor	City Transportation
Commissioning	Authorisation to switch on the traffic signals	Handover of new/upgraded signals to City Transportation to operate and manage. Signed SAT and written approval to switch on the traffic signals by the RCA traffic signals representative (City Transportation) Unless specific approval is given, commissioning shall not take place on a Friday or the day before a public holiday.	City Transportation and Contractor	City Transportation
Asset information	Asbuilts and associated documentation	Contractor to supply all required asset information as stated in P43, including: - Final plans showing ducting and layout	Signals contractor	Client and City Transportation

TASK	SUPPLY	DESCRIPTION / REQUIREMENTS	CREATED BY	APPROVED BY
		- RAMM Asset Collection Sheet - C&I sheet - Keys - Test certificates - Producer statements - Cable termination chart		
Safety Audit	Post construction Safety Audit	A post conduction safety audit will be required at all new sites and upgraded signals that are complex or within high speed areas. Client may request a post construction safety audits following any traffic signal upgrades or modifications at their discretion.	Qualified safety auditor	Client/City Transportation

3.8 QUALITY SYSTEMS

This section is intended to describe the formal testing and acceptance requirements of construction. The design portion of this document must be read and complied with fully.

3.8.1 Inspections and Acceptance

This section details the inspections and hold points where council acceptance is required before continuing. Site visits may be carried out at any time during construction. Specific details about testing measures are detailed in section 3.8.2.

3.8.1.1 Carriageway Construction Inspections

After completion of the subgrade, sub-base and basecourse layers, testing in accordance with clause 3.8.2.2 shall be carried out:

3.8.1.2 Hold Points

- Kerb and Channel
- Footpath and Cycleway
- Signs and other street furniture
- Street Lighting

The Installation contractor shall provide the following documentation to Council:

a) Approved Application for New Connection

b) Electrical Certificate of Compliance or Electrical Safety Certificate signed by authorised person

c) As built drawings in format approved by the electrical network provider including results of inspections and testing.

d) Street light control point form.

e) Lighting pole and luminaire data using RAMM Streetlight Data Form F3.10.

f) Network company's approval sheet

3.8.1.3 Traffic Signals

Traffic signals have a specific procedure set out in 3.7.8.

3.8.2 Testing Guidelines

The following are a summary of the testing requirements. The results of each of these tests must be provided to Council.

3.8.2.1 Carriageway Test Spacing

Compaction and material strength tests are to be taken at the following locations and frequency:

Table 3-19: Test Spacing locations and frequency

For carriageways 4.0m wide and less	Along centreline	15m spacing between tests
For carriageways between 4.0m and 8.0m	At the kerbside wheel tracks	Alternating Sides, 10 centreline metres between tests (20m repetition of testing rows)
For carriageways 8.0m and wider	At centreline and kerbside wheel tracks	Staggered across road, 10 centreline metres between tests (30m repetition of testing rows)

On small sites there must be a minimum of 10 tests carried out.

The kerbside wheel tracks are assumed to be 1m inside the kerb and channel alignment.

3.8.2.2 Subgrade Testing Prior to Design

Subgrade testing should begin at 100mm above the design subgrade level.

Subgrade testing is to be by Scala Penetrometer for all materials that are suitable.

If the material has larger aggregates then a Clegg Hammer test should be used instead.

3.8.2.3 Subgrade Testing Prior to Sub-base Construction

If subgrade improvement measures have been carried out (such as replacement with Pit Sand, Granular Rock Fill Material, or use of a stabilisation agent) Pit Sand or stabilised materials shall be tested by Scala Penetrometer. Granular rock shall be tested by Clegg Hammer.

The shape of the subgrade shall be measured by stringing.

3.8.2.4 Sub-base Testing

The compaction of sub-base shall be tested by Nuclear Densometer.

The thickness and shape of sub-base shall be measured by stringing. Clegg hammer testing is also required.

3.8.2.5 Basecourse Testing

The compaction of basecourse shall be tested by Nuclear Densometer.

The thickness and shape of basecourse shall be measured by stringing. Clegg hammer testing is also required.

3.8.2.6 Sealed Surface Testing

Just prior to the surface receiving its first surfacing coat, Benkelman beam testing shall be carried out.

3.8.2.7 Footpath Testing

Scala subgrade tests are to be carried out at 15m intervals along the length of the footpath.

3.8.2.8 Private Way Testing

As part of the compliance evidence for the construction of Private Ways, the forms are to completed and submitted. See F3.11 on page 187.

3.8.2.9 Vehicle Crossings/Entranceways

A minimum of three scala penetrometer tests randomly spread shall be taken to a depth of 300mm below the final subgrade level per crossing. One test per $5m^2$ on crossings greater than $15m^2$ (kerb to boundary).

3.8.2.10 Kerb and Channel

If kerb and channel is constructed on top of the same sub-base pavement as the carriageway there are no additional subgrade or sub-base tests required.

If kerb and channel is constructed separate to the road, the base that the kerb and channel is founded on must be tested every 15m by Clegg Hammer (to sub-base standard). The pavement reconstruction adjacent to the kerb must be tested every 15m by Clegg Hammer prior to surfacing (to basecourse standard).

3.8.3 Testing Methods

3.8.3.1 Scala Penetrometer

The Scala Penetrometer shall only be employed where a significant part of the particles pass a 9.5mm sieve.

The CBR vs Penetration graph for sand silt materials is shown on Drawing D3.2.2.

The cone is bedded into the soil with one (or more) blows. The zero point for depth and the number of blows is taken neglecting the bedding blows.

There are 2 methods of recording the results and all test sites must comply.

Table 3-20: Procedures

CBR	max mm/blow	min blows/100mm
7	32	3

10 (footpath and vehicle crossing subgrade)	23	4
15 (carriageway subgrade)	17	6

As a means of compliance for an acceptable CBR in carriageways at the insitu subgrade, the scala readings are averaged for the top 600mm. At the imported subgrade or lower subbase surface, the scala readings are averaged for the full depth of the pavement layer being tested.

For footpath and vehicle crossing subgrade testing, the results are the average of the top 300mm.

3.8.3.2 Lab Tested Soaked CBR

Subgrade samples from the site are to be tested by an IANZ accredited laboratory for their Soaked CBR (California Bearing Ratio).

3.8.3.3 Clegg Hammer

Where the Clegg Hammer is used, it shall be the Standard Australian Digital model with a 4.5 kg compaction hammer, using a drop height of 450 mm. The test certificate must be less than 12 months old.

Testing is carried out on a surface that has no loose material (removed by scuffing with a stiff hand broom). The maximum Clegg Impact Value (CIV) at the end of the 4th blow shall be recorded and the on-site CBR value shall be taken as 0.07 (CIV)^2.

Table 3-21: Quality Systems Testing – Clegg Hammer Compliance Values

COMPLIANCE VALUES	CLEGG IMPACT VALUE (CIV)
Aggregate Subgrade (e.g. Granular rock fill material)	15
Subbase (trench reinstatement only)	25
Basecourse (trench reinstatement only)	40

3.8.3.4 Nuclear Densometer

Compaction testing shall be carried out by a suitably qualified operator using a calibrated Nuclear Densometer in Backscatter Transmission mode. The compaction is measured as a percentage of the Maximum Dry Density of the material.

The test spacings for nuclear densometer may be double the standard carriageway test spacings shown in Clause 3.8.2.1 with a minimum of 5 tests per site.

Table 3-22: Quality Systems Testing – Nuclear Densometer Compliance Values

COMPLIANCE VALUES	MINIMUM VALUE	AVERAGE (MEAN) VALUE
Subbase	92% MDD	95% MDD
Basecourse	95% MDD	98% MDD

3.8.3.5 Benkelman Beam Test

The surface shall be tested prior to sealing with a standard Benkelman Beam test apparatus. The organisation carrying out the tests shall have an IANZ accreditation.

The beam test shall be undertaken in accordance with NZTA's specification T/1 : Benkelman Beam Deflection Measurement except that the recordings for bowl deflection shall not be recorded or used in the deflection calculation.

Deflections conform to the target figures in Table 3-15 below. No more than 10% of the test results shall exceed the 90th Percentile and no single result shall exceed the maximum.

Table 3-23: Maximum Benkelman Beam Deflections

	AVERAGE (MM)	90TH PERCENTILE (MM)	MAXIMUM (MM)
A. On carriageways where asphalt is to be placed (with the exception of where asphalt is to be placed at cul-de-sac heads only):			
A1. Residential cul-de-sacs and private ways ≤40 household units	1.30	1.60	2.10
A2. All other carriageways up to 10^5 EDA	1.10	1.35	1.80
A3. All carriageways between 10^5 and 10^6 EDA	1.00	1.20	1.60
B. On other carriageways surfacing situations (factored by 1.5 for block paving):			
B1. Residential cul-de-sacs and private ways ≤40 household units	1.50	1.80	2.40
B2. All other carriageways up to 10^5 EDA	1.25	1.50	2.60
B3. All carriageways between 10^5 and 10^6 EDA	1.00	1.20	1.60

Table 3-24: Shape and Relative Height Tolerances

AT TOP OF LAYER	CENTRELINE AND NEAR PAVEMENT EDGE	AT CHANNEL EDGE	DEVIATION FROM 3M STRAIGHT EDGE OR CAMBER BOARD
Surface			1: 12mm 2: 8mm
Basecourse	-5mm to +15mm	1: 0mm to +10mm	12mm
Subbase	-25mm to +5mm	-25mm to +5mm	15mm
Subgrade	-30mm to 0mm	-30mm to 0mm	15mm

1: Chip sealed surface

2: Asphalt surface (typically 25mm thick)

Construction levels are based on lip of channel, appropriate crossfall and designed pavement layer thickness.

3.8.3.6 NAASRA Roughness

A post sealing NAASRA roughness measure is required. This measure shall be 70 maximum average value with no more than 3% readings in excess of 70 for each traffic lane. The Engineer will not consider remedial measures other than remaking of the pavement surface for NAASRA roughness compliance. The survey result is required to be provided prior to the issue of a practical completion certificate or 224C.

Roughness Specification

All road roughness surveys shall be in accordance with the latest revision of the "RAMM Computer User's Manual", "RU Technical Recommendation TR12 Roughness Meter Guidelines" and "Standard Operating Instructions for the NAASRA Roughness Meter" or the RIMS "Specification for Road Condition Data Collection". All results are to be reported as NAASRA counts.

The Project Manager and test operators shall be suitably experienced and familiar with the test equipment and results required.

Measurements are to be taken on the various road types as follows:

- On narrow single carriageway roads measurements are to be taken in the normal driven wheel path. This is likely to straddle the road centre-line. The survey is to be completed in one direction only. Data processing techniques should account for instances when the vehicle deviates from the road onto the shoulder.
- On single carriageway, two-lane roads both increasing and decreasing lanes are to be measured. The measurements are to be taken in the wheel paths. Where no obvious wheel path is visible the measurements are to be taken 50 to 70 cm from the edge of the pavement.
- On divided carriageway roads and service lanes survey both increasing and decreasing lanes (both carriageways and service lanes). The measurements are to be taken in the wheel paths; where no obvious wheel path is visible the measurements are to be taken 50 to 70 cm from the edge of the pavement.
- On dual carriageway roads survey both increasing and decreasing lanes (both carriageways). The measurements are to be taken in the most heavily trafficked wheel paths; where no obvious wheel path is visible the measurements are to be taken 50 to 70 cm from the edge of the pavement.

Laser Profilometer

The Consultant may use a non-contact laser profilometer to measure the paved roads' longitudinal profile. The profilometer should conform to the ASTM E950-94 standard, have a vertical resolution of less than 0.1 mm, and achieve a roughness measurement accuracy of< 0.1 mm. The Consultant shall record and report the longitudinal profile data and process the profile data to provide and report NAASRA count/km. The lane roughness calculations are made from the average of the left and right wheel path profiles, and the data recorded and reported as follows:

- Number of wheel paths: two
- Longitudinal profile sampling interval: no more than 25 mm
- NAASRA Counts interval 20 m and 100 m.

Any factors which may influence the survey result must be recorded during the survey and the data corrected accordingly. These factors include, for example, survey speed in congested areas, traffic congestion, sudden braking, and other events.

Some operational practices, such as sudden acceleration or braking during surveys, may also influence the result and operators should avoid these.

Response Type Roughness Meter

The roughness data may be collected using a single/dual response-type roughness meter/s or similar, with the instrument calibrated in accordance with ASTM E 1448-92/98. The roughness data must be reported at 20 m and 100m intervals in NAASRA count/km. The vehicle speed shall be recorded during the survey and taken into account when calculating the roughness from the raw data.

Factors which may influence data quality must be recorded during the survey and the data corrected accordingly. These include, for example, traffic congestion, pavement construction activities and having to travel off the carriageway.

Equipment Validation

Roughness measurement equipment with current NZTA approval for use on the State Highway network may be used without further validation checks. Other equipment must be validated before use as described in the RIMS High Speed Data Collection Guidelines.

3.8.4 As-built Data Provision

As built data requirements are detailed in Section 1, Table 1-9.

APPENDIX 3A: TRANSPORTATION CORRIDOR HIERARCHY TABLES

Following are links to the transportation corridor hierarchy tables for each participating council:

Table 3-25: Transportation corridor hierarchy tables

COUNCIL	WHERE CURRENTLY HELD	LINK
Hamilton City Council	District Plan	http://www.hamilton.govt.nz/our-council/council-publications/districtplans/PODP/appendix15/Pages/default.aspx
Waikato District Council	District Plan	http://districtplan.waidc.govt.nz/pages/plan/Book.aspx?exhibit=ws&hid=1445
Waipa District Council	District Plan	T4 - Criteria for Public and Private Roads.pdf
Matamata Piako District Council	Development Manual, Page 3-2, Table 3.1	http://www.mpdc.govt.nz/districtplan/DevelopmentManual/DevelopmentManual2015.pdf
Hauraki District Council	District Plan	http://www.hauraki-dc.govt.nz/assets/council_documents/dptext/1252639_Sect8.6.pdf
South Waikato District Council	CoP **Urban roads** Page 93, Table 4	http://www.southwaikato.govt.nz/our-services/planning/Documents/COP/code_of_practice_subdivions_part_7.pdf
	CoP **Rural roads** Page 112, Figure 12	http://www.southwaikato.govt.nz/our-services/planning/Documents/COP/code_of_practice_subdivions_appendices.pdf
Otorohanga District Council	District Plan	http://www.otodc.govt.nz/assets/Uploads/ODC-Operative-District-Plan-On-Line-Version2.pdf
Waitomo District Council	N/A	

APPENDIX 3B: TRANSPORTATION ASSET DATA FORMS

Table 3-26: Transportation Asset Data Forms

NO.	TITLE
	Quality Forms
F3.1	Basecourse Shape and Relative Height/Clegg Hammer Test and NDM Checklist
F3.2	Sub-base Shape and Relative Height/Clegg Hammer Test Checklist
F3.3	Subgrade Shape and Relative Height/Scala Penetrometer Test Checklist
F3.4	As-built Data Checklist
F3.5	Subgrade Scala Penetrometer Data Form
F3.6	Trench Backfill Compaction Form
	RAMM Forms
F3.7	Asphalt Data
F3.8	Chipseal Data
F3.9	Pavement Data
F3.10	Street Light Data
F3.11	Privateway – confirmation of Design, Supervision and Construction
F3.12	Privateway construction materials

F3.1 BASECOURSE SHAPE AND RELATIVE HEIGHT / CLEGG HAMMER TEST / NDM (CIRCLE ONE TEST)

SUBDIVISION	STAGE	
PLAN NO.	CH FROM	TO
TEST LOCATION	ROAD NAME/NUMBER	
CONTRACTOR	DATE	

CH	1.0M FROM K&C (L)	CENTRELINE	1.0M FROM K&C (R)	KERB SIDE WHEEL TRACKS	
				LEFT	RIGHT

F3.1 ANALYSIS OF RESULTS

Basecourse Shape / Clegg Hammer Test Completed (Circle one test).
Clegg Hammer results attached ❑

❑	Pass	Ch. from:		to:	
❑	Fail	Ch. from:		to:	
❑	Remedial work required		Date of calibration		
❑	Contractor's control Offset pegs or Grader GPS				
❑	**NDM Results attached**		Dry density used:		

Comments/Required Remedial Work

Signature of Developer/Contractor _____

Signature of Council Representative _____

F3.2 SUBBASE SHAPE AND RELATIVE HEIGHT / CLEGG HAMMER TEST (CIRCLE ONE TEST)

SUBDIVISION	STAGE	
PLAN NO.	CH FROM	TO
TEST LOCATION	ROAD NAME/NUMBER	
CONTRACTOR	DATE	

CH	1.0M FROM K&C (L)	CENTRELINE	1.0M FROM K&C (R)	KERB SIDE WHEEL TRACKS	
				LEFT	RIGHT

F3.2 ANALYSIS OF RESULTS

Sub-base Shape / Clegg Hammer Test Completed (Circle one test).
Clegg Hammer results attached ❑

❑	Pass	Ch. from:		to:	
❑	Fail	Ch. from:		to:	
❑	Remedial work required		Date of calibration		
❑	Contractor's control Offset pegs or Grader GPS				
❑	**NDM Results attached**		Dry density used:		

Comments/Required Remedial Work

Signature of Developer/Contractor _____

Signature of Council Representative _____

F3.3 SUBGRADE SHAPE AND RELATIVE HEIGHT/ SCALA PENETROMETER TEST

SUBDIVISION	STAGE	
PLAN NO.	CH FROM	TO
TEST LOCATION	ROAD NAME/NUMBER	
CONTRACTOR	DATE	

CH	1.0M FROM K&C (L)	CENTRELINE	1.0M FROM K&C (R)	KERB SIDE WHEEL TRACKS	
				LEFT	RIGHT

F3.3 ANALYSIS OF RESULTS

Sub-grade Shape / Scala Penetrometer Test Completed (Circle one test).
Scala penetrometer test sheet attached ❑

❑	Pass	Ch. from:		to:	
❑	Fail	Ch. from:		to:	
❑	Remedial work required				
❑	Contractor's control Offset pegs or Grader GPS				

Comments/Required Remedial Work

Signature of Developer/Contractor _____

Signature of Council Representative _____

F3.4 AS-BUILT DATA CHECKLIST

The following are the as-built data requirements to be met:

DRAWINGS

Drawings must show the following in a clear and uncluttered way:

- ☐ Design centreline and chainage
- ☐ Clear indication of the area corresponding to the GST register
- ☐ Surfacing Changes and types (e.g. cobbled sections, surfacing joins)
- ☐ Typical Cross Section (carriageway width, pavement, surfacing, footpath etc.)
- ☐ Footpaths
- ☐ Traffic Islands
- ☐ Parking / Bus Bays
- ☐ Streetlighting Location (with differing symbols for streetlight types)
- ☐ Tactile Pavers / Signage / Cycle Parking / Bollards
- ☐ Kerb and Channel, Catchpits and other drainage related assets
- ☐ Any assets that have been removed or made redundant (e.g. Road Stopping, Streetlight Relocations).

Additional details are required for:

1. Subsoil Drains, Soak Holes, Soak Trenches & Culverts (less than 3.4m²)
   - ☐ As-built drawings
   - ☐ Material
   - ☐ Dimensions

2. Structures, including retaining walls in or bordering the road reserve >1m high, bridges, culverts (greater than 3.4m²), underpasses and any other miscellaneous structures. The following must be provided;
   - ☐ Construction Drawings
   - ☐ As-built Drawings
   - ☐ Producer Statements and Code of Compliance (if applicable)
   - ☐ Any applicable guarantees and warranties
   - ☐ Recommended Maintenance Schedule

F3.4 AS-BUILT DATA CHECKLIST

3. Stormwater Management Plans (where there is only a transportation asset and not stormwater) for:

   ☐ Swale maintenance schedule

   ☐ Detention pond maintenance schedule

   ☐ Overland flow path maintenance schedule

   ☐ Soakage pit observation bore inspection

4. Detail Sheets for:

   ☐ Asphalt or chipseal surfacing (including chipseal stone PSV testing sheet)

   ☐ Pavement

   ☐ Streetlights

DOCUMENTS AND FORMS

1. Structures, including bridges, culverts (greater than 3.4m²), underpasses and any other miscellaneous structures

   ☐ Producer statements (PS3)

   ☐ Applicable guarantees and warranties

   ☐ Recommended maintenance schedule

2. Streetlighting

   ☐ Network company's approval

   ☐ Electrical Certificate of Compliance

   ☐ Manufacturer warranty documents for lights, columns and coatings

3. As-built information, including:

   ☐ Streetlight data forms

   ☐ Pavement data forms

   ☐ Asphalt or chipseal data forms

Signature of Developer/Contractor _____

F3.5 SUBGRADE SCALA PENETROMETER DATA FORM

Scala penetrometer testing of subgrade materials to determine consistency.

Company Name _____

Tester Name _____

Subdivision Name and Stage _____

Testing Date _____

Testing Results

Road Name		
Displacement		
Location	Center / Left / Right / Footpath	Center / Left / Right / Footpath
Blows top 100mm		
Blows 100 to 200mm		
Blows 200 to 300mm		
Road Name		
Displacement		
Location	Center / Left / Right / Footpath	Center / Left / Right / Footpath
Blows top 100mm		
Blows 100 to 200mm		
Blows 200 to 300mm		
Road Name		
Displacement		
Location	Center / Left / Right / Footpath	Center / Left / Right / Footpath
Blows top 100mm		
Blows 100 to 200mm		
Blows 200 to 300mm		

F3.6 TRENCH BACKFILL COMPACTION FORM

(to be completed for excavation reinstatement)

As per the National Code of Practice for Utility Operators, sections 5.5.4 and 5.5.5

Clegg Hammer testing is required for Carriageway Basecourse and Sub-base layers, Driveways and Footpaths prior to surfacing.

The target results are:
Carriageway Basecourse CIV 40
Carriageway Sub-base or Driveways CIV 35
Footpaths CIV 25

Where the excavated area is greater than 0.5m² and less than 5m², one test is required, or for larger excavations, one test per 5m². For backfilling within the carriageway, testing must be carried out for each backfilled layer.

Company Name ____

Tester Name ____

CAR Number ________________

Testing Results

Test Date			
Road Name			
House Number / Location			
Layer (circle one)	Sub-base / Basecourse / Driveway / Footpath	Sub-base / Basecourse / Driveway / Footpath	Sub-base / Basecourse / Driveway / Footpath
Clegg Impact Value			
Test Date			
Road Name			
House Number / Location			
Layer (circle one)	Sub-base / Basecourse / Driveway / Footpath	Sub-base / Basecourse / Driveway / Footpath	Sub-base / Basecourse / Driveway / Footpath
Clegg Impact Value			
Test Date			
Road Name			
House Number / Location			
Layer (circle one)	Sub-base / Basecourse / Driveway / Footpath	Sub-base / Basecourse / Driveway / Footpath	Sub-base / Basecourse / Driveway / Footpath
Clegg Impact Value			

F3.7 RAMM ASPHALT DATA

(to be completed for each seal layer on each road section)

Subdivision _____

Road No / Name _____

Start m _____ Start Description _____

End m _____ End Description _____

Width _____

Contractor _____

Date of Work _____

Asphalt Type (circle one) AC / OGPA / SMA / Other

Grading (e.g. M/10 DG10) _____

Area Surfaced (m²) _____

Average thickness (mm) _____

Laying Temperature (°C) _____

Tack Coat Residual Application Rate (L/m²) _____

Additional Notes (e.g. Weather, Temp, Polymer Modification) _____

_____

_____

_____

F3.8 RAMM CHIPSEAL DATA

(to be completed for each seal layer on each road section)

Subdivision _____

Road No / Name _____

Start m _____ Start Description _____

End m _____ End Description _____

Width _____

Contractor _____

Date of Work _____

Seal Type (circle one) 1 Coat / Racked in Chipseal / 2 Coat / Other: _____

Seal Reason Waterproofing First Coat / Second Coat / Asphalt Membrane

Area Sealed (m²) _____

Chip Grading (e.g. 3/5) _____

Binder Type (e.g. B180/200) _____

Chip Source Company _____

Chip Source Quarry _____

Total Volume of Binder Used (Hot) (Litres) _____

Temperature of Binder (°C) _____

Residual Binder Rate (L/m²) _____

Cutter (e.g. 3 pph Kero) _____

Other Additives with concentrations (e.g. Polymer modification RS1, 3%) _____

_____

Sealing Notes (e.g. Weather, Temp) _____

_____

_____

_____

Surfacing Chip PSV testing form attached ☐

F3.9 RAMM PAVEMENT DATA

(to be completed for each road section)

Subdivision _____

Road No / Name _____

Start m _____ Start Description _____

End m _____ End Description _____

Width _____

Basecourse

Date Completed _____

Thickness _____

Grading _____

Quarry _____

Sub-Base

Date Completed _____

Thickness _____

Grading _____

Quarry _____

Undercut / Imported Subgrade (If Required)

Whole Site Yes / No

Length _____

Width _____

Depth _____

Backfill Material _____

Subgrade

CBR Without Stabilisation _____

Material _____

Stabilised? No / Cement / Lime

% Stabilising Agent _____

Stabilised Depth _____

Stabilised CBR _____

F3.10 RAMM STREETLIGHT DATA

(to be completed for each change in streetlight type)

Subdivision and stage/Contract _____

Number of street lights of this type _____

General

Date Installed _____

Control Type Network Streetlight Feed / Photocell / Other:

Origin of Power Supply Streetlight Circuit / Metered Power Supply

Light

Manufacturer _____

Model _____

Total Power Consumption (W) _____

Light Height (m) _____

Tilt Angle (º Degrees) _____

Outreach

Outreach Type Curved / Mitre / Other Decorative:

Outreach Distance (m) _____

Pole

Manufacturer _____

Type Octagonal / Circular / Power / Other Decorative:

Pole Height (m) _____

Material Galvanised Steel / Steel / Other:

Coating N/A / Painted / Powder Coated

Colour (if coated) _____

Mounting Frangible ground plant / Shear Base

- ☐ Manufacturer's Warranty documents for Poles, Lights and Coatings attached.
- ☐ Shown on as-built drawings.

F3.11 PRIVATEWAY – CONFIRMATION OF DESIGN, SUPERVISION AND CONSTRUCTION

(One form for each privateway or access lot on consent)

File Number:

Applicant's Name			
Applicant's Address			
CP Engineer's Name			
CP Engineer's Address			
Subdivsion Name			
Subdivision Address			
Number of Privateways		Number/Reference	

DRAINAGE TO PRIVATEWAY (TYPE OF DRAINAGE)

Soakpits	Number	
Results of Percolation Tests		

Piped system	Number of sumps		Pipe Size and Length	
Watertables	Meterage		LHS	RHS
Outlet Location and Details (to meet Waikato Regional Council drainage requirements)				

Other (please specify)	

The Privateway and entrance to the Privateway detailed meets all the specifications and requirements of the RITS and all the Resource Consent conditions relating to the Privateway in the consent approval dated ……..

Signature of Chartered Professional Engineer _____

Any uncompleted items will be assumed as non-complying.

F3.12 PRIVATEWAY CONSTRUCTION MATERIALS

Materials used – type and depths (e.g. GAP/WHAP/TNZ M4/Brown Rock/Pitsand)

Basecourse	Material		Design	
	Depth		Actual	
Subbase	Material		Design	
	Depth		Actual	
Subgrade	Material		Design	
	Depth		Actual	
Subgrade	CBR		Test Method	

Compaction during construction

Tests Used	**Target**	**Result**
Subbase		
Basecourse		

Sealing (two coat seal to be provided based on 15 years minimum life span)

Date of Seal		Grade of Bilumen	
Grade of Chips		Application Rates	

Where structures involved (e.g. bridge, culvert, well)

Name and Company of Design Engineer
Materials used (i.e. steel/precast RC/insitu RC/gabion)
Name of Supervising Engineer

The Privateway and entrance to the Privateway detailed meets all the specifications and requirements of the RITS and all the Resource Consent conditions relating to the Privateway in the consent approval dated ……..

Signature of Chartered Professional Engineer _____

Any uncompleted items will be assumed as non-complying.

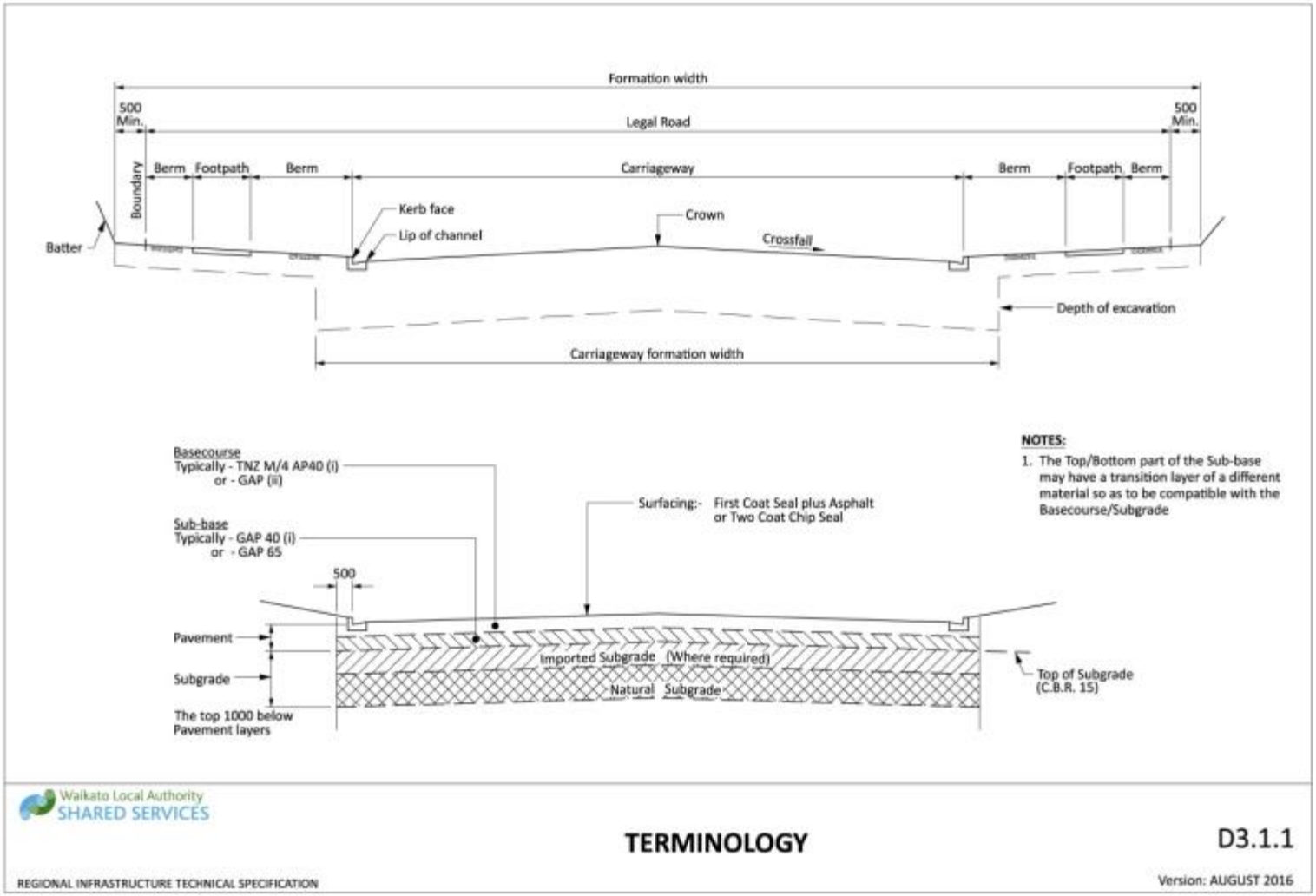
APPENDIX 3C: DRAWINGS

Table 3-27: Drawing Register

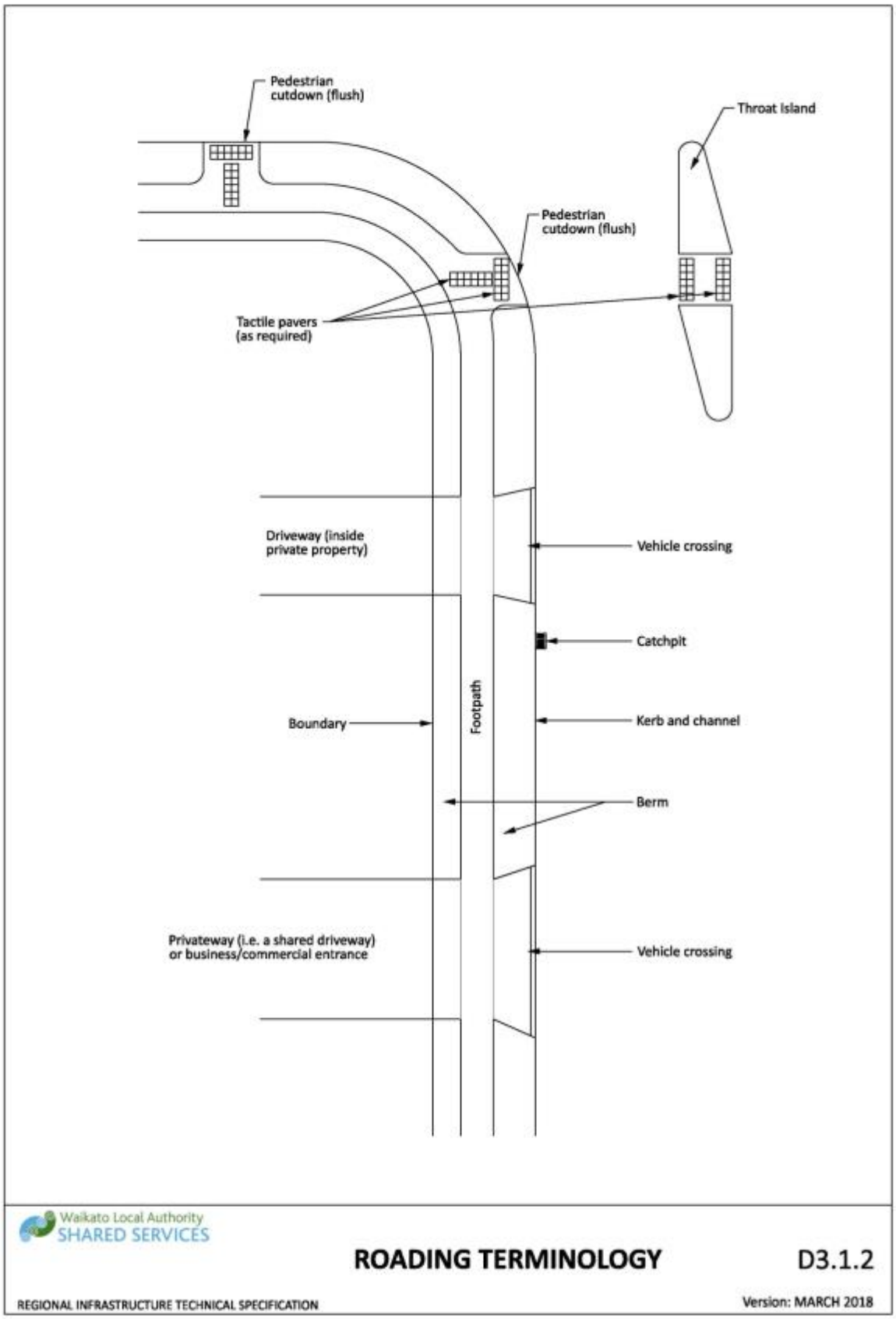
DRAWING NO	TITLE
D3.1.1	Terminology
D3.1.2	Roading Terminology
D3.1.3	Location of Services in Transport Corridor
D3.1.4	Cross Section Details Typical Berms
D3.1.5	Boundary Splay
D3.1.6	Standard Residential Private ways
D3.1.7	Cul-de-Sac Head
D3.1.8	On Street Parking Dimensions and Setout
D3.2.1	Normal Carriageway Camber and Construction Tolerances
D3.2.2	C.B.R. v Penetration Graphs for Hamilton Sand Silt Materials
D3.2.3	Trench Reinstatement
D3.3.1	Vehicle Crossing and Pedestrian Cutdown Set Out
D3.3.2	Vehicle Crossing Profiles
D3.3.3	Kerb and Channel Profiles
D3.3.4	Rural Entranceways – Residential, Light and Heavy Commercial)
D3.3.5	Cross Section Details for Footpath, Vehicle Crossings and Depressed Kerb and Channel
D3.3.6	Cross Section Details Associated Kerb and Channel Reinstatement Within Existing Pavement
D3.3.7	Concrete Vehicle Slot Crossings
D3.3.8	Accessible Bus Stop
D3.4.1	Location of Subsoil Drainage
D3.5.1	A/C, SMA and OGPA Overlay Details
D3.5.2	A/C Overlay V-Ramp Detail
D3.6.1	Timber Edging Details for Chip Seal, Asphalt and Block Paving
D3.6.2	Pedestrian Crossing Point Location at Intersections
D3.6.3	Tactile Paving for Vision Impaired
D3.6.4	Pedestrian Facilities in Islands
D3.7.1	Sign Location and Visibility At Intersections
D3.7.2	Street Name Signs Arterial/Collector Intersection
D3.7.3	Street Name Signs Arterial or Collector Intersection with Local Roads
D3.7.4	Street Name Signs Local/Local Intersections
D3.7.5	Cycle Signage for Off Road Cycle Paths
D3.7.6	Neighbourhood Watch Signage
D3.7.7	Drawing deleted
D3.7.8	Drawing deleted
D3.7.9	Ground Sockets for Removable Poles
D3.7.10	Installation of Chevron or Route and Low Level Road Name Sign
D3.7.11	Attachment of Street Name Sign Blades to Poles

