Manawatū District Council

Engineering Standards For Land Development

July 2017 (Amended 2024)

Version Control

Revision No.	Date	Changes	Reviewed by
1	August 2024	Section 3.27 Streetlighting	Wendy Thompson – **Infrastructure Planning and Compliance Manager**

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1. GENERAL REQUIREMENTS

1.1 Introduction

The purpose of the Council's Engineering Standards for Land Development (the Standards) is to provide specific requirements, guidelines and minimum engineering standards for subdivisions and developments within the Manawatū District area. Together with the Manawatū District Plan (the Plan), it sets out what the Manawatū District Council (the Council) requires from sub dividers and developers to address the requirements of both the Resource Management Act and the ongoing management of the District's assets.

The standards contained in this document serve as a basis for technical compliance for the subdivision and development of land, where these activities are subject to the Resource Management Act 1991 (RMA). The standards must be read in conjunction to the provisions of the Manawatū District Plan and any applicable statues, regulations and bylaws.

The intent of the Standards is to provide efficiencies for all parties involved throughout the development process. These efficiencies include:

- Ensuring the consent application is correct when presented to Council.
- Minimising both Developer and Council resource time by ensuring design standards have been met.
- Ensuring that all discussions and negotiations between parties occur throughout the development process.

The Manawatū District Council encourages innovative and sustainable design and therefore welcomes alternative solutions to these Standards where this will result in better results. Alternative methods of compliance may be submitted on a case-by-case basis for consideration by the Council.

The following criteria apply to the Standards:

1.1.1 Mandatory Standards

Mandatory standards are those considered essential for the overall design and construction objectives. Mandatory standards are indicated by the use of the word 'must.'

1.1.2 Advisory Standards

Advisory Standards are important but do allow some flexibility to accommodate genuine identified constraints within a development. Advisory standards are identified by the use of the word 'should.' Approval is required from the Utilities Manager with approval of other Council Asset Managers in the first instance if the Developer wishes to adopt alternative designs for the development. The Utilities Manager reserves the right to decline any alternative design.

1.1.3 Permissive Standards

Any other criteria not included in either mandatory or advisory standards. This is identified by the use of the word 'may'. Prior approval is not required.

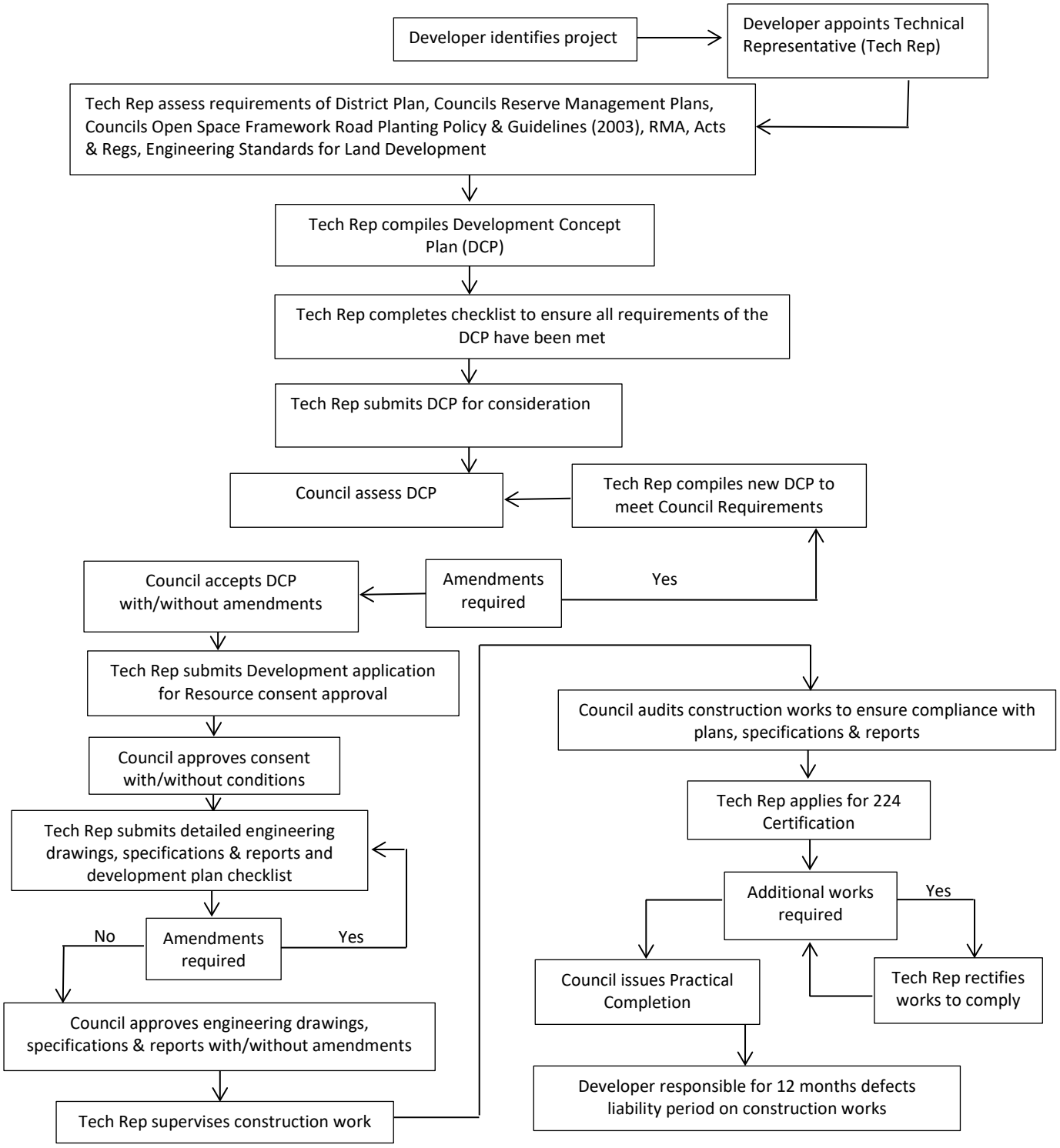
The Utilities Manager with approval of other Council Asset Manager, has the authority to deviate from any of the conditions identified in the Standards providing it is in interests of the parties.

1.1.4 Register

A register of all Developers/Organisations who have uplifted The Engineering Standards for land development will be kept. Any alterations or additions found necessary from time to time would be issued to registered holders of this document who must ensure that they keep up to date with such amendments.

ENGINEERING STANDARDS FOR LAND DEVELOPMENT REQUIREMENTS

Process Elements For Major Developments



Early engagement with Council will help you make informed decisions about your subdivision or development and avoid unnecessary processing delays. Please refer to the Council web site *www.mdc.govt.nz* to book a pre application meeting with Council staff.

1.2 Interpretation

Unless the context specifies otherwise:

Access	Includes Right of Ways, access lots and any private land area for the purpose of pedestrian and/or vehicular access
Approved	Mean approved by the Utilities Manager
Council	Mean the Manawatū District Council
Development Concept Plan (DCP)	Mean a formal plan and documentation identifying the extent of the proposed development with sufficient information to allow Council to assess the feasibility or otherwise of the proposal. Council approval is required prior to any further advancement of the project.
Developer	Technical Representative also referred to as the applicant or person responsible for the land to be developed.
Engineering Approval	Mean ALL plans, specifications and reports for development works are approved by the Utilities Manager and that construction works can proceed.
Geotechnical Specialist	Mean a Geotechnical Engineer and/or an Engineering Geologist, who is a NZ chartered Professional Engineer (CPEng, Geo-Tech) and experienced in the field of soils engineering and more particularly land slope and foundation stability.
Health and Safety at Work Act 2015	Mean the Health and Safety in Employment Act 2015
Manager	The Utilities Manager – Infrastructure, or such persons duly authorised to act on his behalf.
Major Subdivision	>6 lots – A subdivision consent application of more than 6 allotments.
Minor Subdivision	<6 lots – A subdivision consent application of less than 6 allotments.
Nodal definition	As identified in Manawatū District Plan
Technical Representative	The person or persons appointed by the developer in accordance with Clause 1.20.1.
Regional Council	Mean the Manawatu-Wanganui Regional Council trading as Horizons Regional Council.

Recognised Coordinate System	New Zealand Transverse Mercator 2000. Levels in terms of New Zealand Vertical Datum 2016 (NZVD2016)
RMA	Resource Management Act 1991
Rural	Any development on land zoned Rural under the District Plan
Rural Lifestyle	Any development on land identified as Rural Zone in the District Plan as a Nodal area and to which nodal subdivision rules apply.
Services	Means and include water, wastewater, storm water, power, gas, telecommunications /data, whether below, on or above ground.
NZTA	New Zealand Transport Agency
Subdivision Consent	Has the same meaning as set out in the section 87(b) of the Resource Management act 1991.
Residential	Means any land zoned Residential and Industrial (Feilding only), Inner and outer Business, Village and Special Development Zone.
Utilities Manager	MDC Utilities Manager – Infrastructure or their delegated officer
Period of Defects Liability	Has the meaning assigned to it as Clause 11.1 NZS 3910, Conditions of Contract for Building and Civil Engineering Construction
Practical Completion Certificate	Has the meaning assigned to it as Clause 10.4 NZS 3910, Conditions of Contract for Building and Civil Engineering Construction
Pipe Diameter	All pipe diameters are to be internal diameters (ID, NB), unless specifically stated otherwise

1.3 Developers Technical Representative

The Developers Technical Representative must have experience acceptable to Council in subdivision development/construction work. The Developer's Technical Representative must be a Licensed Cadastral Surveyor or a NZ Chartered Professional Engineer.

The Developers Technical Representative will be responsible for:

i. Coordinating with all Network Utilities companies.
ii. All compliances with the requirements of the Resource Management Act 1991.
iii. The preparation of Engineering Drawings and Specifications in accordance with the Engineering Standards for Land Development.
iv. Obtaining all consents and approvals.

v. Construction Monitoring.
vi. Provision of all test results as required in the Engineering Standards for Land Development
vii. Consultation with Council Officers.
viii. Preparation of "As Built" Plans and list of assets to be vested with the Council including value.
ix. Final Inspection.
x. Completing the requirements of maintenance of works.

1.4 Required Engineering Standards for District Plan Zones

All proposed developments must comply with these general standards and the zoning requirements outlined in the Manawatu District Plan.

1.5 Resource Management Act 1991

The effects of the provisions of the Manawatu District Plan and higher order documents prepared under the Resource Management Act 1991 on the subdivision and neighbouring properties must be considered and taken into account when the Engineering Plans are being prepared. In particular, the effects of dust, vegetation, material stockpiles, stormwater runoff and noise are to be addressed to the satisfaction of both the Regional and District Councils.

Some proposed activities, subdivisions and developments may require additional consultation or consents from other consent authorities.

1.6 Building Act

All design and construction associated with the Building Act 2004 is to be adhered to at all times unless the standards specify conditions in addition to the requirements of the Building Act 2004. The standards must take precedence over the Building Act 2004 where such situations should arise.

1.7 Development Concept Plan

Prior to any application for a major subdivision consent being made, the Developer must forward a DCP to Council for approval. The DCP is to include the following details where relevant to the application:

i. Total area of the development
ii. Total number of allotments to be developed
iii. Programme / timeframe for development including stages
iv. Residential / Business / industrial / recreational mix
v. Design and Access Statement
vi. Primary / secondary road network layout including pavement widths
vii. Location of reserves within development
viii. The location of natural watercourses and how they will be managed
ix. Existing contour plan
x. Earthworks including cut and fill battens, finished contours

xi. Walkways, pedestrian linkages and cycleways

xii. Disabled facilities

xiii. Infrastructural network servicing requirements

xiv. Appendix 9A – 9C of the District Plan "Structure Plan Growth Precinct 1, 2 and 3", Appendix 10: Subdivision design guidelines

xv. Allowance of infrastructure capacity for future development extensions

xvi. Effects on the surrounding environment

xvii. Geotechnical feasibility report (preliminary assessment only)

xviii. Request for Council contributions (if applicable)

xix. Approval in Principle, that all external agencies such as New Zealand Transport Agency, Regional Council, and Department of Conservation etc. are in agreement with the proposed development.

xx. Completed Development Concept Plan Checklist

xxi. Kawakawa Industrial Park Structure Plan

xxii. Manawatu District Council Open Space Framework and Road Planting Policy and Guidelines

The Developer is responsible for including and funding walkways, cycleways and disabled facilities within the proposed development where applicable. Walkways and cycleways are to be positioned so that as much direct access as possible is provided to existing subdivisions, shopping centres, recreational facilities and community facilities.

Land Transport Safety Authority's publication – Cycle Network and Route Planning Guide must be considered as part of the design concept for cycleways where applicable. NZS 4121 – Design for Access and Mobility and RTS 14 – Guidelines for Facilities for Blind and Vision Impaired Pedestrians must be considered in the design concept for disabled facilities.

1.8 Application For Consent

Once the Development Concept Plan has been approved, the Developer is able to apply for subdivision consent. The following documents must be provided with the consent application:

i. Application Plan- in accordance with the approved Development Concept Plan with all amendments.

ii. Details of engineering practices to be adopted throughout the development. Details are to include but are not limited to construction methodology, required resource consents, construction programme, and management strategy for the protection of adjacent properties, stormwater control, erosion and sediment control, health and safety provisions and site access control.

iii. Full Land Suitability and Earthworks report. Refer Section 2 of Engineering Standards of Land Development

iv. Details of how existing infrastructure that is required to be altered as part of the development will be managed.

v. Details on how the development will provide for any further extensions in relation to all network services, roading and any other amenities

vi. If consents are required from other agencies or Horizons Regional Council then Council will not accept the subdivision consent until the consents or permissions from other agencies are approved and attached prior to lodgment.

1.9 Development Consent

As part of the consent approval, Council may require services to be relocated, increased in size or altered in any other way. Where the alteration is required as a direct result of the subdivision development, the Developer will be responsible for all costs associated with the alteration including design, consultation and physical works. Where, at the discretion of the Utilities Manager, services are to be altered to align with the development work but not as a result of the development itself, then Council will fund additional costs for such works.

1.9.1 Connection Of Services

Connection of new works to the existing water supply reticulation must be carried out by a Council approved Contractor. Connections to live wastewater and stormwater drainage systems must be carried out by an approved person under the supervision of the appropriate Council staff.
The Developer's Technical Representative must give Council Officers at least five working days' notice of the intention to connect to any existing water, wastewater or stormwater reticulation. Such connection will be permitted only after the new reticulation has passed its necessary tests.

1.9.2 Design Review

A peer review of any design or technical report may be required prior to granting consent. The Utilities Manager must select, or approve, the reviewer in consultation with other Council Asset Managers. The Developer is responsible for all costs associated with the review.

1.10 Other Consents

1.10.1 Consents Under The Resource Management Act

The Developer, when lodging a consent application must formally advise if any discharge and/or water consent(s) under Section 88 and Schedule 4 of the RMA have been granted or have been applied for from the Regional Council.

A copy of the approved consent forms that are part of the consent application process must be forwarded to Council upon receipt. Approval will not be issued until the approval advice has been received.

1.10.2 Consents Under The Regional Council

Where resource consent is required from the Regional Council, this consent will form part of the application process and consent approval for the development will not be issued until a decision has been granted and conditions settled (beyond dispute).

Under the Resource Management Act, resource consents are required for the following activities;

- The damming of natural water during construction work (water permit). The Developer is responsible for both obtaining and adhering to the conditions of this consent including all costs.

- The permanent use, damming or diversion of natural water as a consequence of the development (water permit). The Developer is responsible for both obtaining and adhering to the conditions of this consent including all costs. Once the Period of Lability of the construction works associated with development has expired completed defects liability the name of the consent holder is to be amended to Manawatu District Council.
- The discharge of stormwater or other contaminants into water, into air or onto land (discharge permit). The Developer is responsible for both obtaining and adhering to this consent including all costs. Once the Period of Liability of the construction works associated with development has expired, the name of the consent holder is to be amended to Manawatu District Council.
- The disturbance of land or clearing of vegetation from erosion prone land (land use consent). The Developer is responsible for both obtaining and adhering to the conditions of this consent including all costs.
- A general authorisation has been issued by Regional Council to cover permanent diversions of natural water, the disturbance of the bed of a river, lake or artificial watercourse (land use consent). The Developer is responsible for both obtaining and discharges of stormwater within certain limits and complying with the conditions of this consent, including all costs.

The advice of Regional Council should be sought on all water right matters and activities involving waterways, vegetation clearance, or disturbance of land or the beds of rivers, at the earliest stage of planning the subdivision.

1.11 Network Utilities

Prior to lodging an application for consent, the Developer must forward all subdivision proposals to all public utility providers. This will enable each service provider to design and allow for their utilities to be installed with minimum delay and ensure that no interference to the final surfacing of carriageways, and footpaths and formations of berms. Formal advice from all network utility providers as to programming and extent of works is to form part of the engineering approval application process.

Provision must be made for the installation of suitable ducts within the development area if an authority is unable to install its services at the time of initial construction. In Residential areas and Rural Lifestyle areas, all services are to be underground. Where a proposed development fronts a road reserve with existing overhead power and telecommunication services, these services are to be installed underground as part of the development at the Developer's cost.

1.12 Engineering Drawings, Specifications And Reports

The Developer must provide a complete set of detailed and complete engineering drawings, specifications and reports. The drawings, specifications and reports are to include the following:

1.12.1 Earthworks

i. Assessment of suitability of land for development in its natural state

ii. Assurance that all earthworks are of acceptable design conforming to all relevant standards and Engineering Standards for Land Development.

iii. That all identified allotments have sufficient area for building.

iv. Assurance that no proposed works will have a detrimental effect on the stability of any land both within and adjacent to the development.

v. Any natural land surfaces from the developable area that are considered unstable are identified and excluded.

1.12.2 Roadworks

i. Earthworks including effects on any/all lot(s)

ii. Pavement construction including design details

iii. Kerb and channel and road drainage

iv. Surfacing

v. Footpath construction

vi. Treatment of areas outside carriageway

vii. Traffic Services including but not limited to road marking, traffic signs and street name plates.

viii. Street lighting

ix. Streetscape including feature walls

x. Walkways and cycleways

1.12.3 Drainage

i. Layout and details of stormwater drains, subsoil drains, sumps and ancillary work

ii. Layout and details of wastewater drains and ancillary work

iii. Stormwater and flood management, silt discharge management

1.12.4 Water Supply

i. Layout and details of watermains and ancillary work

1.12.5 Gas Reticulation

i. Layout and details of gas mains and ancillary work

1.12.6 Power Reticulation

i. Layout and details of power cables, ancillary work and street lighting.

1.12.7 Telecommunications network

Layout and details of telephone cables and ancillary work.

1.12.8 Miscellaneous

Any associated structures, pumps, special manholes, penstocks, retaining walls, bridges etc.

1.12.9 General

The drawings must show sufficient details and levels to allow the Utilities Manager to accurately ascertain the feasibility of the design in all areas and to allow contractors to confidently construct the

project. Specifications must provide sufficient details to both support the engineering drawings and additional detail to ensure the design and construction criteria comply with the standards.

When approved, the Developer is to provide a complete set with all the required amendments to Council.

Where land is developed in stages, each stage must include a plan showing how the particular stage relates to the block as a whole and to other stages. At least one plan of the area encompassed by the works, which may be a roading or a service plan, must clearly define the boundaries or limits of the subdivision.

Storm water reticulation drawings must include catchment area limits and actual areas must be noted on the drawings. Catchment design details are to be included in the documentation for approval.

1.12.10 Services

All network utility services are to be located as shown on Standard Drawing 1.2, except where an alternative location has been approved by the Utilities Manager.

1.12.11 Development of Existing Residential Allotments

The Utilities Manager will require evidence of materials servicing existing allotments prior to subdivision approval. Where existing services are provided to a vacant allotment, all copper, ceramic and asbestos cement materials must be replaced.

1.12.12 Subdivision and Servicing of Properties with existing multiple Dwelling Units

Where it is proposed to subdivide a section on which there are existing multiple dwelling units and the proposed subdivision meets all requirements with regard to areas, frontage etc. and structural requirements with regard to party walls, the use of existing services may be permitted provided that:

- All shared underground services are covered by suitable easements;
- Additional manholes or inspection chambers are constructed in the shared length of wastewater and storm water to facilitate maintenance.