DRAWING NO	TITLE
D3.7.12	Street Name Plate
D3.7.13	Kea Crossing Flag
D3.7.14	Kea Crossing Flag Pole
D3.7.15	School Patrol Signs
D3.7.16	Bus Stop / Taxi Supplement
D3.7.17	Through Truck Route Marker
D3.7.18	Drawing deleted
D3.7.19	Drawing deleted
D3.7.20	Drawing deleted
D3.7.21	Drawing deleted
D3.7.22	Drawing deleted
D3.8.1	CBD Cycle Rack
D3.8.2	Bike Rack – Ribbon Style
D3.8.3	Bike Rack – Hoop Style
D3.8.4	Drawing deleted
D3.8.5	Wooden Bollard see D7.7
D3.8.6	Lockable Removable Bollards
D3.8.7	CBD Pedestrian Barrier
D3.8.8	Pedestrian Balustrade Barrier
D3.8.9	Pedestrian Barriers
D3.8.10	Pedestrian Accessway Fence Detail
D3.8.11	Pedestrian Handrail or Walkway Barrier
D3.8.12	Concrete Base Details for Steel Litter Bins
D3.8.13	Standard 3.5m Bus Shelter Foundation Detail
D3.8.14	Bus Shelter and Mini Bus Shelter
D3.8.15	Bus Stop Seat – No Shelter
D3.9.1	Typical Cycle Advance Stop Lines Layout
D3.9.2	On Road Cycle Lane Connection to Off Road Shared Path
D3.9.3	Clearway and P5 Roadmarking
D3.9.4	Mobility Cardholders Parking
D3.10.1	Roundabout Details
D3.10.2	Flush Threshold (for maintenance purposes only)
D3.10.3	Paved Raised Pedestrian Ramp (for maintenance purposes only)
D3.10.4	Concrete Raised Pedestrian Ramp (for maintenance purposes only)
D3.10.5	Asphaltic Concrete Tapered Raised Pedestrian Ramp
D3.10.6	Asphaltic Concrete Full Width Raised Pedestrian Ramp
D3.10.7	Full Width Raised Pedestrian Threshold – Imprint Patterns and Coloured Surfacing
D3.11.1	Pedestrian Belisha and Warning Globe Detail
D3.11.2	Pedestrian Belisha and Floodlighting
D3.11.3	Drawing moved to Appendix C as D.3.C2

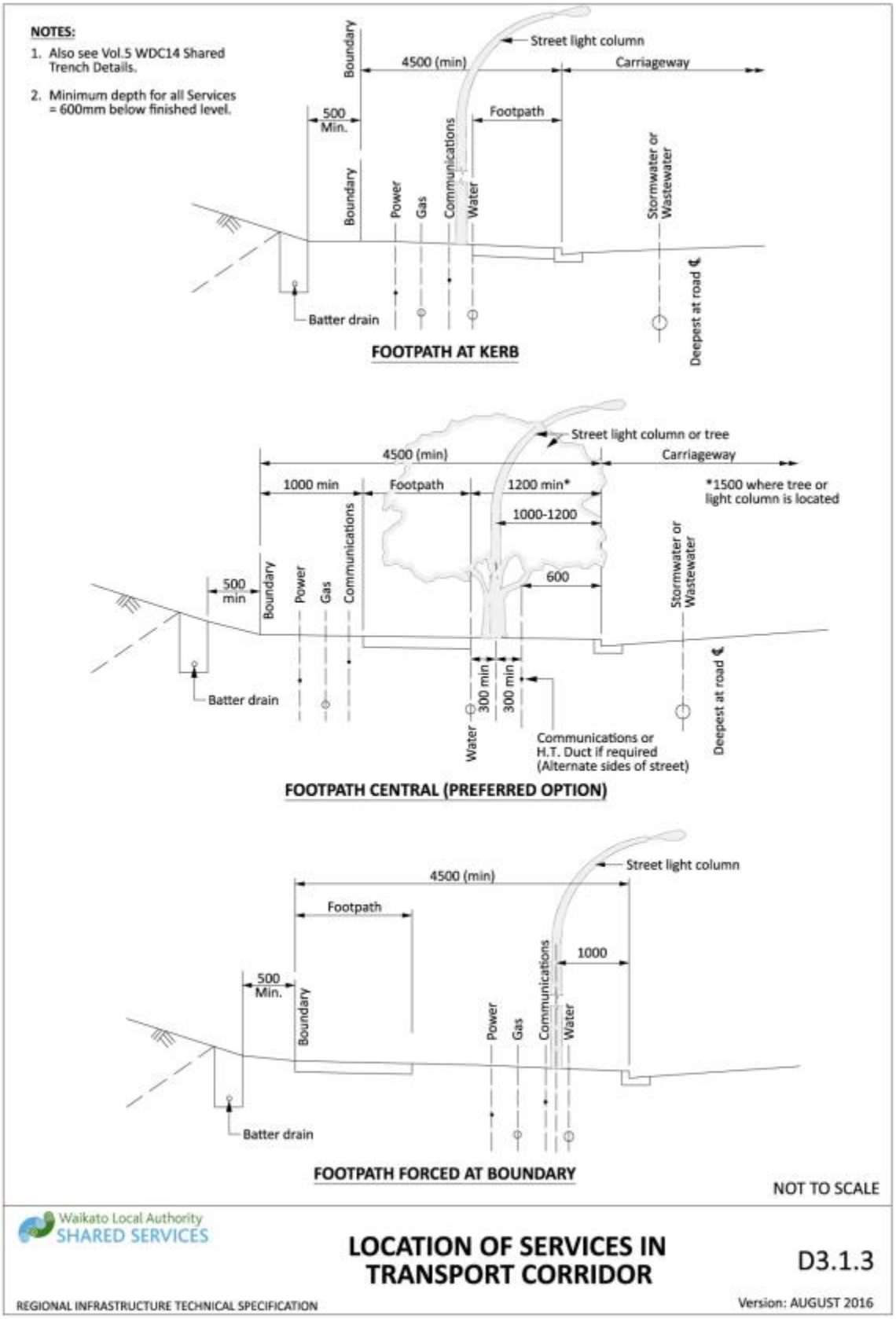
DRAWING NO	TITLE
D3.12.1	Traffic Signal Ducting Under-Kerb Access Details
D3.12.2	Fold Down Traffic Signal Pole
D3.12.3	Removable Traffic Signal Pole
D3.12.4	Standard Dimensions for Stop Line Detectors and Advanced Cycle Stop Box
D3.12.5	Drawing deleted
D3.12.6	Street Name Signs at Signalised Intersections
D3.12.7	Traffic Controller Base, Signal Pole and Mast Arm



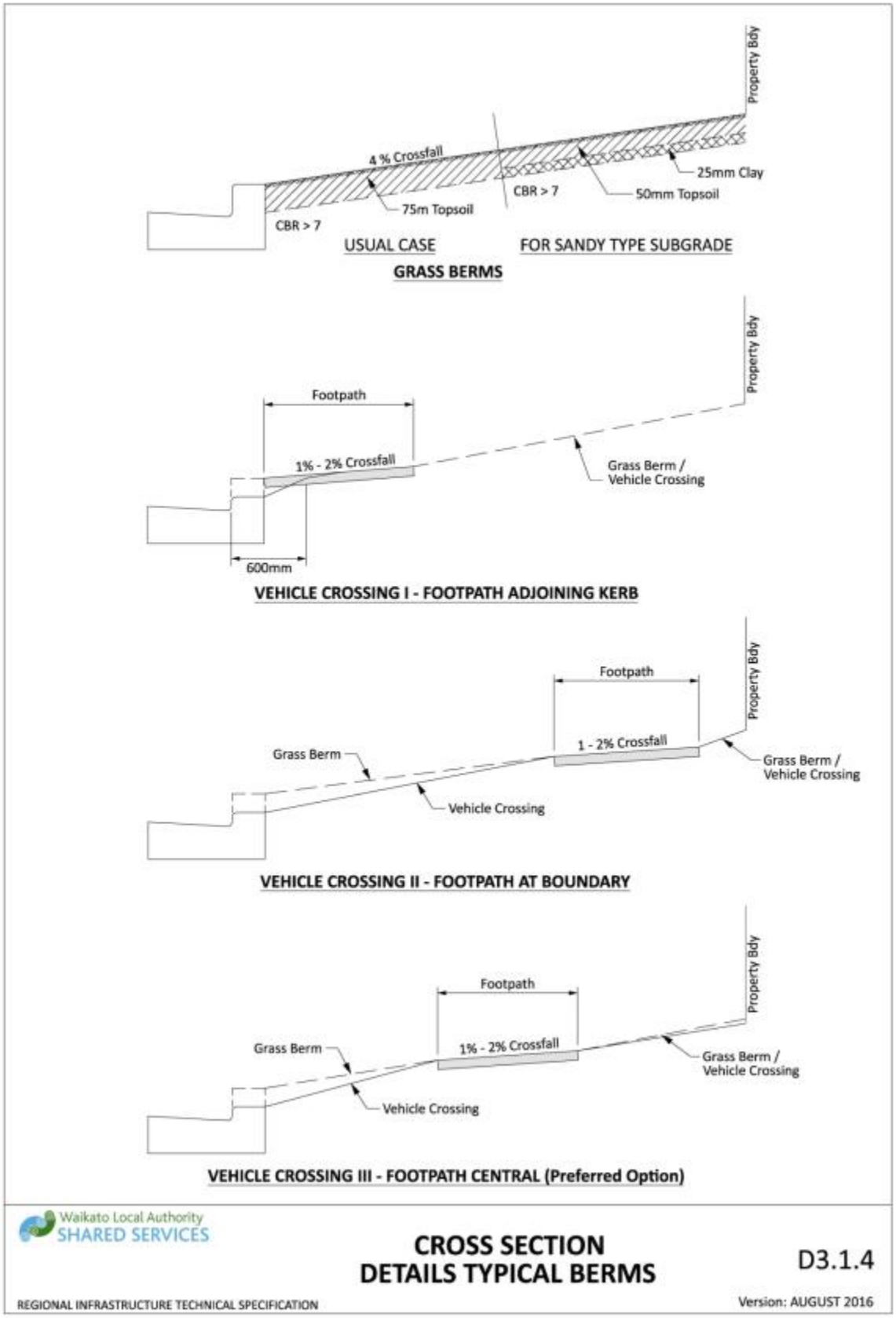
Drawing 3-2: Terminology



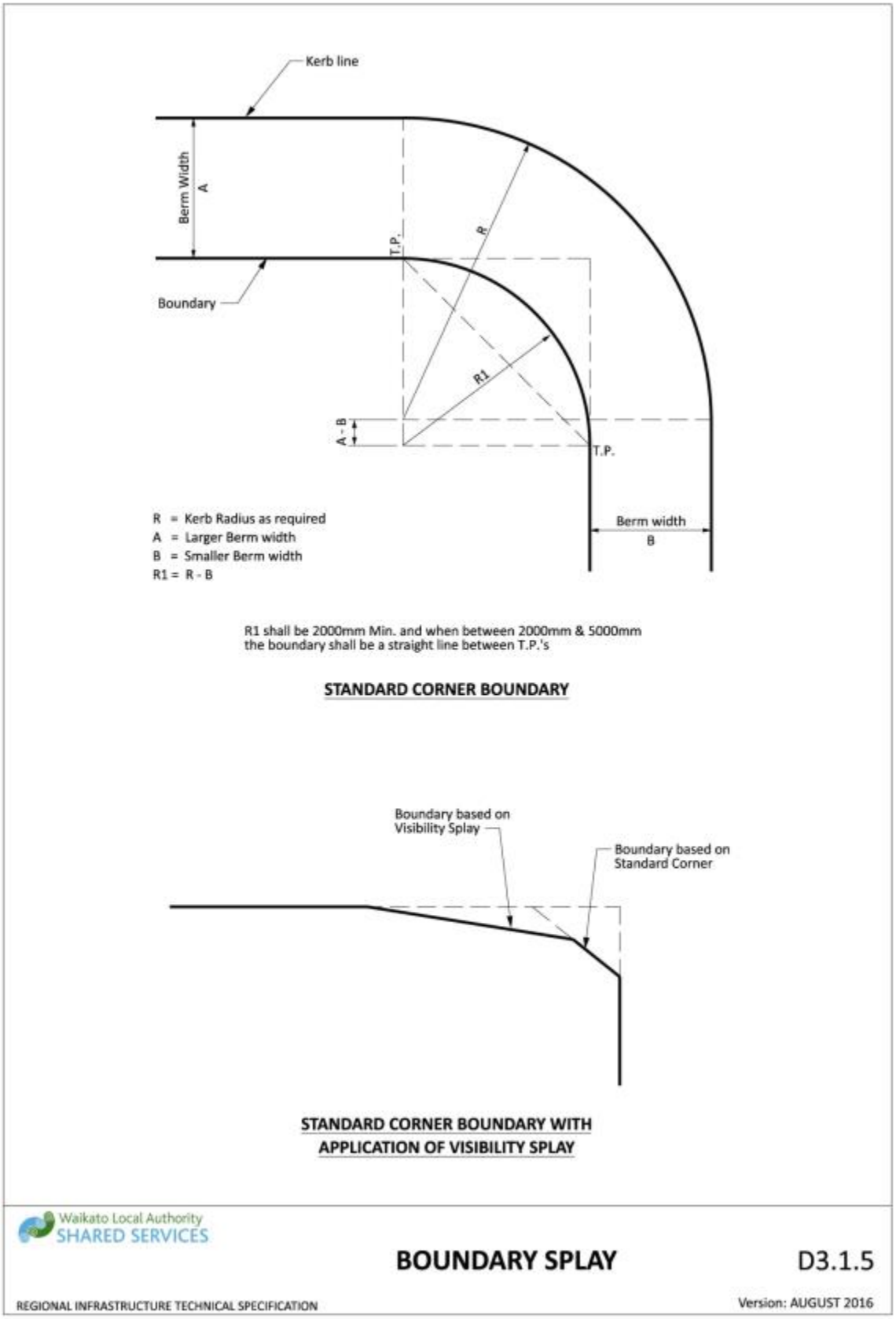
Drawing 3-3: Roading terminololgy



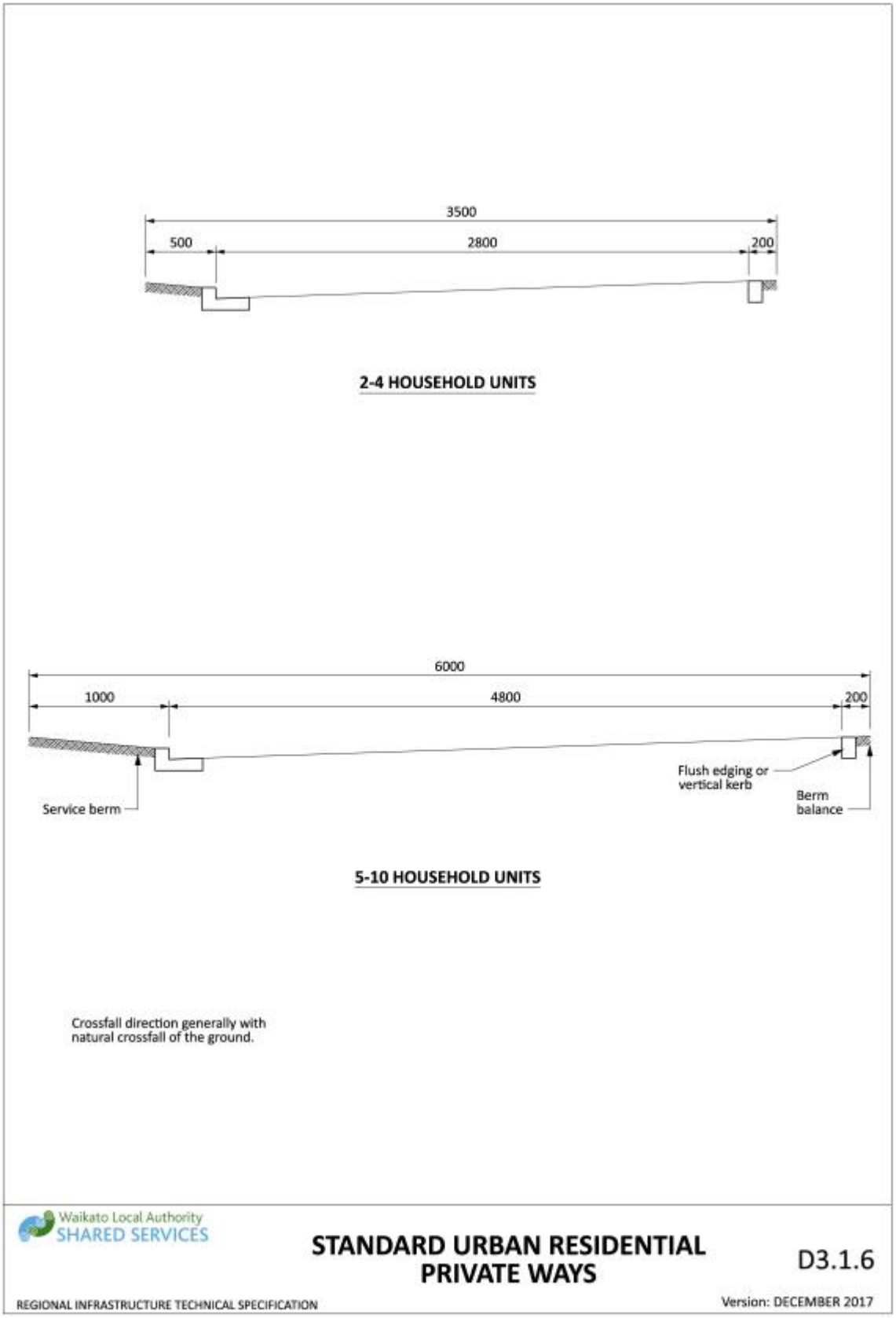
Drawing 3-4: Location of services in transport corridor



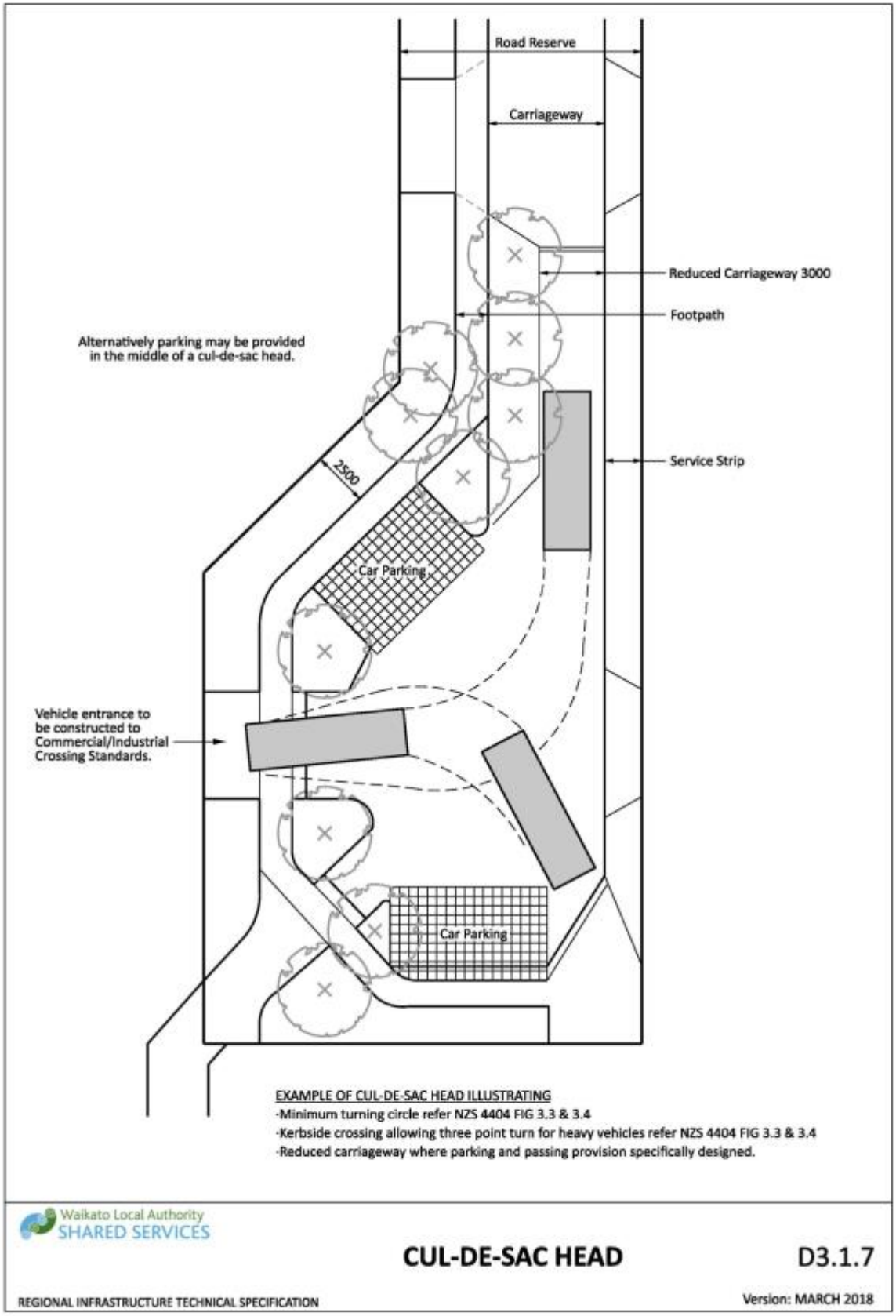
Drawing 3-5: Cross section details typical berms



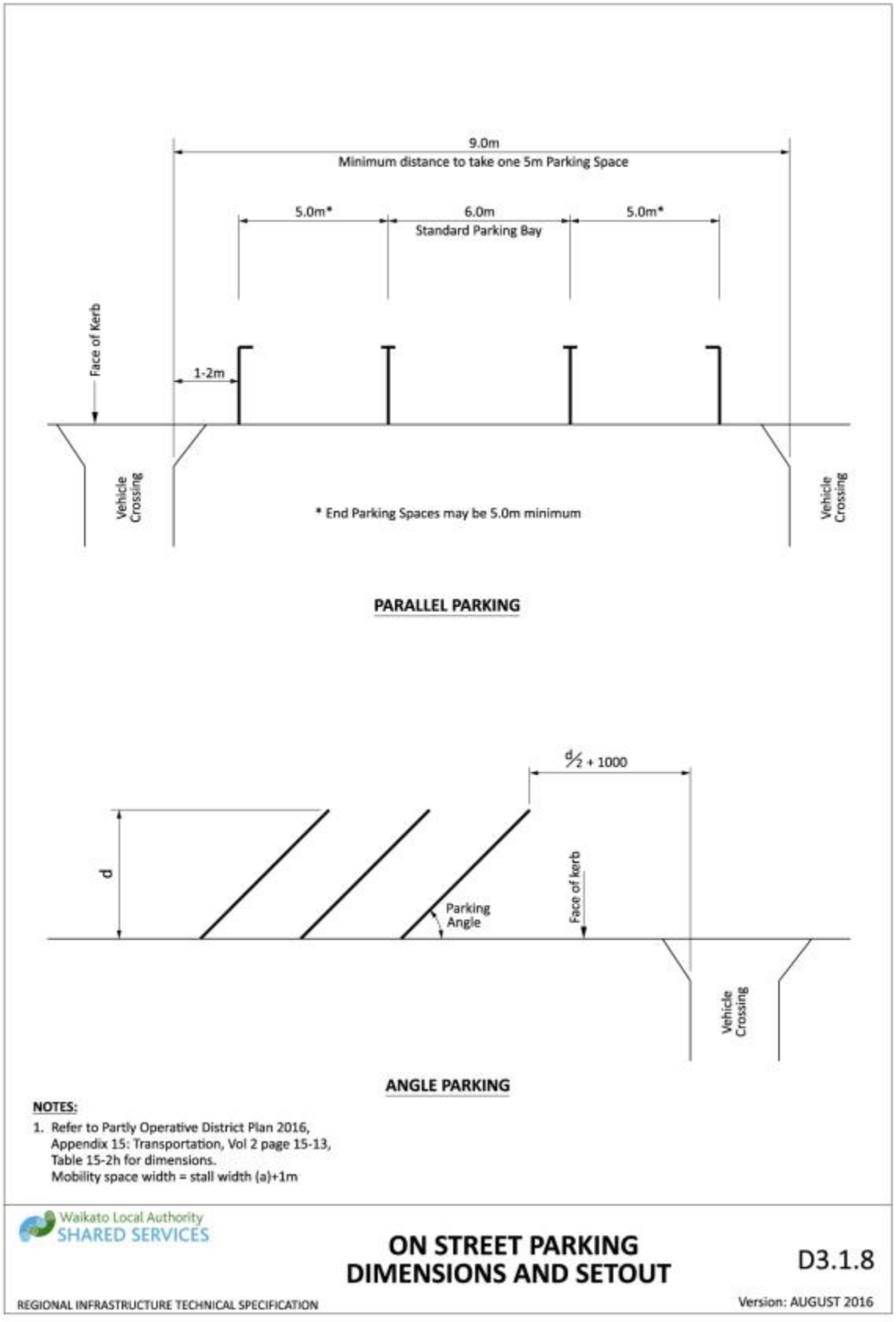
Drawing 3-6: Boundary splay



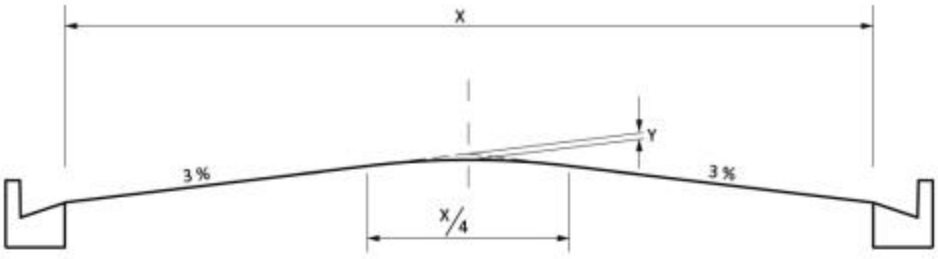
Drawing 3-7: Standard residential privateways



Drawing 3-8: Cul-de-sac head



Drawing 3-9: On street parking dimensions and setout



Y (in mm) = 2 X (where X is in metres)
e.g. X= 7.9 (8.5 carriageway)
∴ Y = 2 x 7.9
= 16mm

Crown Height above lip of channel (in mm) = 13X (where X is in metres)

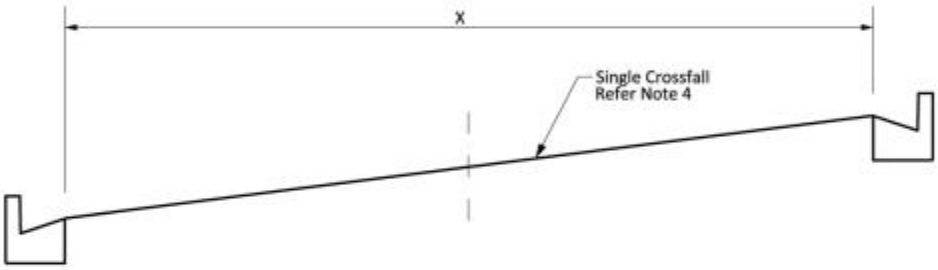


TABLE OF LEVEL TOLERANCES FOR FLEXIBLE PAVEMENTS

At top of Layer	Centreline and near Pavement edge	At Channel edge	Deviation from 3m straight edge or camber board
Surface			1: 12mm 2: 8mm
Basecourse	-5mm to +15mm	1: 0mm to +10mm 2: -5mm to +5mm	12mm
Sub-base	-25mm to +5mm	-25mm to +5mm	15mm
Subgrade	-30mm to 0mm	-30mm to 0mm	15mm

NOTES:

1. Chip sealed surface
2. Asphalt surface (minimum 25mm thick)
3. Construction levels are based on lip of channel, appropriate crossfall and designed pavement layer thickness
4. Single crossfall may be permitted in certain circumstances, eg super-elevation or private entrance.

Waikato Local Authority SHARED SERVICES

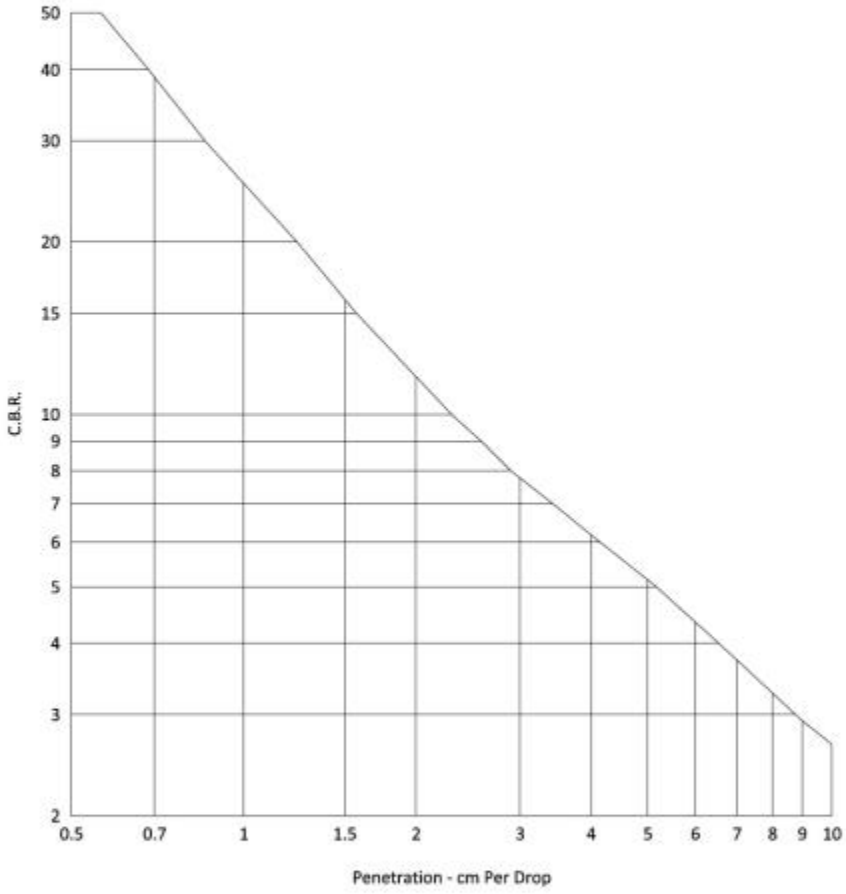
NORMAL CARRIAGEWAY CAMBER AND CONSTRUCTION TOLERANCES D3.2.1

REGIONAL INFRASTRUCTURE TECHNICAL SPECIFICATION Version: AUGUST 2016

Drawing 3-10: Normal carriageway camber and construction tolerances

NOTES:

1. C.B.R. values obtained from the ground are not applicable where material contains aggregate greater than 10mm in size.
2. Penetration readings are valid after 75mm of penetration into firm material being tested.
3. To use graph below, count number of blows for each 100mm (10cm) approx. of penetration and divide by number of drops. This gives Penetration (cm per blow).
4. Graphs show C.B.R. (California Bearing Ratio) equivalent values on Hamilton Sand Silt materials.
5. Plot is based on research work undertaken by J.F. Briggs, Senior Engineer, M.W.D., Hamilton.



SCALA PENETROMETER (9kg Hammer)

Waikato Local Authority SHARED SERVICES

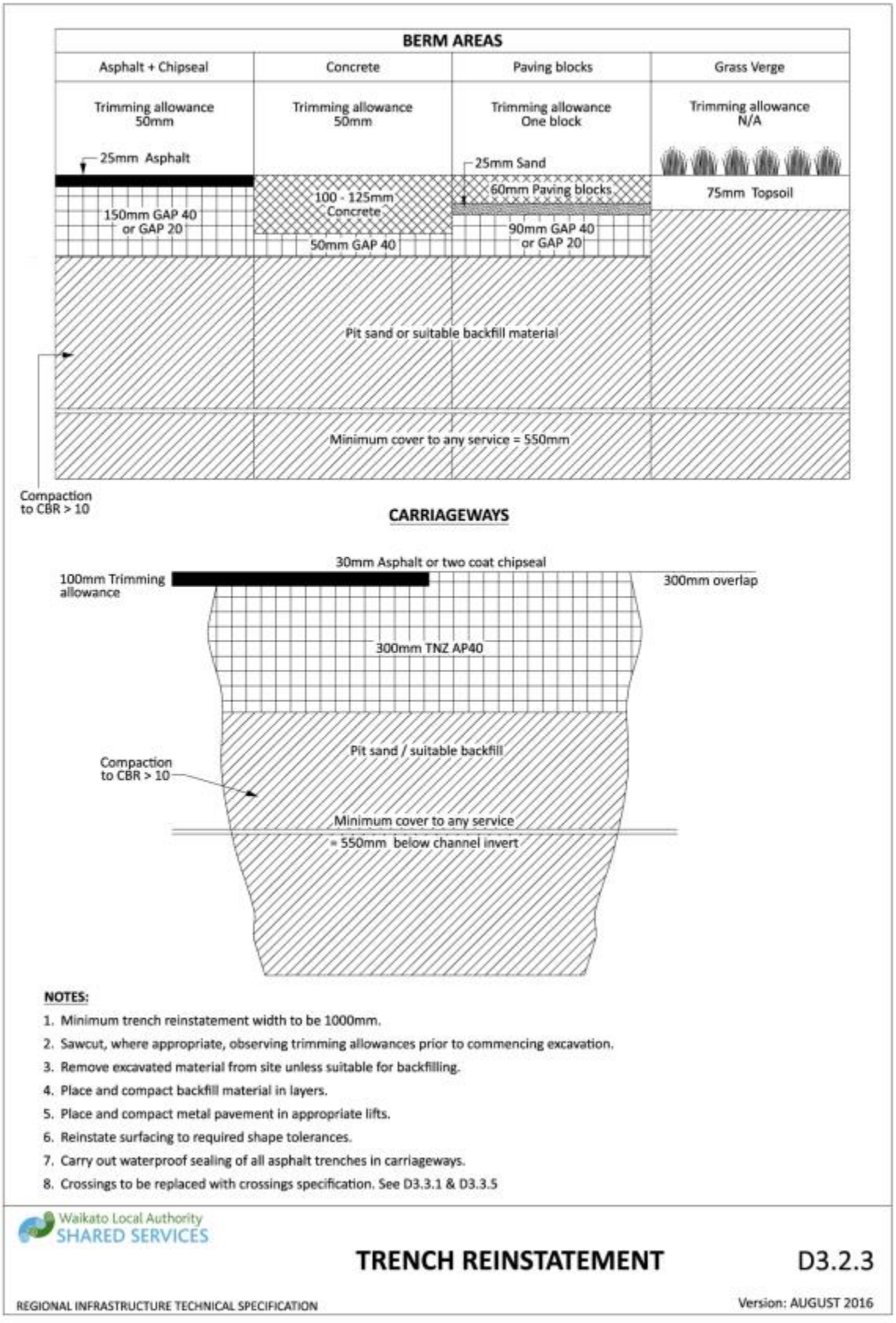
C.B.R. v PENETRATION GRAPHS FOR HAMILTON SAND SILT MATERIALS

D3.2.2

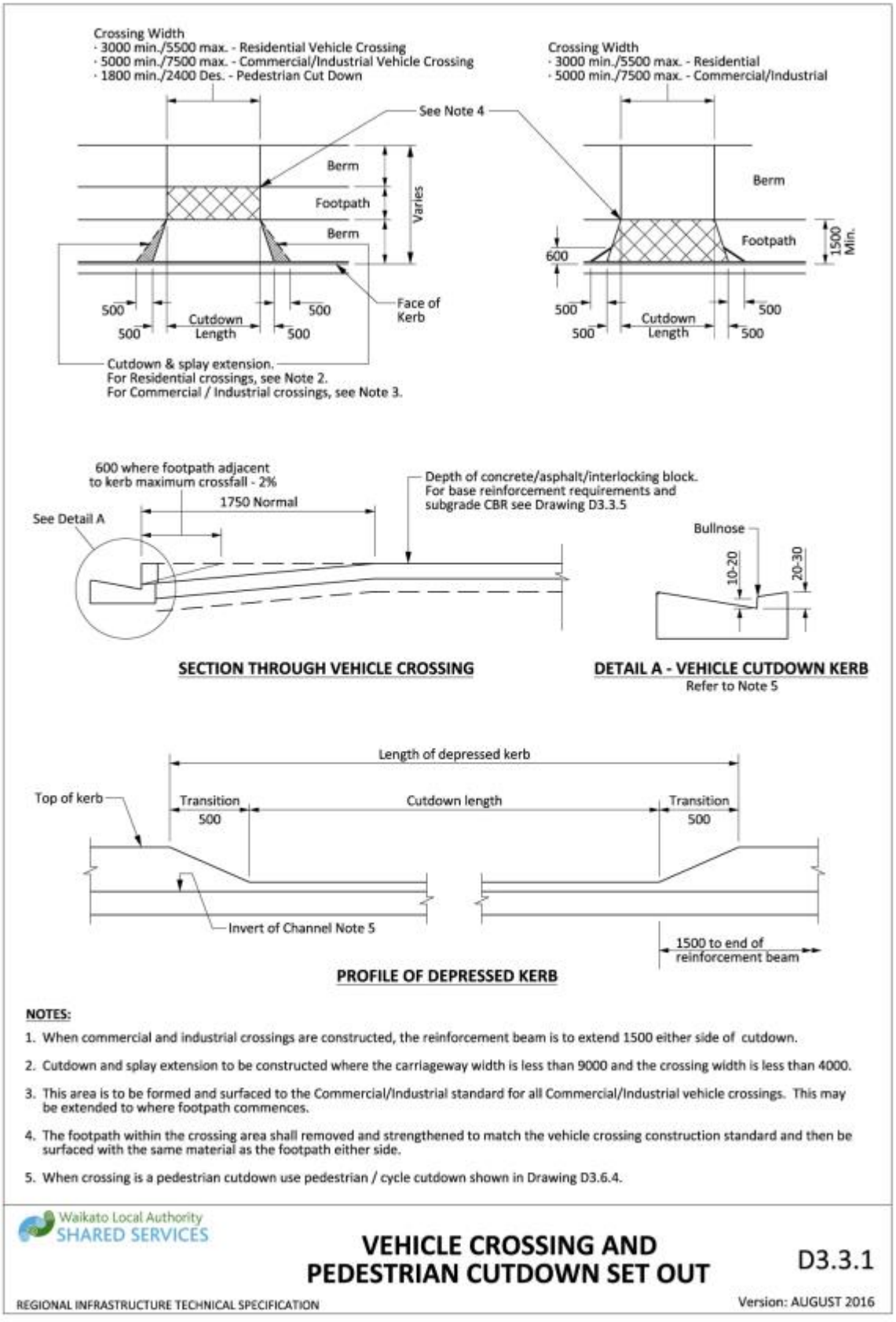
REGIONAL INFRASTRUCTURE TECHNICAL SPECIFICATION

Version: AUGUST 2016

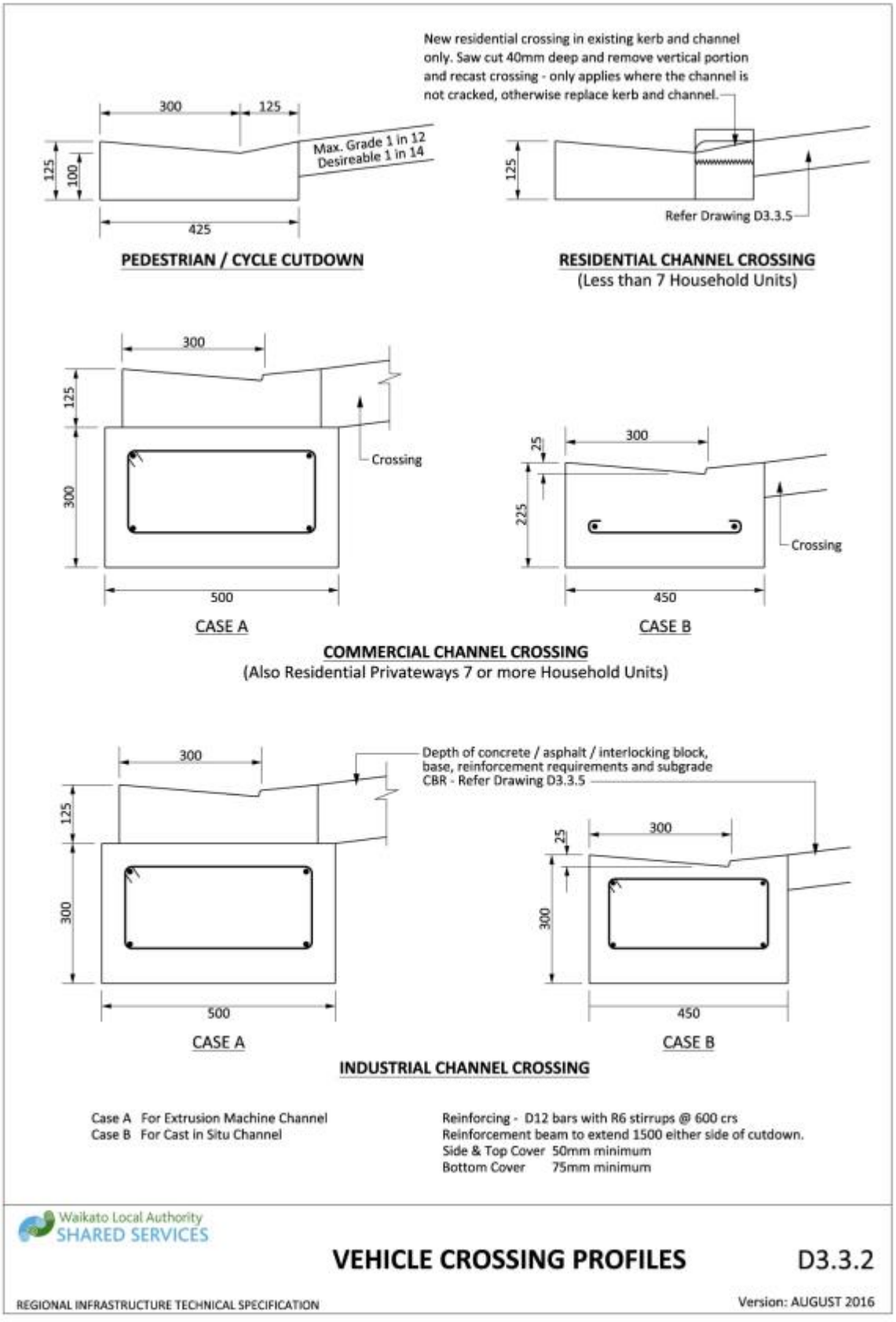
Drawing 3-11: C.B.R v penetration graphs for Hamilton sand silt materials



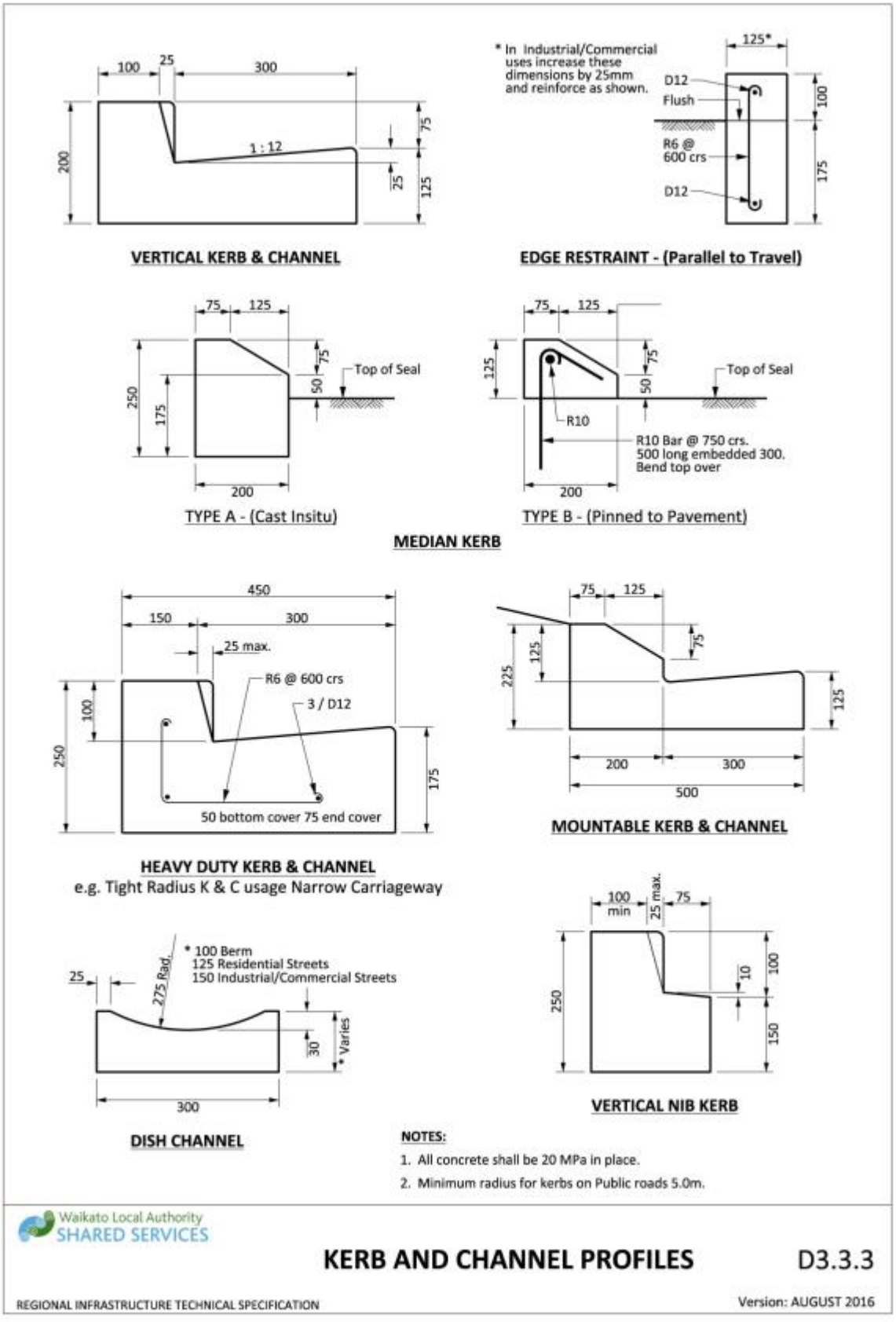
Drawing 3-12: Trench reinstatement



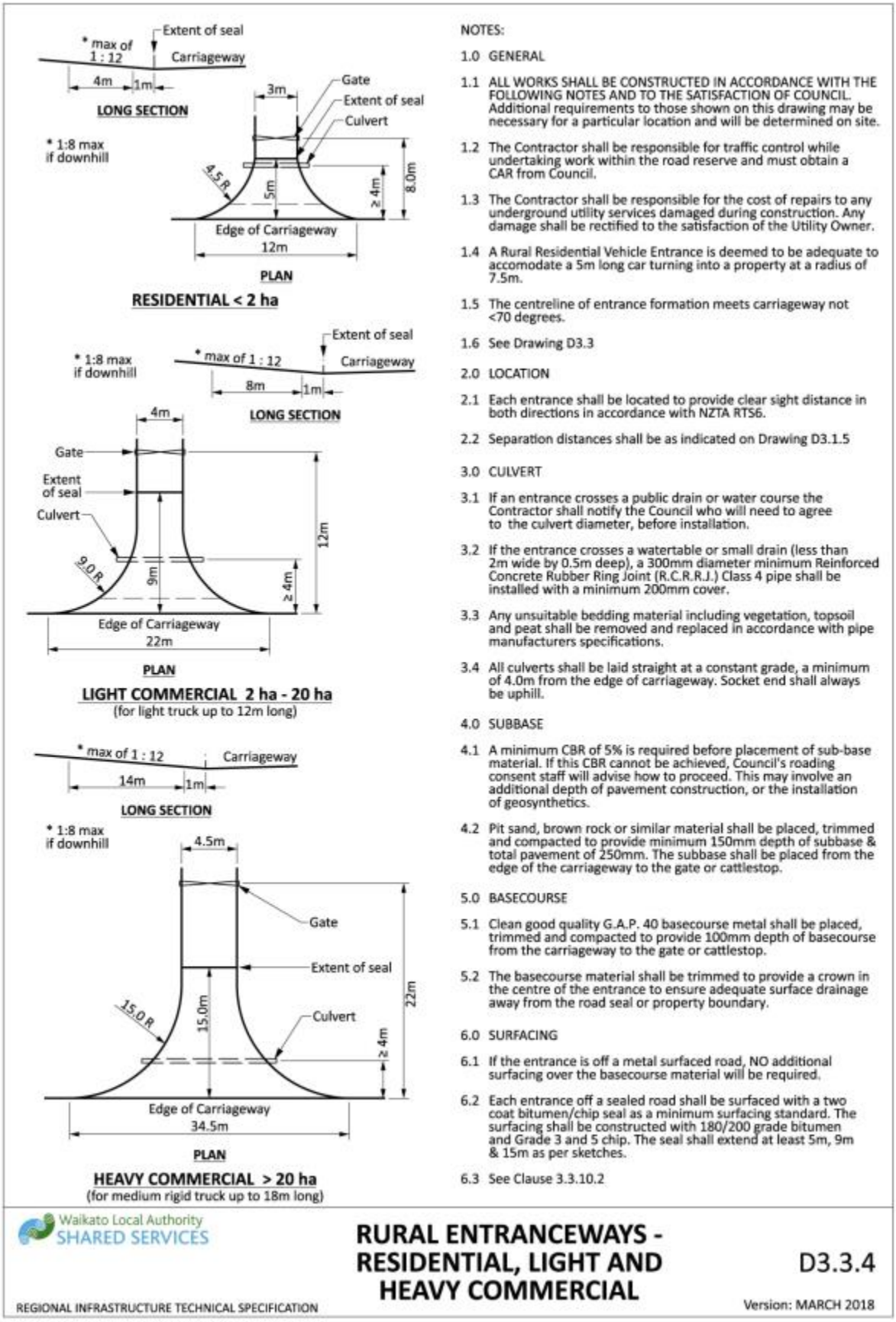
Drawing 3-13: Vehicle crossing and pedestrian cutdown set out



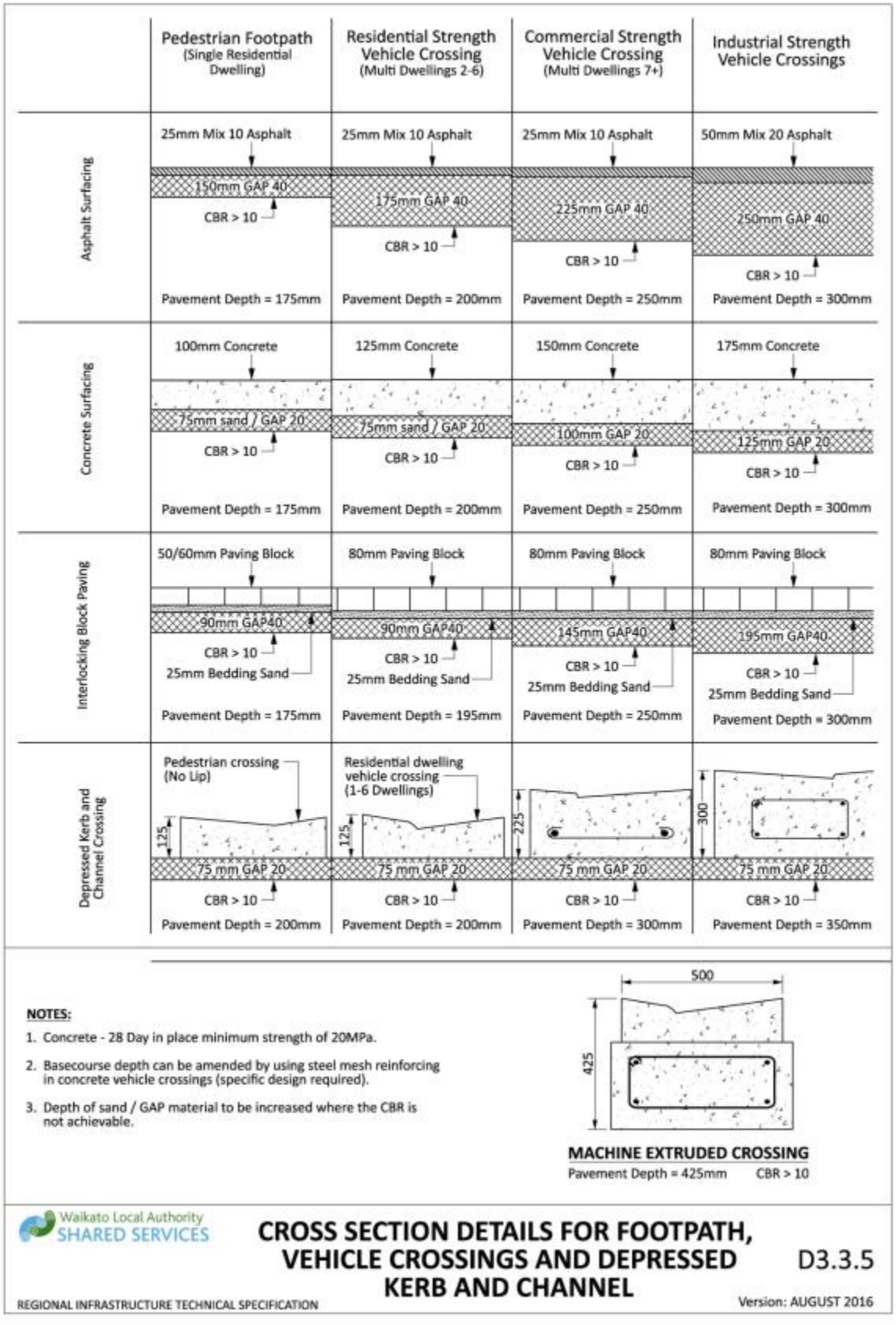
Drawing 3-14: Vehicle crossing profiles



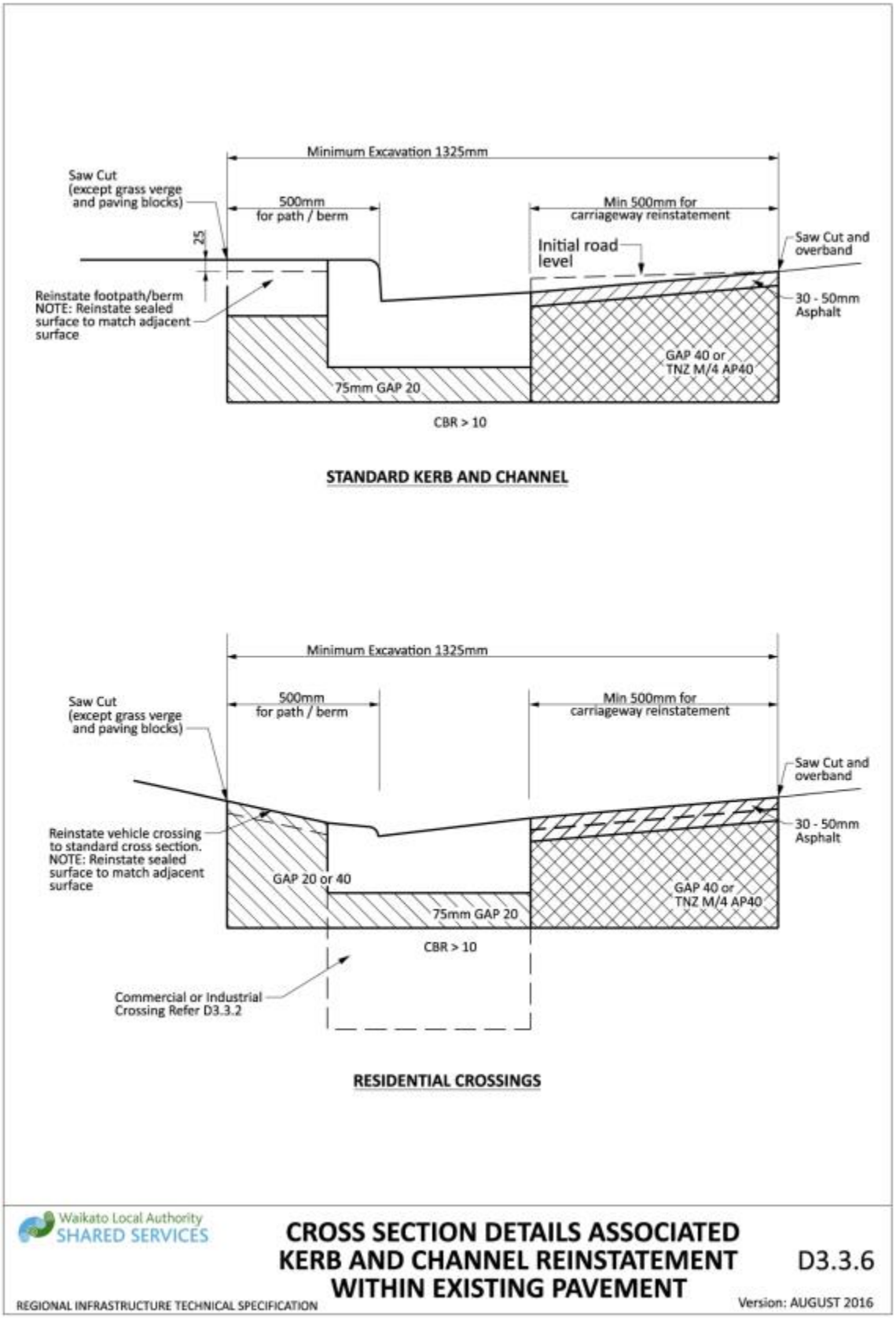
Drawing 3-15: Kerb and channel profiles



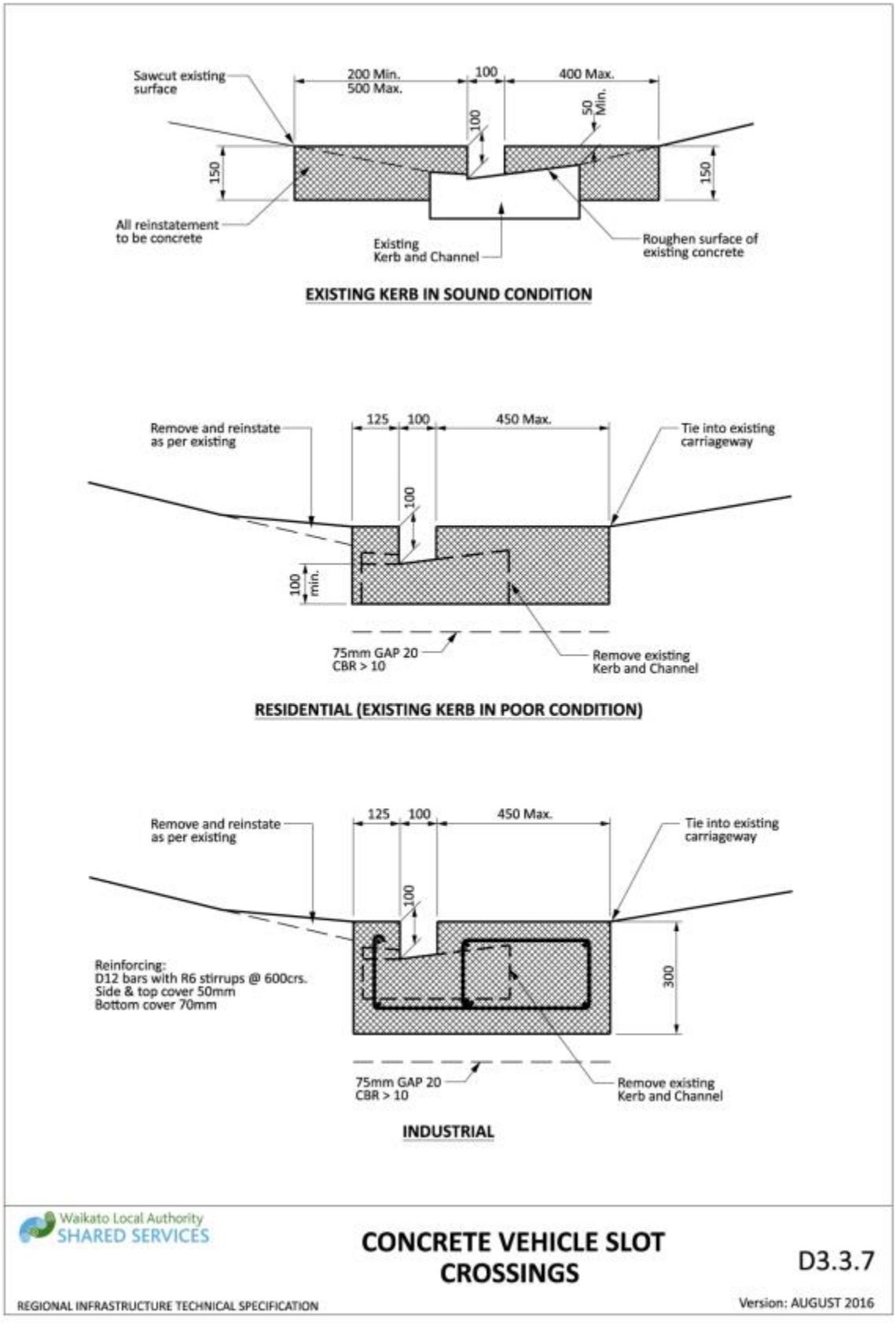
Drawing 3-16: Rural entranceways - residential, light and heavy commercial



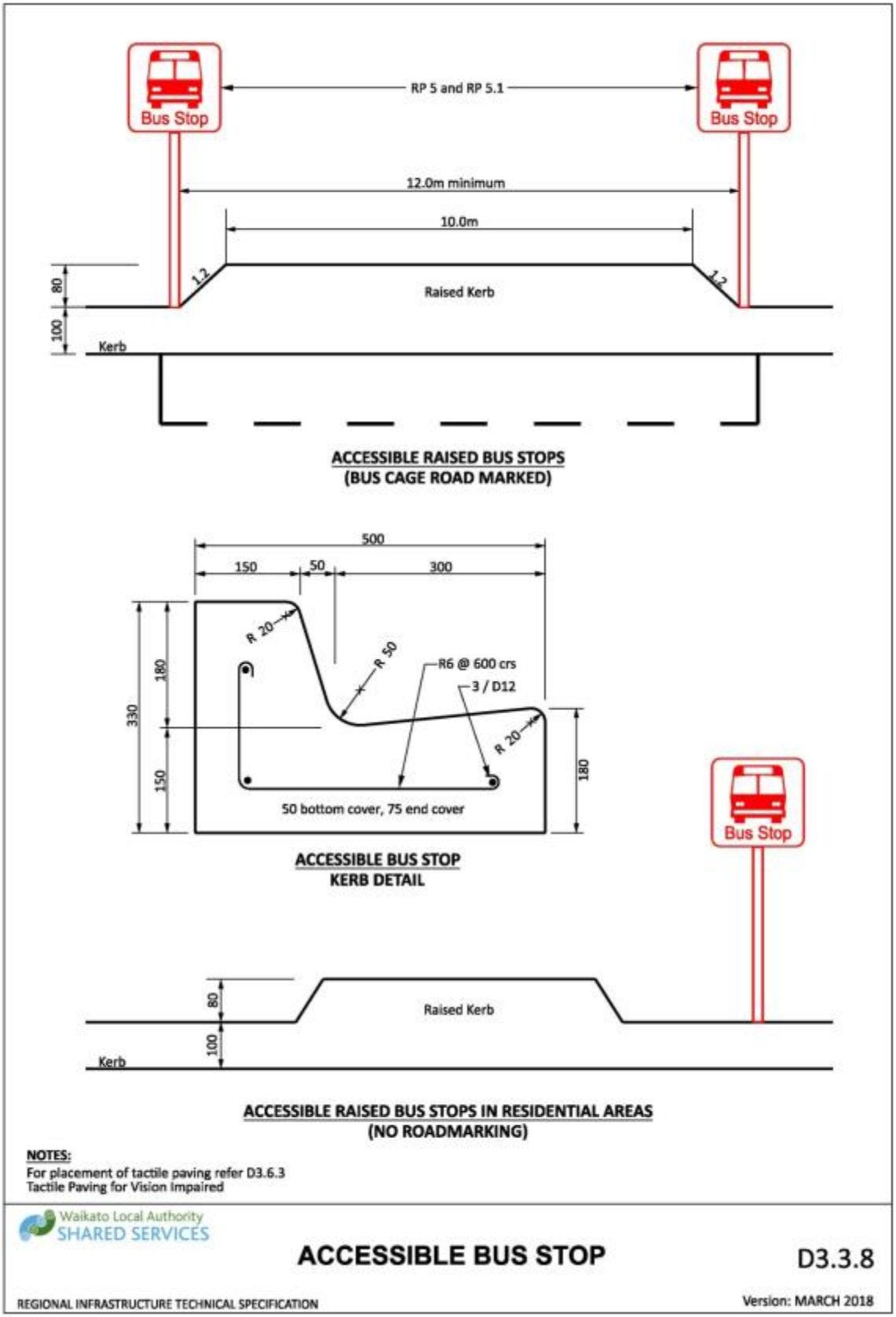
Drawing 3-17: Cross section details for footpath, vehicle crossings and depressed kerb and channel



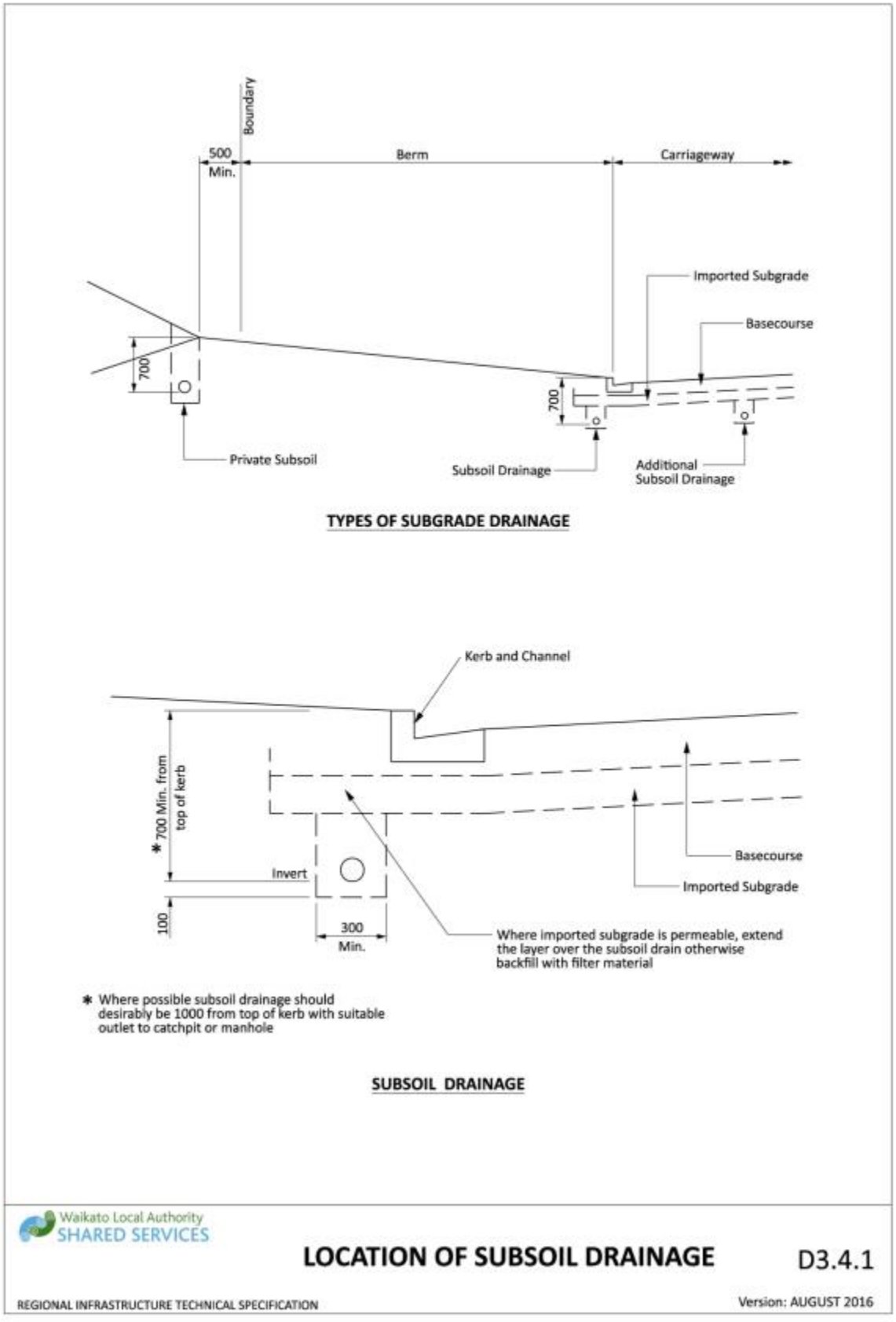
Drawing 3-18: Cross section details associated kerb and channel reinstatement within existng pavement



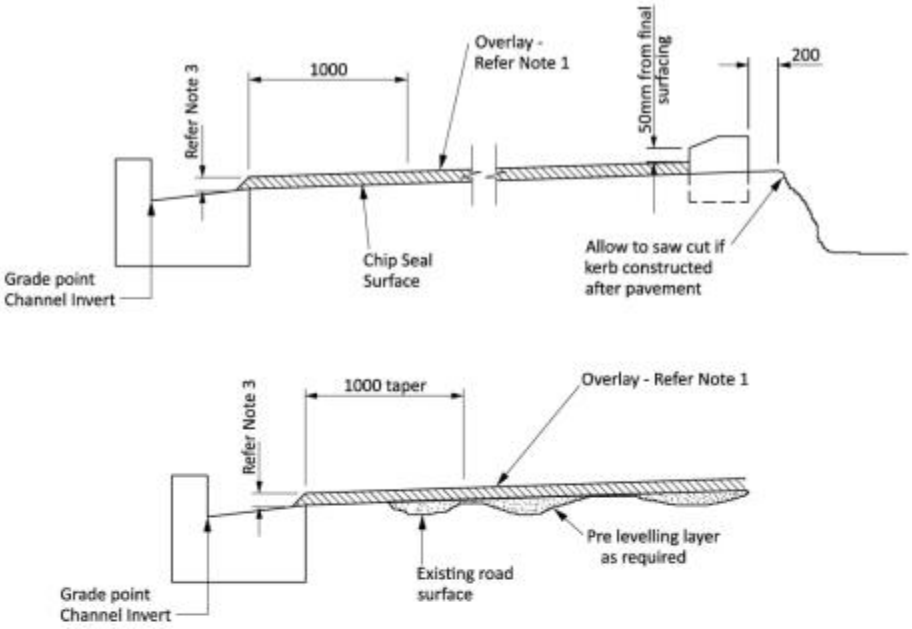
Drawing 3-19: Concrete vehicle slot crossings



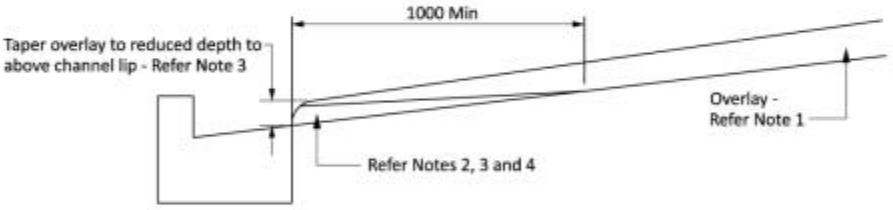
Drawing 3-20: Accessible bus stop



Drawing 3-21: Location of subsoil drainage



OVERLAY ON EXISTING CHIPSEAL SURFACE



OVERLAY EDGE DETAILS WHERE EXISTING SURFACE IS PROUD OF LIP OF CHANNEL

NOTES:

1. Overlay thickness shall be the following unless specified otherwise:
   - AC Mix 10 - nominal 25mm thickness
   - OGPA (Open Graded Porous Asphalt) - nominal 30mm thickness
   - SMA - nominal 35mm thickness
2. Prior to placing overlay:
   - Mill off existing surfacing to flush with lip of Kerb and Channel
   - Seal any exposed basecourse with bitumen and G5 chip.
3. Tapering of overlay shall be made over a minimum of 1m - desirably 2m, resulting in a overlay depth of
   - 10mm for AC Mix and SMA
   - 15mm for OGPA
4. When overlay is placed adjacent to a pedestrian cutdown extra care is required to ensure that the overlay ties into the lip of the channel and does not have a vertical face.