Each existing dwelling/proposed lot is to be supplied with an individual water supply (e.g. Toby).
All services including access, water supply, wastewater and stormwater may require upgrading at the discretion of the Utilities Manager.

1.13 Draughting Standards-Engineering Drawings

Engineering drawings can be provided on both a hard copy standard sheet and an electronic format compatible with the latest version of AutoCAD and must be in either a .DXF or .DWG file.

Details of roading, wastewater drainage, stormwater drainage, water supply, gas, power, telecommunications and miscellaneous infrastructure must be shown as clearly identifiable separate services and if necessary in separate drawings.

Council's standard symbols must be used. Refer Standard Drawing 1.1.

The following scales must be used:

Plans	1 in 500
	1 in 200
Long Sections	1 in 500 Horizontal
	1 in 50 Vertical
Cross Sections	1 in 100
	1 in 50
Details	As required

All plans must be produced with the following requirements:

- North orientation must be at top of plans.
- Cross sections commence at lower station value at bottom left hand corner.
- Long sections and plan layout commence at lower station value on left hand side of plan.

1.14 Approval Of Engineering Drawings And Specifications

NO CONSTRUCTION WORK INCLUDING EARTHWORKS IS TO PROCEED UNTIL ENGINEERING APPROVAL HAS BEEN PROVIDED.

Approval of engineering drawings and specifications will be provided in writing following the satisfactory correction or amendments of any required details. Approval will be considered within 10 working days for minor consents and major developments (subject to DCP approval) will be approved within 20 working days.

All approvals expire within five years of the date of the Utilities Manager's approval if construction work has not commenced. The Developer must not proceed with any work until all plans and specifications have been resubmitted to the Utilities Manager for approval with any amendments that have been made.

1.15 Variations

Any alteration to works in progress resulting in a variation from the approved drawings and specifications must be notified to the Utilities Manager in writing prior to the commencement of these works. Such work must not commence without the approval from the Utilities Manager.

1.16 Hours Of Work

The hours of work in residential, inner and outer business, village, industrial, and special development and rural lifestyle zoned subdivisions must be between:

Weekdays	7.00am- 7.00pm
Saturdays	8.00am- 5.00pm
Sundays/ Public Holidays	No Work

The Utilities Manager's approval must be obtained before any work can occur outside of these hours. There is no limitation on the hours of work in Rural subdivisions unless there is specific requirement. All works are subject to noise provisions under the Manawatū District Plan.

1.17 Works In Roads Or Road Reserves

1.17.1 Corridor Access Request

The Developer's Contractor is required to apply to Council's Corridor Access Co-ordinator for a Corridor Access Request where existing roads or road reserves are affected by the proposed development works.

1.17.2 Traffic Management Plans

An approved Traffic Management Plan is required to be lodged with Council prior to the commencement of any works in/on/or adjacent to an existing road or road reserve.

1.17.3 Development adjacent to existing infrastructure

Where a proposed development is adjacent to an existing road, services and the proposed development will utilise that road, and services as part of the completed development then that road and services must be upgraded in accordance with the Standards. The Developer must meet the full cost of the required upgrade works.

1.17.4 Ancillary Structures

All structures including entrance walls, postal facilities, transformers are to be incorporated into the proposed development must not be located within the road reserve corridor. The Developer must be responsible for the on-going maintenance of any structure during the Period of Defects Lability.

1.18 Naming of Roads/Developments

The naming of all proposed roads/developments other than approved suburban/rural names must be in accordance with Councils Road Naming Policy.

1.19 Insurance

The Developer will ensure that the following insurance cover is obtained prior to commencement of any works within existing road reserves and that cover remains current until the Period of Liability has expired.

Public Liability	$2,000,000
Professional Indemnity	$5,000,000
Motor Vehicle/ Plant Insurance	For all vehicles and for plant over $50,000
Contract Works Insurance	80% of the value of the works

Evidence is to be provided to the Utilities Manager that insurance cover outlined above has been obtained and will form part of the consent process.

1.20 Construction Monitoring

1.20.1 The Developers Technical Representative

The Developers Technical Representative is responsible for construction monitoring (inspection) and certifications. The level of "Construction Monitoring" must be one of the five levels of construction monitoring as defined by the Institute of Professional Engineers New Zealand (IPENZ).

The level of construction monitoring must be calculated for each subdivision. Certain phases of construction may require additional or constant monitoring.

1.20.2 Council and Joint Inspections

The Developer's Technical Representative must be fully satisfied that Council's requirements have been complied with prior to requesting any inspections. Testing equipment, if required is to be made available. Reimbursement of costs will be sought by Council should any inspection request be made for uncompleted works.

Council inspections must be required at the following points:

1.20.3 Roading

i. Completion of earthworks
ii. Completion of subgrade preparation for road pavement, kerb and channel, vehicle access ways and footpaths
iii. Completion of subbase compaction
iv. Completion of basecourse compaction (includes finished level)
v. Surface prior to sealing
vi. Post – sealing inspection

1.20.4 Water supply

i. Prior to backfilling of trenches
ii. Free Available Chlorine test prior to pressure testing
iii. Pressure testing prior to connection to live main
iv. Flow testing
v. Bacteriological testing

1.20.5 Wastewater

i. Prior to backfilling of trenches
ii. Inspection of manholes prior to pressure testing, alignment and grade checks and CCTV Inspection
iii. Pressure testing prior to connection to live mains

1.20.6 Stormwater

i. Prior to backfilling of trenches
ii. Inspection of manholes prior to pressure testing, alignment and grade checks and CCTV inspection
iii. Pressure testing prior to connection to live mains

1.20.7 Notice prior to an Inspection

i. The Developers Technical Representative must give at least 24 hours' notice to Council prior to requesting an inspection. Requests from Contractors and/or Sub Contractors will not be considered.
ii. The Utilities Manager reserves the right to make inspections at any time.

1.20.8 Health and Safety at Work Act 2015

i. The Developer must ensure that the requirements of the Health and Safety at Work Act are met.

1.21 Emergency Procedure

If during the course of construction, any situation that arises whereby the safety of persons, public or private property and/or the operation of any public facility is endangered, the Utilities Manager may instruct the undertaking of remedial measures to remove the danger. Any work associated with the Utilities Manager's instruction must be carried out immediately at the Developers expense. Failure to comply will result in Council undertaking the required emergency works at the developer's expense.

1.22 Samples for Testing

The Utilities Manager must be able to take samples of materials at any time for testing. All samples taken must be a fair average sample of bulk material or of the article that it represents. Samples taken from bulk must be obtained by an approved sampling procedure and tested by an I.A.N.Z registered laboratory.

1.23 Sample Testing Requirements

The Developer is responsible for ensuring all tests required in the standards are carried out by an I.A.N.Z approved laboratory. Records of results of all tests are to be kept and provided to the Utilities Manager in accordance with the standards or made available at any time to the Utilities Manager on request.

1.24 Temporary Fencing

Temporary fencing must be provided for and erected by the Developer at all entrances to the development site and all areas within the development site to protect the general public at all times. All fencing is to comply with the Health and Safety at Work Act 2015 and amendments. Appropriate warning signage must be erected. The use of barbed wire is not permitted.

1.25 Damage to Infrastructure

Any damage to any infrastructure within existing road reserves including but not limited to road pavement, kerb and channel, footpaths, vehicle access ways, street and traffic signs, power poles, cabinets, fire hydrants, water valves, water tobies, manholes, survey markers and private properties caused as a result of the development must be made good by the Developer at the Developer's cost. Remedial work must be undertaken as soon as practicable. Where damage has occurred to any network utility services or pavement that has an immediate adverse impact on surrounding residents

it must be repaired immediately. Council reserves the right to repair the damaged infrastructure at the developers cost.

Any blockage situation of open/closed drains, roadways, footpaths, driveways, properties and temporary ponds must be cleared forthwith by the Developer at the Developer's cost.

1.26 Trenching

The excavation, installation and backfilling of trenches must be in accordance with:

- NZS/AS3725. 20007 Design for installation of buried concrete pipes.
- AS/NZS 2566: Buried flexible pipelines
- AS/NZS2033 2008 Installation of polyethylene pipe systems

Trenching works must conform to the following document:

- Department of Labour's Approved Code of Practice Excavation and Shafts for Foundation and National Code of Practice for Utility Operators Access to Transport Corridor.

Compaction tests be carried out on all service trenches within the development. The Developer's Technical Representative must retain all compaction and provide certification of the tests to the Utilities Manager.

1.27 Stockpile Sites

The Developer must not utilise locations for any stockpile site for any equipment, plant, materials and soils outside the designated development area unless approved by the Utilities Manager. The Developer must ensure that any stockpile site used within the development area does not impact adversely on the adjacent neighbourhood.

1.28 " As Built" Drawings

Prior to the of the issue of the Practical Completion Certificate, the Technical Representative must amend all drawings and necessary documents to represent the true 'As Built'. The amendments can be made on a standard hard copy sheet as well as on electronic format providing it is compatible with the latest version of AutoCAD and in either a DXF or DWG file.

The 'As Built' information required on these drawings is as follows; with all coordinates in terms of New Zealand Transverse Mercator 2000 Coordinates must be provided in .xls or .dbf format. See Standard Drawing 1.1 for details of Councils standards draughting symbols, G.I.S. point codes and line types.

i. New Zealand Transverse Mercator 2000 (NZTM2000) coordinates with levels in terms of New Zealand Vertical Datum 2016 (NZVD2016) must be provided in .xls or .dbf format. See Plan No. 1.1 for details of Council's standards draughting symbols, G.I.S. point codes and line types.
ii. The size and type of all wastewater, storm water and water supply pipes.
iii. The position, related to a side boundary, and depth, related to ground level at the marker, of all wastewater and storm water laterals.
iv. The coordinated position of the centre of the cover of all manholes. Levels to two decimal places, to Council's datum, of the invert and centre of cover, of each manhole.
v. The coordinated position of all fire hydrants, swabbing points, valves, tees and bends.
vi. The position, related to a side boundary, of all manifolds.

vii. The coordinated position of the centre of the kerb behind each sump.
viii. The coordinated position of the road centreline after line making has been completed identifying start/finish and tangent points including centre points of each intersection.
ix. The extent of all fill areas.
x. The depths and types of pavement formation.
xi. Where appropriate, any restriction limiting building on any part of the lot must be shown on either the wastewater or stormwater plan.

1.29 Final Inspection

Prior to the acceptance of the Practical Completion Certificate and Council receipt of the 'As Built' plans, a final inspection must be undertaken between the Developer's Technical Representative and the Utilities Manager.

The final inspection must include a review of all test results, visual assessment, and CCTV survey of all sewer and storm water supply systems that are vested as public drains.

Any damage or faults identified either in the final inspection or previous inspections must be made good before issue of practical completion (refer Clause 1.31).

1.30 Bonds

Section 108(2)(b) of the Resource Management Act 1991 provides the Developer with the opportunity to cover completion of works with a bond. Consideration will be given to the execution of a bond relating to works that have not been completed due to it being out of season or else beyond the control of the Developer. Any such bond shall include a 25% contingency and bond administration fee.

Any bond for the completion of such works will be at Council's discretion.

When applying for approval for such consideration, the Developer must supply an accurate estimate for the value of work to be completed and an estimate of the time needed for final completion. Council will add a contingency amount to this figure. The Council will not accept bonds for essential services (sewer, water and stormwater). Bonds could be for vehicle crossings, seal work for right of ways and development aesthetics.

The Council's Consents Planners will prepare the bond documentation. A cash bond or a bank guarantee or both will be required before the Council signs off the development.

The dates for the release of the bond and the date for Council if necessary to commence completion of the works will be by agreement between the Manawatū District Council and the Developer however it will not exceed a timeframe of one year.

1.31 Acceptance Or Approval Of Works

Prior to the issue of Practical Completion Certificate (e.g. Schedule 1C NZS4404) the Developer must have supplied to Council:

i. "As Built" drawings as detailed in clause 1.28
ii. A certificate regarding earth fills and compaction
iii. A certificate regarding water main disinfection after completion of water main construction. Refer Appendix 5

iv. Certification that the construction works have been monitored in accordance with the clause 1.20 and have been carried out in accordance with sound engineering practice. Refer Appendix 6
v. Formal advice from all network utility providers acknowledging that all works have been completed
vi. The bond (if any) to cover any uncompleted work has been signed by all parties (see clause 1.30)
vii. CCTV records of sewer and stormwater pipelines in DVD standard format
viii. Where an alternative or unique solution is approved as part of the Engineering Approval process, this does not set a precedent for any future development proposals.

1.32 Maintenance Of Works

Notwithstanding that the notice to the Utilities Manager has been issued, the Developer must be responsible for completing maintenance of the engineering works until such time as the Council has been advised that the Land Transfer (LT) Plan has been deposited.

The Developer must be responsible for any defects as a direct result of faulty and/or substandard workmanship for a period of 12 months from the approval of the Practical Completion Certificate.

1.33 Disputes

In the event of a dispute between the Developer and the Council over any engineering activity associated with the development, a meeting between both parties should occur no later than 10 working days after the dispute is identified to resolve the conflict. The content of the Engineering Standards for Land Development must take precedence in all decisions. Where the Standards do not provide a solution to the dispute, the General Manager - Infrastructure must decide the final outcome of the dispute.

2. LAND SUITABILITY AND EARTHWORKS

2.1 General

Section 2 of the Engineering Standards for the Land Development provides for the management of earthworks, excavation, soil disturbance, sedimentation and addresses the following:

i. Assessment of suitability of land for development in its natural state.
ii. Ensures that subsequent earthworks/remediation works are of appropriate design and are carried out in accordance with relevant standards
iii. Confirms that the finished landform is suitable for development and that each lot provides a safe adequate area for building, access and effluent disposal.
iv. No earthworks associated with the development must be undertaken, which will have a detrimental effect on the stability of any land.
v. Where applicable reference must be made to Earthwork provisions under the Manawatū District Plan.

2.2 Objectives

All earthworks and land disturbance activities in the Manawatū District area, regardless of the scale and size of the activity must comply with permitted activity standards and conditions, or resource consent conditions and should be consistent with the following objectives:

a. Low impact design – where possible, a low impact approach to earthworks is preferred;
b. The extent and scale of disruption should be minimised – significant works should be staged, to minimise the total area of exposed soils at any point in time. Every effort should be made to minimise disturbance of existing vegetation;
c. Maintain natural drainage – where practicable, retain existing natural contours and features, such as gullies, streams and wetland areas. Avoiding disturbance of these areas can help to reduce the potential for excessive soil loss, erosion, sedimentation and inundation;
d. Topsoil stripping - All topsoil must be stripped from the earthwork areas with the stripped area being kept to the practical minimum at any one time. Topsoil should be stockpiled and used in the rehabilitation of the site;
e. Unsuitable material - all unsuitable material uncovered during stripping or earthworks must be excavated. Unsuitable material is generally described as any material having a California Bearing Ratio (CBR) inferred value of three or less;
f. Compaction – all fill areas must be re-worked and compacted in accordance with the appropriate design relevant to soil conditions and geology.;
g. Protect steep slopes – Steep slopes must be protected to reduce erosion and sedimentation.
h. Stabilise exposed areas rapidly – Exposed areas must be stabilised as soon as practicable. Vegetated ground cover is the most effective form of erosion control. Keep machinery off areas that have been stabilised;
i. The protection and where possible enhancement of watercourses;
j. Install perimeter controls - Install diversion drains, silt fences and earth bunds to divert clean water runoff away from worked areas and keep separate from sediment prone water.;
k. Soil loss - All practicable measures should be undertaken to minimise soil loss, erosion and sedimentation from exposed surfaces;

2.3 Standards

The following Standards and Codes of Practice are referred to in Section 2 of the Engineering Standards for Land Development. The design, materials and method of construction must comply with the Standards and Codes of Practice applicable.

The Standards used must incorporate the latest amendments. Standards superseding those listed and the latest version must automatically apply.

NZS 4402 Methods of Testing Soils for Civil Engineering Purposes
NZS 4431 Code of Practice for Earth Fill for Residential Development

2.4 Land Suitability

The determination of suitability of land for subdivision requires that the land be assessed in each of the following categories:

a. Landform – Risk of erosion and slippage
b. Location – Flood prone or swampy land
c. Bearing capacity and settlement in areas of building foundations
d. Chemical contamination
e. The presence of Hazardous Activities and Industries (HAIL)
f. Liquefaction under earthquake loading

Each of these areas must be addressed and evidence provided prior to consent approval.
Where, in the opinion of the Utilities Manager, concern is expressed over the suitability of any land included in a subdivision development proposal, the Utilities Manager will require an independent investigation and report(s) from a suitably qualified person or persons. The Tech Rep must provide a preliminary report as to suitability of land for building construction as part of the development concept plan approval process. This report must be prepared by a geotechnical specialist to provide a professional opinion that suitable building sites, access and effluent disposal areas, if appropriate, will be available in the completed subdivision.

2.4.1 Geo-Professionals

Where, land within the proposed development appears subject to inundation erosion, land slippage or any land instability, the Utilities Manager will require an independent investigation and report(s) (Peer Review) from a suitably qualified person or persons. The cost of this additional assessment will be the responsibility of the Developer.

These standards provide information for professionals involved in designing and constructing a land development project and require geotechnical expertise in projects where land stability could be an issue.

Geotechnical assessment must only be undertaken by a geo-professional. A geo-professional is a chartered engineer (CPEng, Geo-Tech), or an engineering geologist, with recognised qualifications and experience in geotechnical engineering and experience related to land development.
A geotechnical assessment must be undertaken where any of the following apply:

a. The assessment of land stability requires specialist expertise;

b. The construction of earthworks associated with any batters remain stable and that fill material is placed in such a way that it remains stable and can support the future loads imposed on it;
c. There is historical fill which has not been constructed or undertaken in accordance with any Standard or where natural slopes, banks or batters are involved;
d. The assessment of ground for the foundations of buildings, roads, services, and other infrastructure requires specialist expertise as weak ground may require special design;
e. The wide range of soil types, physical conditions and environmental factors applying in different areas make it difficult to specify precise or prescriptive requirements for land stability assessment or earthworks.

A geo-professional needs to be involved in the choice of final landform. This decision depends on many factors, which may be specific to the development. These include the relationship with surrounding landscapes, the size of the development, the proposed and existing roading patterns, the preservation of natural features, wahi tapu, and other historic and archaeological sites, the land stability and underlying structural geology, the function and purpose of the development and the potential for flooding, and erosion and other natural hazards and events including earthquakes. The aim is to also give guidance on the identification of and assessment of the order of importance of the above factors which will vary from project to project.

2.4.2 Landform

All development proposals that contain land with slopes in excess of 10 degrees will require assessment under this Section 2.4.1.

2.4.3 Location

The District Plan has identified areas of flood prone land. All localised low spots, swampy areas, springs or seepage, floodways and overland flow paths within and surrounding the proposed development area must be highlighted and methods of drainage for flood protection must be proposed.

2.4.4 Foundation Conditions

An area on each lot with adequate bearing capacity for the proposed structures (residential/industrial) must be identified, and any required rectification works (filling/excavation/compaction) must be proposed.

Similarly, areas designated for roads, pipelines, service corridors and underground structures must be shown to have adequate bearing capacity for their intended purposes.
Consideration, prevention of, and preventative design where necessary must also be given to the likelihood of settlement beneath foundations and services as listed above, including the settlement under both static and seismic loads.

2.4.5 Hazardous Activities and Industries List and Chemical Contamination

The National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (1 January 2012) establishes provisions for identifying and rectifying areas of chemical contamination. Site investigations may be required depending on whether the site has been identified as a HAIL site.

A design proposal for remediation or containment must be submitted and approved prior to consent approval.

2.4.6 Earthquake Loading

Consideration must be given to the effects of an earthquake on earth fills, slopes and liquefiable ground, and these effects must be taken into account in the design and construction of any development.