Waikato Local Authority SHARED SERVICES

A/C, SMA AND OGPA OVERLAY DETAILS

D3.5.1

REGIONAL INFRASTRUCTURE TECHNICAL SPECIFICATION

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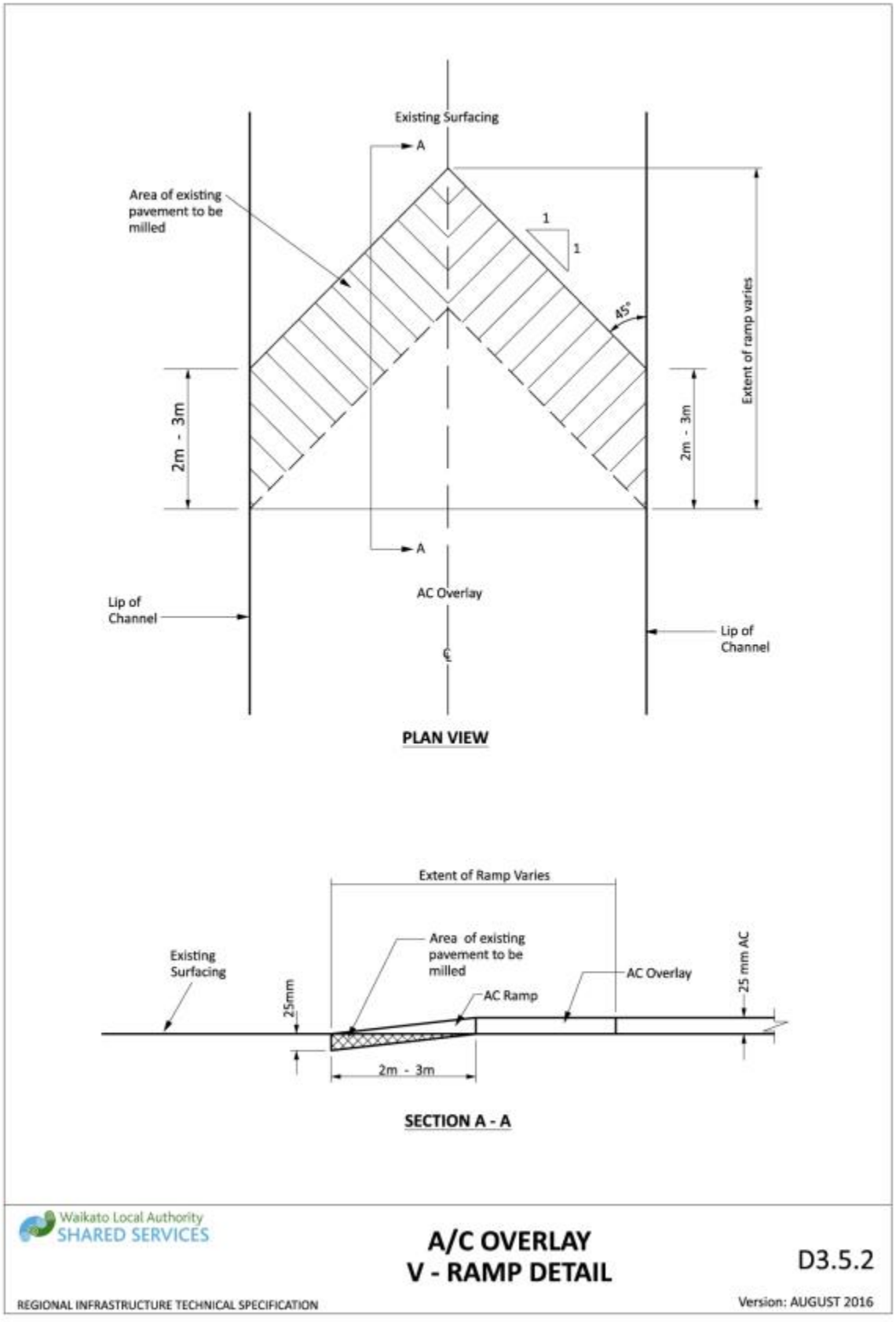
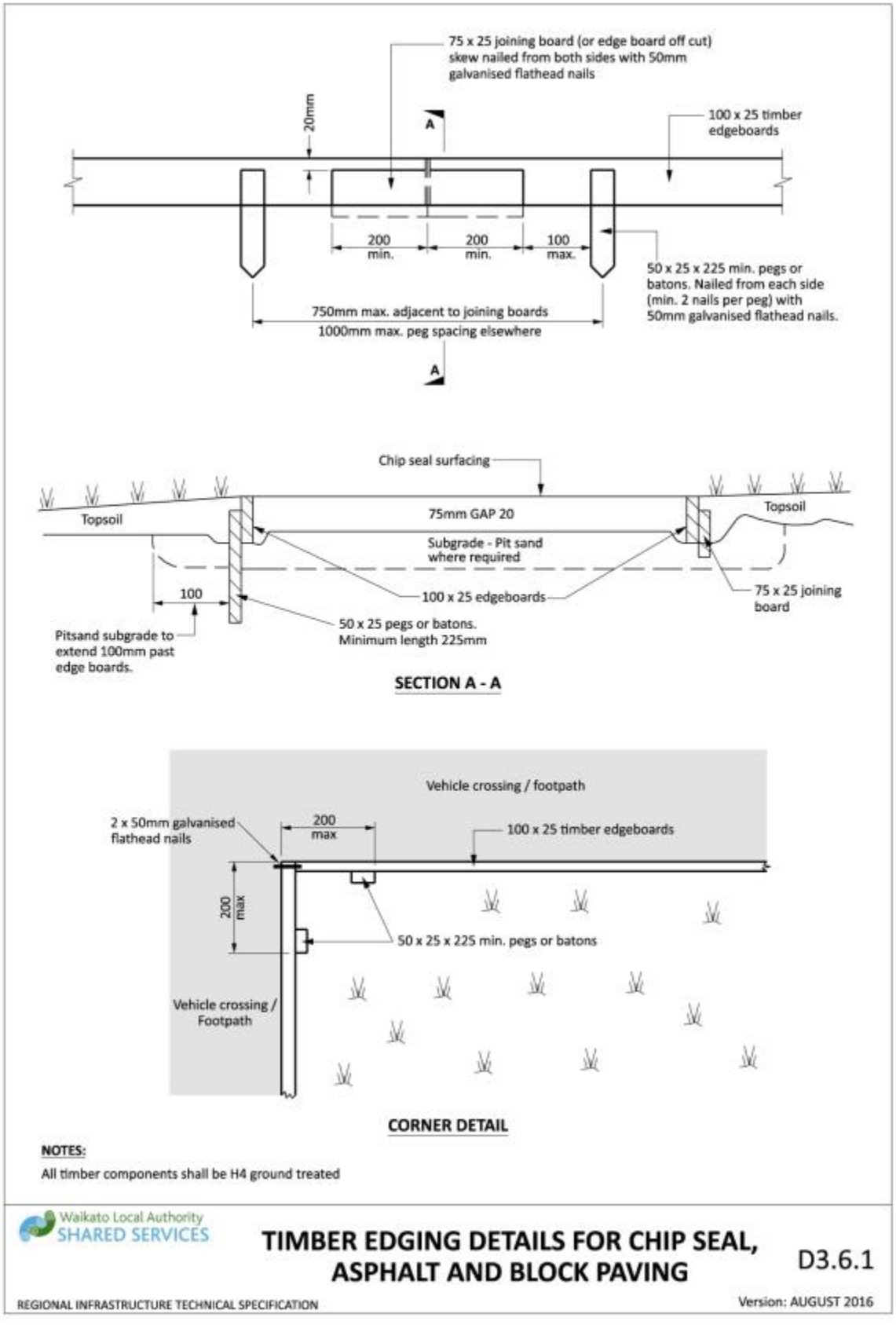
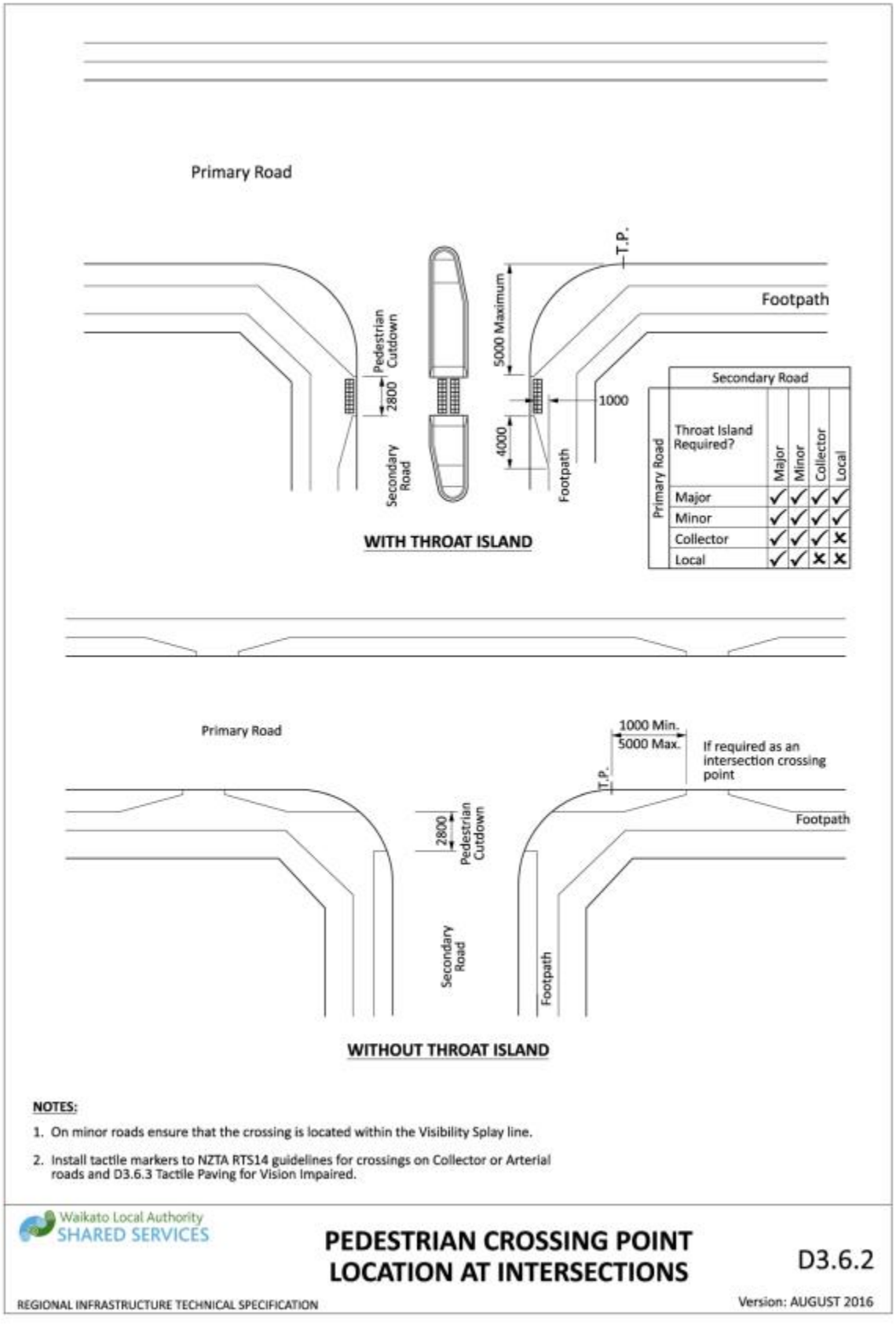
Drawing 3-22: A/C, SMA and OGPA overlay details



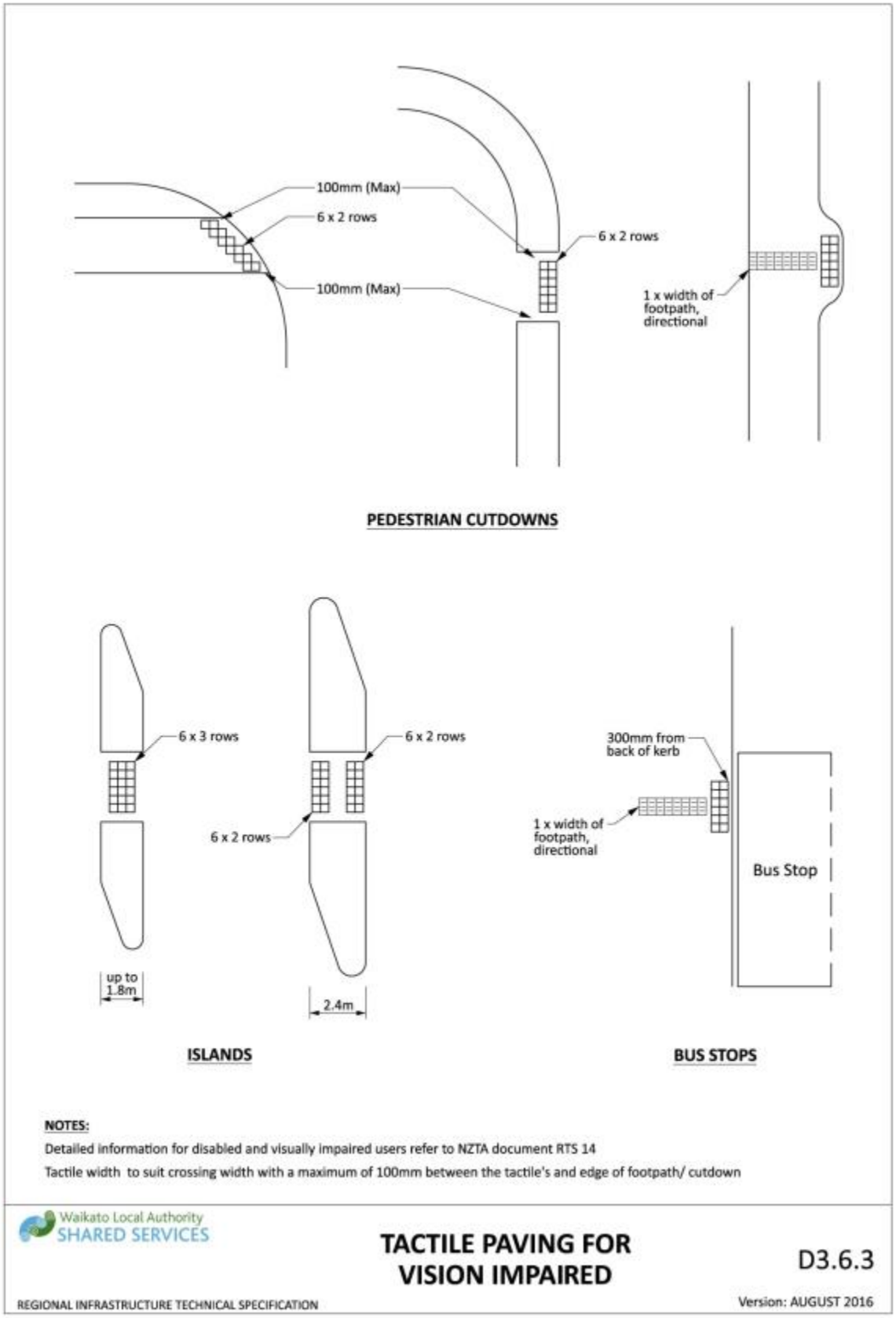
Drawing 3-23: A/C overlay v-ramp detail



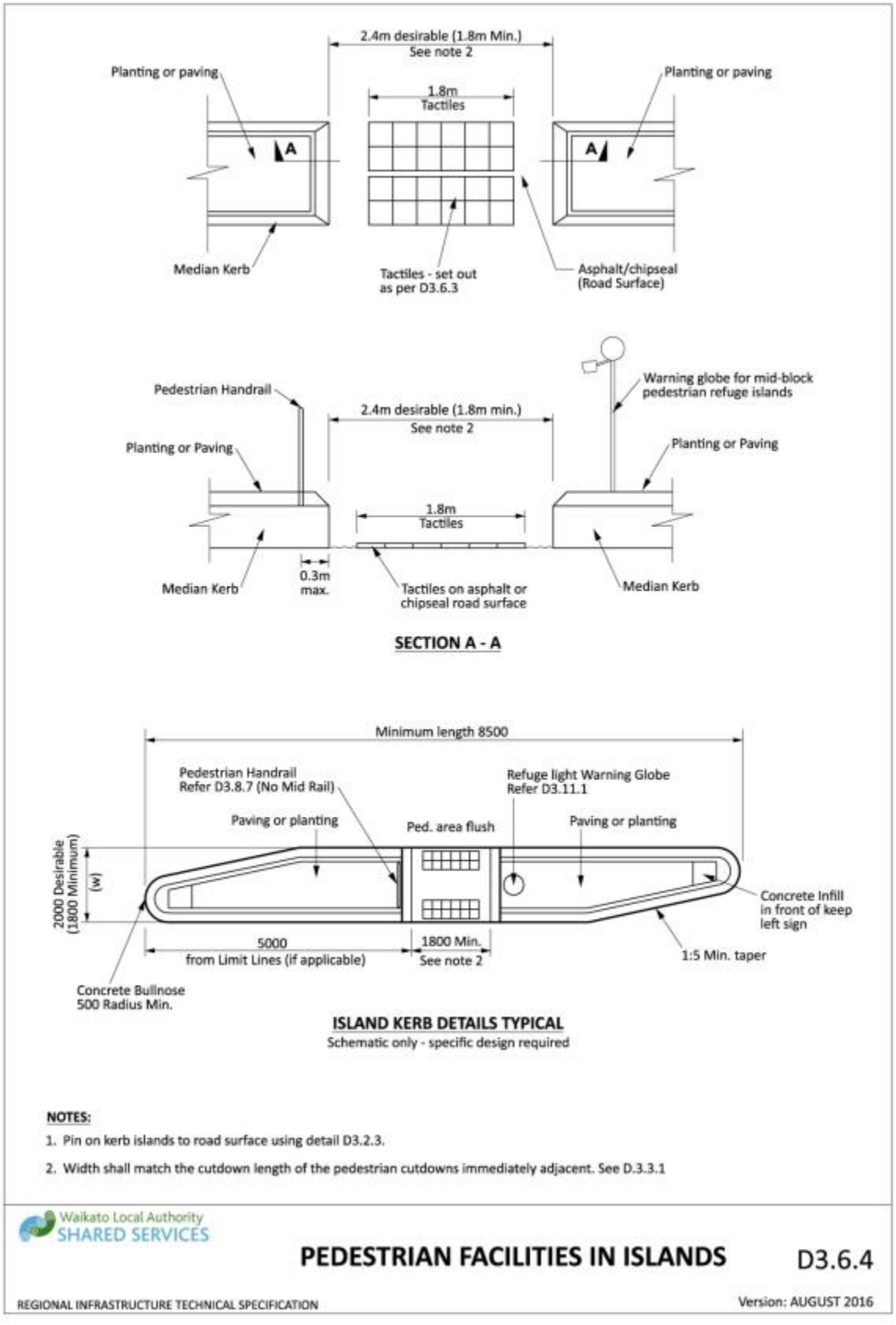
Drawing 3-24: Timber edging details for chip seal, asphalt and block paving



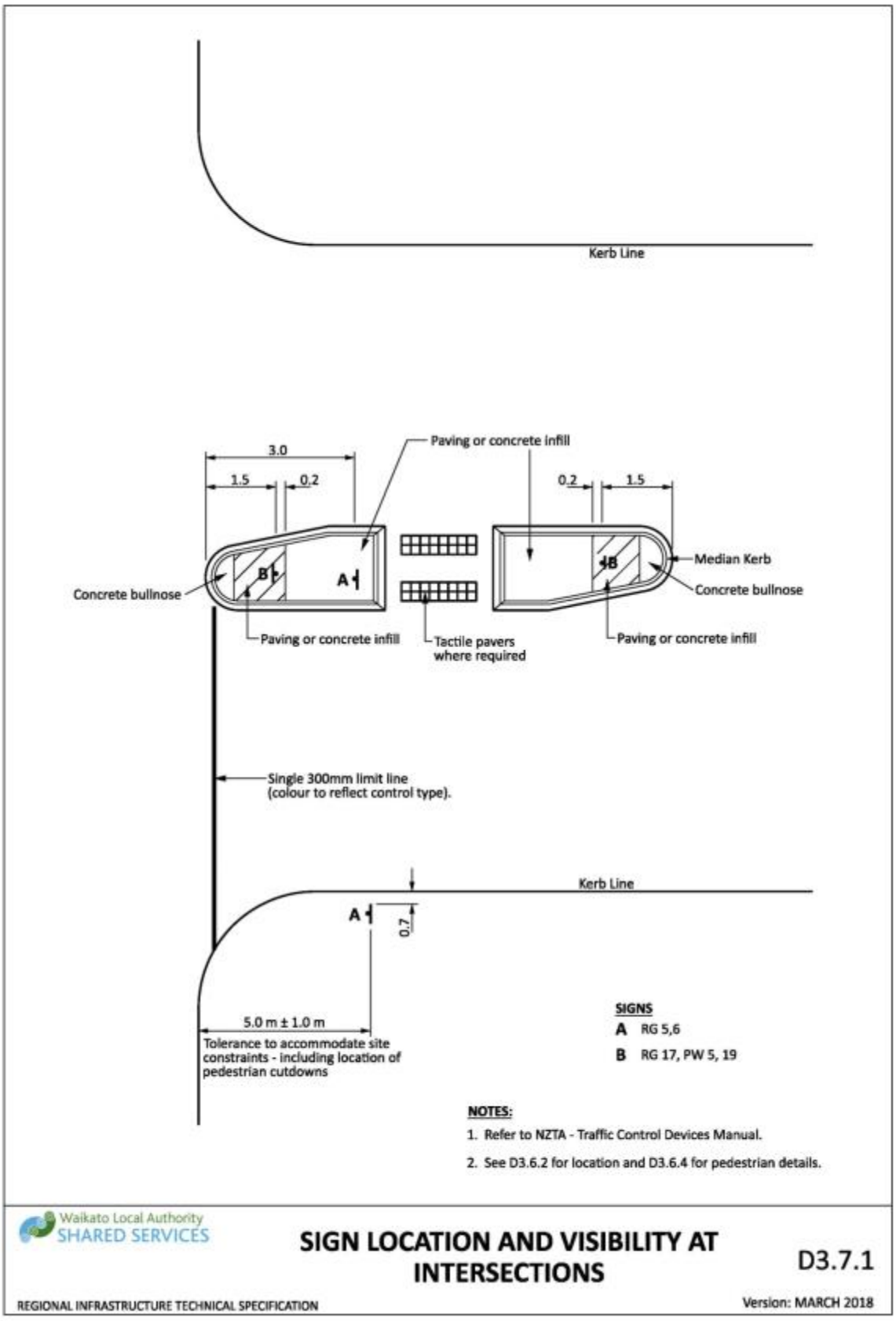
Drawing 3-25: Pedestrian corssing point location at intersections



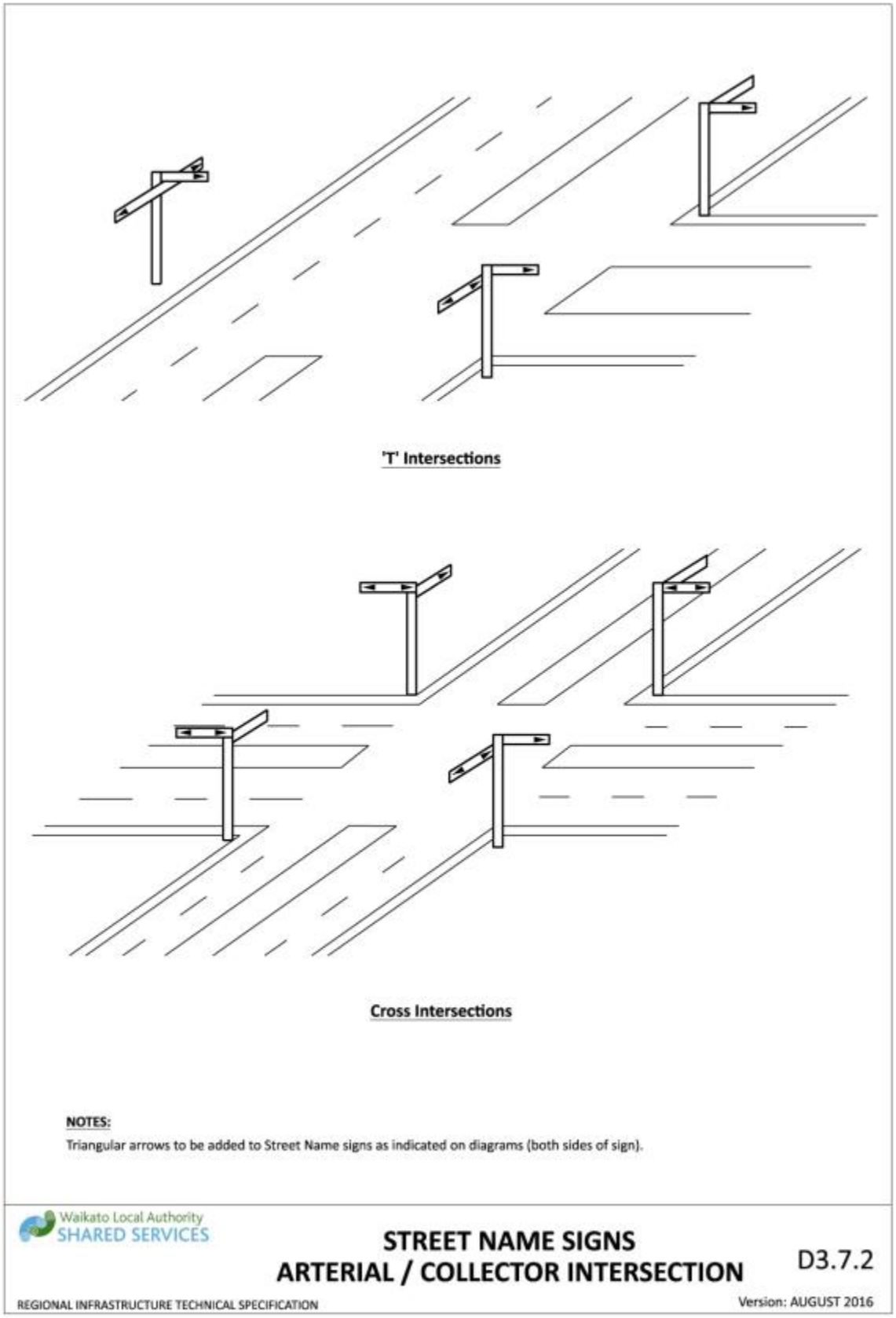
Drawing 3-26: Tactile paving for vision impaired



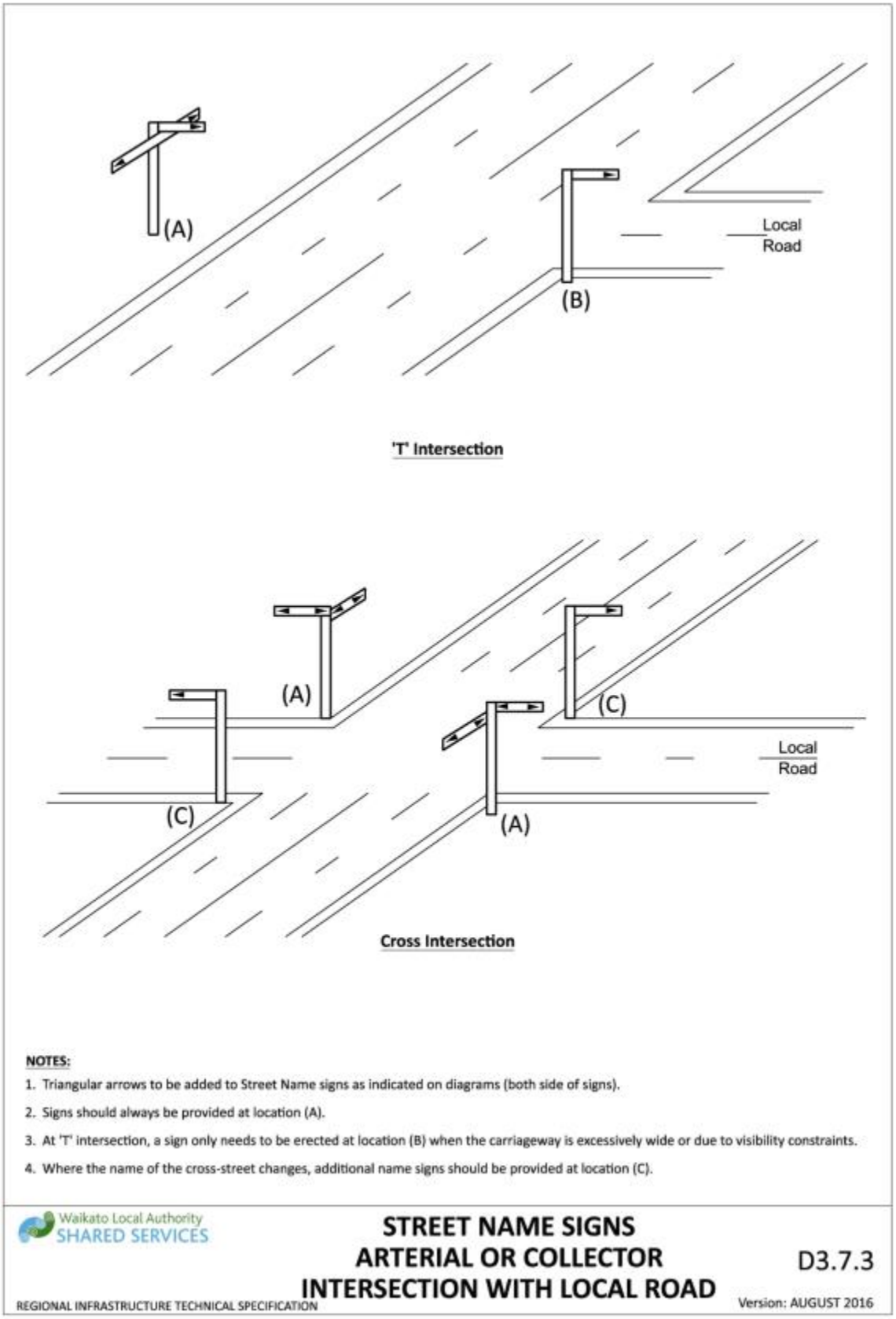
Drawing 3-27: Pedestrian facilities in islands



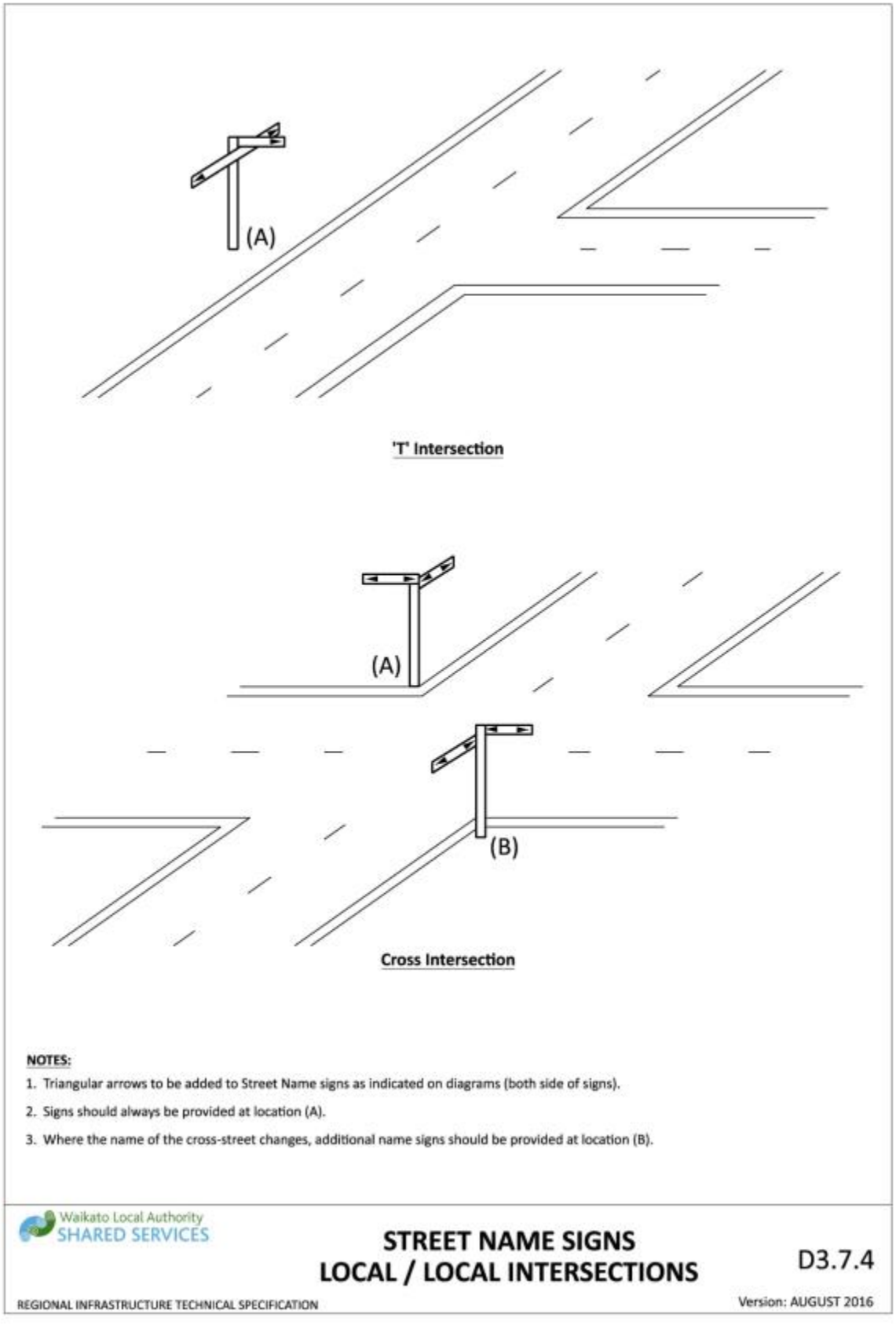
Drawing 3-28: Sign location and visibility at intersections



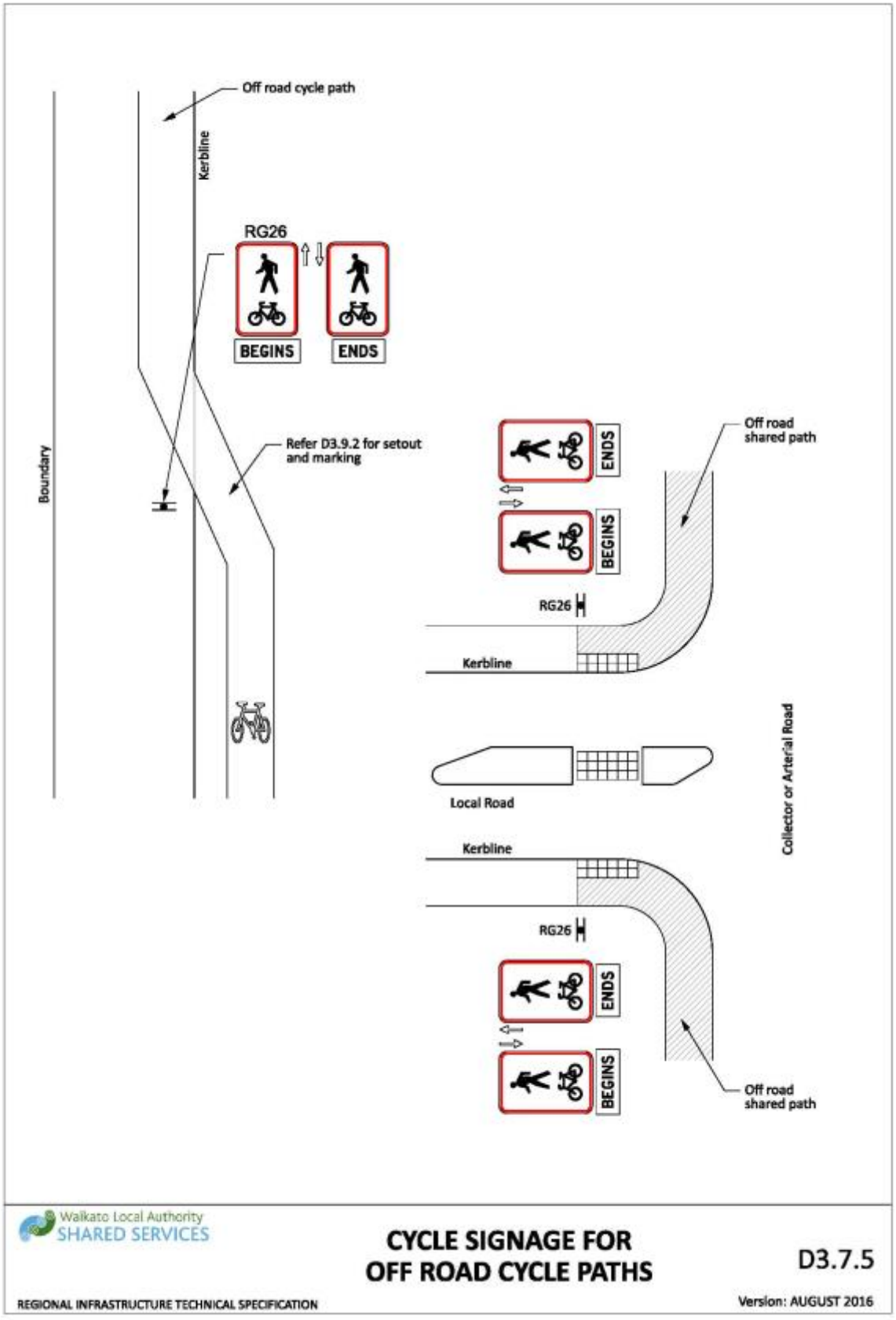
Drawing 3-29: Street name signs arterial/collector intersection



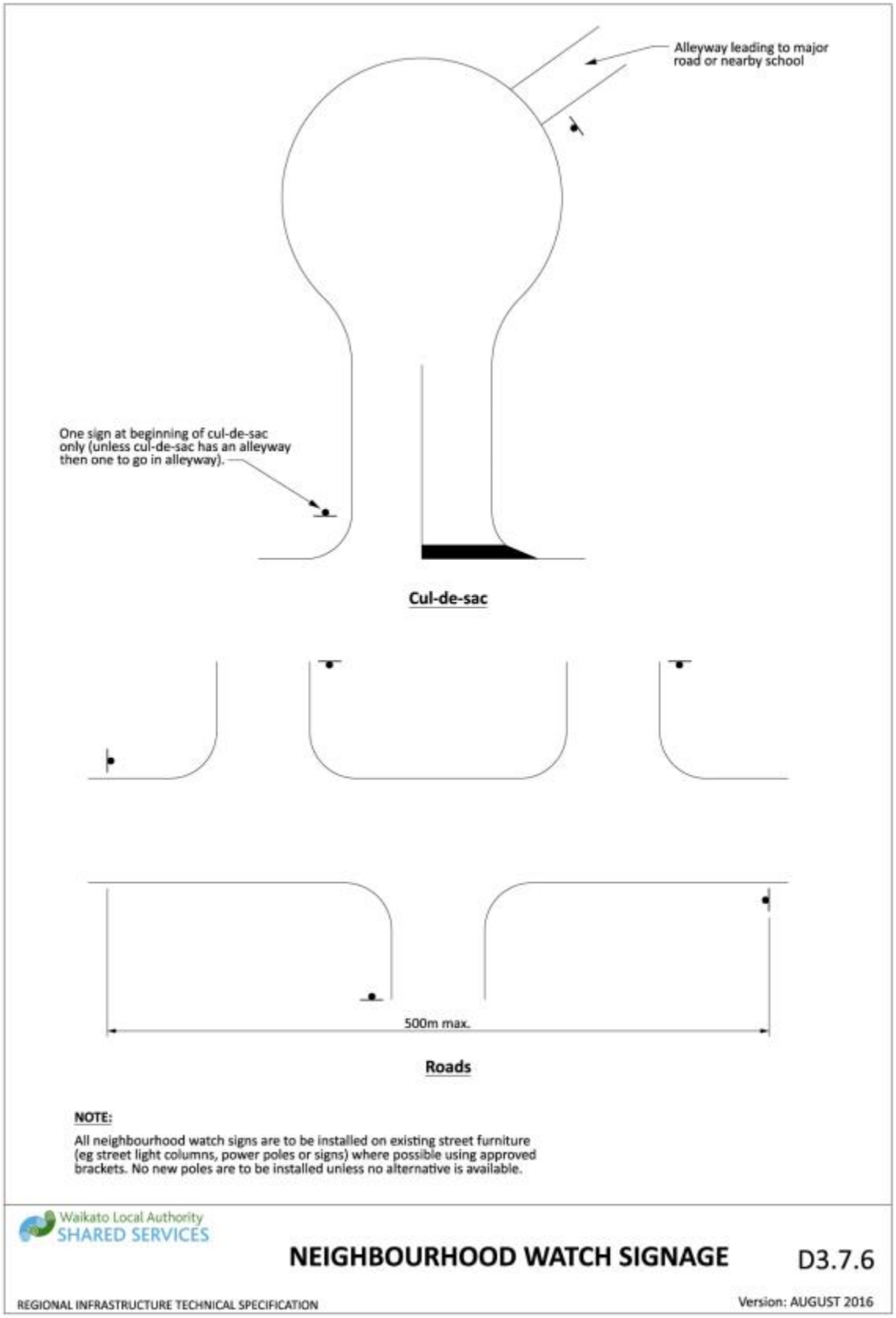
Drawing 3-30: Street name signs - arterial or collector intersection with local road



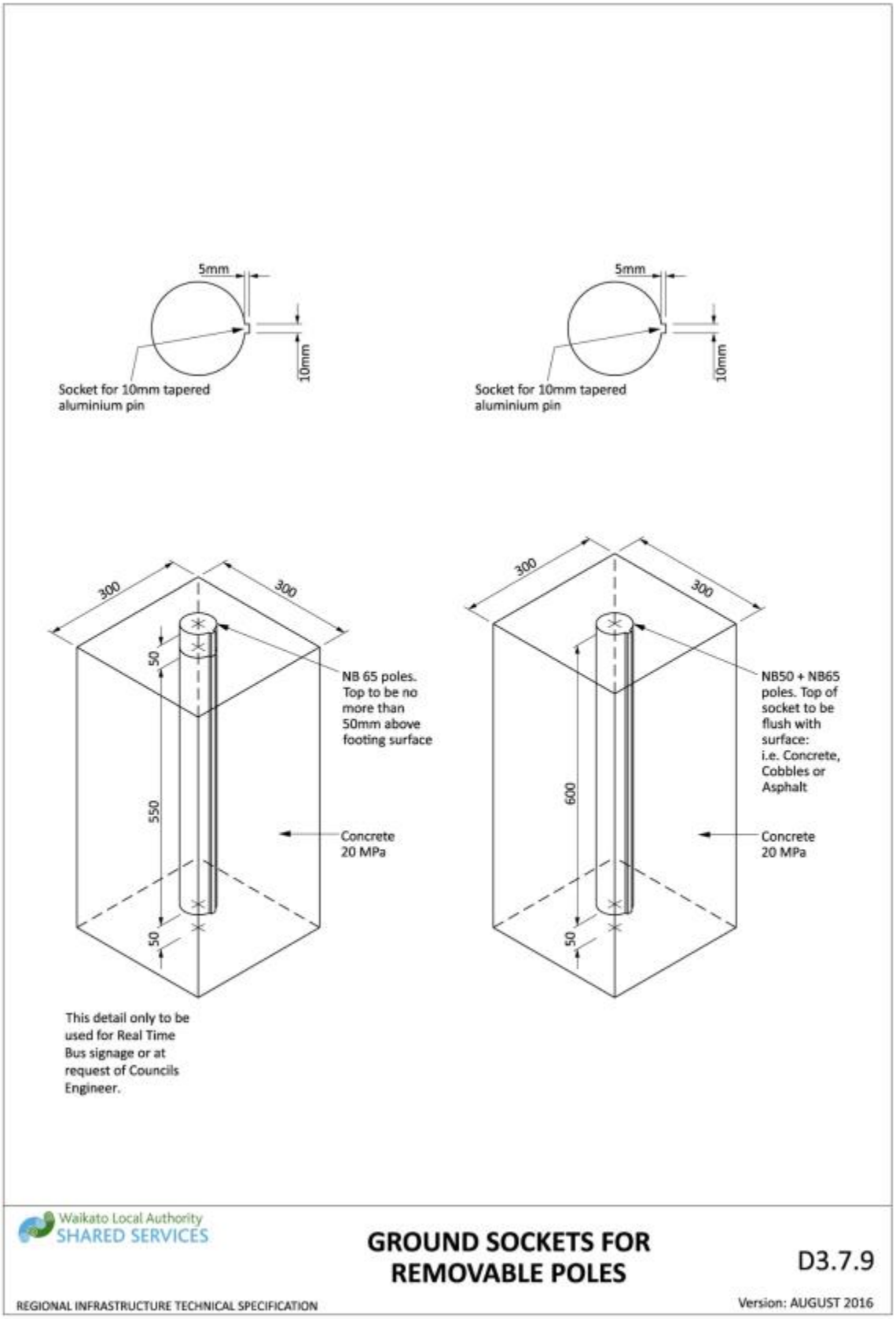
Drawing 3-31: Street name signs local/local intersection



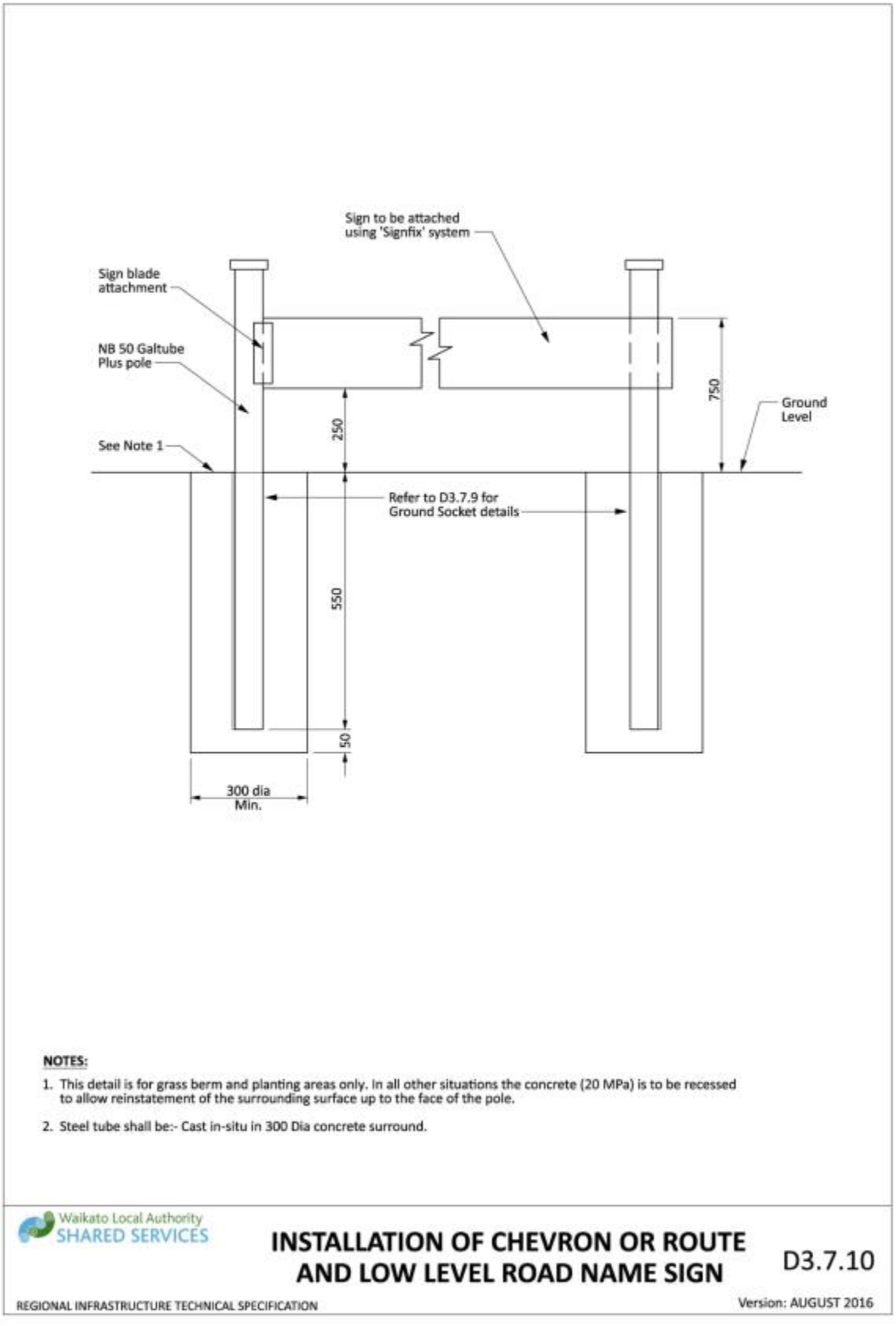
Drawing 3-32: Cycle signage for off road cycle paths



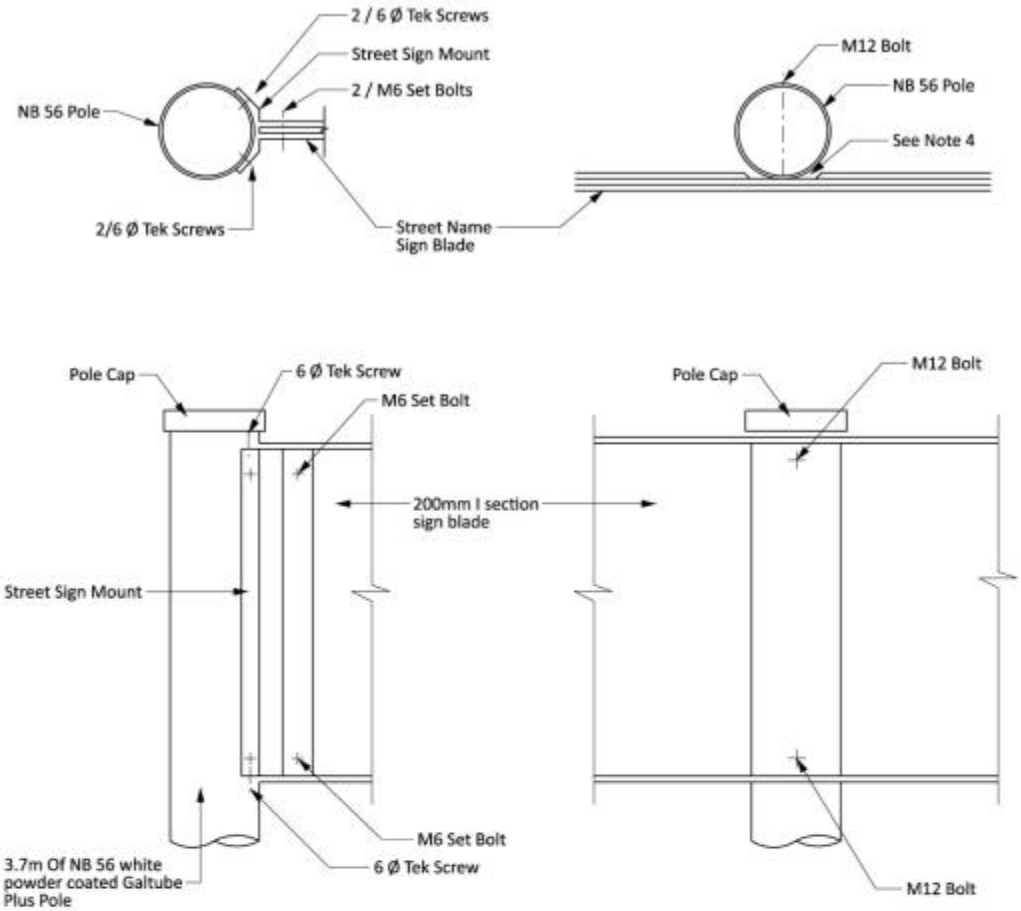
Drawing 3-33: Neighbourhood watch signage



Drawing 3-34: Ground sockets for removable poles



Drawing 3-35: Installation of chevron or route and low level road name sign



NOTES:

1. Plastic washers are to be used against the sign face. Bolts are to be tightened in a manner which will not tear the reflective sheeting.
2. The distance between the ground and the top of the top sign blade shall be 3.0m.
3. Lettering on the sign blade to finish not less than 30mm from blade end to allow complete visibility of the sign.
4. Where street name signs are to be attached to other than N.B. 56 Poles, the street sign mount is to be slotted top and bottom and strapped to pole with stainless steel bands.
5. Cut notch into I section sign blade (top and bottom) to enable sign to sit flat against pole.
6. No Exit supplements are to be taped to bottom flange of sign.
7. 'Signfix' brackets shall be used for end mounted signs longer than 1.2m.

Waikato Local Authority SHARED SERVICES

ATTACHMENT OF STREET NAME SIGN BLADES TO POLES

D3.7.11

REGIONAL INFRASTRUCTURE TECHNICAL SPECIFICATION

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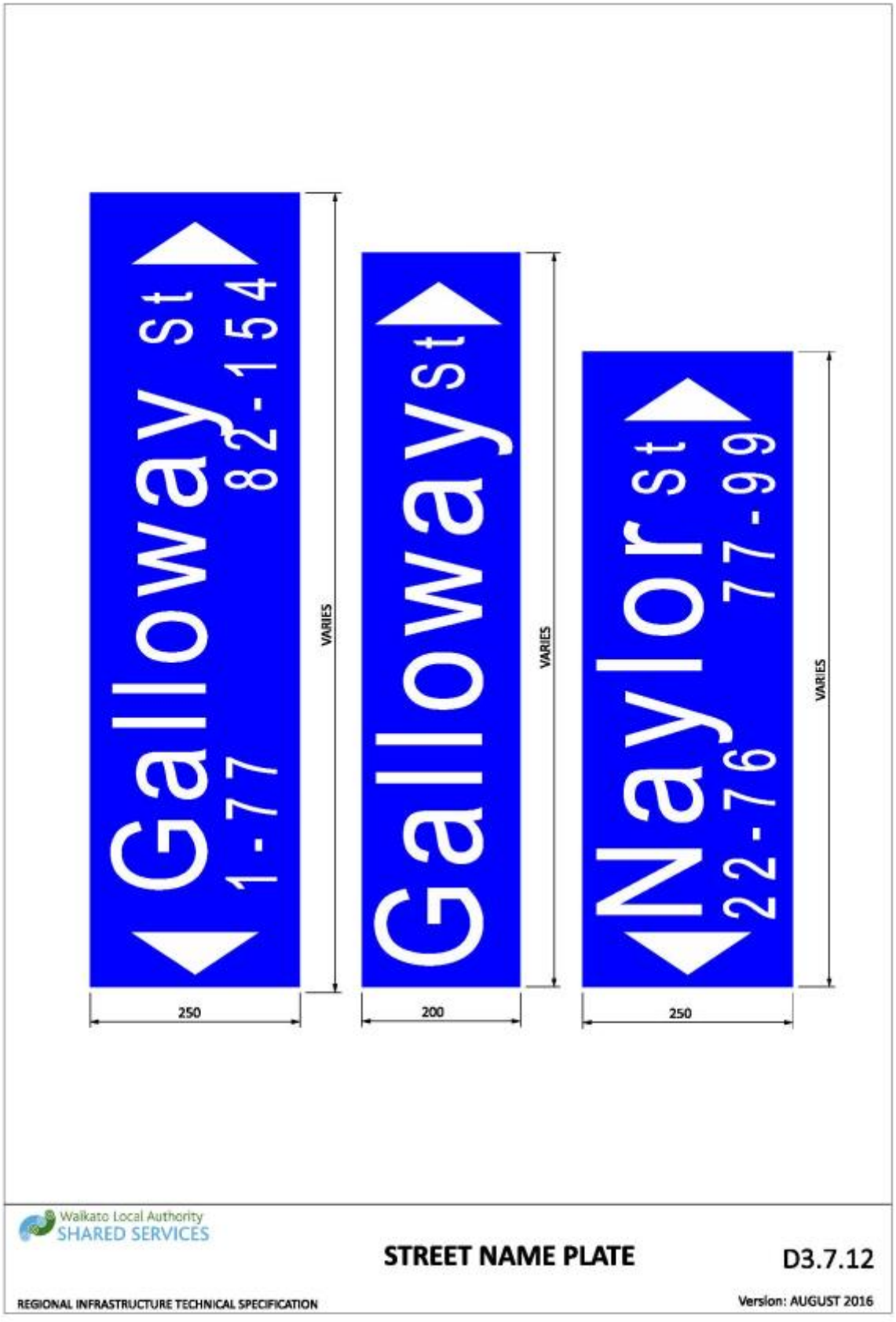
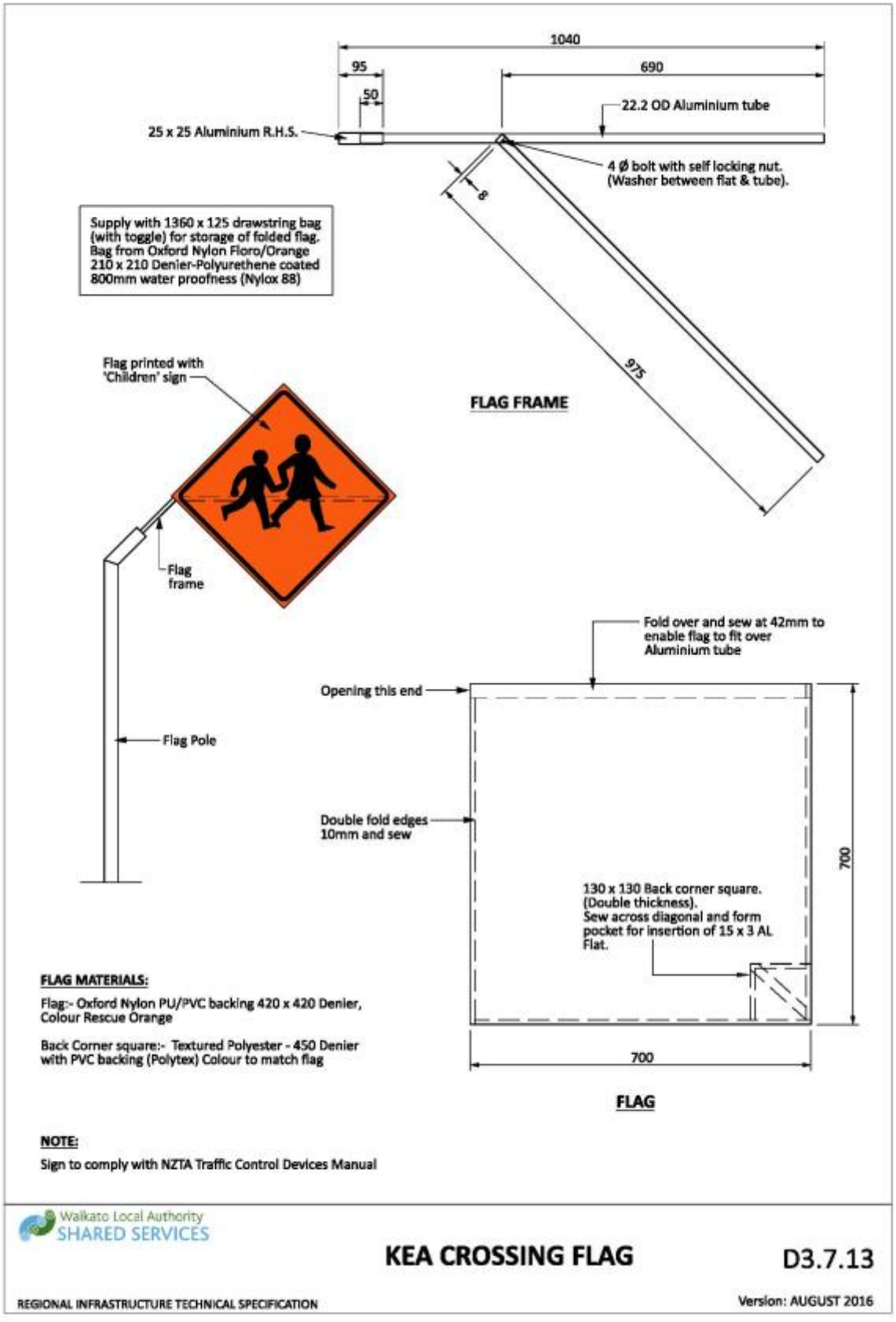
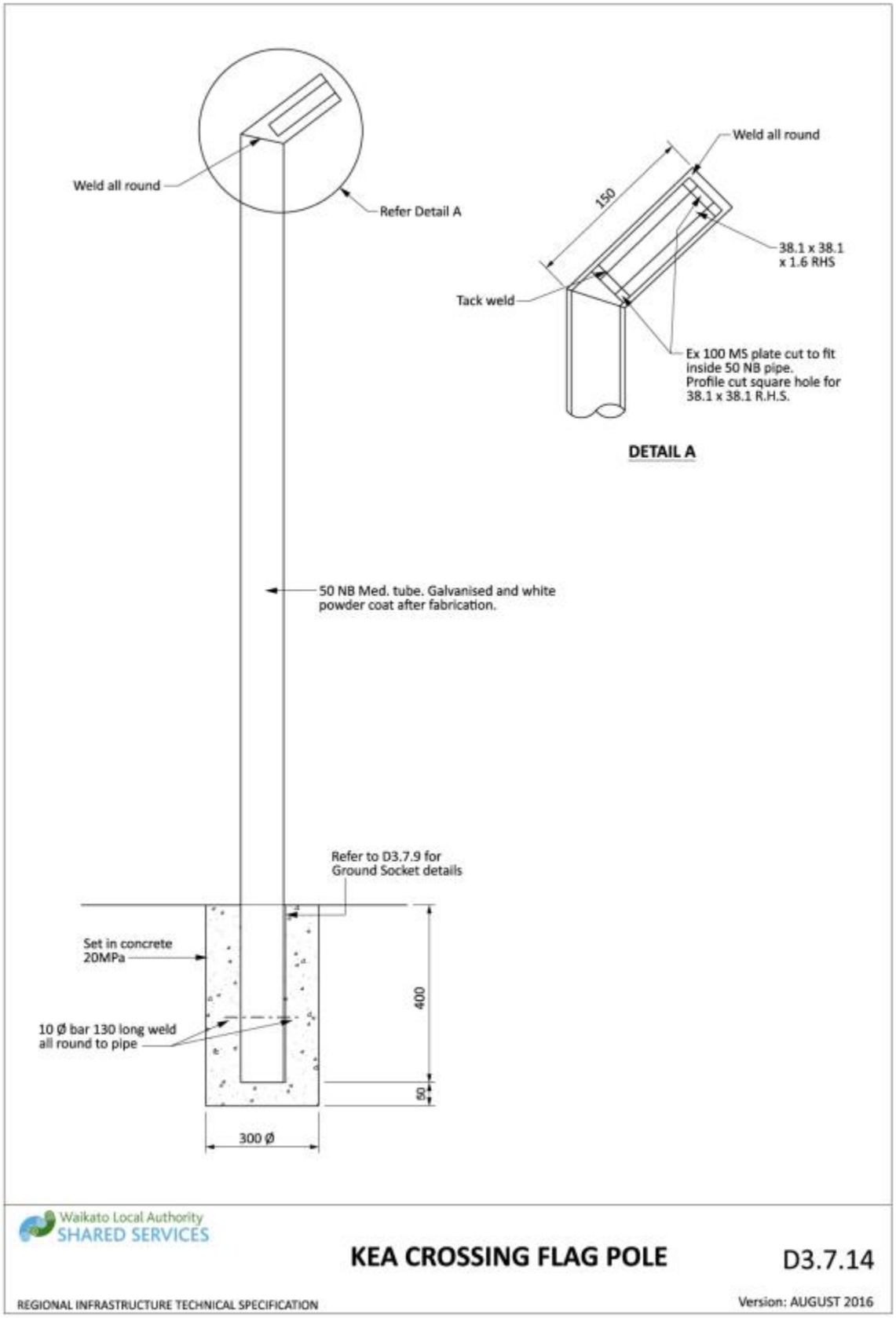
Drawing 3-36: Attachment of street name sign blades to poles



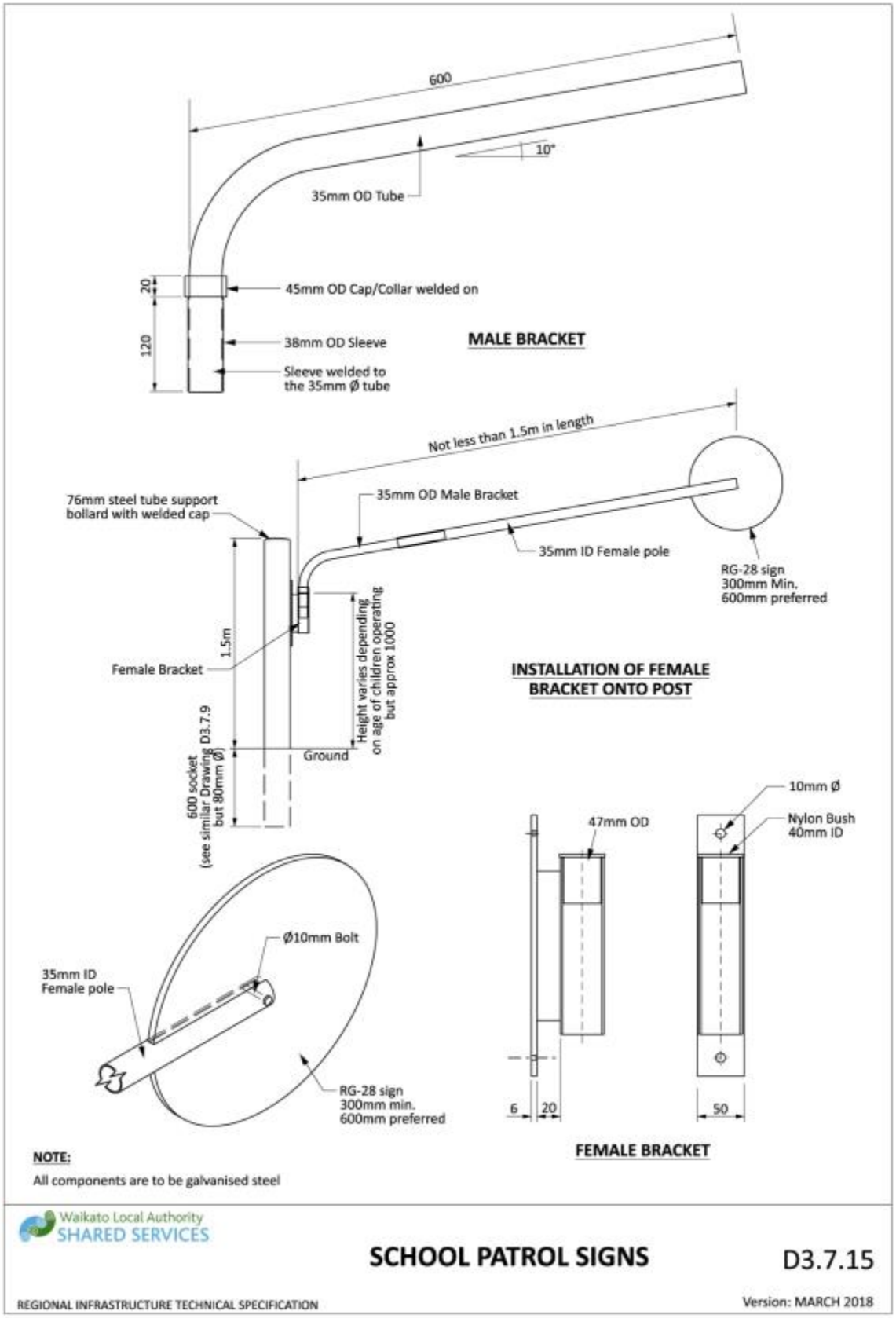
Drawing 3-37: Street name plate



Drawing 3-38: Kea crossing flag

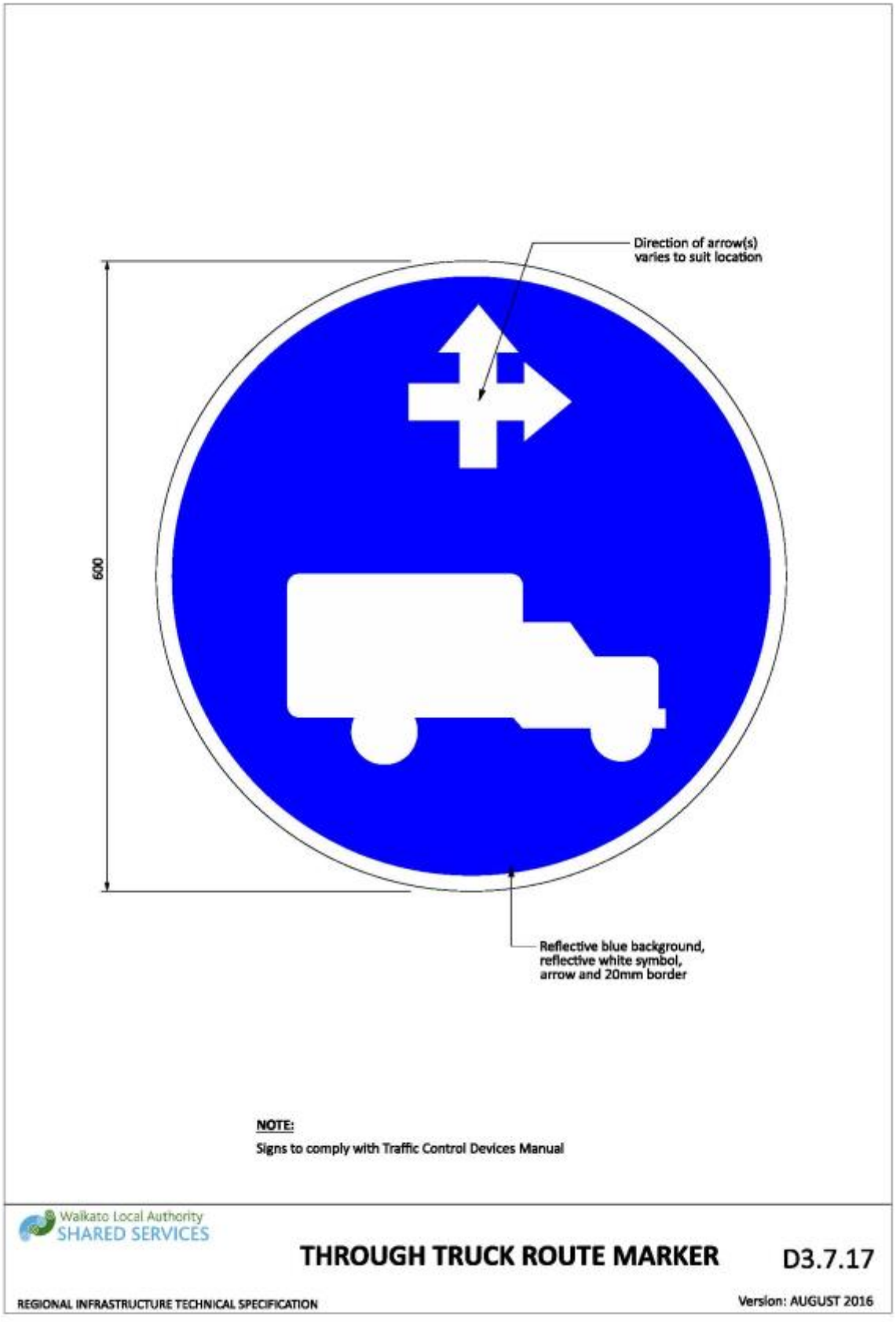


Drawing 3-39: Kea crossing flag pole

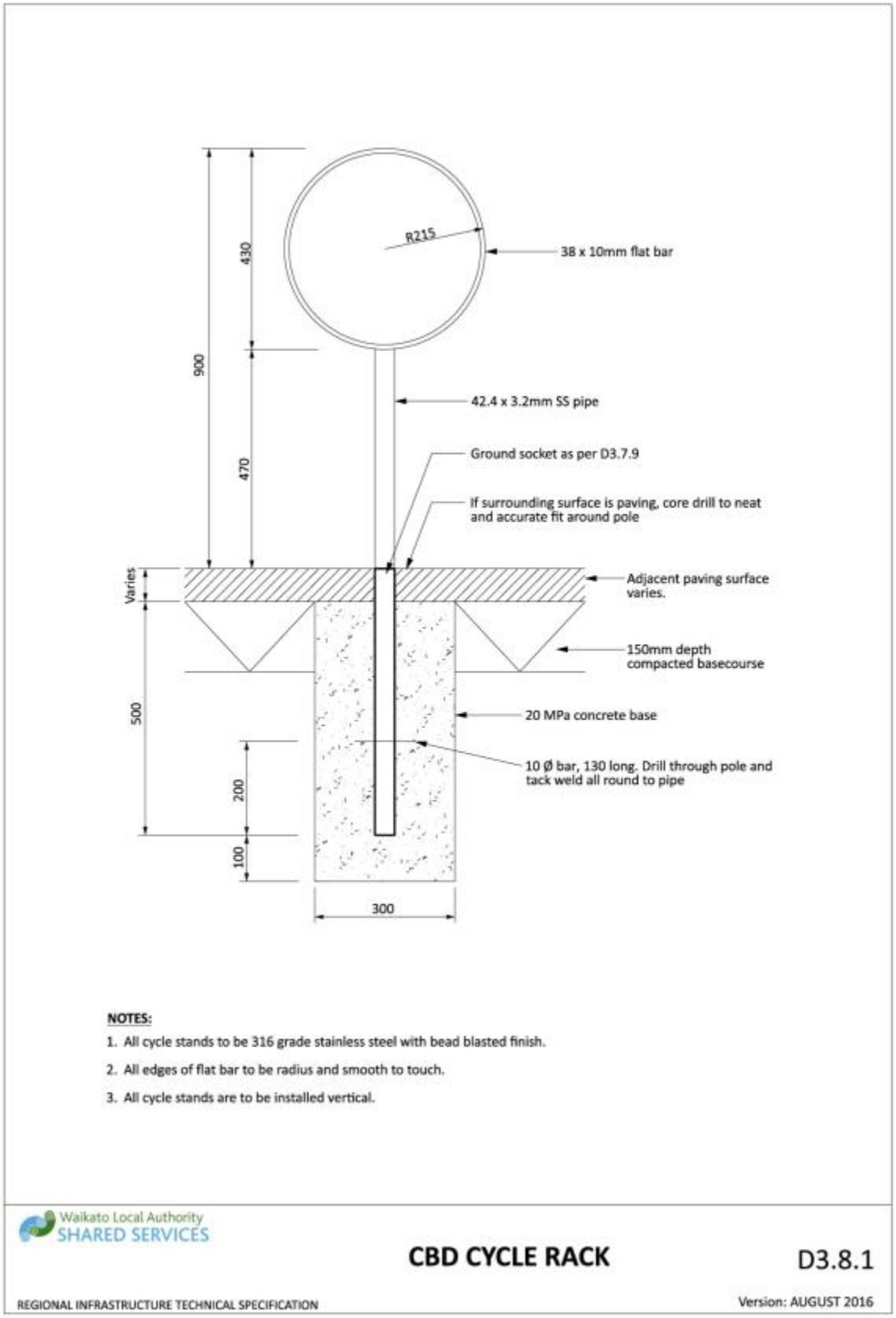


Drawing 3-40: School patrol signs

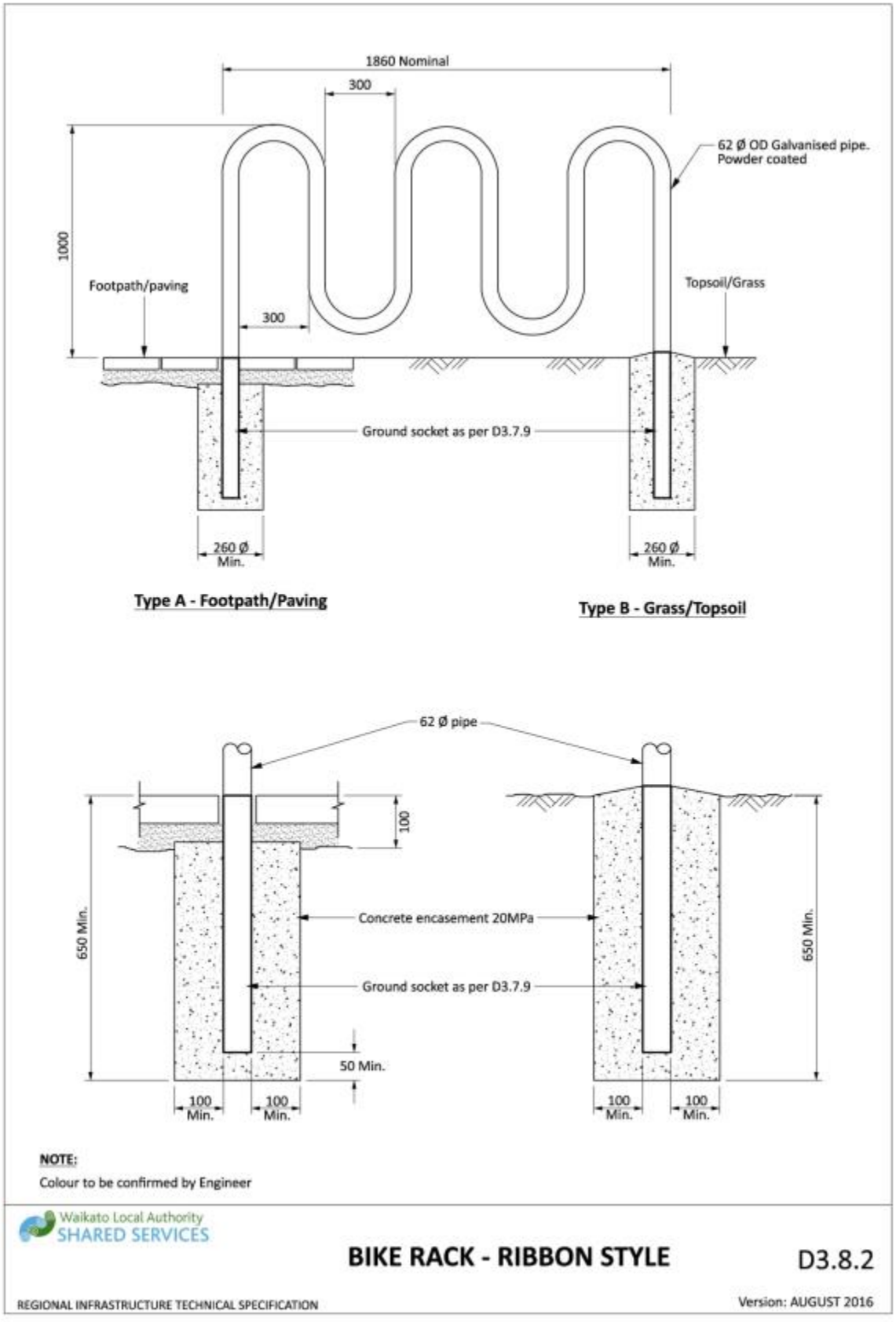
Drawing 3-41: Bus stop / taxi supplement