2.5 Earthworks

During construction, the following standards must be complied with:

- NZS 4431 Code of Practice for Earth fill for Residential Development

2.5.1 Fill Areas

Requirements relating to the compaction of fill for all subdivision lots are:

For residential lots, requirements for compaction may be limited, with the approval of the Utilities Manager to those areas on which buildings are likely to be sited. Such permission should not normally be withheld unless the extent of the filling in relation to the original topography is such that stability of the building site may be affected.

Previously filled areas must be tested in accordance with NZS 4431 and a report compiled and forwarded to the Utilities Manager. Any previously filled areas which prove unsatisfactory must be excavated and reconstructed as prescribed in this section.

Where the proposed development adjoins an established subdivision, the proposed surface level of the new allotments must be similar or lower than the existing surface level of the existing subdivision.

2.5.2 Detailed Investigation and Testing

Where soils are intended to form the in-site base for stable fills, or where they are intended for use as fill material or where they are intended to be permanently exposed in batters or to remain as permanent slopes or cuts, then the standard test methods outlined in NZS 4431 Section 11 “Test Methods” must be used to determine the stability of such soils.
Sufficient investigation work must be undertaken to:

i. Classify the soil strata and structure by field and visual methods;
ii. Establish the extent and variation in depths of the principal soil types involved, and
iii. Determine natural ground water levels.

Further sampling and testing on the representative soil types must be carried out, as required, to determine the relevant soil test properties necessary to properly assess the strata over the site.

2.6 Sampling and Testing

2.6.1 Areas of Soft Soil

Where it is intended to leave particular soft soil under any depth of fill, liquid and plastic limit tests, natural moisture content tests, consolidation and shear strength sensitivity tests must be carried out in accordance with NZS 4402 Methods of Testing Soils for Civil Engineering Purposes.

2.6.2 Areas Covered By Deep Fill

Areas which are to be covered by deep fill must require liquid and plastic limit tests, natural moisture content tests on the fill material, where this data indicates the likelihood of slumping or settlement, consolidation and shear strength and sensitivity characteristics must be assessed in accordance with NZS 4402

2.6.3 Alterations to Natural Surface or Sub-Surface Drainage

Where an area is to have its natural surface or sub-surface drainage altered the liquid limit and plastic limit tests along with natural moisture content, shrinkage and swelling characteristics, organic characteristics, organic content and the position of the natural water table must be determined by test methods outlined in NZS 4402.

2.6.4 Fill Materials

For natural moisture content and compaction characteristics (optimum moisture content at maximum dry density). Where materials indicate plasticity, the liquid limits and plastic limits must be determined. Such tests are to be carried out in accordance with NZS4402.4.1.1:1986 and NZS4431:1989 Code of Practice for earth fill for residential development.

2.6.5 Compaction Standards

The following percentages of maximum densities as determined by NZS 4402 Test 4.1.1 must apply;

i. Within 0.6 m of the street subgrade and extending to the outer edges of the footpaths etc., the densities must not be less than 95% of those given by New Zealand Standard Compaction Test (Test 4.1.1).
ii. Within 1 m (vertical measurement) of the finished surface of all fill areas and within 3 m (horizontal measurement) of all batter boundaries of unenclosed fills, the densities must not be less than 95% of that given by the NZS Compaction Test (Test 4.1.1)
iii. Increased percentages may be required in certain cases where directed by the Utilities Manager.
iv. Below 1 m (vertical measurement) of the finished surface except within 3 m of the boundaries, the densities must be not less than 95% of that given by the NZS Compaction Test (Test 4.1.1).
v. Increased percentages may be required in certain cases where directed by the Utilities Manager.
vi. Where the slope of a fill batter precludes the use of normal compaction equipment, approved methods must be made for rolling the completed fill, including topsoil, from the top of the batter.

2.6.6 Slope Design

For cut and fill batter slopes, refer Section 2.5.

2.6.7 Drainage

Stormwater runoff infrastructure must be designed to ensure full and effective control of the stormwater discharge is maintained at all times.

The Developer is responsible for ensuring that adequate drainage; temporary stormwater drainage and detritus ponds are constructed and maintained during the construction period of the development

work. These activities are to be maintained until such time as the land completely stabilises and no damage will result to both the development and the surrounding area.

Where earthworks involve the re-contouring of the land on any development site, the final surface levels must be such as to direct the flow of surface water to a watercourse or a street and not onto neighbouring lots. Where it is not feasible to direct the flow of surface water away from neighbouring lots, the Developer must provide for specific drainage infrastructure to catch surface flow and direct into the approved stormwater system.

Where overland flow path exists from an existing adjacent development, the flow must be intercepted on the common boundary and managed so that it is directed into the approved stormwater system.

2.6.8 Topsoil and Re-Vegetation

All residential sections and road cut and fill areas including roadside berms, open spaces and reserves must be topsoiled and grassed to provide a uniform minimum depth of 100 mm after settlement. The topsoil and grass must be of good quality and free from stones. Details of topsoil and grass to be used including the application rate must be forwarded to the Utilities Manager for approval prior to commencement of the work.

Hydroseeding by approved methods may be used where normal topsoiling/seeding methods cannot be used.

The consent approval may require special vegetative plantings in some areas. The plants are to be of good quality and planted in an approved manner.

2.7 Certification

On completion of the earthworks, a geotechnical completion report being Appendix 4- “Schedule 2A – Statement of Professional Opinion as to Suitability of Land for Building Construction” (NZS 4404 – Land Development and Subdivision Engineering) must be provided by the Developer to the Utilities Manager.

An “As-Built” plan must be submitted which shows the extent and depth of all fills, the position, type and size of all sub-soil drains and their outlets and any areas of low density fill or fill that does not comply with the specifications agreed during design and consent process.

3. ROADING AND STREET DESIGN

3.1 Introduction

Council's objective to street layout in residential areas is to provide for the effective and efficient circulation and operation of vehicles, cycles and pedestrians while maintaining an environment which provides for the safety of all users. Council's aim is to encourage subdivision layouts in which the function of each street is clearly expressed by its location and alignment and its relation to other streets.

The Developer must provide for roads and associated infrastructure including:

- footpaths, cycle ways and pedestrian access ways, vehicle crossings,
- Water, stormwater, drainage pipelines and associated structures,
- traffic and street signage, street furniture, street lighting, road marking
- street landscaping, including street trees,
- Where applicable reference must be made to the Transport provisions under the Manawatū District Plan.

The above infrastructure, which are to be all incorporated into the development project and be specifically designed and constructed to cope with the volumes and loadings of traffic and provide a functional and safe environment for the users of the development over the design life.

3.2 Standards And Specifications

The following standards and specifications must be used for the design and construction of the proposed road network within the development project.
The standards used must incorporate the latest amendments. Standards superseding those listed and the latest version must automatically apply.

Bracketed figures indicate the New Zealand Transport Authority's (NZTA's) document reference number.

NZS 2890	Off-street Parking Facilities
NZS 3104	Specification for Concrete Production
NZS 3109	Concrete Construction
NZS 4121	Design for Access and Mobility – Buildings and Associated Facilities
NZS 1428	Design for Access and Mobility – Means to Assist the Orientation of people with Vision Impairment - Tactile Ground Surface Indicators
NZS 4402	Methods of Testing Soils for Civil Engineering Purposes
NZS 4404	Land Development and Subdivision Infrastructure
NZS 4407	Methods of sampling and Testing Road Aggregates
AS/NZS 1158	Road lighting
RTS 6	Guidelines for Visibility at Driveways
RTS 14	Facilities for Blind and Vision Impaired Pedestrians

NZTA M/01	Roading Bitumen's
NZTA M/04	Basecourse Aggregate
NZTA M/06	Sealing Chip
NZTA M/10	Asphaltic Concrete
NZTA P/03	First Coat Sealing
NZTA P/09	Construction of Asphaltic Concrete Paving
NZTA	Bridge Manual (SP/M/022)
NZTA	Guidelines for Highway Landscaping (SP/M/020)
NZTA	Manual of Traffic Signs and Markings, Parts 1 and 2 (MOTSAM1 and MOTSAM2)
NZTA	Land Transport Safety Authority Cycle Network and Route Planning Guide
Austroads	A Guide to the Structural Design of Road Pavements including NZ Supplement (AP-G17/04)
Austroads	Guide to Stabilisation in Roadworks including New Zealand cover note (AP-60/90)
Austroads	Guide to the Traffic Engineering Practice Parts 1 -11, 13 and Part 14, including NZ supplements
Austroads	Guide to Road Design Parts 1-8
Austroads	Guide to Traffic Management Part 8: Local Area Traffic Management
NZTA	State Highway Geometric Design Manual
Austroads	Roundabouts – Guide to Traffic Engineering Practice Part 6 (AP 11.6/93)
Austroads	Sampling and Testing of Stabilised Materials during Construction
Austroads	Urban Road Design: A Guide to the Geometric Pavement Technology
NZTA	Cycle Network and Route Planning Guide
NZTA	Pedestrian Planning and Design of Major Urban Roads (AP-G69/02) Guide
NZTA	Traffic Control Devices Manual (all parts)

3.3 Carriageway Widths

3.3.1 General

The Manawatū District Plan describes the roading hierarchy which classifies the existing proposed roading network.

Section 3 Roading and Street Design of the standards provides a guide for minimum criteria that is to be used in defining road classifications for proposed development. Council may require development design to exceed the criteria outlined in Tables 3.1 and 3.1A. The Developer will be advised of any changes to Tables 3.1 and 3.1A and the rationale why they have been changed.

Where a proposed development involves or requires an extension of the primary roading network, design and construction must be to the same or better standard as that required for that part of the

network. It is advisable that the Developer discuss proposals with the Utilities Manager prior to the preparation of the Development Concept Plan for major developments.

On primary roads and roads with a design speed of ≥ 80km/h, the pavement must be of sufficient width to ensure that all left hand vehicle-turning movements exiting from properties must not encroach across the road centreline.

3.3.2 Primary Network

The hierarchical classification of subdivision streets forming part of the primary network will be determined by the criteria in the Manawatū District Plan Appendix 3B.1 – Roading Hierarchy Diagram 1, Diagram 2 and Diagram 3.

3.3.3 Secondary Network

To ensure Council's objectives are met, the following EDUC and EPE design factors must be used to determine the hierarchical classification of subdivision streets within secondary networks as listed in Table 3.1 and 3.1A.

3.3.3.1 Estimated Dwelling Units In Catchment (EDUC)

For the design of Area and Local Residential Streets an assessment must be made of the total possible number of dwelling units in the "catchment".

The definition of "catchment" must be deemed to include all such household units, the traffic from which could reasonably be assigned to that part of the street having regard to its distance and time of travel. Special consideration must be given to specific traffic generators such as schools, shopping areas, parks for organised sport, and the like.

In addition to catchment considerations, regard must also be given to the intended character and function of each street in determining its appropriate carriageway width.

3.3.3.2 Vehicles Per Day (VPD)

For design purposes allow ten vehicle movements per day per residential lot or Rural/Rural Lifestyle Lot. Specific assessment is to be undertaken to determine vehicles per day for Business and industrial developments.

3.3.3.3 Estimated Personnel Employed (EPE)

For the design of Area and Local Industrial Streets, an assessment must be made of the possible maximum number of persons who could be employed in the industrial subdivision with the due regard to the zoning of the industrial area.

3.4 Minimum Standards for Residential, Village and Industrial Subdivision

Table 3.1 Street Classification and Street Width

Area Served (zoning)	Lots/Dwelling Serviced	Classification	Legal Road/ ROW Width (minimum)	Carriageway Width (Minimum)*	Footpath	Total Berm Width	Max/Min Grade	Normal Camber	Notes
Residential	2-3	Private ROW / Access Lot	3.5m	3.5m (U1)	N/A		12.5% 0.4%	3%	Approved stormwater control
Village	Up to 4	Private ROW / Access Lot	3.0m	3.0	N/A		12.5% 0.4%	3%	Passing opportunities may be required (as per MDC District Plan)
Residential	4-5	Private ROW / Access Lot	6.0m (U2) (U3) (U4)	5.0m (U5)	(U2)	1.0m	12.5% 0.4%	3%	Min kerb and channel one side. Turning Area required.
Village	5-7	Private ROW / Access Lot	6.0m (U4)	6.0m	N/A	N/A	12.5% 0.4%	3%	Passing opportunities may be required (as per MDC District Plan)
Industrial	N/A	Service Lane	7.5m	6.0m	1 @ 1.5m	N/A	12.5% 0.4%	3%	Footpath required >1 lot/Business
Residential/Village Cul-de-sac	Up to 12 Lots or 12 du Max length 150m	Local Roads (Public Roads)	16.0m (U3) (U4)	7.0m (U5)	1 @ 1.5m	9.0m	12.5% 0.4%	3%	Kerb and Channel both sides. Cul-de-sac turning head required
Residential/Village	12-20 lots		17.0m	8.0m (U5)	2 @ 1.5m	9.0m	12.5% 0.4%	3%	Kerb and Channel both sides. Cul-de-sac turning head required
Residential/Village	>20 lots		20.0m	11.0m (U5)	2 @ 1.5m	9.0m	10% 0.4%	3%	Road connectivity required
Industrial			20.0m	11.0m (U5)	2 @ 1.5m	9.0m	10% 0.4%	3%	Road connectivity required

Residential		Collector	20.0m	11.0m	2 @ 1.5m	9.0m	10% 0.4%	3%	Road connectivity required
Industrial			22.0m	13.0m	2 @ 1.5m	9.0m	10% 0.4%	3%	Road connectivity required
All roads		Arterial	22.0m	13.0m	2 @ 1.5m	9.0m	10% 0.4%	3%	Road connectivity required

Notes:

All cut and fill batters, including retaining structures, shall be located clear of the Legal Road / ROW.

U1. Approved carriageway construction, either: chipseal, concrete, asphaltic concrete or paving. Passing Bay where visibility is limited or if ROW over 75m long.

U2. Where the ROW / Access Lot exceeds 75m in length a 1.5m wide footpath is required on one side.

U3. Council may require additional “On Street” Parking where Lot sizes are less than 500sq.m. (Typically one car park per two lots).

U4. The Legal Road / ROW width shall be widened to maintain the standard berm widths at all turning heads and cul-de-sacs.

U5. All vehicular turning heads to be Asphalt Cement.

*Carriageway formation includes kerb and channel/nibs/stormwater.

3.5 Minimum Standards For Nodal (Rural Lifestyle) And Rural Subdivisions

Table 3.1A

Area Served (zoning)	Lots/Dwelling Serviced (R4)	Classification	Legal Road/ROW Width (R4)	Carriageway Width	Seal Width	Traffic Lane / Shoulder Width	Total Berm Width	Max / min grade	Normal Camber	Notes
Nodal/Rural (R1, R5)	1-2	Private ROW/Access Lot	8m	4.0m	N/A	To be designed				Approved stormwater control.
Nodal/Rural (R1, R2, R3, R5)	3-4	Private ROW / Access	10m	4.0m	4.0m	To be designed				Approved stormwater control.
Nodal/Rural (R1, R2, R3, R5)	5-7	Private ROW /Access Lot	12m	7.0m	6.0m (R3)	N/A	6.0m	12.5% 0.4%	3%	Approved stormwater control. Turning head required.
Nodal/Rural	≥8 -12	Local Road (Public)	16m	9.0m	7.0m	3.5m/1.0m	9.0m	10% 0.4%	3%	Two-coat chip sealing and turning head required.
Nodal/Rural	>12 (120-200 vpd)	Local Road (Public)	20m	10.0m	8.0m	3.5m/1.5m	10.0m	10% 0.4%	3%	Two-coat chip sealing and turning head required.
Nodal/Rural	>20 (greater than 200 vpd)	Local Road (Public)	20m	11.0m	9.0m	3.5m/2.0m	9.0m	10% 0.4%	3%	Two-coat chip sealing and turning head required.

Notes:

All cut and fill batters shall be incorporated within the Legal Road/ROW. Fences may be located inside road reserve subject to Council approval.

R1. If the ROW /Access Lot exceeds 150m in length, then 6m wide passing bays shall be placed at intervals not exceeding 150m and also where the minimum safe sight stopping distances cannot be achieved.

R2. Rural Lifestyle/ Nodal subdivisions shall be two-coat chip sealed.

R3. Legal roads/ROW widths are based on providing for open swale stormwater design solutions these may be reduced if a kerb and channel/reticulated stormwater design is proposed.
R4. Lots/Dwelling Serviced and Legal Road/ROW Widths are in accordance with the Manawatū District Plan.
R5. Vehicle entranceways are to be constructed to Councils Engineering Standards at time of development.

3.6 Road Reserves

3.6.1 Reserve Widths

The minimum widths must be as shown in Tables 3.1 and 3.1A. In the event of there being insufficient width in the berm to locate all services, the Utilities Manager may approve some services to be laid under the sealed carriageway.

3.6.2 No Exit Roads/Cul-de-sac (Residential)

To ensure positive traffic functions within subdivisions, the approved maximum number of dwellings within a cul-de-sac must be:

i. 20 dwellings with a maximum length of 300m* in residential areas

* measured from the start of the road to the end of the cul-de-sac.

No Exit Roads and Cul-de-sacs must allow for pedestrian connectivity (Refer to Section 3.17).

3.7 Geometric Design Of Carriageways

3.7.1 Longitudinal Gradients

i. Maximum grade for primary roads 10.0% (1 in 10)
ii. Maximum grade for secondary roads 12.5% (1 in 8)
iii. Minimum Grade 0.4% (1 in 250)

In difficult situations, and for short lengths of streets not exceeding 50m, gradients outside these limits may be approved. However, the Developer must refer any such requests to the Utilities Manager during the preliminary design stage.

3.7.2 Design Speeds

The design speed for the geometric design of residential streets must, where possible, be 10kph above the posted speed limit or proposed posted speed limit.

The design speed is the speed used to determine geometric elements of a road such as sight distance, stopping sight distance, curve radii, super elevation, curve widening, traffic lane width and friction demand for the road. The design speed that is adopted provides a margin (typically 10 km/hr) over the proposed speed limit and should not be less than the 85th percentile of the speed distribution for a particular geometric element within a given speed environment.

All roads must be designed in accordance with Austroads Standard Urban Guide to Road Design: Part 3 Geometric Design. The following design speeds must be used.

Table 3.2 Design Speeds

Road Type		Environment			
		Rural			Residential
		Terrain			All
		Flat	Rolling	Mountainous	
Two Lane	Low Volume[1]	80	60	40[2]	50
	Secondary road	100	80	60	60
	Primary	120	110	100	70
Dual Carriageway		Subject to specific design			

Notes:

1 Low volume – Low volume roads where AADT is less than 200vpd.
2 Requires approval from the Utilities Manager

- Source: Transit Draft State Highway Geometric Design Manual 2004 (refer to source document for terrain definitions)
- The Developer must ensure that the alignment is designed to the speed identified in Table 3.2.
- The Utilities Manager may require a design speed that exceeds the values listed in Table 3.2 to allow for future growth.

3.7.3 Variance of Design Speed in Successive Elements

The variance of design speed in two successive geometric elements must provide sufficient time and distance for a driver to observe, react and adjust the vehicle speeds and ensure a smooth driving experience and is not to exceed the following:

- 10km/hr for reverse curves tangent to curves
- 5km/hr for compound curves
- downgrade exceeding 6% requires specific design in accordance with Austroads Guide to Road Design Part 3: Geometric Design.
- Alternatively, variance in design speeds can be determined using the methods outlined in Austroads Guide to Road Design Part 3: Geometric Design.

3.7.4 Vertical Curves

Maximum grade change without a vertical curve.
The maximum grade change in the longitudinal alignment without a vertical curve is summarised in Table 3.3 below.

Table 3.3 Maximum Grade Change without a Vertical Curve

Design Speed (km/h)	Grade Change (%)
40	1.0
50	0.9
60	0.8
70	0.7
80	0.6
90	0.5

Design Speed (km/h)	Grade Change (%)
100	0.4
110	0.3
120	0.2

There are two types of vertical curves. Sag curves are curves that have a positive change in grade whereas crest curves have a negative change in grade.