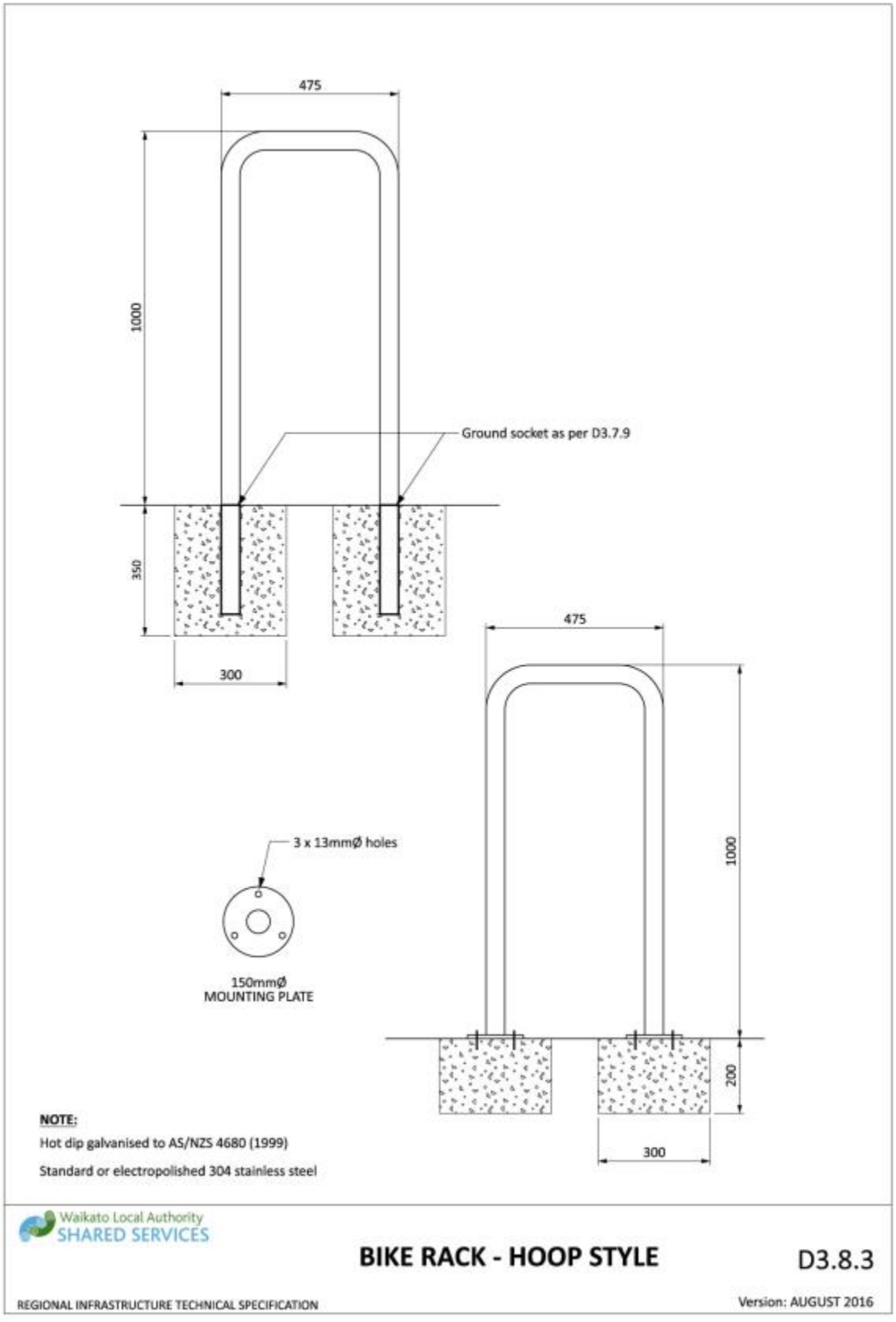
Drawing 3-42: Through truck route marker



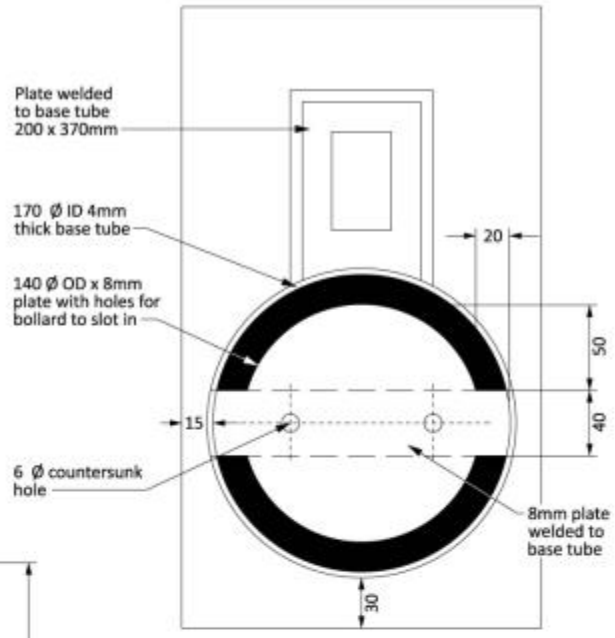
Drawing 3-43: CBD cycle rack



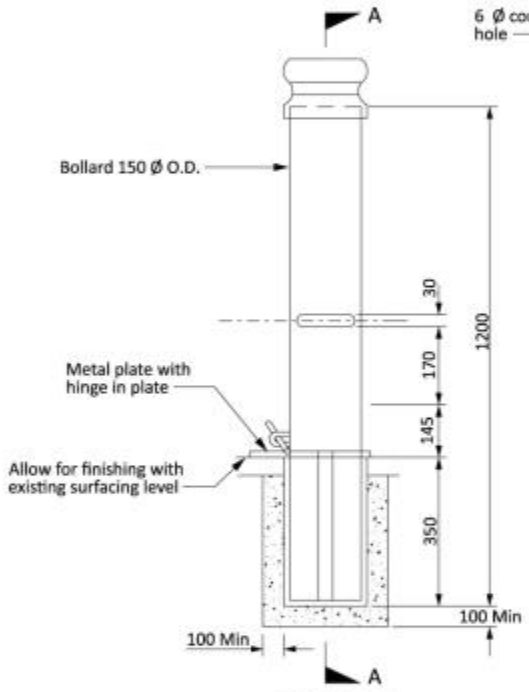
Drawing 3-44: Bike rack - ribbon style



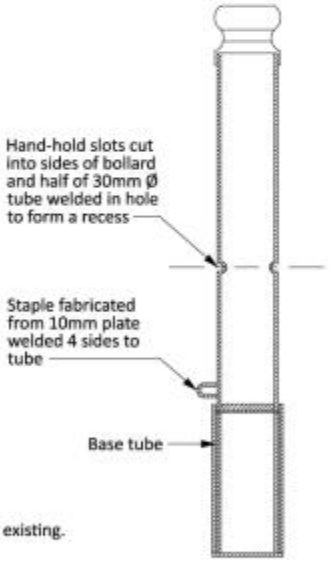
Drawing 3-45: Bike rack - hoop style



BASE TUBE PLAN



ELEVATION



SECTION A-A

NOTES:

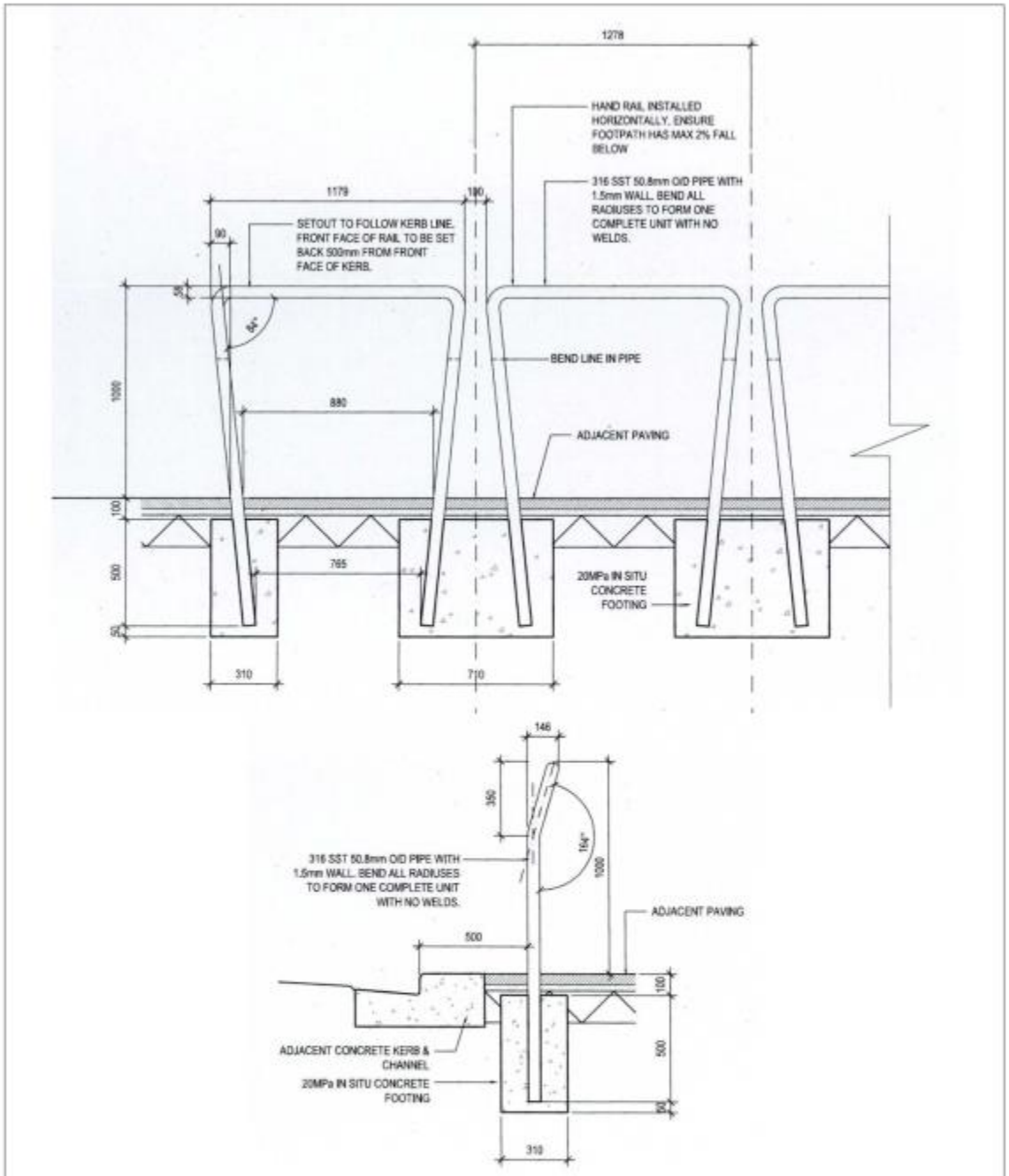
1. All bollards are to be installed in footpath areas.
2. Base tubes are to be cast into concrete and the surrounding surface is to be reinstated as per existing.
3. The base tube and locking plate are to be flush with the existing surface.
4. All bollards are to have a 600mm clearance to the kerb face.
5. Bollard cap is made of spun aluminium (scalloped style shown)
6. Bollard caps are to be held in place with rivets.
7. Galvanised or Powder coating, colour to be specified.
8. Bollard is to be slotted 350mm from the bottom to allow it to sit in base tube.
9. A secondary base tube, located nearby, may be required to allow for safe storage of bollards when removed for extended period.

Waikato Local Authority SHARED SERVICES

LOCKABLE REMOVABLE BOLLARDS D3.8.6

REGIONAL INFRASTRUCTURE TECHNICAL SPECIFICATION Version: AUGUST 2016

Drawing 3-46: Lockable removable bollards



NOTES:

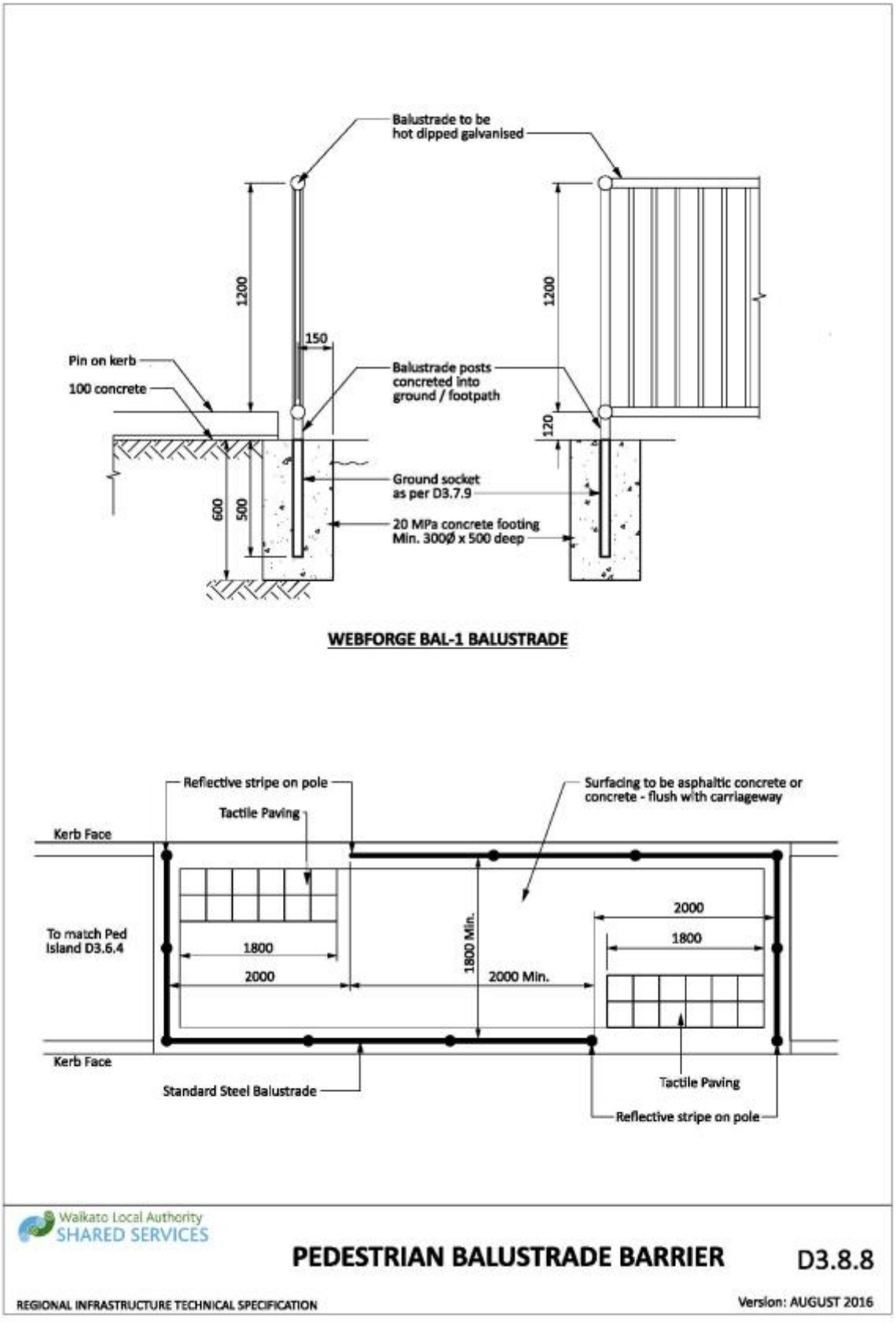
1. All pedestrian barrier rails to be 316 grade stainless steel with bead blasted finish.
2. All edges to be smooth to touch.
3. All pedestrian barrier rails are to be installed vertical

Waikato Local Authority SHARED SERVICES

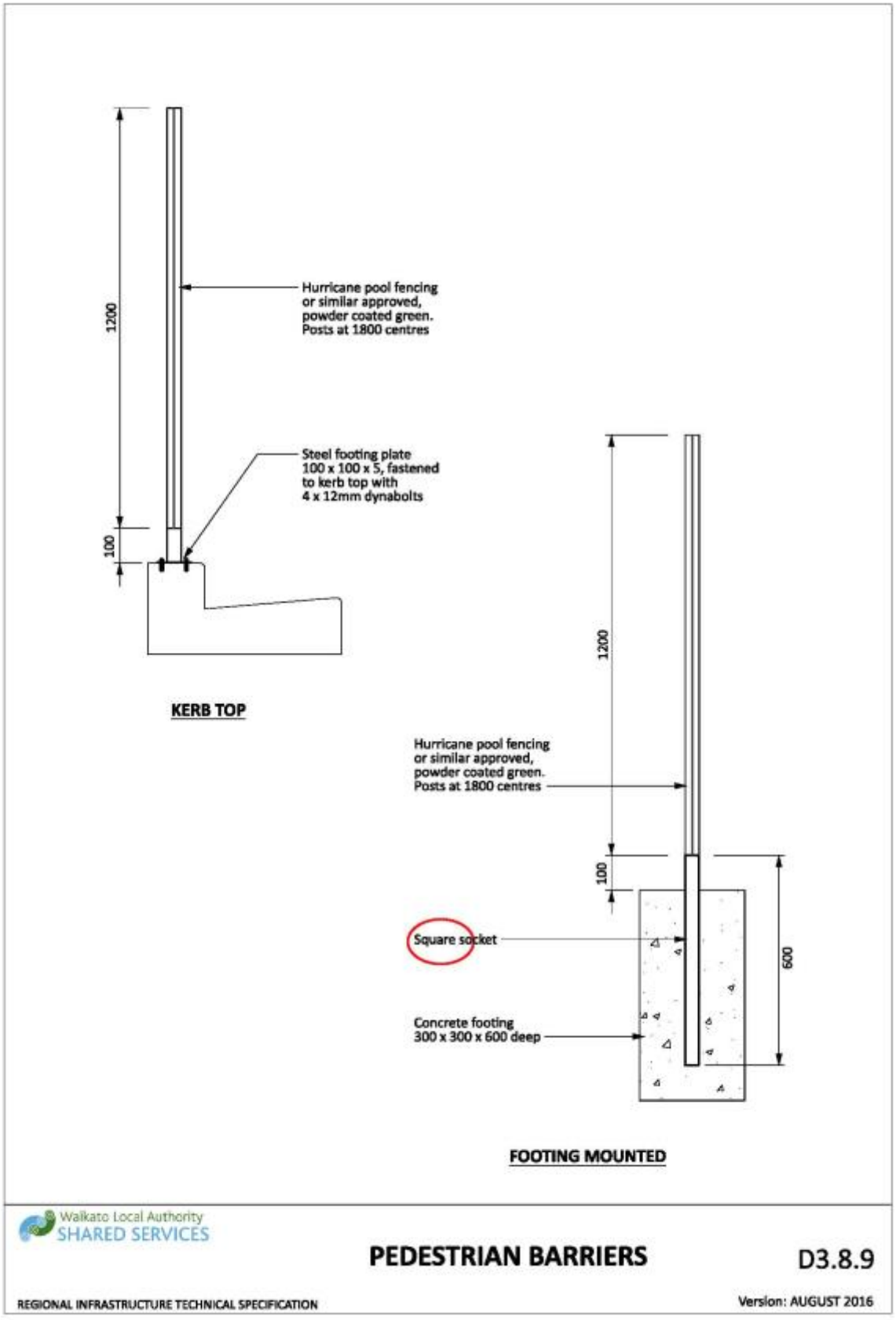
CBD PEDESTRIAN BARRIER D3.8.7

REGIONAL INFRASTRUCTURE TECHNICAL SPECIFICATION Version: AUGUST 2016

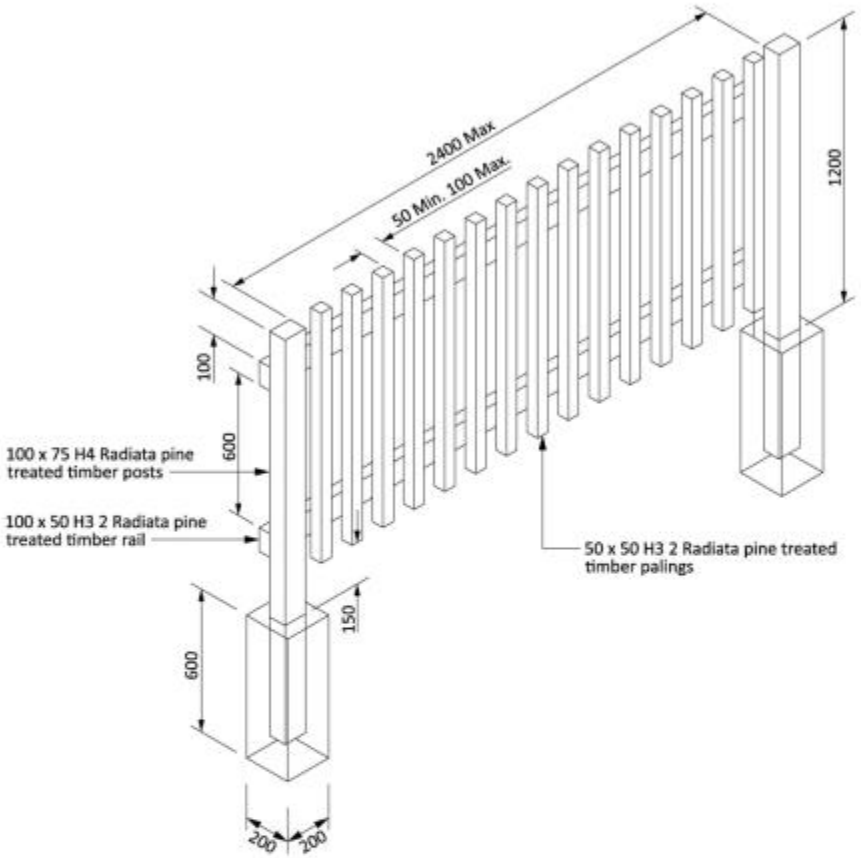
Drawing 3-47: CBD pedestrian barrier



Drawing 3-48: Pedestrian balustrade barrier



Drawing 3-49: Pedestrian barriers



NOTES:

1. Posts 100 x 75mm H4 Radiata pine treated timber posts.
2. Rails 100 x 50mm H3.2 Radiata pine treated timber rails x 3.
3. Paling 50 x 50mm H3.2 Radiata Pine treated timber palings.
4. 1.2m high for approx 10m from each end of accessway then 1.5 or 1.8 max.
5. Alternative treatments such as pool fence may be acceptable.

Waikato Local Authority SHARED SERVICES

PEDESTRIAN ACCESSWAYS FENCE DETAIL

D3.8.10

REGIONAL INFRASTRUCTURE TECHNICAL SPECIFICATION

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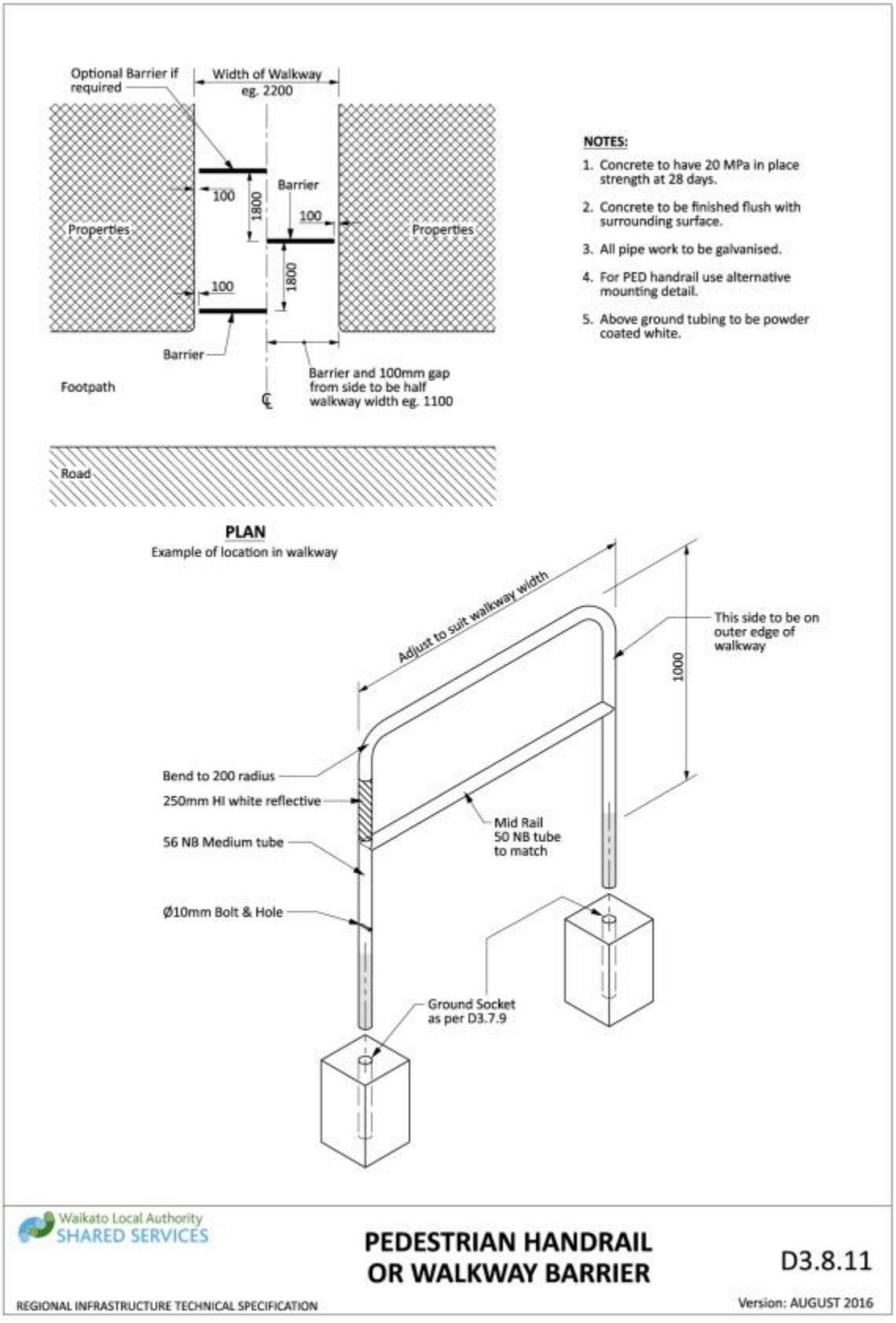
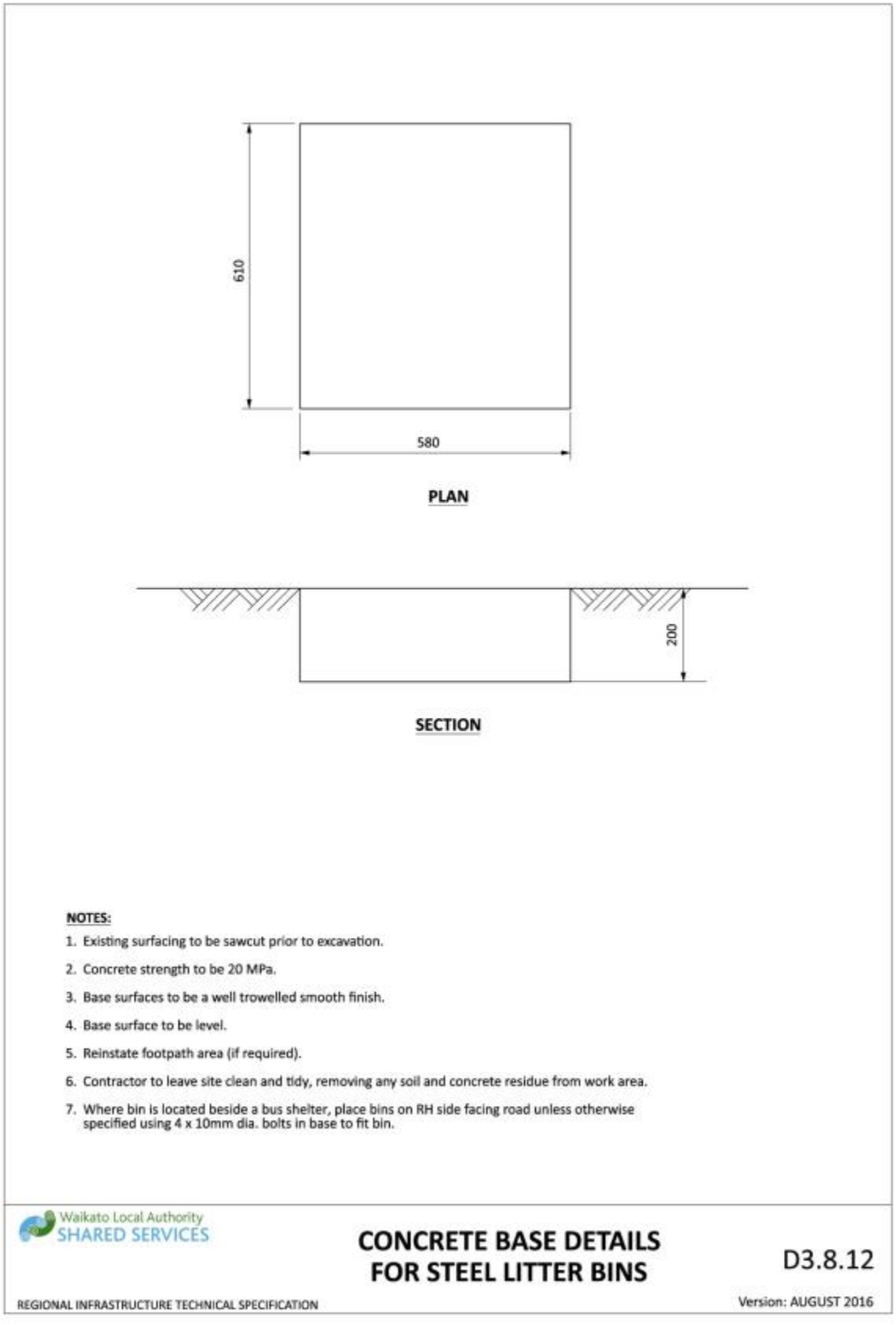
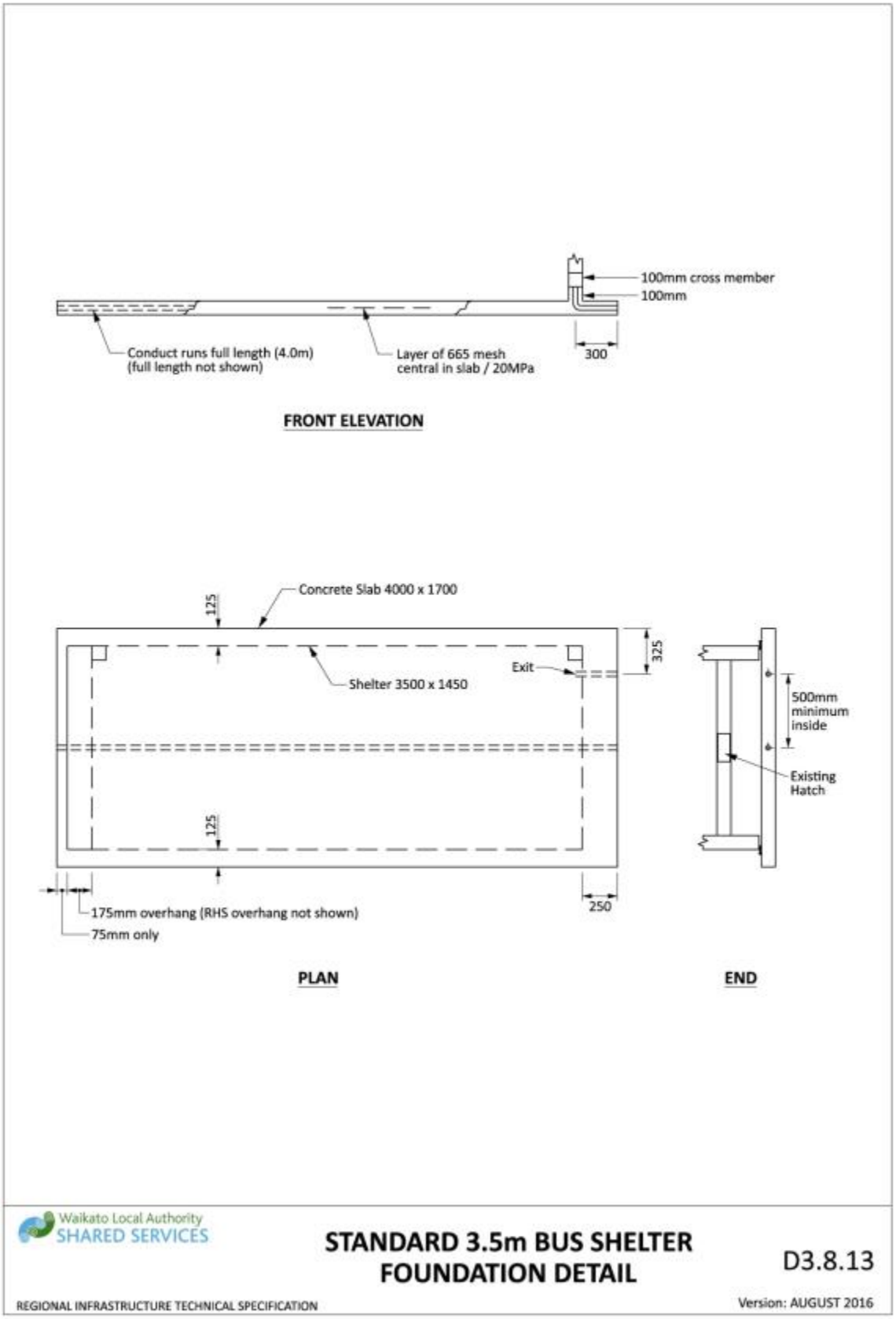
Drawing 3-50: Pedestrian accessways fence detail



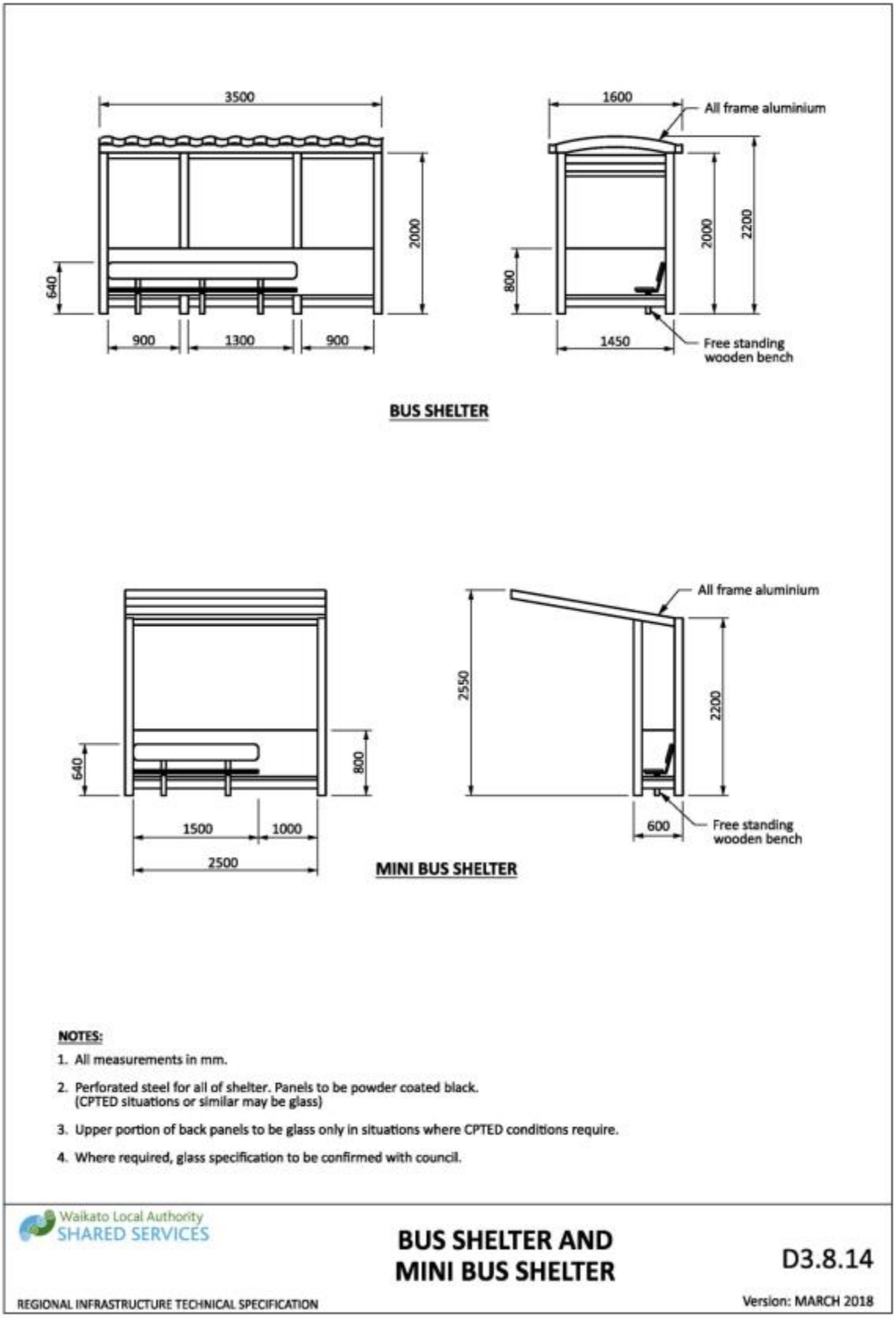
Drawing 3-51: Pedestrian handrail or walkway barrier