The design of the crest and sag vertical curves must be in accordance with Austroads Guide to Road Design Part 3: Geometric Design for all roads within the residential area as defined in the District Plan.
The curve length can be determined using the formula below:

L= K x A
Where:
L= Length of Vertical Curve, but a minimum of 0.815 x V metres
K = is the length of vertical curve in meters for 1% change in grade
A = algebraic difference in gradient (expressed in percentage)

Table 3.4 is to be used in the design of the sag vertical curves in addition to Austroads criteria.
Table 3.5 is to be used in the design of crest vertical curves in addition to Austroads criteria.

In calculating the vehicle (light and heavy) stopping distance a minimum reaction time of 2.0 seconds must be used for 70kph or less and 2.5 seconds for greater than 70kph (design speed).

The design and installation of traffic signage and road pavement markings must be in accordance with TNZ Manual of Traffic Signage and Markings (MOTSAM).

Table 3.4 Sag Vertical Curves

	K = Length of Vertical Curve in metres for 1% change in grade				
Design Speed (km/h)	Comfort Considerations		Headlight Considerations (C = 150)		Headlight Manoeuvre Time (secs)
	General Design a = 0.5 g	Special Cases a = 0.10 g	Sight Distance m	K	
40	3	1			
50	4	2	50	17	3.6
60	6	3	65	28	3.9
70	8	4	85	48	4.4
80	10	6	105	74	4.7

Note:

- C = the sight line constant which for a mounting height of 750 mm and zero elevation gives a value of C = 150.

Table 3.5 Lengths of Crest Curves – Sight Distance Criterion for Change of Grade A%, Length of Curve L = KA

				Overtaking Provision h1 = 1.15, h2 = 1.15 C = 920			
				Establishment		Continuation	
Design Speed (km/h)	Stopping Sight Distance (m)	K h1=1.15 h2=0.2, C=461 Note (a)	K h1=1.15 h2=0 C=230 Note (b)	Sight Distance (m)	K	Sight Distance (m)	K
50	50	5.4	10.8	350	133	165	29
60	65	9.2	18.4	450	220	205	46
70	85	15.7	31.4	570	353	245	65
80	105	23.9	47.6	700	532	320	111

Notes:

- Normal minimum sight distance. However, values aimed at in design should be between values in this column and those for zero object height
- In cases where zero object height may be considered appropriate e.g. At intersections, values in this column apply.

3.7.5 Horizontal Curves

The design of horizontal curves must be in accordance with Austroads Guide to Road Design Part 3: Geometric for all roads as defined on the District Plan. NZTA State Highway Geometric Design Manual must be used for all roads within the rural area as defined in the District Plan.
Table 3.6 is to be used in addition to Austroads for widening urban curves.

Table 3.6 Widening on Curves

Radius (m)	Curve Widening per lane (m)	
	Rigid Truck or Bus	Articulated Vehicle
30	1.03	Specific Design
40	0.82	
50	0.71	
60	0.59	
70	0.52	1.31
80	0.46	1.16
90	0.41	1.03
100	0.36	0.90
120	0.32	0.80
140	0.28	0.71
160	0.24	0.62
180		0.53
200		0.45

Radius (m)	Curve Widening per lane (m)	
	Rigid Truck or Bus	Articulated Vehicle
250		0.37
300		0.30
350		0.26
400		0.22

Radius of Curvature	Widening (m)	
	Carriageway Width	
	7.00 m	8.00 m
Up to 40 m	1.25	0.75
40 m to 50 m	1.00	0.50
50 m to 80 m	0.75	-
80 m to 150 m	0.50	-

Total widening must be applied equally to the two shoulders of the carriageway.
Any extra widening must apply to both the carriageway and the street reserve, to preserve the minimum distance between kerb and boundary.

Kerbs, where possible, must be at the same level on both sides of the street. In special circumstances, the left hand and right hand kerb line may be better graded individually in conjunction with centreline levels, footpath levels and boundary levels. Kerbs may differ from each other in level, provided the following standard design tolerances are not exceeded.

3.7.6 Coordination between Horizontal and Vertical Curves

The horizontal and vertical geometry must be coordinated to ensure that drivers can anticipate, observe and react to changes in road geometry, ensure a smooth driving experience, tie in with the natural landform and allow adequate distance for drivers to detect hazards on the road. The coordination of horizontal geometry must be designed in accordance with Austroads Guide to Road Design Part 3 Geometric Design.

3.7.7 Superelevation

Super elevation is determined using the following equation:

$$e_1 = \frac{V^2 e_{max}}{127R(e_{max} + f_{max})}$$

Where:

R =curve of the radius (m)
V = vehicle speed (km/hr)

e_{max} =maximum super elevation (m/m)
The general maximum super elevation for all new roads is 6% except in hilly or mountainous terrain or in places where there are site constraints, the maximum super elevation is up to 10% subject to the Utilities Managers approval.
f_{max} =maximum coefficient of side friction (Table 3.7)

The corresponding coefficient of side friction is calculated from:

$$f_1 = \frac{V^2}{127R} - e_{1\,rounded}$$

Table 3.7 Maximum Coefficient of Side Friction Factor, f_{max}

Operating Speed (km/hr)	f_{max}	
	Cars	Trucks
40	0.30	-
50	0.30	0.21
60	0.24	0.17
70	0.19	0.14
80	0.16	0.13
90	0.13	0.11
100	0.12	0.12
110	0.12	0.12
120	0.11	0.11
130	0.11	-

The maximum rate of rotation is 2.5%. Except in hilly or mountainous terrain or places where there are site constraints, the maximum rate of rotation is 3.5% subject to the Utilities Manager's approval.

Table 3.8 Kerb Line Levels

Width of Carriageway	Maximum Difference in Kerb Line Level
7 m	130 mm
8 m	150 mm
9 m	160 mm
11 m	175 mm
11.5 m	175 mm
12.5 m	200 mm
13 m	200 mm

The design and installation of traffic signage and road pavement markings must be in accordance with NZTA Manual of Traffic Signs and Markings (MOTSAM) and Traffic Control Devices (TCD) manual.

The Developer must ensure that the design of horizontal alignment will not create adverse driving conditions. Caution must be given to the use of negative camber to ensure vehicle operation is not hindered in any way.

3.7.8 Intersections

Design of intersections must be in accordance with Austroads Guide to Road Design Part 4, 4A, 4B and 4C or relevant NZ Transport Agency standards such as MOTSAM/TCD Manual and State Highway Geometric Design Manual.

All intersections will be subject to specific review. The following matters provide guidance in achieving acceptable outcome. All designs must be consistent with the road hierarchy and intended use of the road.

3.7.9 Structure Plans

Larger subdivisions require a structure plan that establishes a road hierarchy and promotes a "connected and efficient road network for all users."

3.7.10 Angle of Connecting Roads

The angle of connecting roads at intersections must be 90˚. However, a minimum angle of 70˚ may be used only when justified by other constraints and with the approval from the Utilities Manager.

3.7.11 Intersection Approaches

No intersection will be formed with more than four approach arms converging.

3.7.12 Intersection Spacing

Intersection spacing must be in accordance with the District Plan Appendix 3B.3.

3.7.13 Corner Splay

At intersections with all residential Primary and industrial streets the minimum corner splay must be 9m. At all other residential intersections, the minimum corner splay must be 6m. Refer Standard Drawing 3.1.

3.7.14 Intersections

The design of rural/Rural Lifestyle intersections is also to incorporate details outlined in Standard Drawing 3.3. The design of residential intersections is to incorporate Standard Drawings 3.1 and 3.2.

Chevron boards to NZTA Manual of Traffic Signs and Markings (MOTSAM) must be installed at the head of all intersections in rural areas.

3.7.15 Road Connection

Where a new road is connected to an existing road or street, the pavement of the existing road is to be upgraded to a similar standard to the new road unless it is already to the required

standard. In all cases, the existing sealed surface is to be resurfaced with a similar surface to the new works over the full extent of the intersection work area.

Where a proposed road or access intersects a State Highway, the Developer must forward the design to the New Zealand Transport Agency for approval. New Zealand Transport Agency approval and conditions, including the approved design, must be provided to the Council and will form part of the consent approval process.

3.7.16 Signs and Markings

Chevron boards to NZTA Manual of Traffic Signs and Markings (MOTSAM) must be installed at the head of all intersections in rural areas.

The design of traffic signs and road markings at intersections be in accordance with NZTA Manual of Traffic Signs and Markings (MOTSAM).

3.7.17 Radii of Kerbs at Intersections

The minimum radius for kerbs is shown in Table 3.9 below. Refer to Standard Drawing 3.1.

Table 3.9 Radii of Kerbs at Intersections

	Local - Residential	Local – Other	Collector	Minor Arterial	Major Arterial
Local Road- Residential	4-6m*	4-6m*	4-6m*	10.5m	10.5m
Local Road- Industrial/Business	13.5m	13.5m	13.5m	13.5m	13.5m
Collector	-	-	-	10.5m	10.5m
Minor Arterial	Specific Design				
Major Arterial					

*The selection of kerb radius ranges from 4-6m and is selected based on the road geometry, design speed and types of traffic turning into the intersection.

3.7.18 Kerb Crossing

Provision must be made in the kerb for the installation of vehicle and mobility crossings. The positions of each crossing must be detailed on the engineering plans submitted for engineering approval.

3.7.19 Camber

The pavement camber on straight alignment regardless of terrain must be 1 in 33 or (3%). Reductions to 1 in 50 (2%) may be considered by the Utilities Manager for complex intersection design.

The developer must give due consideration to the use of negative camber in 50kph areas to ensure vehicle operation is not hindered in anyway.

3.7.20 Cul-de-Sac Heads

Cul-de-Sac heads must have minimum 10m radius turning area in residential areas. In Business / industrial zones the radius must be 15m. Refer Standard Drawing 3.6. No parking is permitted anywhere within the total turning area of the Cul-de-Sac unless it has been specifically designed to allow parking.

Off centre Cul-de-Sac heads must be designed by offsetting the road carriageway crown to create symmetrical conditions with the kerb return. Refer Standard Drawing 3.6.
Any alternative arrangement proposed must fully demonstrate the ability to accommodate turning manoeuvres of an 8m rigid truck for refuse and recycling collection services.
The minimum longitudinal grade of kerb and channel in Cul-de-Sac heads must be 1 in 300. Where grades are less than 1 in 200, sumps are to be placed either at the neck of the Cul-de-Sac on both sides of the carriageway or a double sump at the end of the Cul-de-Sac.

3.7.21 Cut and Fill Batters

Earth slopes beyond the road boundary into the adjacent properties should be no greater than 1:6.

Cut and fill batters steeper than 1:6 require approval from the Utilities Manager. Refer to Standard Drawing 3.9.

Cut batters must be specifically designed. Where cut and fill batter heights exceed 4.0 meters, the Utilities Manager must require either the flattening of the slope to allow drive access or the batters to be incorporated within the road reserve.
In undulating and hilly country, the reserve width must be extended as necessary to incorporate 1.0m beyond the toe of fill batters and the top of cut batters.

3.8 Structural Design And Testing Of Pavements

3.8.1 General

All flexible pavements must be designed for a life of 50 years.
All pavements must be designed in accordance with the Austroads Guide to Pavement Technology – Part 2: Pavement Structural Design of Road Pavements including the New Zealand supplement AP-G17/04.

All materials must comply with NZTA specifications. The Utilities Manager may approve materials that do not fully comply with the specifications; however, these materials must be from a proven source both in performance and durability.

3.8.2 Pavement Loading

3.8.2.1 Primary road network

Structural design must be undertaken using mechanistic design methods from Austroads Guide to Pavement Technology – Part 2: Pavement Structural Design.

The total number of Equivalent Design Axles (EDA) that will use the pavement during its design life must be determined from Table 3.10 of these standards and Austroads Guide to Pavement

Technology – Part 2: Pavement Structural Design. The minimum growth rate to be applied to the traffic loading is 1.5% per annum.

3.8.2.2 Secondary Road Network

Structural design must be undertaken by using mechanistic or standard chart based methods from Austroads Guide to Pavement Technology – Part 2: Pavement Structural Design.

The following Equivalent Design Axles (EDA) traffic loadings must be adopted for the Secondary Roading Network. The minimum growth rate to be applied to the traffic loading is 1.5% per annum.

Table 3.10 Assumed EDA Traffic Loadings

Street Classification	EDA/Lane
Arterial	3.8×10^6
Collector	3.8×10^5
Local	1.0×10^5
Rural Lifestyle	5.0×10^4
Rural	3.65×10^4
Industrial	Specific design required

The design pavement loading must be stated as a note on the engineering drawings where the details of the pavement cross section are shown.

3.8.3 Subgrade Evaluation

The subgrade bearing capacity (CBR), required for the pavement design must be based on soaked laboratory values of the pavement subgrade. Undisturbed samples must be tested in accordance with NZS 4402 Test 6.1.2.

For Local Roads, CBR values for the subgrade, other than soaked values, may be used in the pavement design provided these are submitted for approval with sufficient evidence to support their adoption. Alternative values will generally be in CBR's or derived CBR's from a penetrometer, however, before approval is granted to use these values, it will be necessary to demonstrate that saturation conditions will not occur. The Utilities Manager must make the final decision regarding what method will be accepted.

The design CBR must be the tenth percentile value of the CBR tests taken on the subgrade material, whether occurring naturally or imported to the site, and to a depth of one meter below the subgrade surface.

Calculated as follows:

Design CBR = tenth percentile value of test CBR values
= C – 1.28 S
Where C is the mean of all test CBR's and S is the standard deviation of all values.

To calculate the design CBR, collate only with the CBR test results from samples taken at the same level relative to the subgrade. Individual CBR test results which are relatively very low or high, should be isolated from the analysis and considered as a separate section of the pavement. The position of the CBR sampling must be in the outer wheel path of all lanes, taken, at intervals not exceeding 75 meters with a minimum of four results required for any road less than 75m length.

3.8.4 Subgrade Drainage

In areas where subsoils are not free draining or where the pavement design adopts CBR values other than soaked values, allowance must be made for subgrade drainage. This must take the form of either:

a. An under-channel drain which must consist of an approved filter drainpipe 100mm nominal diameter in a trench backfilled with an approved free draining filter material. These trenches must be 300 mm wide, and the pipe invert 275mm below the subgrade level, and the pipe laid on the trench bottom.
b. In residential streets, the subsoil drain must be positioned immediately behind the back of the kerb. These drains must discharge by gravity and be connected into the sumps and be connected such that the drain invert is not lower than the outlet pipe soffit. Refer Standard Drawing 3.5.
c. In residential streets batter drains must be constructed where the topography is likely to cause ground surface water to concentrate on the street berms. Batter drains must be as above and must normally be constructed beyond the street reserve boundary.

3.8.5 Thin Surfaced Unbound Pavements

a. The minimum basecourse and subbase layer thickness for Thin Surfaced Unbound pavements must be no less than the requirements stated in the Austroads Guide to Pavement Technology – Part 2: Pavement Structural Design of Road Pavements including the New Zealand supplement; however, the thickness must be no less than the minimum pavement depth requirements outlined in clause 3.6.7.
b. The subbase material must achieve a CBR of >40. It must be a uniformly graded material with all material passing through a 100mm sieve. It must be free from organic material.
c. The recognised base course must be TNZ M/4 AP40.

3.8.6 Thin Surfaced Pavements Incorporating a Modified Layer

Modification of subgrade material normally will be considered when a CBR of less than 10 is encountered. Such soils which exhibit less than a three-fold increase in CBR stabilisation should be classified as modified materials unless tensile testing is undertaken and indicates strength in excess of 80 kPa.

Modified methods must be determined using Austroads Guide to Pavement Technology Pavement Technology – Parts 4D, 4E, 4F and 4G as applicable.

3.8.7 Minimum Pavement Depth

The minimum depth of pavement construction must be equivalent to a 300mm thick unbound granular pavement except in residential accessways where the minimum equivalent thickness must be 250mm or 150mm for concrete pavements.

3.9 Pavement Construction And Testing

3.9.1 Subgrade Construction and Acceptance

Subgrades must be constructed to the requirements of Part 2 - Land Suitability and Earthworks of these Standards and drained.
The subgrade must be constructed to the same cross section profile as the finished pavement surface.
The Utilities Manager must inspect the subgrade and the Developer must provide subgrade test results prior to metaling or stabilisation.

The mean value of the subgrade compaction for any proposed uniform length of carriageway must be determined from a series of nuclear densometer readings taken on the subgrade, on the outer wheel paths in all lanes, and at a maximum mean value must be 95% standard compaction as set out in Section 2 of these Standards.

Once the subgrade is approved it must not be left exposed for longer than 4 days. Should the subgrade be exposed for longer than this period or if weather conditions or traffic deteriorates the subgrade surface or depth, the Developer is to advise the Utilities Manager who will further inspect the pavement. Preparation of the subbase/basecourse is not to proceed until approval has been given. Council will recover costs of any additional inspection if the Developer has made no genuine attempt to protect the subgrade.

3.9.2 Stabilisation Treatments

Where the pavement design involves stabilisation of one or more of the layers, or the inclusion of Geotextiles or Geogrids the Developer must provide a construction specification for this work for approval by the Utilities Manager. All site work must be undertaken in strict accordance with the approved specification for the treatment selected to ensure the material properties are achieved.
Strict attention must be made to the quality control of stabilisation operations and the following factors controlled to ensure uniformity and acceptability of the treated layer.

i. Uniformity of the material to be stabilised quantity and distribution of the stabilizer
ii. Quantity and distribution of the stabiliser
iii. Thickness of the processed layer
iv. Degree of pulverisation
v. Mixing
vi. Water content
vii. Compacted density
viii. Quality of the stabilised material
ix. Surface finish
x. Integrity of geotextiles/geogrids

Stabilisation is to be designed and constructed in accordance with Austroads Guide to Pavement Technology or the manufacturer's specifications.

3.9.3 Metal Course Construction and Testing

The pavement must be constructed in accordance with the approved design.

The subbase must be spread and graded and compacted to the correct formation level and material depth and compacted to achieve a mean density of 95% maximum dry density (MDD) and a minimum of 92% MDD.

The base course must be placed, rolled and compacted in layers not exceeding 150mm in depth and compacted at the correct moisture content. to achieve a mean density of 98% MDD and a minimum of 95% MDD. The correct pavement shape must be maintained at each compacted layer. Material used for blinding off must not exceed 5mm in compacted depth. The surface be swept clean by mechanical broom to expose a clean stone mosaic surface with no raveling prior to sealing.

The Developer must not proceed with any surfacing on the road pavement until approval from the Utilities Manager has been obtained. Testing of final metal layers must be in accordance with NZS 4407- The Methods of Sampling and Testing Roading Aggregates.

The maximum allowable pavement deflections outlined in Table 3.11 must be adhered to for completed basecourse layers in Flexible Pavements. Benkelman Beam Testing must be carried out in accordance with NZTA's 'Standard Test Procedure for Benkelman Beam Deflection Measurements.' 95% of all tests must comply with the deflections appropriate to the road type. In addition, no tests must give deflections greater than 25% above the specified maximum.

Table 3.11 Maximum Benkelman Beam Deflection Standards

Road Type	Maximum Allowable Deflection
Arterial	1.00 mm
Collector	1.20 mm
Local	1.60 mm
Residential ROW (up to 6 lots)	2.00 mm
Rural Lifestyle	2.00 mm
Rural	2.00 mm
Industrial/Business	1.20 mm

The sub-base metal layers in Rigid Pavements be compacted to achieve a mean density of 95% maximum dry density (MDD) and a minimum of 92% MDD.