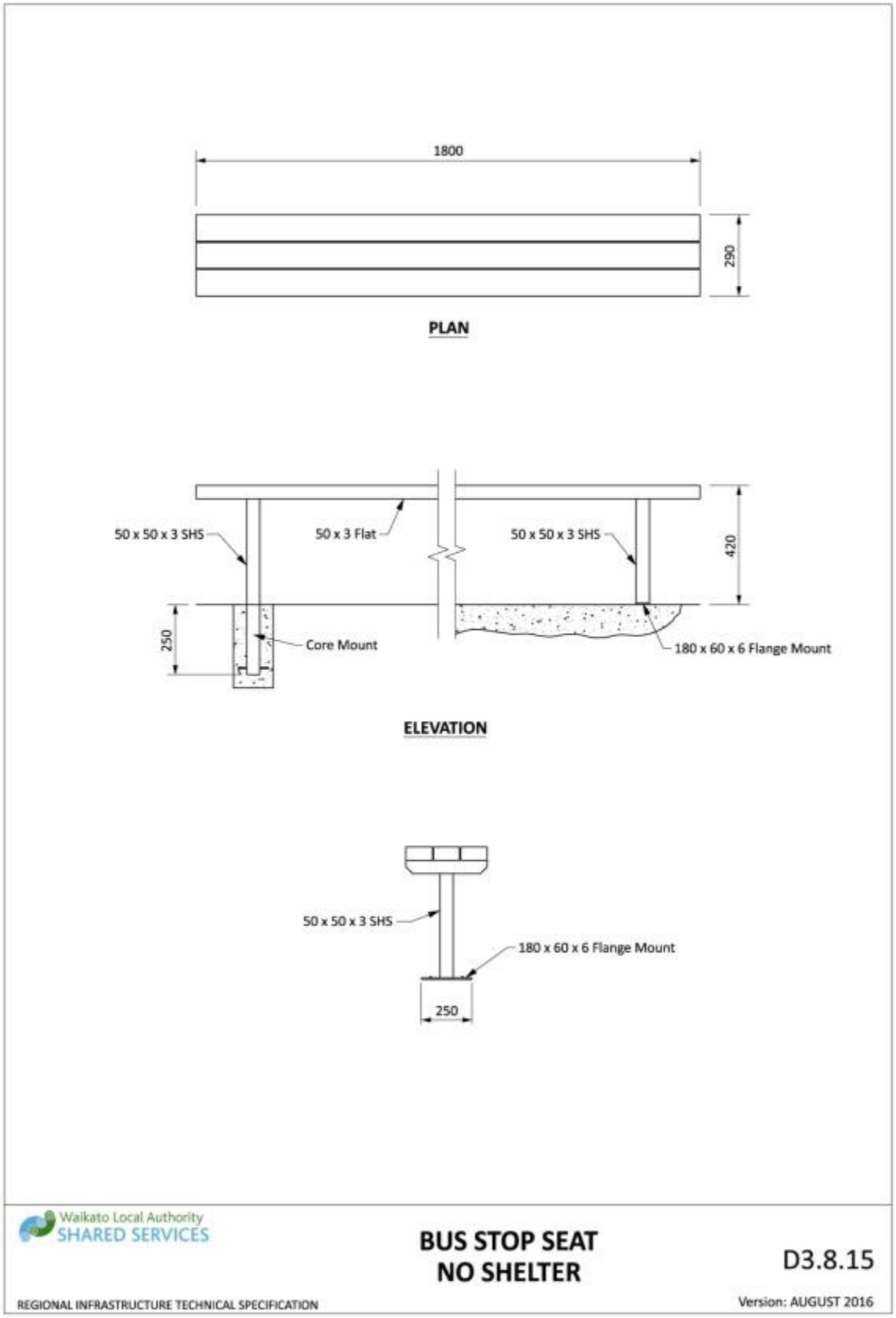
Drawing 3-52: Concrete base details for steel litter bins



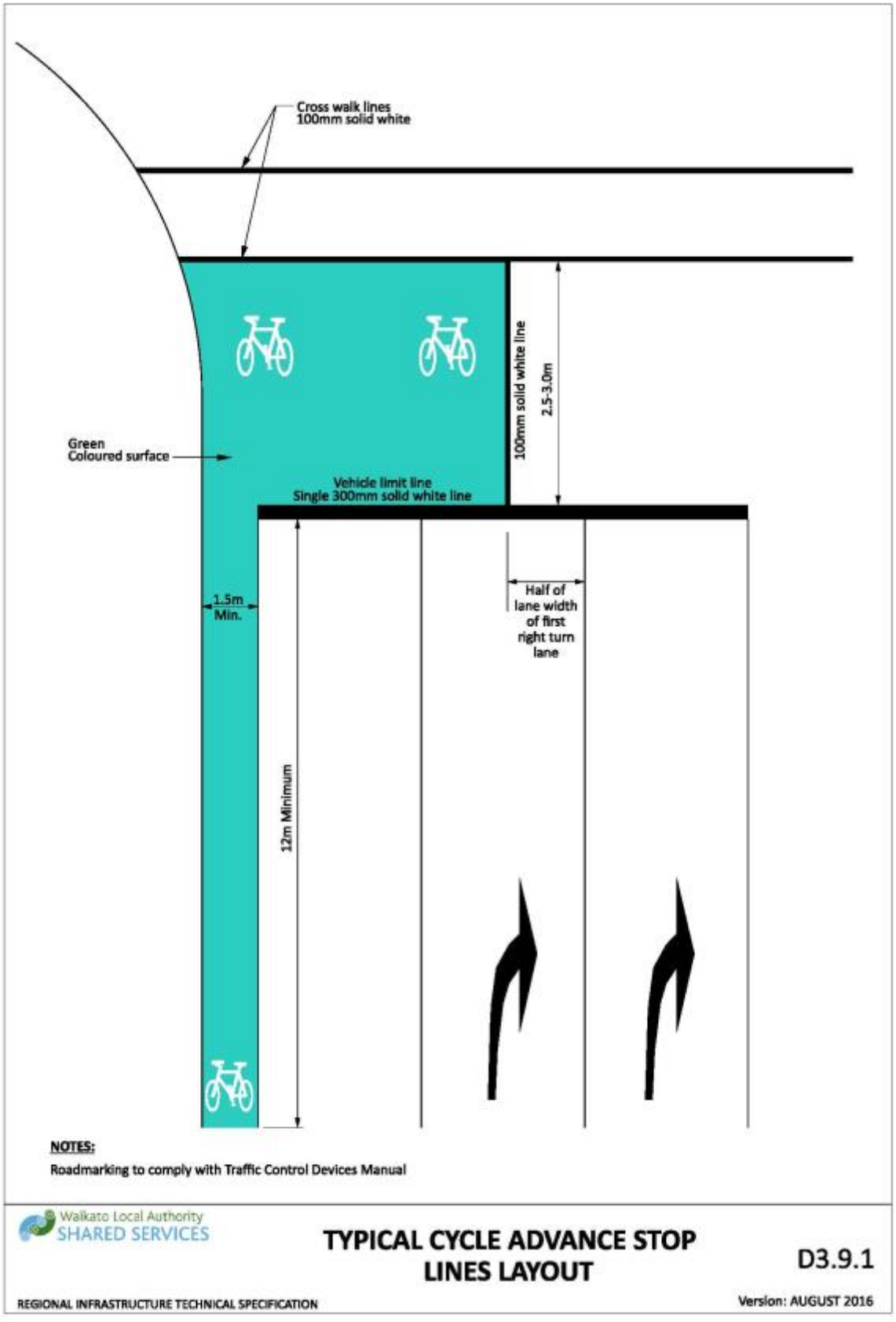
Drawing 3-53: Standard 3.5m bus shelter foundation detail



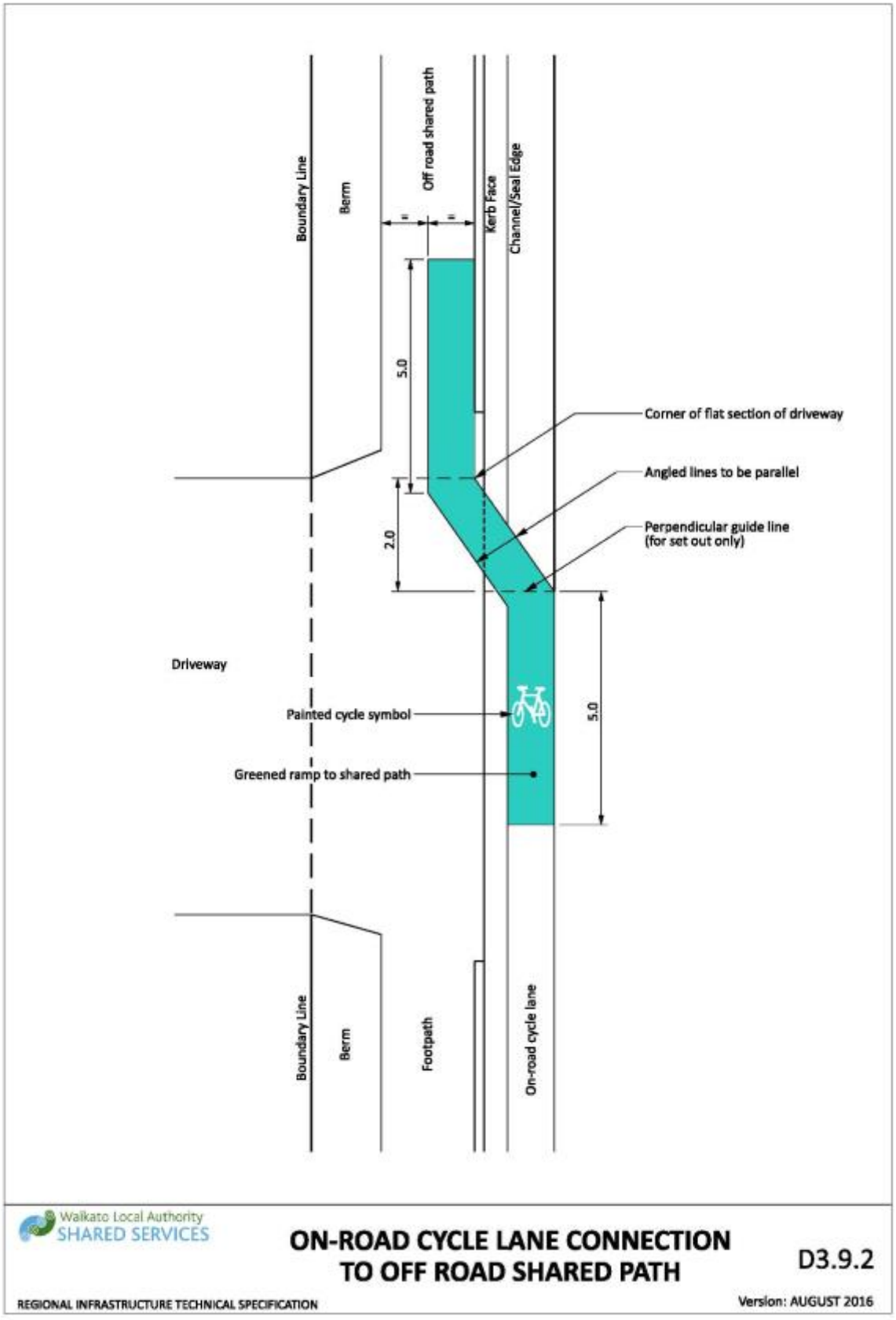
Drawing 3-54: Bus shelter and mini bus shelter



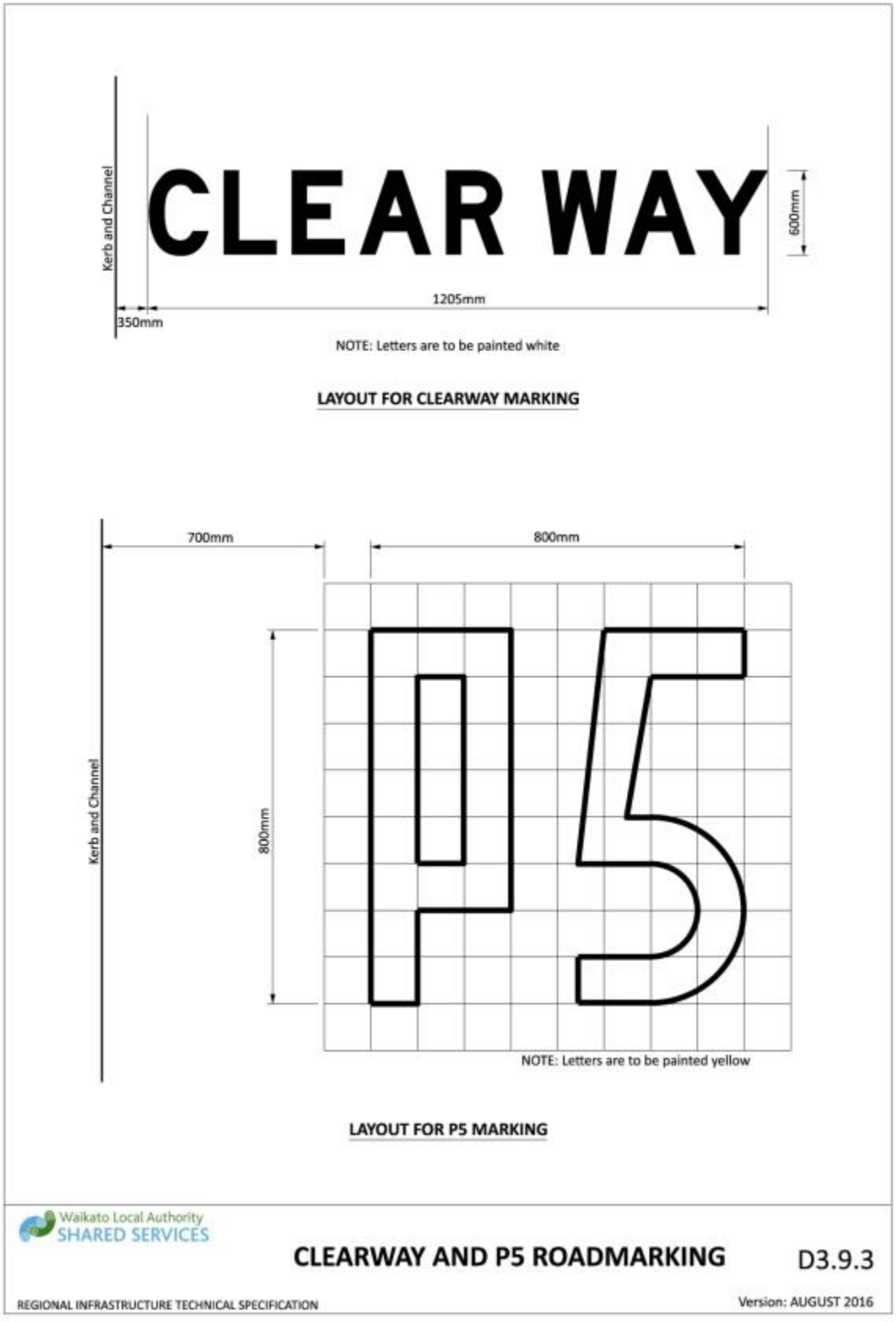
Drawing 3-55: Bus stop seat no shelter



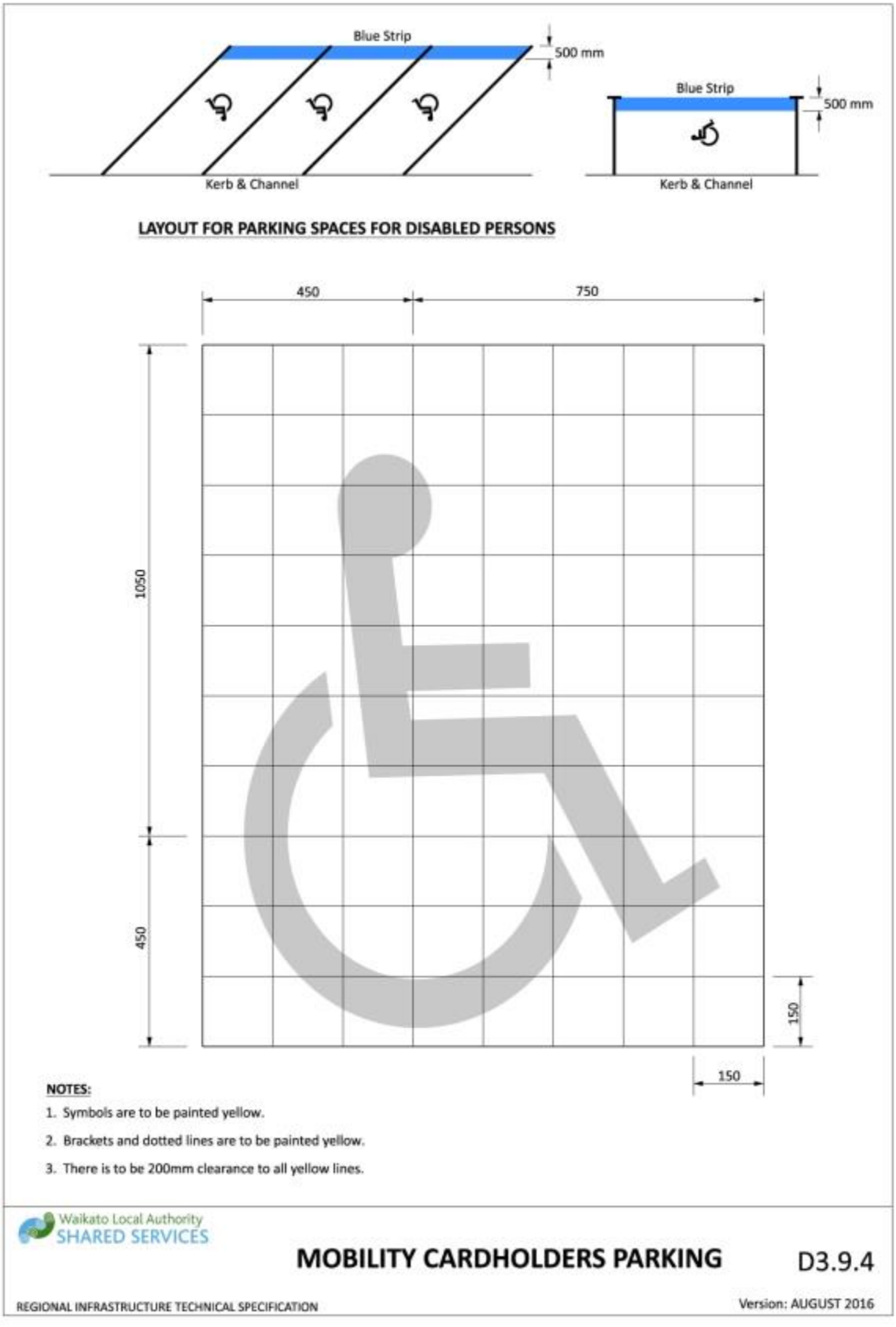
Drawing 3-56: Typical cycle advance stop lines layout



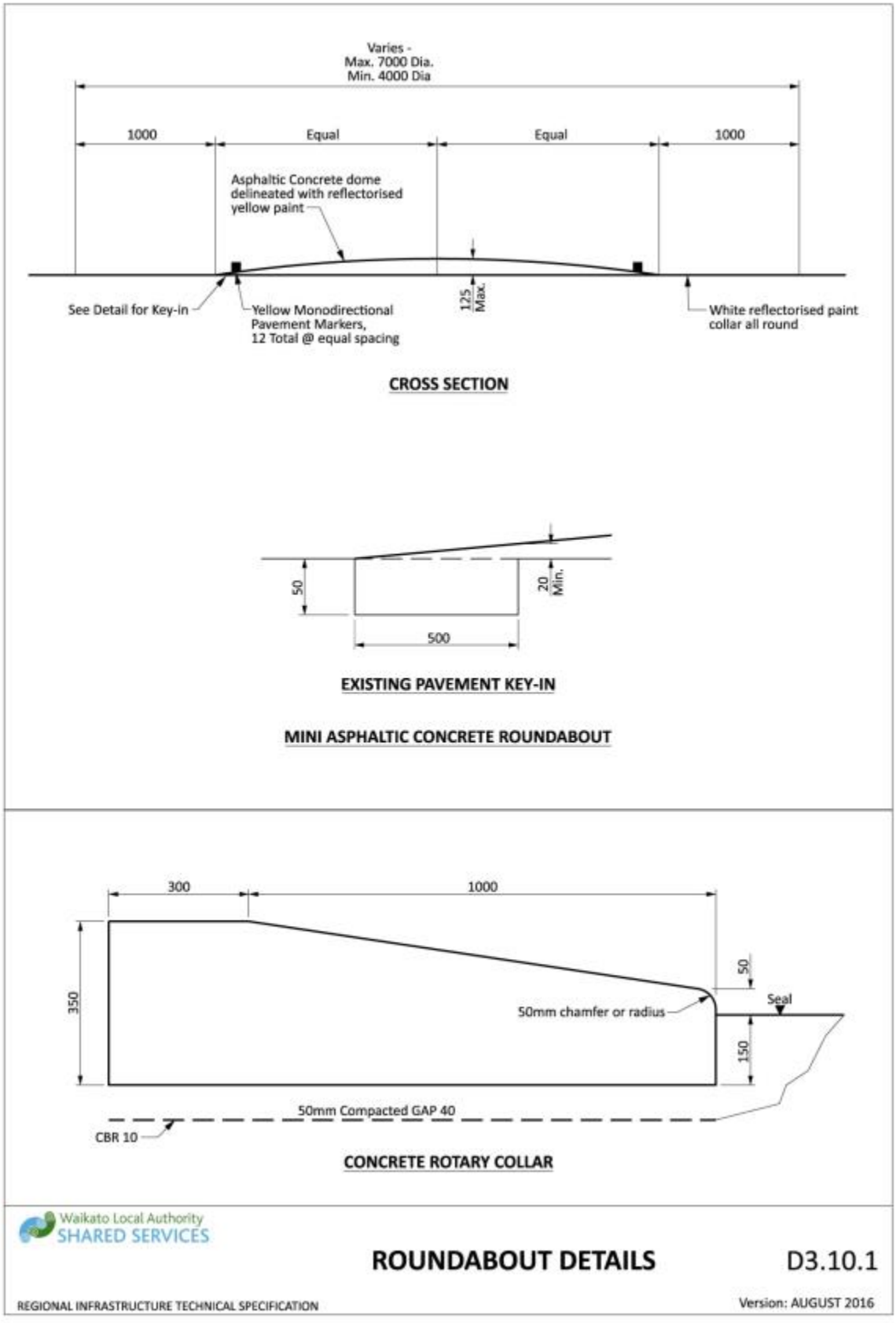
Drawing 3-57: On-road cycle lane connection to off road shared path



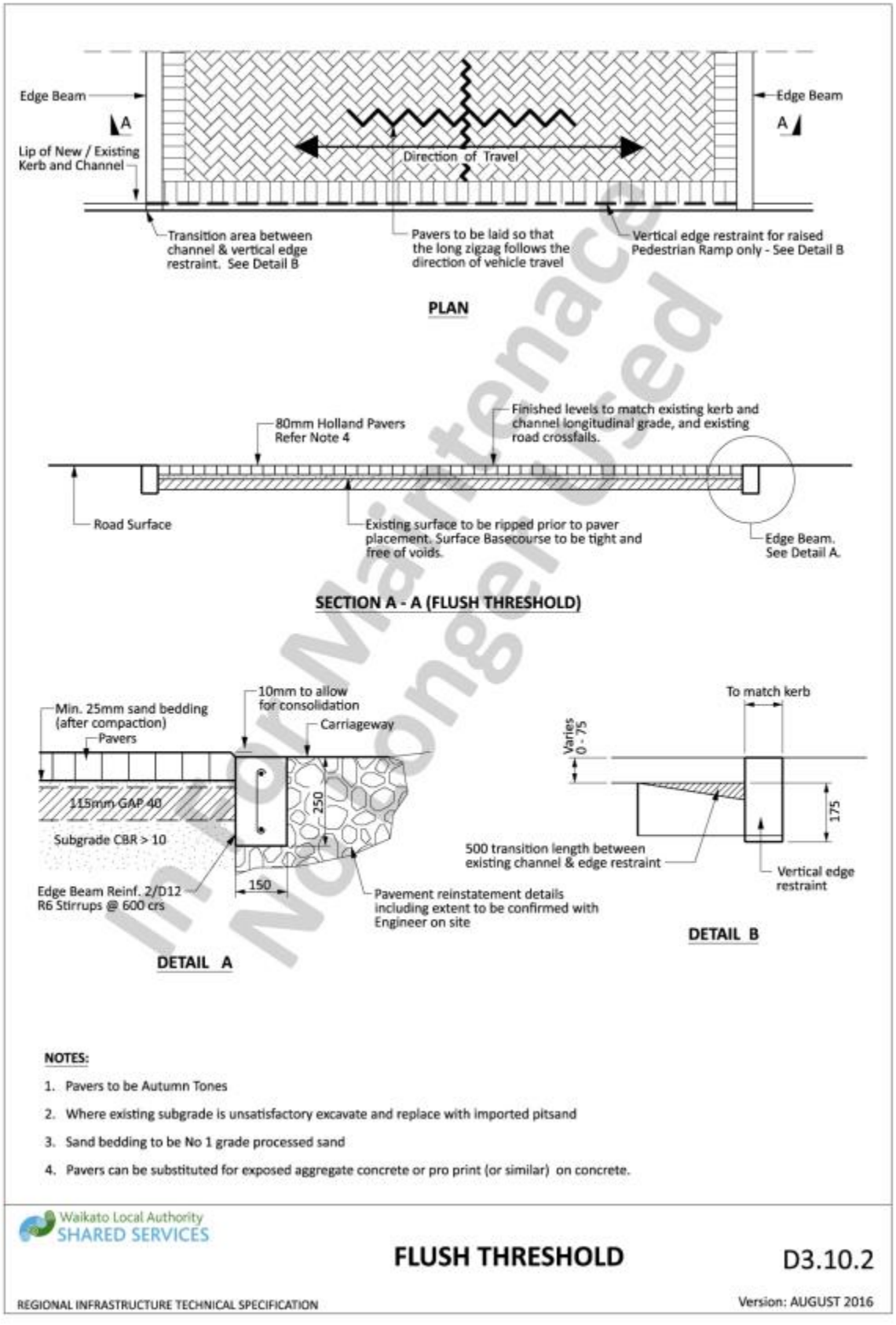
Drawing 3-58: Clearway and P5 roadmarking



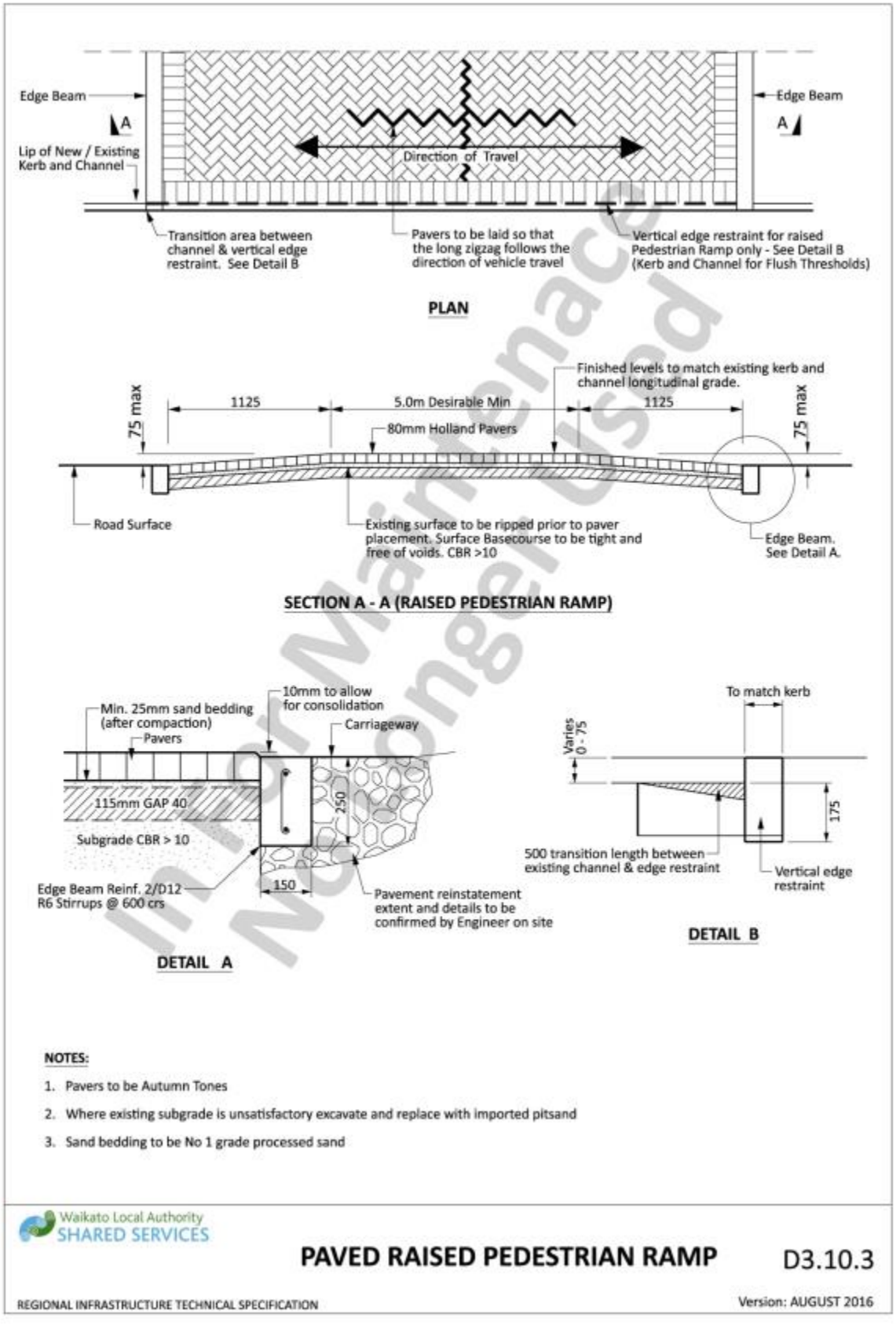
Drawing 3-59: Mobility cardholders parking



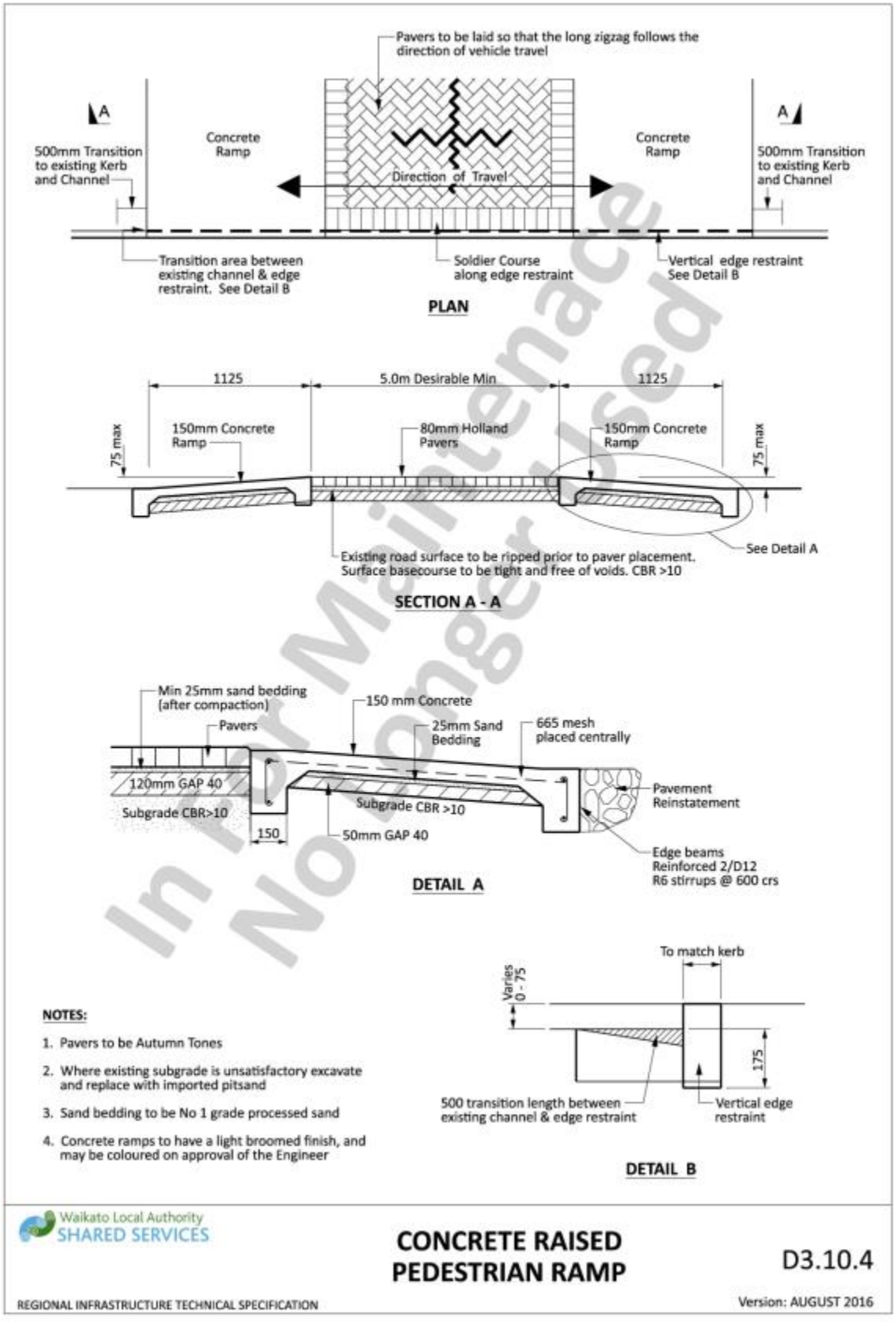
Drawing 3-60: Roundabout details



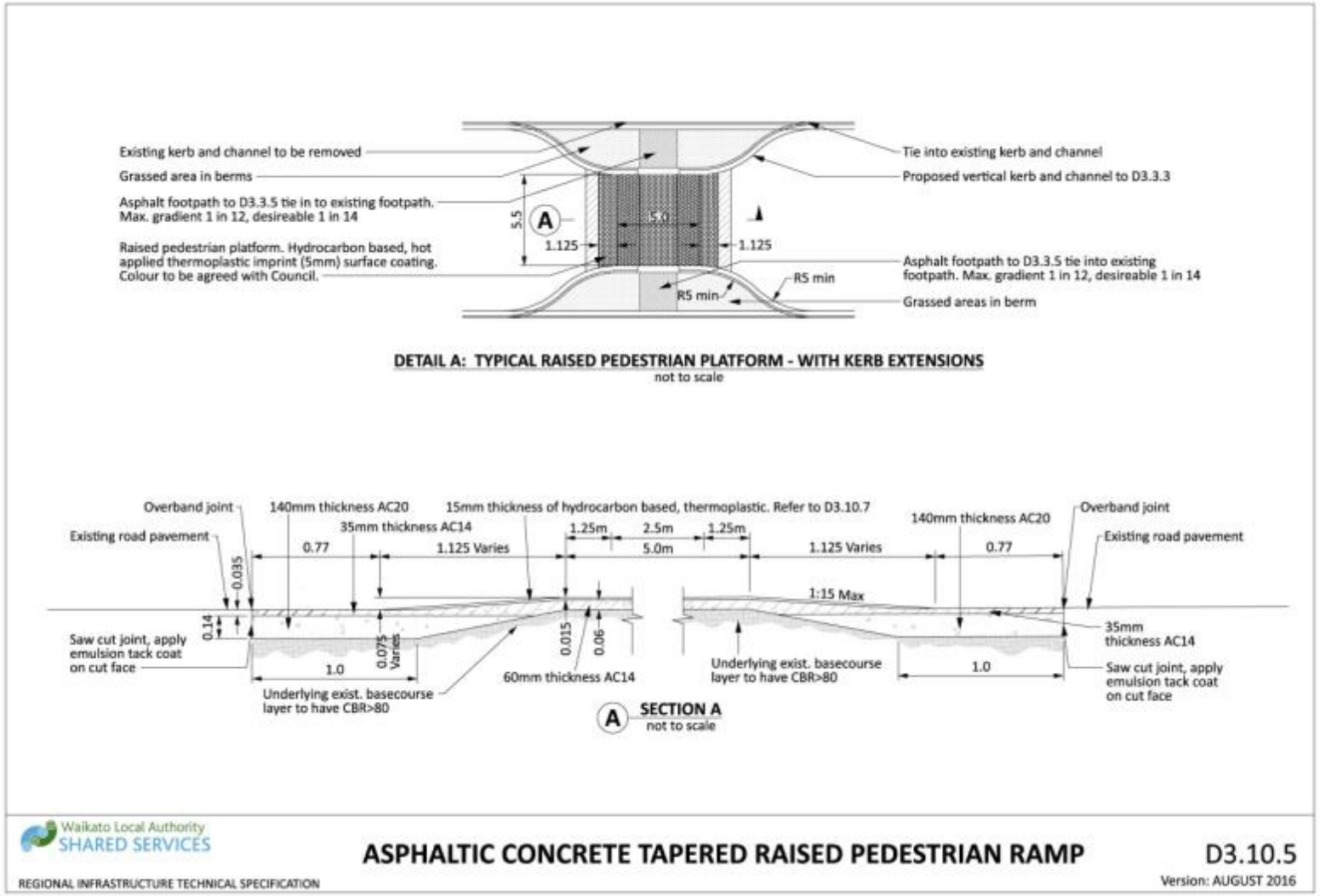
Drawing 3-61: Flush threshold



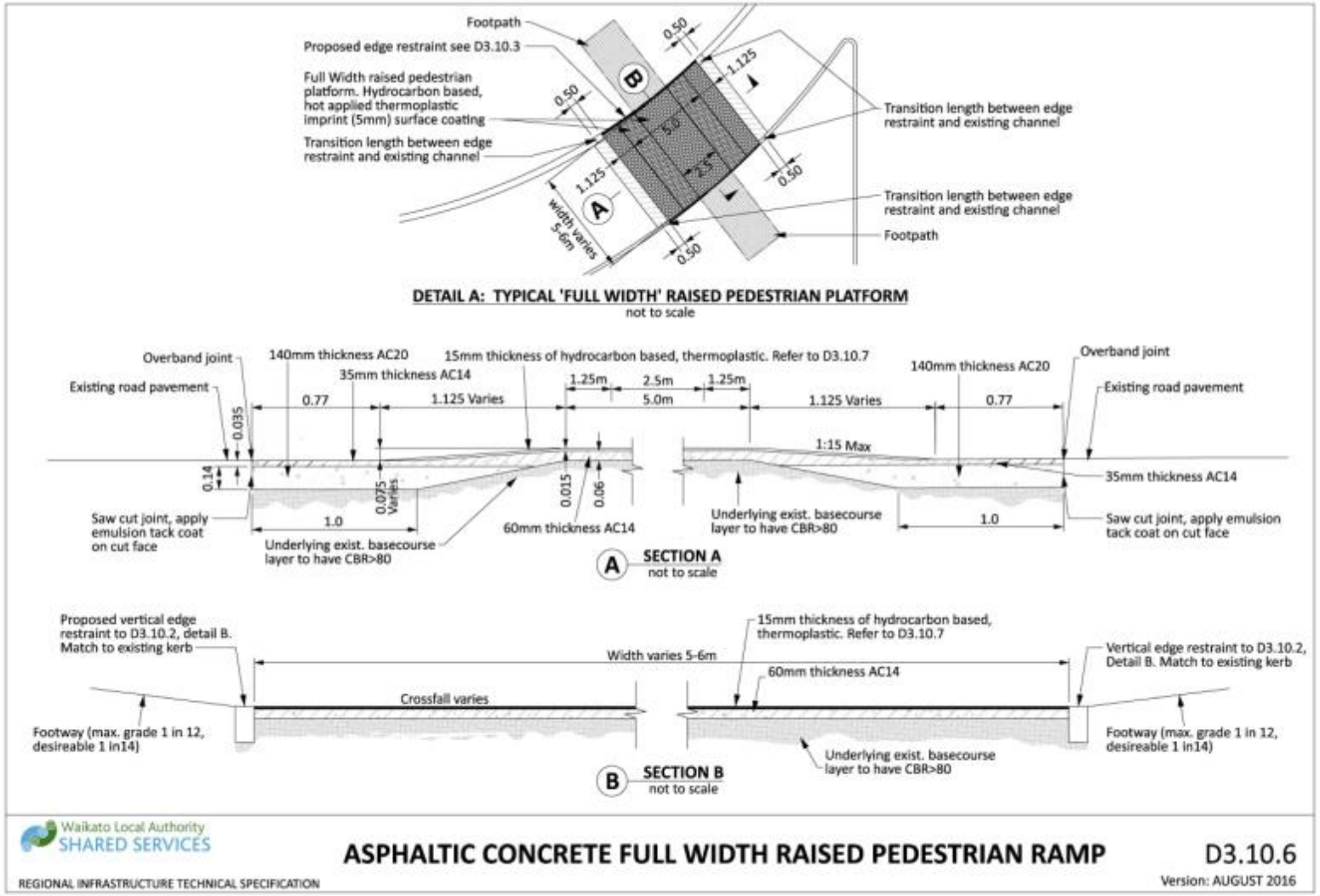
Drawing 3-62: Paved raised pedestrian ramp