3.9.4 Surfacing

The surfacing of the metal course must take place within two working days after Council approves the base course. Should sealing of the basecourse surface exceed this period and/or inclement weather has affected the surface, no sealing work is to proceed until further approval has been obtained.
Immediately prior to sealing a strip 600mm wide contiguous to each channel or seal edge must be sprayed with an approved ground sterilising weed killer at the manufacturer's recommended rate of application.
Surfacing must consist of the following:

3.9.4.1 Structural Asphaltic Concrete Pavements

Industrial and Business Developments	Application of a first coat of chip seal of chip size 4 to be followed by the asphaltic concrete layer. The structural asphaltic concrete mix must comply with TNZ Specification M/10. Alternatively, emulsion can be used providing the AC layer is applied with 24 hours.
	The application of the asphaltic layer must take place within 5 working days after the first coat of chip seal. Should the application of the asphaltic concrete layer exceed this period no further sealing work is to proceed until additional approval has been obtained to ensure the surface is clear from any debris or defects.
(i) Thin Surfaced Pavements	
Residential	Application of a grade 3 and grade 5 two coat seal. In all Cul-de-Sac turning heads an application of a first coat chip seal of chip size 4 followed with 25mm of asphaltic concrete. The asphaltic concrete mix must comply with TNZ Specification M/20 Table 2.
	The Developer may with the approval of the Utilities Manager place an asphaltic concrete surface in lieu of a two coat seal. Application of a first coat seal of chip 4 size followed with 20 mm of asphaltic concrete. The asphaltic concrete mix should comply with the TNZ Specification M/10 Table 2. In cul-de-sac turning heads, the surfacing must be as stated above, accept thickness to be 25mm. The application of the asphaltic layer must take place within 5 working days after the first coat of chip seal. Should the application of the asphaltic concrete layer exceed this period no further sealing work is to proceed until additional approval has been obtained to ensure the surface is clear from any debris or defects. At all major intersections on primary road networks, a friction course layer is to be provided extending 10 meters beyond the kerb and channel tangent points on all roads.
Rural/ Rural Lifestyle	Application of a grade 3 and grade 5 two coat seal.

a. Structural Asphaltic Concrete Pavements
Industrial and Business Developments
Application of a first coat of chip seal of chip size 4 to be followed after a minimum of seven (7) days by the asphaltic concrete layer. The structural asphaltic concrete mix must comply with TNZ Specification M/10. Alternatively, emulsion can be used providing the AC layer is applied within 24 hours.

b. Thin Surfaced Pavements

Residential
Application of a grade 3 and grade 5 two coat seal. In all Cul-de-Sac turning heads an application of a first coat chip seal of chip size 4 followed after a minimum of seven (7) days with 25mm of asphaltic concrete. The asphaltic concrete mix must comply with TNZ Specification M/20 table 2.

The Developer may, with the approval of the Utilities Manager place an asphaltic concrete surface in lieu of a two coat seal. Application of a first coat seal of chip 4 size followed after the minimum of seven (7) days with 20 mm of asphaltic concrete. The asphaltic concrete mix should comply with the TNZ Specification M/10 Table 2. In cul-de-sac turning heads, the surfacing must be as stated above, accept thickness to be 25mm.

At all major intersections on primary road networks, a friction course layer is to be provided extending 10 meters beyond the kerb and channel tangent points on all roads.

Rural/ Rural Lifestyle
Application of a grade 2 and grade 4 two coat seal.

3.9.5 Sealing

Asphaltic bitumen's associated with sealing work must comply with the material TNZ Specifications M/1. Sealing chips used must be in compliance with TNZ M/6.

Work associated with applying first and second coat seals must be in accordance with TNZ Specifications P/3 and P/4, respectively.

Asphaltic binder for all sealing must be applied only to a clean, dry stone mosaic surface, and if an adhesion agent is not used, it must only be applied during warm, dry, settled weather conditions.

3.9.6 Asphaltic Concrete

All asphaltic concrete must comply with TNZ M/10 and TNZ P/9.

3.10 Construction Of Kerb And Channel

3.10.1 General

Kerb and channel must be provided on both sides of all proposed carriageways in both residential areas and may be provided in Rural Lifestyle areas. Refer Standard Drawings 3.10 and 3.10.1. Mountable kerbs may be approved for street islands and lightly trafficked precincts. Dished channel may be used in areas such as parking area and right of ways.

All kerb and channel must be machine poured (slip formed). The exposed face of the kerb and channel must be clean and smooth. Kerb and channel must be laid in the one operation.

Kerb and channel, mountable kerbs and dished channel are to be constructed on a sub-base metal layer compacted to a mean density of 95% maximum dry density (MDD) and a minimum of 92%. Contraction joints are to be placed at a maximum spacing of 4 metres and are to include the full profile of the kerb and channel.
Kerb and channel, mountable kerb and dished channel tolerances are as follows:

i. **Longitudinal**
Maximum +/- 20mm over the total length however must not exceed +/- 5mm over a 10m length.

ii. Vertical

Maximum +/- 12mm over total length however must not exceed +/- 3mm over a 10m length.

The minimum gradient of all kerb and channel, mountable kerb and dished channel must be 1 in 250. The Developer must replace any section where water ponding depth exceeds 3mm over a one metre length.

- A 100 mm diameter nominal connection from the allotment boundary to the kerb must be provided for stormwater disposal from residential allotments. Refer Standard Drawing 3.11. This is not required if approved alternative systems are in place. To avoid unnecessary joints, outlets should be incorporated at the time of the kerb construction. The following identifications must be stamped on the top of the kerb directly above the respective laterals.
  - '**L**' for a wastewater lateral;
  - '**T**' for a water service connection;
  - '**X**' for a stormwater lateral

3.10.2 Dished Channel

Where necessary in parking areas, right of ways and other areas approved by the Utilities Manager, a 600mm wide dished channel (reinforced) must be constructed. Refer Standard Drawings 3.5.

3.10.3 Testing

Kerb and Channel must be replaced in any area where water ponds.

3.10.4 Sumps

Street sumps must be provided as outlined in Section 6 Stormwater Drainage of the standards Openings must be sized and oriented to provide for the safety of pedestrians and cyclists. Cycle-friendly sump grates must be used, with bars traverse to the side channel direction.

3.10.5 Concrete

All concrete, unless otherwise specified by the Utilities Manager, must comply with NZS 3104 and must attain a strength of 20 MPa at 28 days.

The Utilities Manager may require a certificate provided by the concrete supplier to certify compliance with NZS 3104.

3.10.6 Curing

All concrete must be cured in accordance with NZS 3109.

3.10.7 Swales

Swales should be used wherever appropriate in Rural/Rural Lifestyle areas to allow for infiltration to reduce peak discharge flows and to provide stormwater treatment. They can be located either in the berm area or in the centre of the road and must be of sufficient width to accommodate services, plant growth and maintenance. Swales must be designed by a suitably qualified person experienced in the design of swale drains. See standard drawing 3.8.

3.11 Footpaths

3.11.1 General

A footpath must be provided on both sides of all proposed carriageways in all residential, business and industrial zones and must generally follow the gradient of the adjacent kerb.

3.11.2 Construction

All footpaths must be in accordance with the widths specified in Table 3.1 and Table 3.1A, measured from kerb face where set adjacent to the kerb. Footpaths must be constructed with a cross fall of 2%. Refer Standard Drawing 3.12.
Footpaths must be constructed to the following materials and standards.
20MPa 100mm thick concrete laid on 100mm minimum compacted AP 40 material foundation to a mean density of 95% standard compaction.

Other materials including Asphaltic Concrete, Pavers and Limestone (Rural/Rural Lifestyle areas only) may be accepted with the approval of the Utilities Manager.
All footpath surfaces are to be even and non-slip.

Concrete edges are to be straight, properly formed, equal distance out from behind the kerb and edges are to be rendered with an approved edging tool. Construction joints in concrete footpaths must be provided at no more than 3.0m intervals.

The finished surface level of the footpath must be similar to surrounding ground level to ensure no ponding of water.
Footpaths must be connected and accessible by wheeled pedestrians. Dish or V-channels across the footpath must be avoided, or, if necessary designed to be traversable (Refer to NZS 4121).

3.11.3 Low Level Paths

Where the level of the berm is lower than the kerb and channel, a dish channel is to be placed on the lower side of the footpath. Sumps must be provided at no more than 100 metre spacings. Refer Standard Drawing 3.12 and 3.13.

3.11.4 Testing

The Utilities Manager may require core samples of the finished footpath.
Samples are to be taken at centres of not less than 100m. Should these tests indicate insufficient concrete depths and/or concrete strength is less than 20MPa then the path must be removed and replaced. Where tests identify compliance with the Standards, Council will pay the cost of the test and the remedial work. The Developer must pay for all costs if the footpath does not comply with the Standard.

3.12 Crossings

3.12.1 Mobility (Pram) Crossings

Mobility crossings must be provided in the kerb line at all residential intersections and at the end of all walkways and cycleways. Where a walkway/cycleway exits onto a street, a mobility crossing

must be constructed at the kerb on both sides of the carriageway in an alignment similar to the walkway/cycleway. Refer Standard Drawing 3.1. The crossing entrance must be connected to the footpath as shown in the standard drawing and must be of similar construction to the adjacent footpath.
The position of mobility crossings must be identified in the design plans forwarded for engineering approval. Sumps must be placed so as to reduce the flow of stormwater as much as possible in the channel at the crossing entrance.

3.12.2 Vehicle Crossings

a. Concrete crossings must be constructed between the kerb line and the boundary to all Residential, Business and Industrial zones. This must include at the entrance to all accessways to rear lots and service lanes and at any other place where the location of a future driveway to a lot can be determined with certainty. Refer Standard Drawings 3.13 to 3.20 inclusive.
b. The following construction criteria must apply to the following vehicle crossings.

Table 3.12 Vehicle crossing Construction Criteria

Vehicle Crossing Type	Minimum 28 Day Strength	Thickness	Reinforcement
Residential	20MPa	150mm	1/665 HRC
Business	25MPa	200mm	1/665 HRC
Industrial	30MPa	300mm	1/665 HRC

c. For all rural developments, vehicle crossings must be constructed between the carriageway and road boundary. Refer Standard Drawings 3.2.2 and 3.2.3. Sight boards may be required at the discretion of the Utilities Manager.

All existing crossings within new developments must be upgraded to Council standards. Surfacing of vehicle accesses is required to match the surface of the adjoining road. Culvert sizing may require specific design but must not be of a smaller nominal diameter than 300mm. All culverts to be RCRRJ pipes with standard headwalls. Refer Standard Drawings 3.4, 3.4.1 and 6.6.

3.13 Business Service Lanes

Business allotments must have fully formed service lanes to facilitate the delivery of supplies. Service lanes must consist of a minimum 4.0m wide, 25mm thick asphaltic concrete surface with drainage facilities as required. Refer Standard Drawing 3.24. Footpath must be provided on one side where access is provided to more than one lot.

3.14 Industrial Service Lanes

Industrial service lanes must be a minimum width of 6.0m and must be constructed to the same standards as required in the Engineering Standards for the Land Development for industrial streets adjacent to the service lane. Footpath must be provided on one side where access is provided to more than one lot.

3.15 Parking Bays

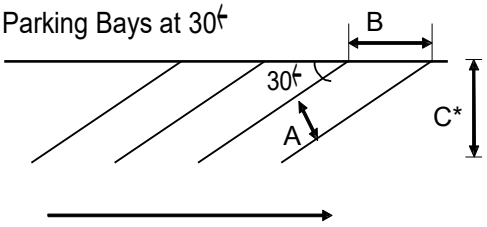
Parking bays must be constructed to the same standard as for the adjoining street. New or upgraded parking areas must be in accordance with Figure 3.1.

Figure 3.1 Car Park Dimensions

Please Note: *Where car parking is required and is not prescribed in the District Plan the following shall be adhered to:*

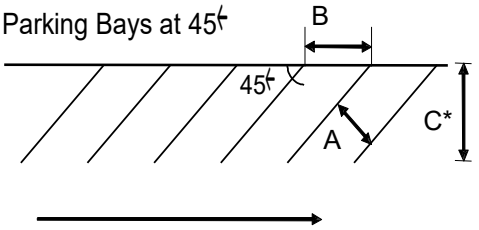
Parallel Parking Bays

Parking Bays at 30°



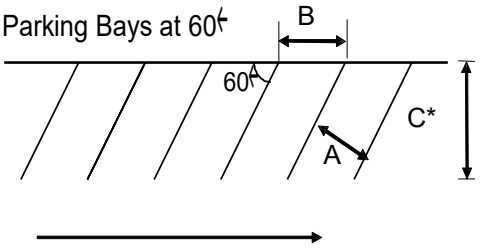
User Class	A	B	C1	C2	C3	Aisle Width
1	2.4	3.4	5.2	4.8	5.5	3.9
2	2.5	3.5	5.2	4.8	5.6	3.7
3	2.6	3.7	5.2	4.8	5.7	3.5
4	3.6	5.1	5.2	4.8	6.1	3.3

Parking Bays at 45°



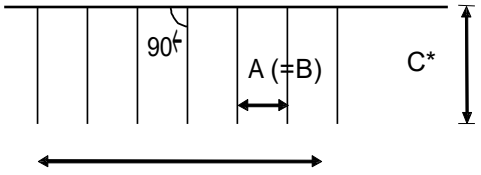
User Class	A	B	C1	C2	C3	Aisle Width
1	2.4	2.8	5.7	5.1	5.9	4.9
2	2.5	2.9	5.7	5.1	6.0	4.6
3	2.6	3.0	5.7	5.1	6.0	4.3
4	3.6	4.2	5.7	5.1	6.3	4.0

Parking Bays at 60°



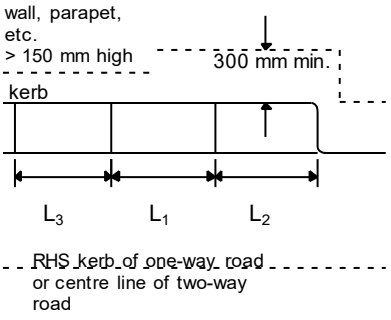
User Class	A	B	C1	C2	C3	Aisle Width
1	2.4	2.4	5.4	4.8	5.4	6.2
2	2.5	2.5	5.4	4.8	5.4	5.8
3	2.6	2.6	5.4	4.8	5.4	5.4
4	3.6	3.6	5.4	4.8	5.4	5.0

Parking Bays at 90°



User Class	A	B	L1	L2	L3	Aisle Width
1, 2, 3	2.1	2.1				
4	3.6	3.6				
All			6.3	6.6	5.4	3.0
All			6.1	6.4	5.4	3.3
All			5.9	6.2	5.4	3.6

Parallel Parking Bays



User Class	A	B	C1	C2	C3	Aisle Width
1	2.1	4.2	4.4	4.1	4.5	3.1
2	2.3	4.6	4.4	4.1	4.7	3.0
3	2.5	5.0	4.4	4.1	4.9	2.9
4	3.6	6.4	4.4	4.1	5.5	2.9

Manoeuvring space and car parking spaces must comply with the minimum dimension set out in NZS2890.1:2004 Parking Facilities – Off Street Car Parking and NZS 4121 (2001): Design for Access and Mobility – Buildings and Associated Facilities.

User Class is defined as:

- 1 for all day parking, such as tenant, employee and commuter parking;
- 2 for medium-term parking, such as long-term town centre parking, motels, airport visitors, sports and entertainment centres;
- 3 for short-term and goods or children loading parking, such as short-term town centre parking, hospitals and medical centres.
- 4 accessible parking for people with disabilities.

Dimension C is selected as follows:

C1 Where parking is to a wall or high kerb not allowing any overhang;
C2 Where parking is a low kerb which allows 600mm overhang;
C3 Where parking is controlled by wheel stops installed at right angles to the direction of parking, or where the ends of parking spaces form a sawtooth pattern.

Dimension L is selected as follows:

L1 Space length for consecutive parallel parking spaces;
L2 Space length for obstructed end spaces;
L3 Space length for unobstructed end spaces.

Aisle width dimensions are for one-way aisles
For parking bays at right angles (90˚) with two-way aisles, aisle width should not be less than 5.5 metres.
For parallel parking bays with two-way aisles, aisles widths must be at least 3 metres wider than for one way aisles.
Car parking areas must include provision for pedestrian movement. This will be assessed on case-by-case basis.

3.16 Hardstand Areas

Hardstand areas must be constructed to the same standard as for the adjoining street.
All weather hardstand areas must have an approved retained edge.
Minimum dimensions for hardstand areas must be 5.2m wide by 5.4m long. This does not include manoeuvring and turning area.
Alternative formations may be approved at the discretion of the Utilities Manager.

3.17 Pedestrian/Cycle Accessways

Accessway is a passage way that provides the public with a convenient route for pedestrians and/or cyclist from any road, service lane, or reserve to another, or to any public place or to any railway station, or from one public place to another public place, or from one part of any road, service lane, or reserve to another part of that same road, service lane, or reserve.

Pedestrian and/or cycle accessways should be designed in accordance with NZTA's Pedestrian Planning and Design Guide. Particular care needs to be taken:

i. where cyclists join the shared route to ensure that they can do so safely and without conflict with pedestrians; e.g. cycle access ramps may be required,
ii. where the shared route ends, to ensure that cyclists do not continue to use a route intended for pedestrians only; e.g. by way of signs and/or markings,
iii. where one route crosses another pedestrian, cyclists or shared-use route
iv. to ensure adequate forward visibility for cyclists who are generally moving more quickly than pedestrians and
v. to provide adequate signage to indicate the shared cycle/pedestrian facility,
vi. accessways should also be designed using Crime Prevention through Environmental Design and should be conspicuous - Have good sight lines for passive surveillance from vehicular traffic, neighbouring properties and other road users.
vii. Fences adjacent to accessways should be less than 1.2m.
viii. provide a direct route,
ix. be well lit (in accordance with AS/NZS 1158.3.1),
x. be aesthetically pleasing using low maintenance surfacing,
xi. be designed to ensure high levels of community use.

A single removable bollard placed centrally must be erected at all intersections with public footpaths and streets.

Minimum pavement width for accessways must be 3.0 metres. The minimum width does not include stormwater channels. The design and construction of access ways must be as required for footpaths. Refer Clause 3.9.

Provision must be made for the collection and disposal of all stormwater from the paved surface so that the water is not discharged across any paved surface or into the adjoining lots.

3.18 Cycle Facilities

Cycle facilities must be selected according to Guide to Choice of Facility Type for Cyclists in Urban Areas from NZ Supplement to Austroads Part 14C Bicycles and designed according to MOTSAM, Traffic Control Devices Manual. If off-street cycle paths are warranted, specific design must be undertaken in collaboration with the Council and is subject to the Utilities Manager's approval.

Cyclists require a high level of protection when adjacent to parking. Cyclists face a risk of being undetected by reversing vehicles. Therefore, cycle facilities/ lanes located adjacent to parallel (0^o) angled parking spaces require clear space between the parked vehicles and cycle lanes, and the clear space must be provided in accordance with Table 3.13 below.

Table 3.13 Clear Space between Parked Vehicles and Cycle Lanes

Parking Angle	0^o	45^o	60^o	90^o
Minimum Spacing	1.0	2.0	2.5	3.0

A single removable bollard placed centrally must be erected at all intersections with public footpaths and streets.

Zero degrees parking: Cycle lanes next to parking should not use a "buffer strip" as suggested in GTEP Part 14 (Section 9.6.1.2) to separate cyclists from parked cars. Any extra width should be provided in the cycle lane.

Lower values for clear space (based on NZ Supplement to GTEP Part 14: Bicycles) can be adopted in low speed environments (85^{th} percentile speed of 40 km/h and below) and when it is not possible to achieve a wider cycle lane, subject to approval of the Utilities Manager.

3.19 Bus Bays

Where the Council identifies a requirement for Bus Bay(s) these must be constructed by the Developer in accordance with Standard Drawing 3.25 at location (s) to be determined by the Utilities Manager. The construction of these areas must be to a minimum design EDA of 2×10^6. Design plans and documentation are to be forwarded to Council as part of the engineering approval process.

3.20 Rural/Rural Lifestyle

3.20.1 General

All roads must be designed in accordance with NZTA State Highway Geometric Design Manual and Austroads Guide to Pavement Technology Part 2: Pavement Structural Design. Refer Standard Drawing 3.9.

3.20.2 Culverts

All culverts must be designed for the catchment area it serves in accordance with Section 6 – Stormwater Drainage of the Engineering Standards for Land Development.

The minimum nominal internal diameter for any road culvert and vehicle crossing is 300 mm. All culverts must extend an approved distance beyond the toe of the filling of the road construction and headwalls are to be built. Refer Standard Drawings 3.7.

Vehicle crossings culverts are to have certified slope ends similar to NZTA specifications if drain is less than 1m depth. Drains deeper than 1m must be subject to specific design.

3.20.3 Intersections

Refer Standard Drawing 3.3.

3.20.3.1 Kerb and Channel

Kerb and Channel in rural or rural/residential developments is required in the following circumstances:

- Where longitudinal vertical gradients exceed 1:10 kerb and channel will be required for stormwater control. This requirement also applies to right-of-way's.
- Where the road or accessway is adjacent to a cutting or embankment

3.20.4 Rural Road Drainage

Roadside drains (open drains) in profile must conform to Standard Drawings 3.7 and 3.8. The grade must be no flatter than 0.2% (1 in 500) and must be directed by enclosed piping into existing water courses or approved soak manholes. Enclosed piping is to extend to the bed of the existing water course, with a suitable rock mattress extending over the total stream bed in front of the outlet and sufficiently up the opposite bank to eliminate scouring. If possible, drains should discharge through a suitably sized RCRRJ pipe at the culvert headwall. Refer Standard Drawing 3.7.

3.20.5 Lighting

A flag light must be provided at the intersection of a proposed road and the intersecting road. The column and luminaire must be located so that both the intersection is identified by approaching traffic and that the traffic conflict area is illuminated. Refer Standard Drawing 3.26. Lighting must not exceed an output greater than 16,000lm and must be mounted at a height not less than 7 metres. Refer AS/NZS 1158.

3.20.6 Turning Areas

A minimum 10 metre radius turning area must be constructed to the same standard as the road pavement at the end of each road. Any alternative arrangement proposed must fully demonstrate the ability to accommodate turning manoeuvres of an 8m rigid truck for refuse and recycling collection services.

3.21 Access To Rear Lots

3.21.1 General

- All accessways to rear lots including those rear lots mentioned in Clause 3.21.2, 3.21.3 and 3.21.4 must be constructed and serviced for the full length of the access.

- In areas previously subdivided for residential purposes.
  i. Construction of a new accessway formation is not required if only one or two lots are to use an existing accessway and the accessway is acceptable in the opinion of the Utilities Manager, however vehicle crossings at the boundary are required.
  ii. Laying of services is required as for new allotments.
  iii. The number of lots using the access and/or services includes front lot with right-of-use over the access and/or right-of-use over the services.

- In all Rural/Rural Lifestyle Subdivisions:
  i. Construction of the accessway formation is generally not required if only one lot is to use the access and the access is acceptable in the opinion of the Utilities Manager, unless this is in a location where no other alternative is possible. In some instances, the terrain will dictate the need for an engineered access. Vehicle crossings are required at the boundary.
  ii. Laying of services within the allotment is required as for new allotments.
  iii. The number of lots using the access and /or services includes any front lot with right-of-way over the access and/or right-of-use over the services.

- The access must be wide enough at the street boundary to allow for the positioning of mail and mailboxes and vehicle passing. Passing bays must be constructed at the road boundary and as a minimum every 100 metres for accessways exceeding 100 metres in length for pavement widths less than 5.0 metres. Visibility between passing opportunities from bay to bay is required.
- Vehicle crossings must be provided between the boundary and the carriageway. Refer Clause 3.12.2.

3.21.2 Residential

i. For 2-3 Lots

Form, metal and surface carriageway with minimum width of 3.5 m for the full length of the shared accessway. Turning heads are not required in the common area where it can be shown that an adequate turning area is available within each lot. For examples of shared accessway refer to Standard Drawing 3.27. Turning area must be as per clause 3.16 Hardstand Areas.

ii. For 4-5 lots

Form, metal and surface carriageway with a minimum width of 5.0 m for the full length of access plus 1.0m berm/footpath. A manoeuvring maximum 3-point turning area in the common area must be provided of a size and in a location approved by the Utilities Manager. Refer Standard Drawing 3.23.

iii. For 6 lots and over

Specific design is required to the approval of the Utilities Manager.

3.21.3 Business and Industrial

i. For 1-4 Lots

Form, metal and surface carriageways with asphaltic concrete with minimum width of 6.0m. Footpath must be provided on one side where access is provided to more than one lot. Construction standards to be similar to carriageway construction for Industrial areas. Manoeuvring and turning areas for all vehicles are to be incorporated within each lot. Refer Standard Drawing 3.23.

ii. For 5 Lots and Over

Specific design is required to the approval of the Utilities Manager.

3.21.4 Rural/Rural Lifestyle

i. For 1 -2 Lots

The minimum width of the accessway reserve must be 8.0m. If necessary, the width must be increased to include cut and fill batters and roadside drainage. The compacted metaled width must be a minimum of 3.5m. For 2 Lots a minimum of two coat seal must be chip size Grade 3 and Grade 5. Services must be laid as required. Sight rails may be required at the entrance. Refer Standard Drawing 3.24.

ii. For 3-4 Lots

The minimum width of accessway reserve is 10.0m. If necessary, the width must be increased to include cut and fill batters and roadside drainage. The compacted metalled width must be a minimum of 5.0m. A minimum of two coat seal width of 3.5 metres must be placed centrally.

The two coat seal must be chip size Grade 3 and Grade 5. Sight rails may be required at the entrance. Refer Standard Drawing 3.24.

iii. For 5-7 Lots

Design and construction requirements to be in accordance with Table 3.1A.
The above minimum standards for residential, business, industrial, Rural Lifestyle and rural are to apply for the total length of the access.

3.21.4.1 Internal Access to Building Platforms

Where required by the Utilities Manager, access through an individual allotment to a building platform must be designed to comply with these standards.

3.22 Access Standards

3.22.1 (a) Position and Construction

All vehicle crossings and intersections must be positioned and constructed in accordance with instructions and specifications of, and to the satisfaction of, the road controlling authority.
NZTA is the road controlling authority for State Highway 1, 3, and 54 within the Council Boundaries, and retains control of the location, design and construction standards of crossing places and road intersections within these State Highways. NZTA will not allow the construction of any vehicle crossing or intersection if its location and use would be unsafe for vehicles using the highway. No crossing place or intersection onto a State Highway will be permitted unless:

i. The location and number of crossing places and intersections are determined so as to minimize the number of intersections, promote safe access to the State Highway, and avoid or minimize adverse effects on the safe and efficient operation of the State Highway;
ii. The property does not have reasonably practicable alternative legal access to some other road.

The District Council is the road controlling authority for all other roads in the Council area, which are not State Highways. The District Council retains control of the location, design and construction standards of crossing places and road intersections (where these are not State Highways)

NOTE TO PLAN USERS:
Notwithstanding this rule; the Council, as the Road Controlling Authority, requires the permission of the Utilities Manager, for any work to construct a vehicle crossing or intersection on all roads other than State Highways; and NZTA permission is required for any work to construct a vehicle crossing or intersection with a State Highway.

3.22.2 (b) Access on to Arterial Roads

Any access to a site or an activity on an Arterial Road (as defined in Appendix 3B of the District Plan) must be provided in accordance with the following standards:

i. Vehicles cannot reverse onto or off that road from any access to a loading or parking area, except where access is to a residential dwelling and the posted speed limit is less than 100km/hr;
ii. Site access must be formed to a maximum of 6 metres in width;

iii. The minimum site distances at intersections and accessways must be as recorded in Table 3.14 (illustrated in Figure 3.2) and measured in accordance with Figure 3.15.

iv. The minimum spacing between successive site accesses and intersections and the minimum distance between any access crossing and any intersection must be as recorded in Table 3.14 and measured in accordance with Figure 3.15.

Table 3.14 Minimum Distance for Permitted Access on Arterial Roads

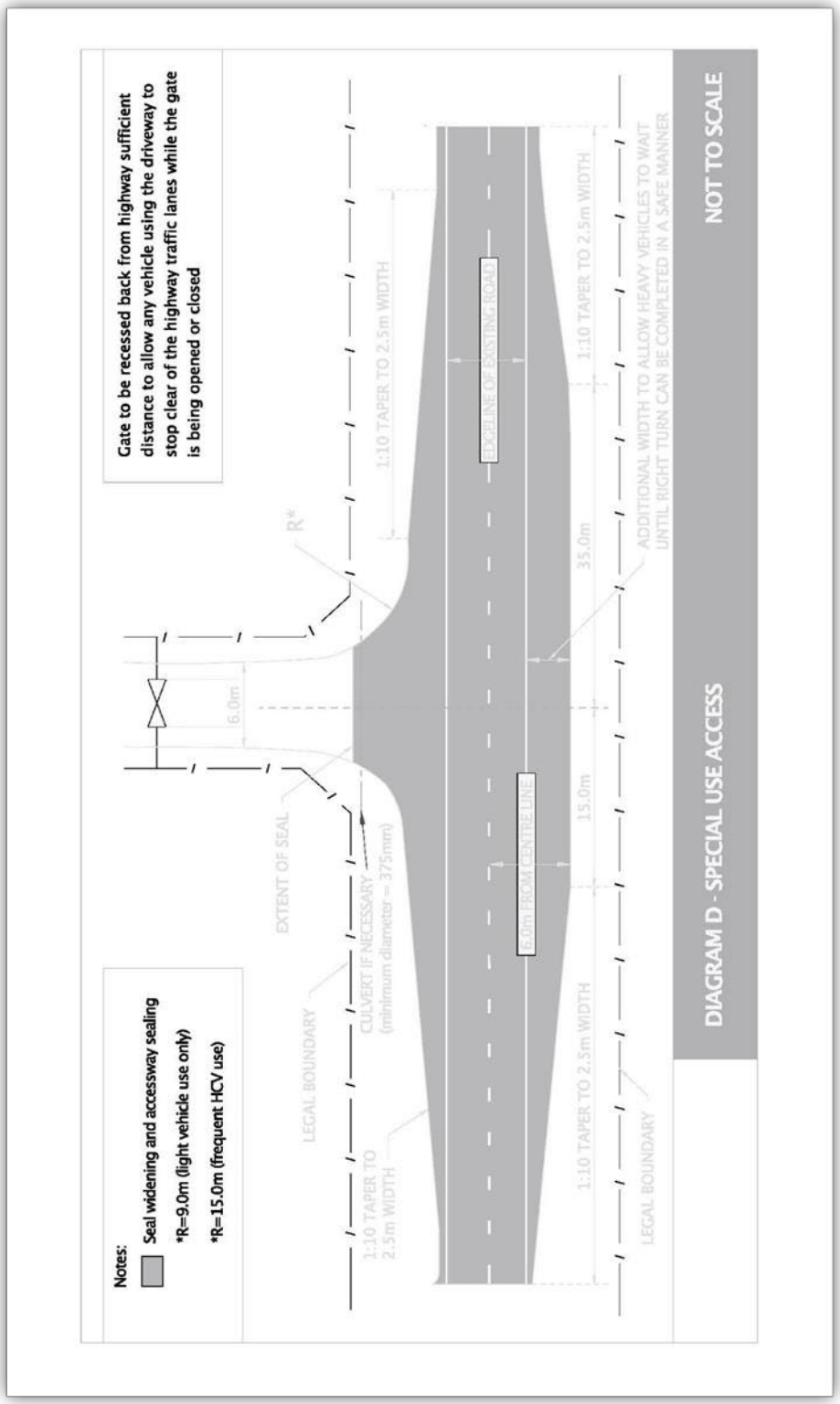
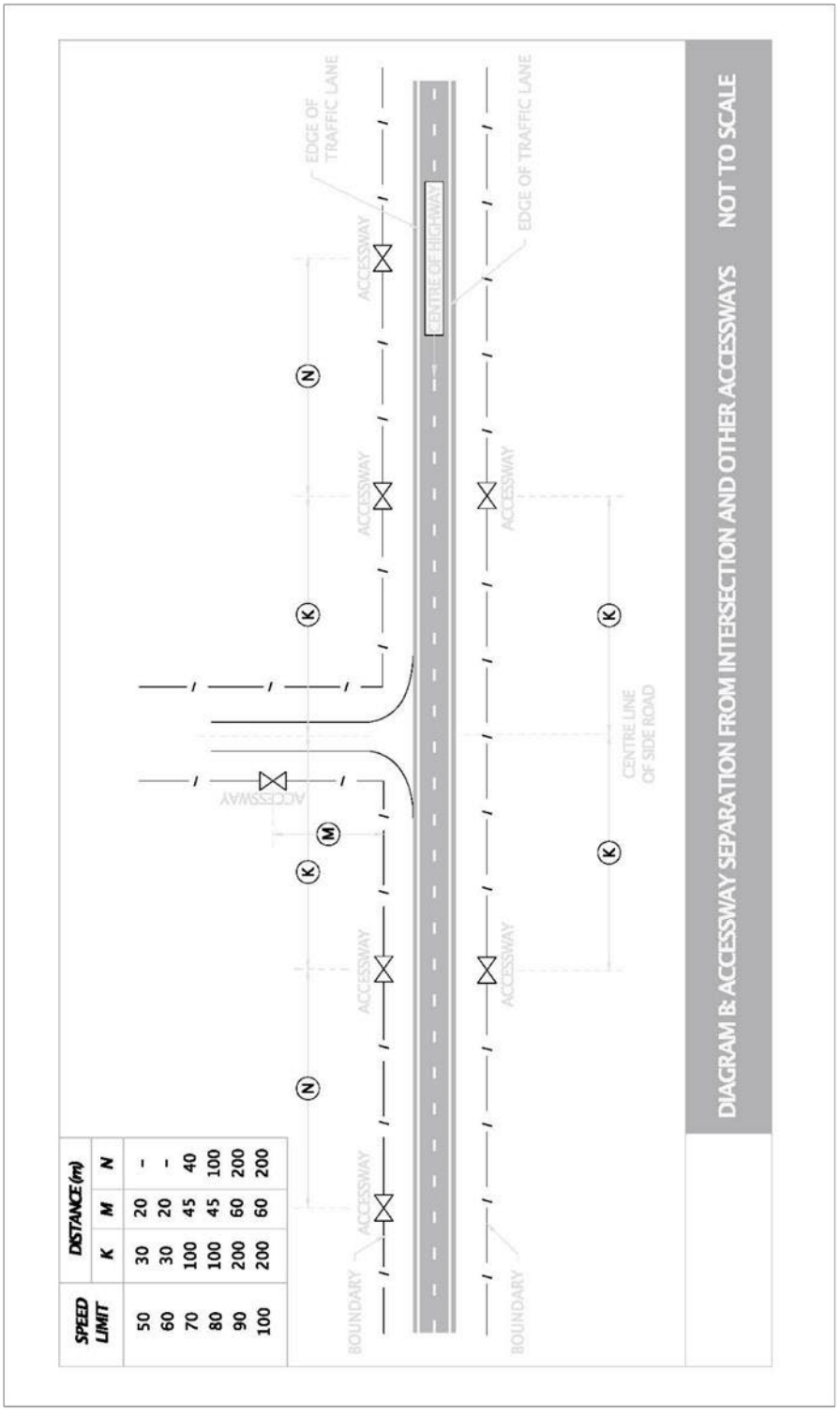


Figure 3.2 Minimum Distances for Permitted Access on Arterial and Principal Roads



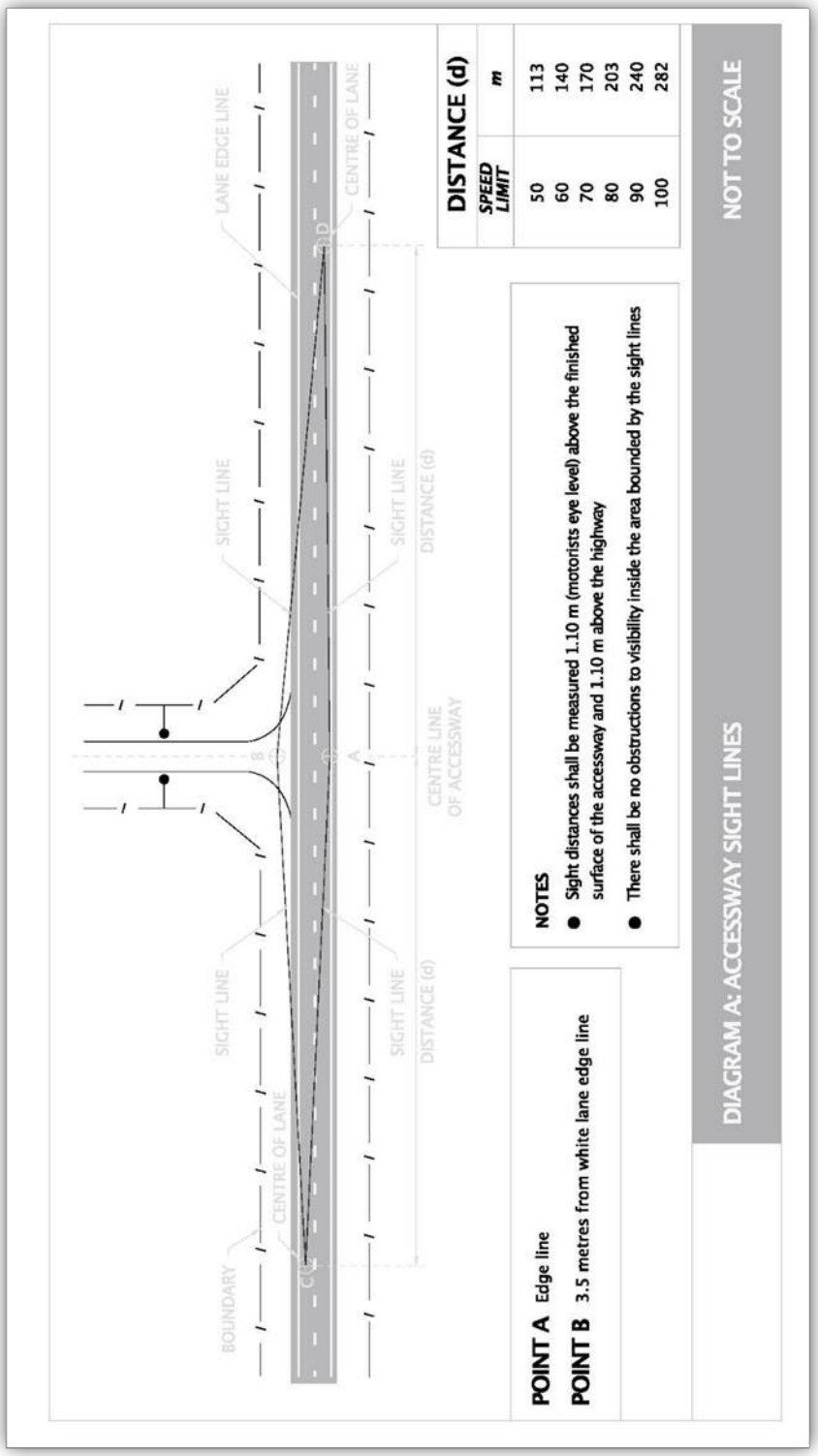
SPEED LIMIT	DISTANCE (m) K	M	N
50	30	20	-
60	30	20	-
70	100	45	40
80	100	45	100
90	200	60	200
100	200	60	200

3.22.3 (c) Access Standards in the Rural Zone

Any access to a site or an activity not covered by rules (b) above, and which is located in the Rural Zone, must be provided in accordance with the following standards:

i. Vehicles cannot reverse onto or off that road from any access to a loading or parking area;
ii. Site access must be formed to a maximum of 6 metres in width;
iii. No vehicle crossing must be located within a minimum distance of 10m from an intersection, measured in accordance with Figure 3.2;
iv. The minimum sight distances at intersections and accesses must be recorded as in Table 3.15, measured in accordance with Figure 3.15.