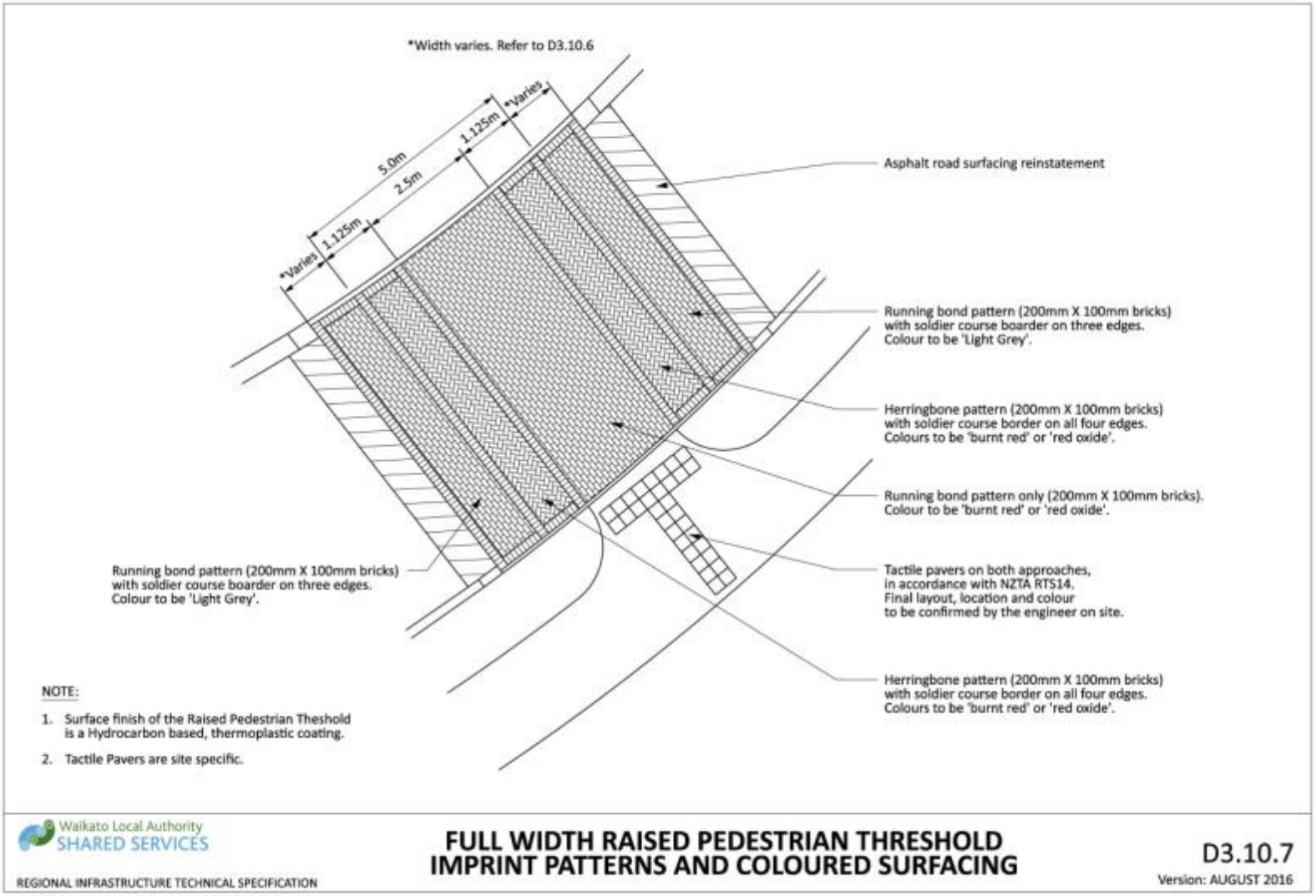
Drawing 3-63: Concrete raised pedestrian ramp



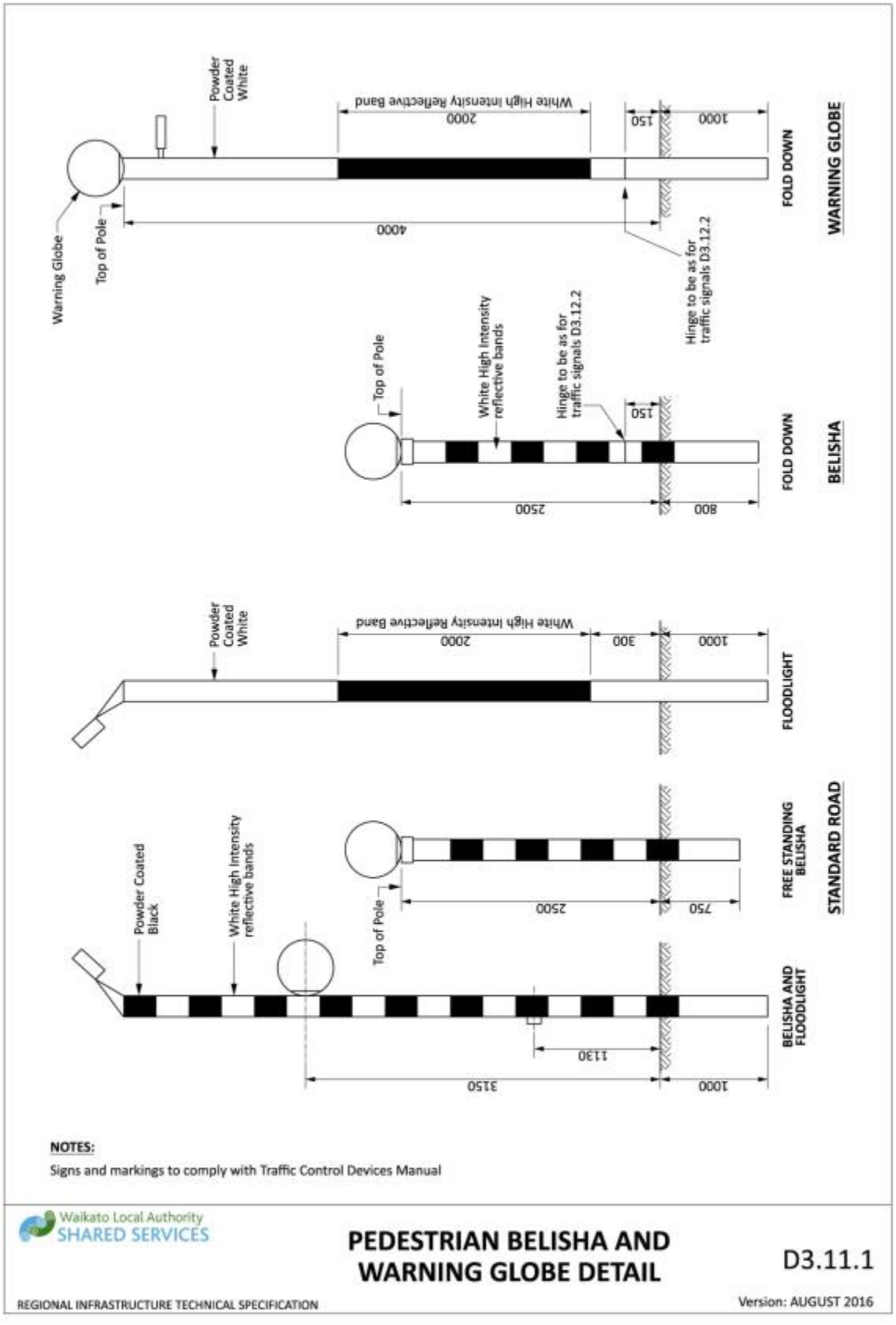
Drawing 3-64: Asphaltic concrete tapered raised pedestrian ramp



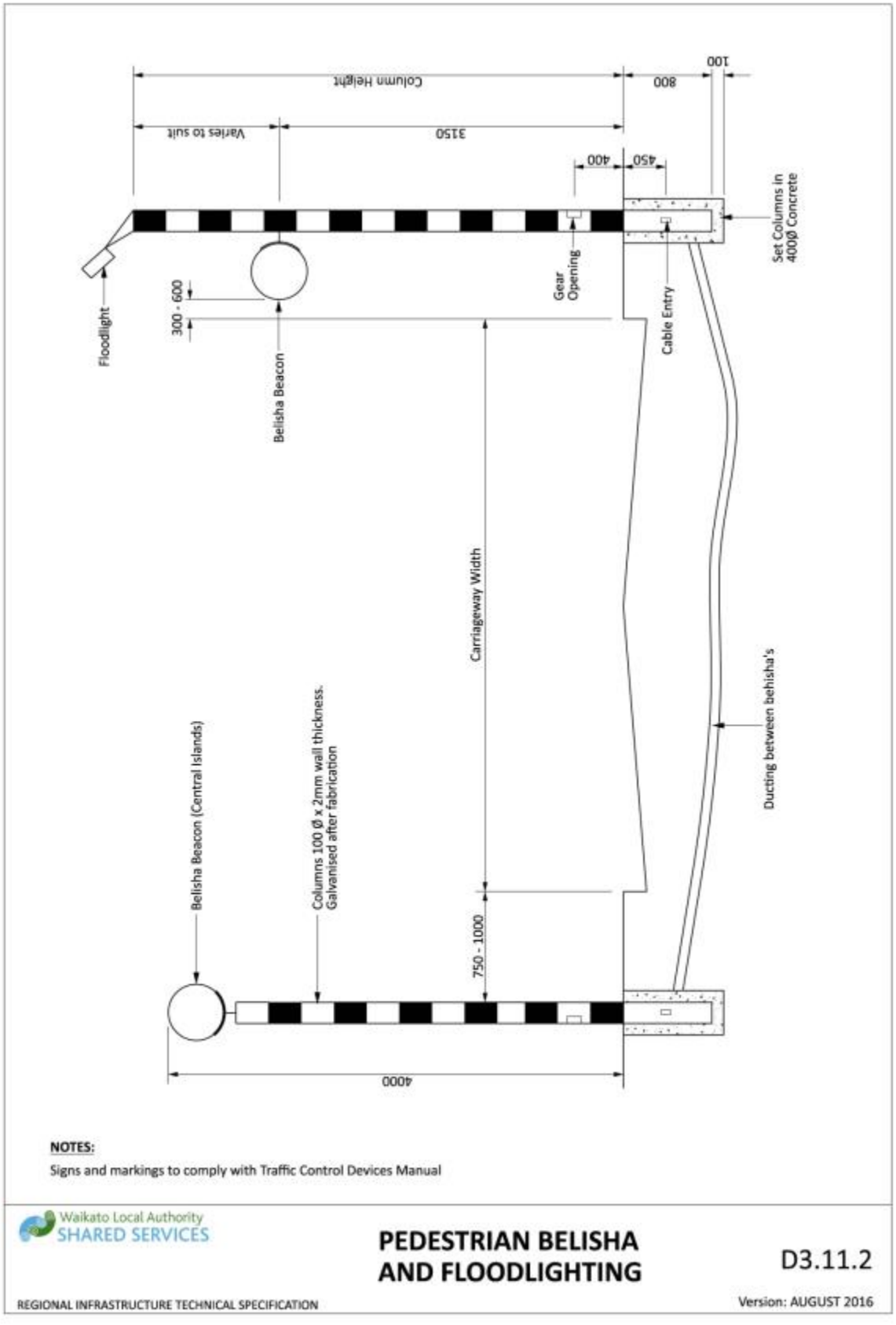
Drawing 3-65: Asphaltic concrete full width raised pedestrian ramp



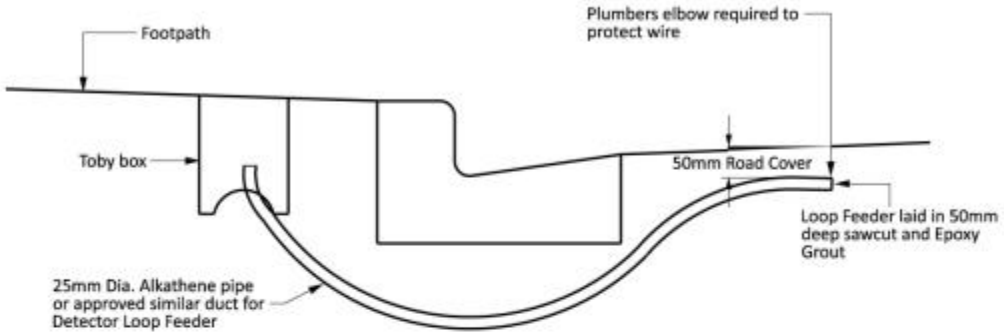
Drawing 3-66: Full width raised pedestrian threshold imprint patterns and coloured surfaces



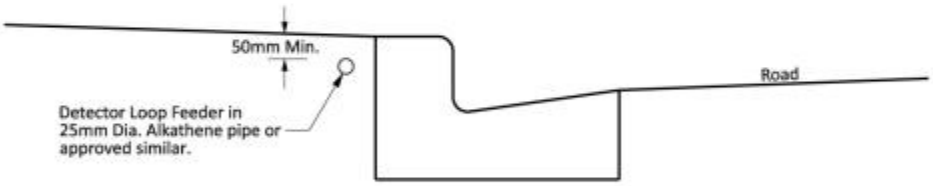
Drawing 3-67: Pedestrian belisha and warning globe detail



Drawing 3-68: Pedestrian belisha and floodlighting



UNDER CHANNEL ACCESS DUCT DETAIL



DETECTOR LOOP FOOTPATH DUCTING DETAIL

NOTES:

When installed after kerb a slot is to be cut with a concrete saw an sealed using a sealer as approved in P43 traffic signal specification.

Waikato Local Authority SHARED SERVICES

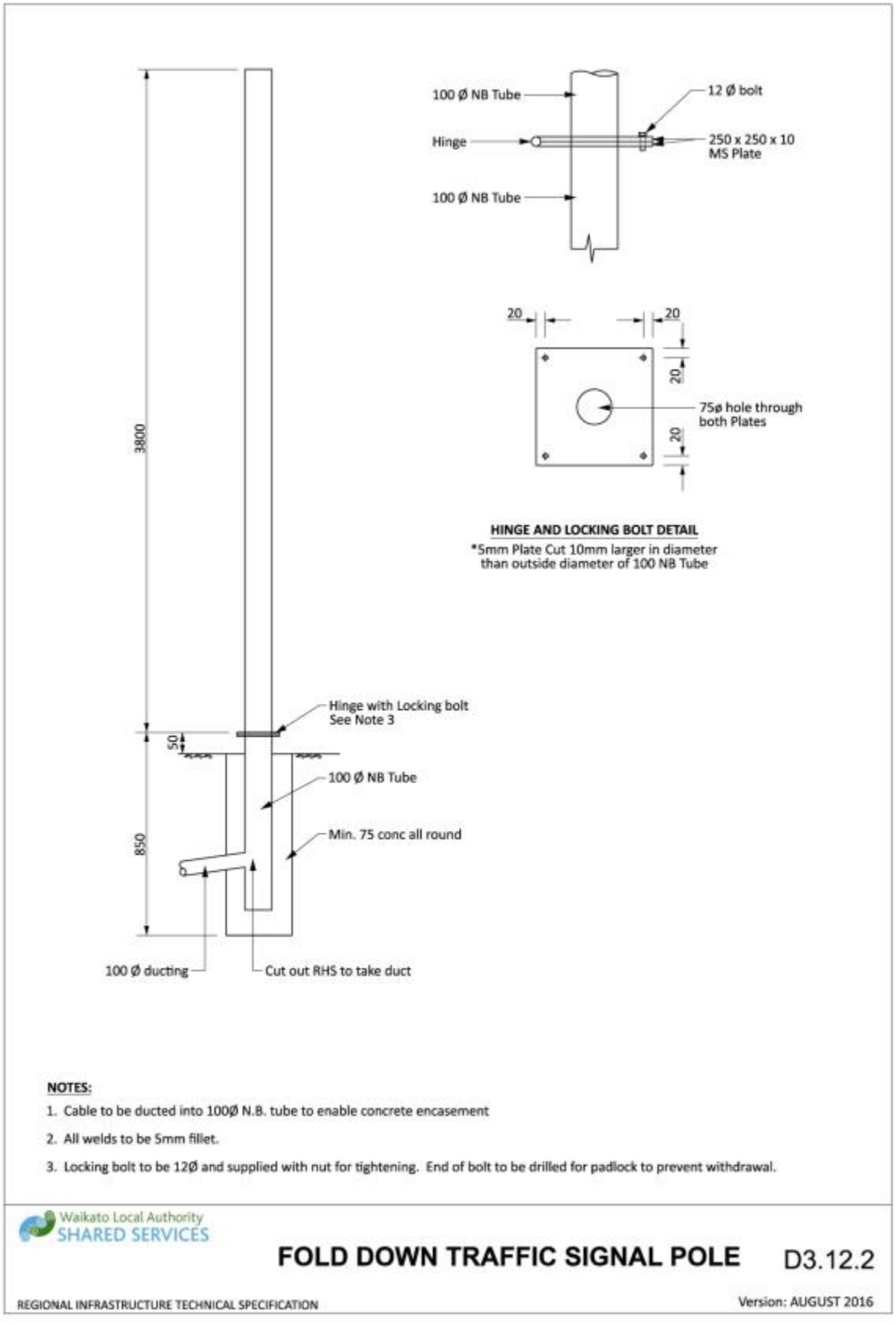
TRAFFIC SIGNAL DUCTING UNDER KERB ACCESS DETAILS

D3.12.1

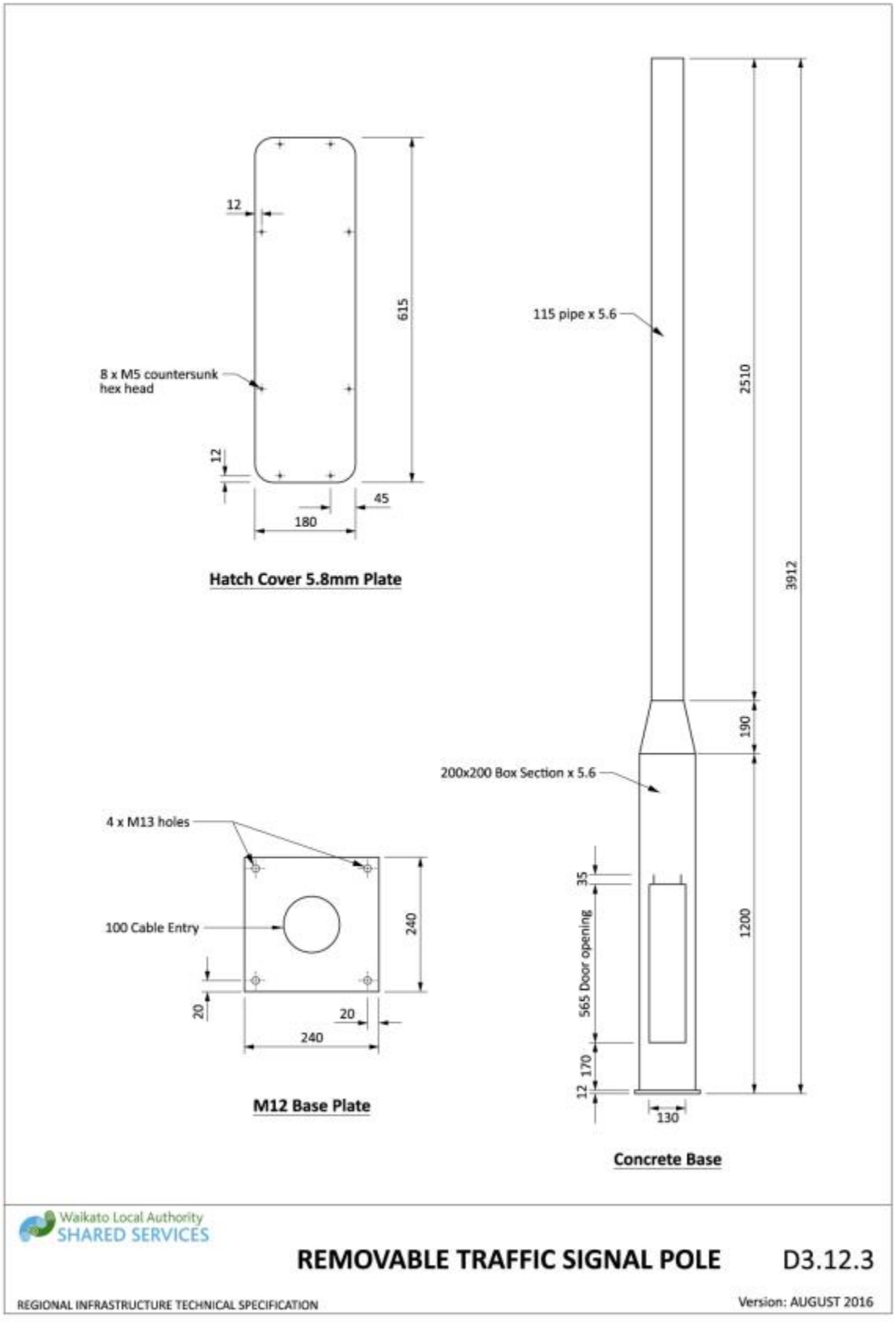
REGIONAL INFRASTRUCTURE TECHNICAL SPECIFICATION

Version: AUGUST 2016

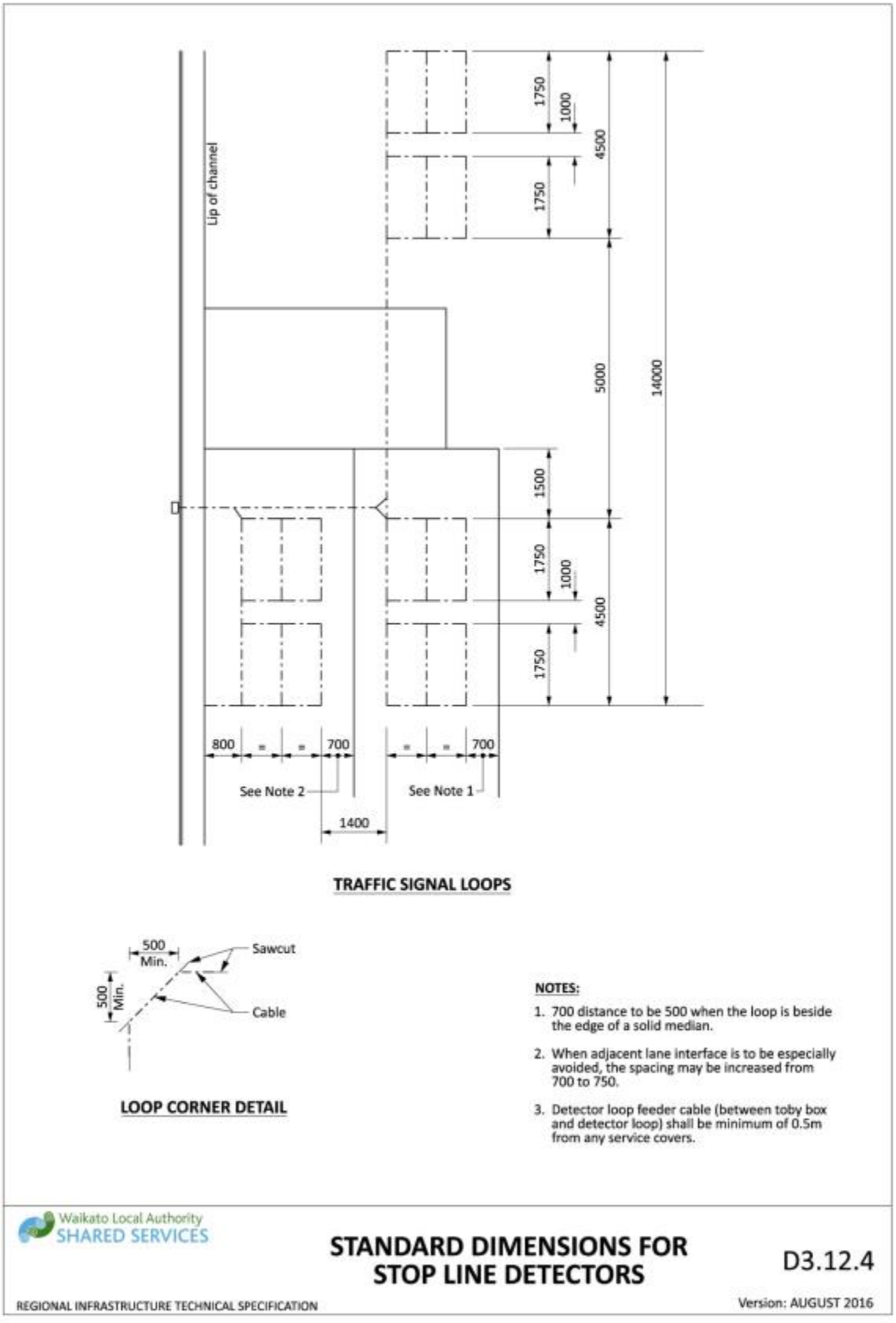
Drawing 3-69: Traffic signal ducting under kerb access details



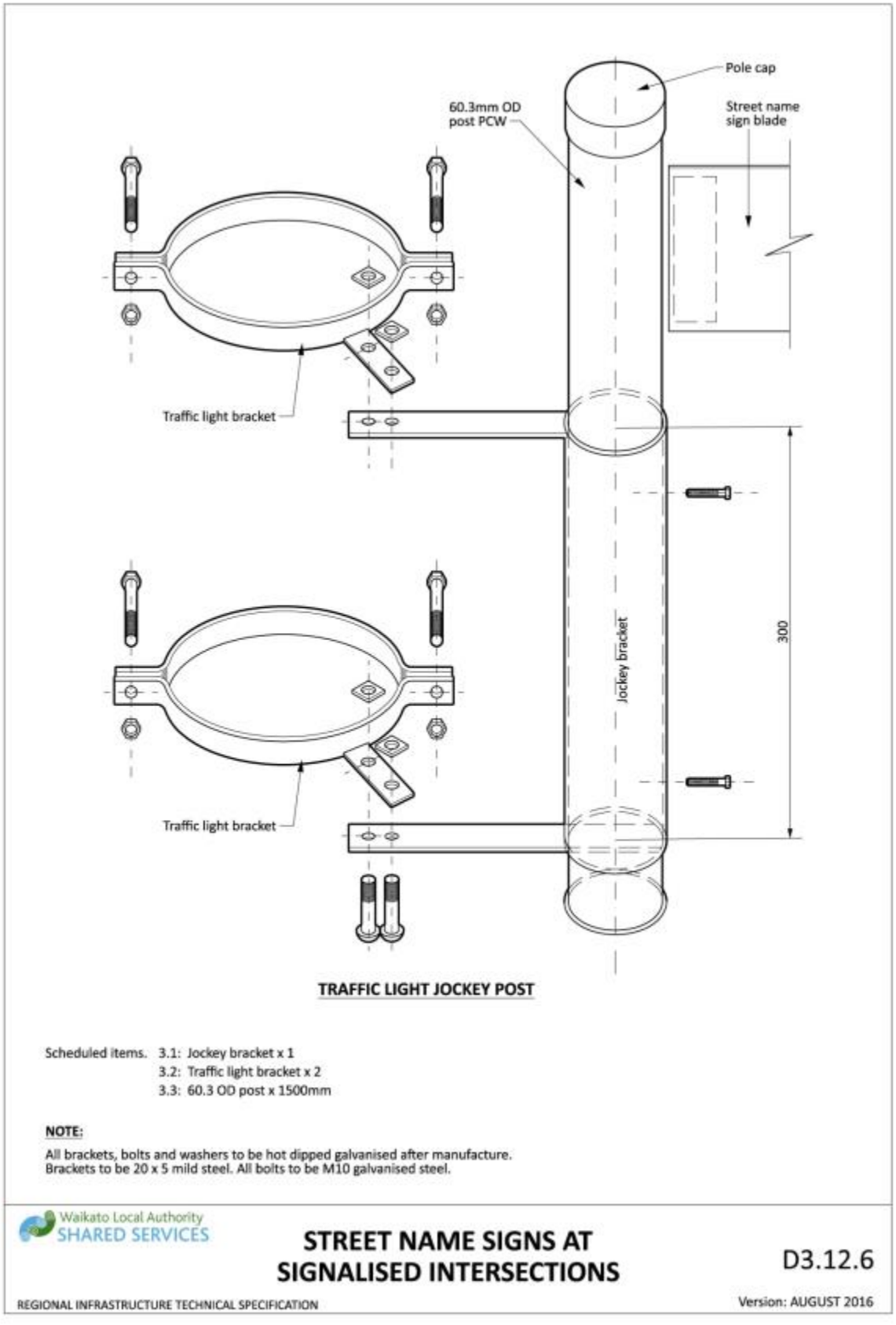
Drawing 3-70: Fold down traffic signal pole



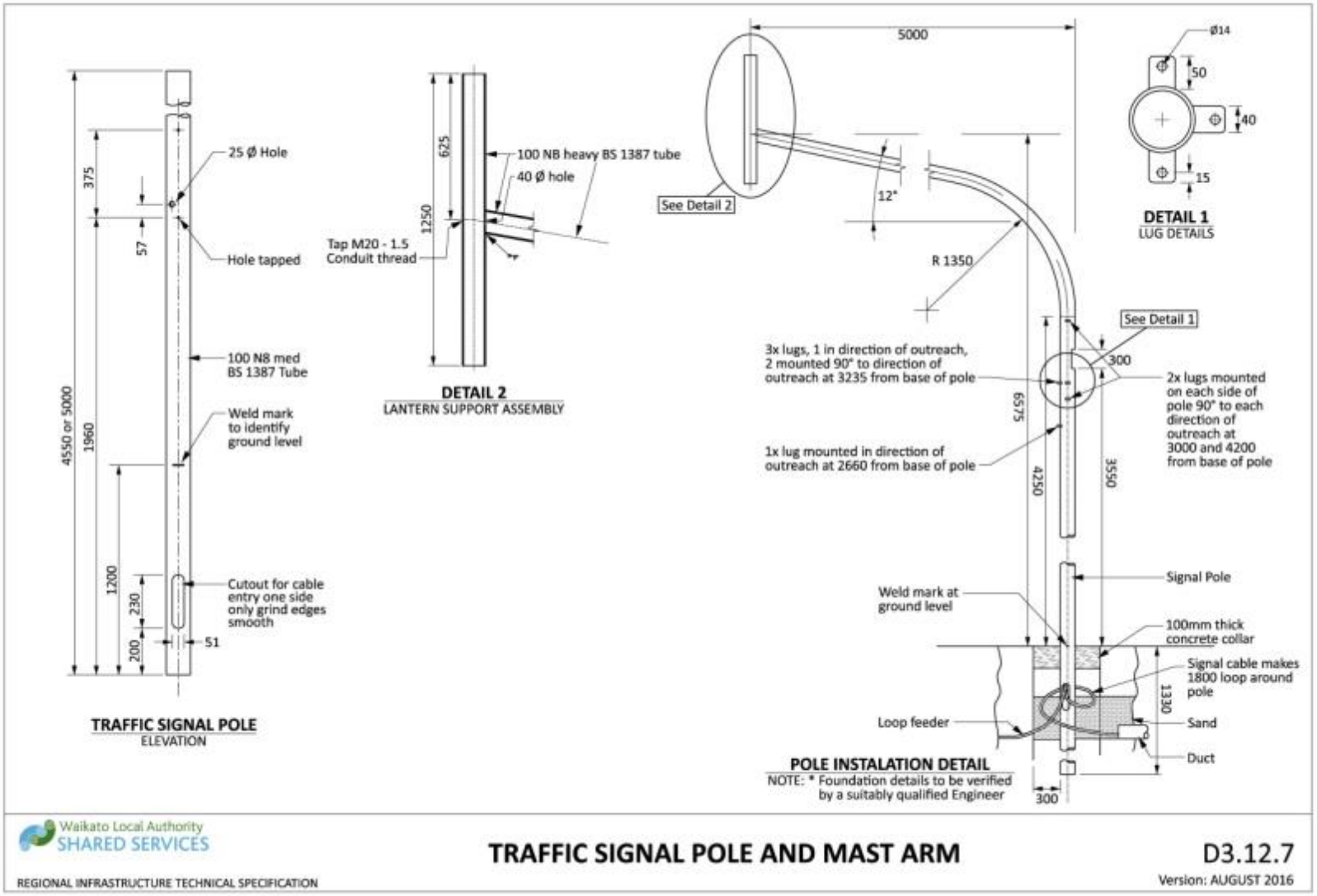
Drawing 3-71: Removable traffic signal pole



Drawing 3-72: Standard dimensions for stop line detectors



Drawing 3-73: Street name signs at signalised intersections



Drawing 3-74: Traffic signal pole and mast arm