Table 3.15 Minimum Sight Distances for Permitted Access In The Rural Zone



3.22.4 (d) Access Standards In Zones other than the Rural Zone

Any access to a site or an activity not covered by the rules (b) and (c) above, and which is located in any zone other than the Rural Zone, must be provided in accordance with the following standards:

i. Where the site or activity is located in the Residential Zone and used for residential purposes:
   (a) One standard crossing of 3 metres width may be provided
   (b) No vehicle crossing must be located within 8 metres of an intersection, measured in accordance with Figure 3.2.

ii. Where the site or activity is located in an Industrial Zone
   (a) Where a site has frontage to one road, one-two way crossing of not more than 8 metres in width, must be provided;
   (b) Where a site has frontage to more than one road, one crossing of not more than 8 metres in width may be provided to each road. The minimum is one two-way crossing of not more than 8 metres in width to one road;
   (c) Where a site has a frontage length of more than 30 metres to a road, it may have two crossings of not more than 8 metres wide each to that road. As a minimum, one two-way crossing of not more than 8 metres in width must be provided to the road;
   (d) No vehicle crossing must be located within 20 metres of an intersection, measured in accordance with Figure 3.2;
   (e) The minimum distance between access crossings and an intersection with a Major Arterial, Minor Arterial or Collector Road must be as recorded in the third column of Table 3.14 (entitled “Other Roads (b)”), measured in accordance with Figure 3.2.

iii. Where the site or activity is located in an Industrial or Business Zone:
   (a) Where a site or Multiple Retail Development has frontage to one road, one two-way crossing of not more than 6 metres in width must be provided;
   (b) Where a site or Multiple Retail Development has frontage to more than one road, one crossing of not more than 6 metres in width may be provided to each road. The minimum is one two-way crossing of not more than 6 metres in width must be provided to the road;
   (c) Where a site has a frontage length of more than 30 metres to a road, it may have two crossings of not more than 6 metres in width each to that road. As a minimum, one two-way crossing of not more than 6 metres in width must be provided to the road;
   (d) No vehicle crossing must be located within 20 metres of an intersection, measured in accordance with Figure 3.2;
   (e) The minimum distance between access crossings and an intersection with a Major Arterial, Minor Arterial, or Collector Road must be as recorded in the third column of Table 3.14 (entitled “Other Roads (b)”) measured in accordance with Figure 3.2.

iv. Where the site or activity is not covered by standards (i), (ii), (iii) above:
   (a) Where a site has frontage to one road, one two-way crossing of not more than 6 metres in width must be provided;
   (b) Where a site has frontage to more than one road, one crossing, of not more than 6 metres in width, may be provided to each road (access from a dedicated service lane must be deemed to form one standard crossing). The minimum is one two-way crossing of not more than 6 metres in width to one road;

(c) Where a site has a frontage length of more than 30 metres to a road, it may have two crossings to that road providing one is for ingress and the other for egress only if not more than 6 metres in width each to that road. As a minimum, one two-way crossing of not more than 6 metres in width must be provided to the road;
(d) No vehicle crossing must be located within 8 metres of an intersection, measured in accordance with Figure 3.2
(e) The minimum distance between access crossings and an intersection with an Arterial, Principal or Collector Road must be as recorded in the third column of Table 3.14 (entitled "Other Roads (b)"), measured in accordance with Figure 3.2.

NOTE FOR PLAN USERS:
For the purposes of interpreting this Rule, vehicle crossing widths are measured at the property boundary.

3.23 Bridges And Culverts

All appropriate building and resource consents must be obtained.
Design is to be in accordance with the NZTA Bridge Manual.

3.24 Traffic Control And Calming Devices

All proposed traffic control and calming devices with and adjacent to the proposed development including, for example, intersection controls, road marking, chicanes and speed humps must be at the discretion of the Utilities Manager.

Council may request the specific traffic control and calming devices be included in the development.
Any traffic control or calming device approved by the Utilities Manager must be designed in accordance with the respective Austroads Guides and meet all regulatory requirements.
The Developer is responsible for all costs associated with any traffic control or calming device.

All signs and markings are to comply with MOTSAM and/or the Traffic Control Devices Manual.
Signs and markings are to be shown on the Engineering Plans submitted to Council.

3.25 Retaining Walls

All appropriate building and resource consents must be obtained.

3.26 Streetscaping (Residential)

3.26.1 General

As part of the development engineering approval process, the Developer must design and construct the following streetscape works:

i. Top soiling
ii. Grassing of Berms
iii. Median Strips
iv. Street Lighting
v. Street Name Plates

Where the development allows for street trees, the Developer must provide for the supply, planting and establishment of the street trees.

Should the Developer wish to plant street trees or install gardens prior to the commencement of building construction, the Developer must be responsible for both the maintenance and replacement of damaged and unhealthy trees and gardens until building construction has been completed throughout the development.

The horticultural streetscape works must be carried out in accordance with good management practices and to the approval of the Utilities Manager.

3.26.2 Grassed Berms

3.26.2.1 Topsoil

The Developer must provide and place good quality clean topsoil; free from silt, sand, stones, weeds, turf and any other foreign materials to all berm areas and median strips to be grassed. The finished level of all topsoil areas is to be level with their surrounding concrete works. The minimum depth of topsoil used for the berm construction must be 100mm. The whole surface must be lightly compacted to a uniform surface free from any stones and/or debris. Topsoil must be free of weeds, especially field horsetail and agricultural contaminated soil must be removed at the Developer's cost.

3.26.2.2 Grassing

Berms must be sown with a bird repellent coated grass seed mixture conforming to the following proportions: chewings fescue 50% and brown top 50%, at 35 grams per m2.
Areas of unsatisfactory grass strike must be resown as soon as practical after the problem becomes apparent.

The Developer must ensure that the grass grows at an acceptable rate and must provide fertiliser and water as necessary. All weeds are to be sprayed to ensure berm area does not become infested.
All berms must be mown when grass height is between 75 to 80mm. The Developer must mow the grass berms at least twice prior to final inspection.
Note: All works must be in accordance with the standards contained in the Council's Parks and Open Space Contract for mowing and spraying.

3.26.3 Median Strips

Median strips must be constructed in accordance with Standard Drawing 3.10.1. The width of the grassed area must be not less than 600mm. Topsoiling and grass requirements are to be similar to grassed berms. Median strips less than 800mm in width are to be concreted.
If a street tree is desired in the median strip the minimum strip must be no less than 1400mm.

3.26.4 Gardens

Topsoil and subsoil should only be removed, in instances where the ground media is not satisfactory to the Parks Asset Manager. There is no need to remove topsoil that is satisfactory in condition and structure.

Gardens at ground level, where the soil profile and quality has been assessed as suitable by the Parks Asset Manager should be cultivated to a depth no less than 450mm and backfilled with good quality clean topsoil free from weeds, silt, sand, stones, turf and any foreign materials. Gardens must be surrounded by a 20MPa concrete strip of 200mm wide and minimum depth of 150mm. The topsoil must be sufficiently compacted to ensure settlement does not occur. The finished level after compaction must be 100mm below the top of the concrete surround. Topsoil must be free of weeds, especially field horsetail and agricultural, contaminated soil must be removed at the Developer's cost.

Planting plans must be submitted and approved by the Parks Asset Manager prior to planting. Planting must fall within the following guidelines:

- All shrubs planted in areas at intersections, vehicle crossings or on an inside bend of a roadway must not exceed 600mm in height at full plant maturity.
- All trees must be planted no less than 40 metres from any intersection.
- The total garden surface area must be covered in clean bark mulch to a depth of 60mm. The finished level of the bark mulch must be 40mm below the top of the concrete surround.

3.26.5 Raised Garden

Raised gardens must be constructed of permanent materials and of a material type in keeping with other structural developments within the development. Garden walls must have a maximum height of 450mm and be filled with good quality, clean topsoil and free draining material. All gardens located within grass areas must be surrounded by a 200mm wide concrete mowing strip. Topsoil must be free of weeds, especially field horsetail and agricultural contaminated soil must be removed at the Developer's cost.

Raised gardens structures within 40 metres of intersections, between vehicle crossings or on an inside bend of a subdivision road must not exceed 300mm in height and the total height from base of structure to top of mature vegetation must not exceed 600mm. Design plans are to be submitted for approval as part of the consent process.

The proposed location, style and planting should be considered in accordance with the Road Planting Policy and Guidelines 2003 and submitted for approval by the Parks Asset Manager.

3.26.6 Street Trees

3.26.6.1 Tree Planting

Tree species and planting locations should be in accordance with the road Planting Policy and Guidelines 2003 and be approved by Council's Parks Asset Manager and Roading Manager.

3.26.7 Street Furniture

3.26.7.1 General

Street furniture must be designed so as not to obstruct visibility for vehicles, cyclists or pedestrians.

Street furniture design must be submitted for engineering approval as part of the consent process and the location approved by Council's Parks Asset Manager and Roading Manager.

3.26.7.2 Street Nameplates

The Developer must provide street nameplates. Product details and installation must be in accordance with Councils Policy for Road Naming. All street signs and nameplates must be installed by MDC's approved contractors.

3.27 Street Lighting

The Developer must provide and pay for the design and installation of streetlights in accordance with:

- AS/NZS 1158 Lighting for Roads and Public Spaces - Part 0: Introduction
- AS/NZS 1158 Lighting for Roads and Public Spaces - Part:1.1: Vehicular Traffic (Category V) lighting - Performance and Design Requirements
- AS/NZS 1158 Road Lighting - Part 1.3: Vehicular Traffic (Category V) lighting - Guide to Design, Installation, Operation and Maintenance
- AS/NZS 1158 Lighting for Roads and Public Spaces - Part 2: Computer Procedures for the calculation of Light Technical Parameters for Category V and Category P Lighting.
- AS/NZS 1158 Lighting for Roads and Public Spaces - Part 3.1: Pedestrian Area (Category P) Lighting - Performance and Design Requirements.
- AS/NZS 1158 Lighting for Roads and Public Spaces - Part 6: Luminaires

Only the following streetlight columns and/or luminaries are to be used in any development:

- CSP Pacific columns
- Schreder columns and luminaire units
- Kendelier column/luminaire units
- Windsor Heritage column/luminaire units
- Spun-lite and Gess columns
- Orangetek and Energy light luminaires
- Sasta LED – Betacom

Column specifics:

(i) CSP Pacific Columns
(ii) Spun-lite Poles Columns
(iii) Schreder Columns
(iv) Kendelier Columns
(v) Windsor Heritage Columns
(vi) Gess Columns
(vii) Steelgal Columns
(viii) Ibex Columns
(ix) Vicole Columns

All streetlight columns must be backfilled with approved granular backfill as per the streetlight column manufacturer's specification. Excavated material must not be used. "Rhino Lining" coating must be applied in accordance with manufactures instructions to the exterior of all columns and is to extend 100mm above ground level.

3.27.1 Design Criteria:

All street lighting designs and calculations are to be sighted and approved by Council prior to the installation of the street lighting. LED street lighting must be used in all new subdivisions/ development.

3.27.2 Lamp Specifics:

Only the highest efficiency LED luminaires are allowed.

3.27.3 Luminaire Specifics:

The luminaires are to meet the AS/NZS 1158.6 standard and are to be included and certified by the Auckland Transport Certification Board and the NZTA M30 Standard.

Only IP65+ ingress protection ratings are allowed.

3.27.4 Earthing

All steel street light columns must have a separate driven earth.
The following fusing/earthing system must only be used in any development:

- SL3 Street Lighting Cut Outs 25A, 240V AC

Any deviation from the standards requires approval from Council's Roading Manager and the design must be cognisant of the special landscape of the location.

3.27.5 Engineering Plans

Street Lighting must form part of the engineering approval process.

The following shall be submitted for approval with the engineering drawings:

1. The existing and proposed electrical load of the street lighting circuits
2. The lighting design details including lighting standard and category that the scheme has been designed to meet, mounting height, up cast, maximum spacings, lux lighting drawing showing hot and/or dark spots, and any non-complying portions or exceptions
3. A lighting schedule

A schedule shall be provided detailing the work required for each light, including:

- Light manufacturer, model and optic used
- Lamp manufacturer, type and wattage
- Pole manufacturer and type
- Mounting height
- Off set
- Any other equipment or work required to ensure a complete installation

Private roads/right of ways/access lots

Street lighting in subdivisions where roads are to remain private must be metered, have a separate ICP, and be independent from Council assets. The maintenance, operation, renewal and supply of power to the lights remains the responsibility of the individual property owners of the road/right of way/access lot. Section 224 certification does not include the handover of assets on a private road/right of way/access lot to Council unless specifically negotiated and sought before seeking resource consent approval.

Council has completed LED replacement of all street lighting on local roads. All road-lighting infrastructure shall comply with Council's current standard details and should be LED unless other wise approved by Council .

Street lighting Location

Street lighting location shall be in accordance with Plan 1.2

4. WASTEWATER DRAINAGE

4.1 Introduction

This section sets out standards and design criteria for wastewater drainage in land development. It is not for the purpose of designing these will require specific design of trunk mains, particular emphasis is placed in this section on measures to prevent stormwater inflow and ground water infiltration into the wastewater drainage system.

4.2 Objectives

The objectives of the design are to ensure that the wastewater system is functional and complies with the requirements of the Council's wastewater systems. In principle, the wastewater system must provide:

a. A single gravity connection for each property;
b. A level of service to the Council's customers in accordance with the Council levels of service;
c. Minimal adverse environmental and community impact;
d. Compliance with environmental requirements;
e. Compliance with statutory OSH requirements;
f. Adequate hydraulic capacity to service the full catchment;
g. Long service life with minimal maintenance and least life-cycle cost;
h. Zero level of pipeline infiltration on commissioning of pipes;
i. The minimisation of pipeline infiltration/exfiltration over the life of the system;
j. Resistance to entry of tree roots;
k. Resistance to internal and external corrosion and chemical degradation;
l. Structural strength to resist applied loads; and
m. 'Whole of life' costs that are acceptable to the Council.

4.3 Standards And Bylaws

The following Standards and Codes of Practice are referred to in this part. The design, materials and method of construction must comply with the Standards and Codes of Practice as applicable.
The Standards used must incorporate the latest amendments. Standards superseding those listed and the latest version must automatically apply.

AS/NZS 1260	PVC-U Pipes and Fittings for Drain, Waste and Vent Application
AS/NZS 1462	Methods of Test for Plastic Pipes and Fittings
AS/NZS 1546.1	On-site Domestic Wastewater Treatment Units – Septic Tanks
AS/NZS 4130	Polyethylene (PE) Pipes for Pressure Applications
BS2494	Specification. Materials for Elastomeric Joint Rings for Pipework and Pipelines
NZS 3107	Specification for Precast Concrete Drainage and Pressure Pipes
NZS 4402	Methods of Testing Soils for Civil Engineering Purposes
NZS 4404:	Land Development and Subdivision Infrastructure
NZS 4452	The Storage and Handling of Toxic Substances
NZS 7643	Code of Practice for the Installation of Unplasticised PVC Pipe Systems
NZS/AS 2033	Installation of Polyethylene Pipe Systems
NZS/AS 3725	Loads on Buried Concrete Pipes
WSA 02 2014	Gravity Sewer Code of Australia

WSA 04 2005 Sewerage Pumping Code of Australia
WSA 07 2007 Pressure Sewerage Code of Australia
Manawatū District Council Drainage By-law 2015 and any amendments.

4.4 General Requirements

The wastewater drainage system must be designed to serve the entire area of the proposed development, and other such areas that the Utilities Manager considers will be ultimately served by the wastewater drainage system, whether it be by gravity or pumping. The system must have a design life of at least 100 years.
Where provision is to be made for drainage of other areas, the Developer must be responsible for the construction and costs through to the boundary of the development.

4.4.1 Design Life

All wastewater systems must be designed and constructed for an asset life of at least 100 years, unless otherwise specified in the Manawatū District Council Layout.

The Wastewater system layout must ensure the following:

a. Access to all parts of the reticulation for inspection and maintenance. Manholes, access points and access chambers must be provided to ensure access to pipelines by modern equipment for CCTV inspection, water jetting, root cutting and grouting.

b. Safety of the wastewater system operators should be maximised.

c. The potential for infiltration and exfiltration must be minimised (e.g. minimise the number of manholes and access points).

4.4.2 Structure Plan

The MDC may provide a structure plan setting out certain information to be used in design, such as flows, sizing, upstream controls, recommended pipe layout, or particular requirements of the Council. Where a structure plan is not provided, the designer must determine this information by investigation using this Standard and engineering principles.

4.4.3 Layout

The Wastewater system layout must ensure the following:
Access to all parts of the reticulation for inspection and maintenance. Manholes, access points and access chambers must be provided to ensure access to pipelines by modern equipment for CCTV inspection, water jetting, root cutting and grouting.

4.4.4 Future Development

Where further subdivision, upstream of the one under consideration, is provided for in the district or regional plan, Council may require wastewater infrastructure to be constructed to the upper limits of the subdivision to provide for the needs of this development.
Additional, Council may require additional capacity to be provided in the wastewater system to cater for existing or future development upstream. Peak flows and cleansing velocities should be taken into account when designing for additional latent capacity.

4.5 System Design

4.5.1 Catchment Design

Pipes within any project area must be designed to be consistent with the optimum design for the entire catchment area and any future extension of the system must be accommodated. This may affect the pipe location, diameter, depth, and maintenance structure location and layout. Designers must adopt best practice to ensure a system with lowest life-cycle cost.

Pipes must be designed with sufficient depth and capacity to cater for all existing and possible development of the catchment. Where future extension of the pipe is possible, it may be necessary to carry out preliminary designs for large areas of subdivided and un subdivided land. This design must use safety factors defined by the Council for hypothetical subdivision and service for layouts to determine the necessary depth and diameter for an extension.

4.5.2 Extent of Infrastructure

Where pipes are to extend in the future, the ends of pipes must extend past the far boundary of the development by a distance equivalent to the depth to invert and be capped off, unless otherwise agreed to by the Council. This ensures that a future extension of the pipe does not require unnecessary excavation within lots or streetscapes already developed.

4.5.3 Topographical Considerations

In steep terrain the location of pipes is governed by topography. Gravity pipelines operating against natural fall create a need for deep installations which may require trenchless installation. The pipe layout must conform to natural fall as far as possible.

4.5.4 Geotechnical Considerations

The designer must take into account any geotechnical requirements determined under section 2 of this document.
The wastewater drainage system must be sized so as to convey the full wet weather flow without surcharging. The design must be based on the following criteria:

4.6 Flow Requirements

The wastewater drainage system must be sized so as to convey the full wet weather flow without surcharging. The design must be based on the following criteria:

4.6.1 Residential Flow

Pipeline flows must be based on allowing 2.9 persons per residential unit for the fully developed subdivision, subject to a minimum of 26 persons per hectare.

4.6.2 Business and Industrial Zones

Each development needs to be considered individually, with respect to employment and the likely mix between "wet" and "dry" sites. The current peak design flow for existing Business and industrial developments range from 30 000 to 100,000 litres/hectare/day.

4.7 Hydraulic Design

4.7.1 Design

The diameter and grade of the sewer must be selected to ensure:

i. that the pipeline has sufficient capacity to cope with peak wet weather flows.
ii. that velocities are sufficient to prevent siltation.
iii. that velocities are not sufficient to cause scouring.
iv. that the pipeline has been designed to cater for future extensions

4.7.2 Minimum Gradients

Minimum gradients to allow for self-cleansing of wastewater pipes must be as follows; however, these gradients may be varied in accordance with individual pipe manufacturers flow velocity assessments.

Table 4.1 Minimum Gradient

Nominal Bore	Grade	%
100 mm	1 in 80	1.25%
150 mm	1 in 150	0.67%
190 mm	1 in 220	0.45%
225 mm	1 in 260	0.38%
300 mm	1 in 390	0.26%

The pipeline within 100m of the upstream terminal manhole, or pipelines draining six or fewer allotments, must be laid at a grade of not less than 1:100.

4.7.3 Diameter

All sizes stated are nominal internal diameters.
No pipe intended to become a public wastewater drain must be less than 150 mm nominal diameter.

4.7.4 Loading

Diameters and gradients of pipes greater or equal to the loadings shown below may be adopted without specific design.

Table 4.2 Minimum Pipe Diameters

Gradient	Maximum number of dwelling units		
	150 mm nominal bore	190 mm nominal bore	225 mm nominal bore
1 in 100	320	600	970
1 in 120	300	540	890
1 in 150	280	500	800
1 in 200		450	710
1 in 260			600

4.7.5 Velocities

The minimum design velocity at full flow is 0.7 m/s to minimise sedimentation, and the maximum design velocity to prevent scour is 3.0 m/s.

4.8 Structural Design

4.8.1 Design

All pipelines must be designed in association with their bedding and backfill to have sufficient strength to safely support the loads normally imposed upon them, including construction loadings. The design must be in accordance with AS/NZS 2566.1, or AS/NZS 3725, including the structural design commentary AS/NZS 2566.1 Supplement 1. Details of the final design requirements must be shown on the drawings. All pipes and structures must be designed with adequate flexibility and special provisions to minimise risk of damage during earthquakes.

4.8.2 External Forces

The external forces to be taken into account must include:

i. Trench fill loadings (vertical and horizontal forces due to earth loadings);
ii. Surcharge;
iii. Groundwater;
iv. Dead weight of the pipe and the contained water;
v. Other forces arising during installation;
vi. Traffic loads;
vii. Temperature (expansion/contraction).

The consequences of external forces on local supports of pipelines must also be considered.

4.8.3 Bedding

The type of bedding and class of pipe must be in accordance with the pipe laying tables and bedding diagrams in NZS/AS 3725 - Loads on Buried Concrete Pipes. Requirements for PVC pipes must be in accordance with NZS 7643 - Code of Practice for the Installation of Un-plasticised PVC Pipe Systems, and with the pipe manufacturer's guidelines. Under normal conditions, compacted granular bedding must be used as shown in Standard Drawing 4.1,4.1.1, 4.1.2. Bedding and trench details must be shown on the Engineering Plan.

Maximum and minimum permitted trench widths are shown on Standard Drawing No. 4.1, 4.1.1 and 4.1.2.

4.8.4 Cover

Minimum cover above the crown of the pipeline must be as follows:

Table 4.3 Minimum Cover

Location	Minimum Cover (mm)
Roads, berms, accesses and parking areas	900*
All other areas	750

*During construction, pipework may require ramped metal protection

Where it is not possible to achieve minimum cover requirements, an approved protection system to the satisfaction of the Utilities Manager must be installed above the pipework.
When pipeline gradients exceed 20% (1 in 5), a cement bonded bedding and anti-scour blocks placed at 6.0 metre intervals midway along a pipe must be provided. As shown in Standard Drawing 4.2.

4.9 Pipework

Rubber rings or welded jointed pipes that comply with the following standards are acceptable. (Latest version standards to apply.)

i. Concrete pipes to NZ 3107
ii. PVC pipes to AS/NZS 1260 (Minimum Grade SN8)
iii. PE pipes to AS/NZS 4130
iv. Other pipe types, e.g. epoxy lined steel, may be considered for specific applications.

All pipework used in sewer reticulation must have flexible joints. Rubber rings complying with BS 2494 are acceptable.

4.9.1 Pipe Selection of Special Conditions

Pipeline materials and jointing systems must be selected and specified to ensure:

i. Structural adequacy for the ground conditions and water temperature;
ii. Water quality considering the lining material;
iii. Compatibility with aggressive or contaminated ground;
iv. Suitability for the geotechnical conditions;
v. Compliance with the Council's requirements.

4.10 Infiltration Control

4.10.1 Mains, Laterals, Manholes and Pumping Stations

All wastewater drainage including mains, laterals, manholes and pumping stations must be constructed so as to prevent the inflow of stormwater, groundwater infiltration and any root penetration.

All joints in manhole structures must be sealed using appropriate sealing systems. No visible infiltration through manhole walls or floors will be permitted.

4.10.2 Abandoned Laterals, Mains and Other Structures

Existing laterals, mains and other structures that are abandoned during construction must be completely sealed off to prevent infiltration into the wastewater drainage system. Laterals must be sealed as close to the main as possible or as required by the Utilities Manager.

4.10.3 Uncompleted Pipework and Structures

While construction of a new wastewater drainage system is underway, the pipeline at the lower end must be effectively plugged to prevent ingress of stormwater into the main network from uncompleted pipework and structures.

4.11 Pipe Laying and Testing

4.11.1 Pipeline Location

Wastewater pipelines must be sited in accordance with the standard position allocated by the Council. Refer Standard Drawing 1.2.
Pipes should be positioned as follows:

a. Within the street to alignments set out in this standard
b. Clear of carriageways and access points where possible; is preferred;
c. Within public land with the permission of Council;
d. Within reserves outside the 1 in 100-year flood area;
e. Where possible, not within private property;
f. Within private property parallel to front, rear, or side boundaries.

NOTE: It is Council's preference for public pipes to be contained within public land as far as possible. Where necessary for public pipes to enter private land, easements must be provided.
Wastewater drainage pipelines must not be laid in the same trench as stormwater drainage or water mains. Service pipes and services in access ways may be laid in a common trench provided the required clearances between services are maintained (Table 4.4).

Table 4.4 Clearances between wastewater pipe and other underground services

Utility (Existing service)	Minimum horizontal clearance for new pipe size ≤DN 300 (mm)	Minimum Vertical clearance(1) (mm)
Gas mains	300(2)	150
Telecommunication conduits and cables	300(2)	150
Electricity conduits and cables	500	225
Drains	300(2)	150
Water mains	1000(3)/600	500

NOTES:

1. Vertical clearances apply when wastewater pipes and other underground services cross one another, except in the case of water mains when a vertical separation must always be maintained, even when the wastewater and water main are parallel. The wastewater pipe should always be located below the water main to minimise the possibility of backflow contamination in the event of a main break.
2. Clearances can be further reduced by 150mm for distances up to 2m when passing installations such as poles, pits, and small structures, providing the structure is not destabilised in the process.
3. When the wastewater pipe is at the minimum vertical clearance below the watermain (500mm) maintain a minimum horizontal clearance of 1000mm. This minimum horizontal clearance can be progressively reduced to 600mm as the vertical clearance increases to 750mm.

Pipelines 300mm or over internal diameter are classified as trunk mains with connection permitted only at manholes. Where a trunk main passes along the frontage or through a subdivision, rider mains will be necessary to facilitate individual lot wastewater connection.

All new public drainage pipes including wastewater must be laid in Council controlled land. Existing services are to be protected via a 3m (min) wide easement in gross, vested in Council. Manhole structures must be placed centrally within the easement.

The Developer is to identify all drainage systems in the Development Concept Plan that are proposed to be located other than the road reserve.

4.11.2 Pipe Laying

All pipelines must be laid in accordance with the manufacturer's instructions, and to the appropriate standard.
NZS 7643: Code of practice for the installation of un-plasticised PVC pipe systems.
AS/NZS 2033: Installation of polyethylene pipe systems.
Backfill for pipes must be as shown on Standard Drawing No. 4.1, 4.1.1 and 4.1.2.
Connections to the existing wastewater drainage system must be carried out by an approved person under the supervision of the appropriate Council staff.

4.11.3 Trenchless Technology

Trenchless technology may be preferable or required by Council as appropriate for alignments passing through or under:

a. Environmentally sensitive areas;
b. Built-up or congested areas to minimise disruption and reinstatement;
c. Railway and major road crossings;
d. Significant vegetation;
e. Vehicle crossings.

Refer to NZS4404:2010 for further guidance.

Further information on trenchless technologies may be found in 'Trenchless technology for installation of cables and pipelines' (Stein), 'Trenchless technology – Pipeline and utility design, construction and renewal' (Najafi), and 'Guidelines for horizontal directional drilling, pipe bursting, micro tunnelling and pipe jacking' (Australasian Society for Trenchless Technology).

4.11.4 Marking Tape or Pipe Detection Tape

Appropriate marking tape or detection tape must be installed at the top of the embedment zone, or tied to the pipe during HDD, to aid future location of the pipe. Refer to AS/ NZS 2032 section 5.3.15 and figure 5.1.

4.11.5 Ends of Pipe

All sewers will terminate at a manhole. Approval may be granted to terminate the line at a blank plug if it is clear that construction of the upstream stage of the development is imminent.

4.11.6 Pipe Testing

4.11.6.1 General

All wastewater drainage mains and laterals must be tested for leakage and other defects. Air testing will generally be acceptable, although water testing may be required in certain circumstances or at the discretion of the Utilities Manager. Testing requirements for PVC pipes will be in accordance with AS/NZS 1462 Methods of test for plastic pipes and fittings.

Pressure testing must be carried out either during or before the Practical Completion inspection.

Pipe joints and end caps must be left exposed to facilitate observation. End caps at the property boundary must be fixed to the pipe. The Developer must provide all necessary testing equipment.

4.11.6.2 Air Testing

The test pressure must be 20kPa. For acceptance, the pressure must not fall below 17kPa over a 10 minute period.

4.11.6.3 Water Testing

Where required, water testing will be in accordance with:

a. Concrete and Ceramic Pipes - NZS 4452
b. PVC Pipes - NZS 7643

4.11.6.4 Closed Circuit Television (CCTV) Inspection

All pipelines proposed to become public drains are to be CCTV surveyed after all other works have been completed. CCTV inspections are to be undertaken in accordance with recommendations contained in the New Zealand Water and Wastes Association (NZWWA) Pipe Inspection Manual – May 2006.

4.12 Manholes

4.12.1 Location

Manholes or other approved maintenance structures are required on pipelines at the head of the line, at changes of gradient, at changes of direction, at changes of pipe size, at the junctions of all pipelines in excess of 100mm diameter and at a spacing of up to 120m on straight lengths and at the discharge of a pressure main into a gravity pipe. Manholes and other maintenance structures should be located clear of carriageways and access points where possible and generally a minimum clearance of 1.0m should be provided around maintenance structures and MH's. Refer to NZS4404 for a list of acceptable MH's, Maintenance Structures and Terminal Maintenance Shafts.

4.12.2 Construction

Manholes must be constructed fully sealed using a plastic lined precast concrete, plastic or MDPE base and precast concrete, plastic or MDPE manhole risers. Single flexible joints to be provided within 750mm of manholes upstream and double flexible joints to be provided within 750mm downstream of the manhole. Refer Standard Drawings 4.3. A circular manhole with minimum internal diameter of 1050mm must be used for pipes up to 600mm dia. Where manholes are more than 5.0m deep they must be specifically designed to incorporate an intermediate landing platform or grill in order to prevent a free fall of more than 3.0m.

All manholes must have heavy duty lids fitted with heavy duty frames and covers.
Where different sizes of pipes are built into a manhole their soffits be at the same level.
All manholes will be haunched as shown on Standard Drawing 4.3. Step irons must be used in manholes where depth to invert is less than 5.0 metres. Where the depth to invert is greater than 5.0 m then a ladder is required.

Landings must be specified in manholes where the depths to invert exceeds 5.0m. The level of the top of the landing must be at least 2 m above the haunching level.

The grade across the invert of a manhole must not be less than the general grade of the sewer. Where a wastewater pipeline changes direction, a minimum additional fall must be provided as follows:

Table 4.5 Minimum Additional Fall due to Change in Direction

Change of Direction	Additional Fall
5° - 15°	25 mm
15° - 60°	50 mm
60° - 90°	75 mm

The grade of the incoming pipes must be similar to the invert of the manhole. Drop manholes will only be approved in exceptional circumstances and at the discretion of the Utilities Manager.
All joints between precast sections including the joint with the concrete lid must be sealed with an approved flexible sealant.

4.12.3 Flotation

In areas of high water table, all MHs must be designed to provide a factor of safety against flotation of 1.25.

4.12.4 Testing

Water testing must be required on all manholes. The test must be over 4 hours continuously and the drop in water level must not exceed 10mm over a one hour period. Manholes are to be rectified where water loss exceeds 10mm per hour and retested.

4.13 Lateral Connections

Each lot of a residential, business and industrial subdivision must conform to the following:

4.13.1 Lateral

a. Be served by a minimum 100m ID lateral connection, or larger connection if design warrants to the wastewater drainage system;
b. The connection must be located at least 1m inside the lot boundary and be at such a level that wastewater can be discharged to it by gravity from any part of the building area of the lot, allowing for 500mm (min) cover. Where the public pipeline runs through subdivision lots, the end of the lateral connection to the lot must be at least 1.0m from the pipeline;
c. An approved plug, or cap of appropriate material must be installed on any inspection pipe and on the last pipe of the lateral connection and securely fastened;
d. A 75mm x 50mm marker painted red/brown must extend from the top of the pipe to at least 300mm above ground level at the point where each lateral terminates;
e. An "L" must be cut into either the face of the kerb at a position "square off" the end of the lateral or into the top of the nib directly above the lateral;
f. Where the length of a lateral connection exceeds 6m from the public main to the boundary, the first pipe off the wastewater main must be an inspection pipe.

4.13.2 Connections

a. Front lots on each side of an access may be connected to the wastewater drainage system in the access, provided the necessary easements are granted;

b. If a corner residential lot is capable of having two dwelling units built on it, then a lateral on each frontage is required;
c. Rear lots must be serviced by a connection terminating in the main body of the lot and not at the road boundary;
d. Up to two residential lots, with a maximum potential of 20 persons, may be serviced by a single lateral of 100m ID. This lateral must be laid in the access way or other location approved by the Utilities Manager and must have an inspection chamber or manhole at each junction and at the head of the line. Separate 100m ID laterals must be provided to each lot, with each lateral covered by an easement, if required.
e. Business and industrial lots must be provided with individual laterals appropriately sized and to the approval of the Utilities Manager;
f. All connections are to be, and remain, easily accessible for future maintenance.

4.13.3 Inspection

The Utilities Manager reserves the right to require any connections within the road corridor to be inspected prior to backfilling. All laterals required in a development must be completed before the Final Inspection.

4.14 Pump Stations

4.14.1 General

The Developer must include pumping station details in the Development Concept Plan. Pumping must only be approved in exceptional circumstances. Where it is considered necessary to service lots by pumping the following must apply:

a. Where six or more residential lots are to be serviced the pumping station will be maintained by Council on completion of the defects liability period. Refer Standard Drawing 4.6.
b. Where there are less than six lots to be serviced, a pressure lateral must be installed to each lot. Design to be approved by Manawatū District Council.
c. All pump station details including drawings, pump station design calculations, system curve control levels, station capacity and pump sets selected are to be provided as part of the engineering approval process for the development.
d. The pump chamber will be lined with an approved epoxy coating to a level 500mm above the normal operating levels to prevent sulphate attack.
e. Adequate ventilation must be provided to the wet well via a bark filter (or similar).

4.14.2 Public Pumping Stations

4.14.2.1 Pumps

Each station must be provided with a minimum of two pumps, each capable of pumping the full wet weather flow (WWF) for the area served. All pumps must be automatically operated. The pumps and controls must be specified by the Utilities Manager so as to retain compatibility with existing infrastructure.

4.14.2.2 Storage

A minimum four (4) hour period of storage capacity equivalent to 2 x DWF above the high level alarm level must be provided for. Manholes and sewer mains up to the overflow invert level may be included as storage volume. Cut in, cut out levels must be set to minimise retention times without exceeding the manufacturers recommended number of starts per hour for one pump.

4.14.2.3 Valves

All pumping stations must be capable of being isolated from the incoming sewer(s). Where possible the isolating valve is to be positioned within the pump station chamber or immediately adjacent to it. If this is not possible, the isolating valve must be located in the first manhole upstream of the pumping station. Each pump set discharge pipe must have an isolating valve and a non-return valve located in a separate or integrated valve pit.
A knife gate isolating valve must be used. This valve must have a non-rising, flanged and extension spindle, and a valve key which allows the operation of the valve from the top of the pumping station.

4.14.2.4 Telemetry

A telemetry link compatible with the Council's telemetry system must be installed to provide alarm and operational data to the Council's master unit. The transmitter unit must be capable of operation from the supply provided in the cabinet. The range of data to be included in the telemetry system must be approved by the Utilities Manager prior to installation.

4.14.2.5 Siting

Public pumping stations must be sited on a separate lot in the development. The site must provide for both sufficient vehicle access from the street and maintenance work area. Onsite parking must be provided for service vehicles adjacent to the wet well and clear of public areas. Both the vehicle access from the kerb to the boundary and internal access and the work maintenance area is to be concreted with 20Mpa, 150mm thick with one layer of 665 mesh placed centrally. The perimeter of the site is to be fenced with 1800mm high security fencing with 3.0 metre wide lockable security gate. The remainder of the site that is not concreted must be grassed.

4.14.2.6 Water Supply

A 25mm water supply outlet fitted with an approved backflow preventer must be provided to the immediate vicinity of all pumping stations.

4.14.2.7 Rising Mains

Rising mains must be designed and constructed to the same standards as potable water pressure mains. The design criteria for sizing the pump discharge pipework is as follows:

i. Pipework diameter must be equal to or larger than the sphere clearance of the pump. The minimum diameter is 100 mm.
ii. Pipework diameter must be large enough to cater for the future capacity of the pump station.
iii. Pipework velocities for both initial and future flows must be within the range of 1 m/s - 3 m/s.
iv. Approved air valves must be installed at all high points on the rising mains.
v. Be evenly graded between high and low points
vi. Scour/drain valves installed at low points
vii. Each discharge pipe must incorporate an isolating valve and a non-return valve located upstream of the isolating valve.

Retention times within the rising main must be less than 8 hours.

4.14.3 Commissioning

a. The contractor must undertake the complete testing, pre-commissioning of the electrical and telemetry equipment installed by the contractor.

b. Commissioning of the works must be coordinated by the contractor.
c. The works will be commissioned by operating the installation and simulating failures of all sensed conditions and demonstrating that the control system in accordance with the specified requirements.
d. Advise the engineer two weeks prior to the expected pre-commissioning date and cooperate with the engineer or nominated representative to allow witnessing of the tests.

4.14.4 Regulations

4.14.4.1 Permits, Fees and Compliance

a. The subcontractor must obtain, keep up to date and pay for all permits and fees arising from the above requirements. Comply with statues, regulations in accordance with the ECP's and NZ/AS 3000.
b. Supply a Certificate of Compliance at the completion of the contract and meet all associated costs for supply C.O.C and inspection costs.

4.14.5 Documentation

4.14.5.1 Records

a. Make a record of all plant and equipment settings, normal motor running currents, level sensor setting and the like.
b. The record must be in the format of a schedule, which lists plant duty and commissioning information against plant item numbers and descriptions to enable plant items to be identified on the maintenance drawings.
c. Copies of the commissioning records must be included in the maintenance manuals.

4.14.5.2 Software Backups

a. Two backup disks must be provided. The Council's copy to be installed on site in a disk box attached to telemetry cabinet door, one copy to go to Councils electrical maintenance contractor
b. A laminated copy of the back-up management procedure is to be fixed to the telemetry cabinet door.

4.14.5.3 Operation And Maintenance Manuals

- An operation and maintenance manual must be produced for the new pump station.
- Drawings must be provided showing dimensional details including pump clearances. Such drawings should be CAD quality and must be available on Disc or CD Rom format.
- The Maintenance manual must incorporate the Electrical Control Manual supplied by the Contractor.
- Include the Telemetry connections on the as built drawings.
- Provide two copies of the electrical circuit drawings, equipment specifications, manufacturers information, installed settings and commissioning results. Note: All control drawings must be completed with identified control cables and control conductors.
- Provide and permanently install inside the cabinet door a laminated copy of the Operation and Maintenance manual
- Supply two copies of the PLC, and MRI software on disc to the Engineer. Software copies to be included with the as built drawings, one copy to be housed in a disc protection box in the pump station.

4.14.6 Guaranties

- The Contractor must guarantee the whole of the electrical equipment for a period of one year.
- The Contractor must supply warranties to this effect.
- The Contractor will operate the pump station through the maintenance period of six months.

4.14.7 Private Pumping Facility

Where development is approved to allow private pumping facilities, each residential lot must have its own pumping facility placed within the allotment.

The Utilities Manager must require that a consent notice be registered against the title of the property stating that a private pumping facility is required for connection to the public wastewater drainage system.

Connection to the wastewater network must require a connection chamber at the head of the rising main to the approval of the Utilities Manager.

4.15 Alternative Disposal

All onsite disposal systems must be specifically designed to suit the location. All designs must be in accordance with Horizons Regional Council's document 'On-site Wastewater Systems, Guidelines for the Manawatū-Wanganui Region'.
The Developer must advise of the requirements including initial design criteria and site suitability to use onsite disposal systems at the time of submitting the Development Concept Plan. Detailed design plans must be submitted for engineering approval. All systems will require the approval of the Utilities Manager.

5. WATER SUPPLY

5.1 Introduction

Section 5 will apply to all residential zones and other zones within the District which have a public water supply. The Developer must meet the following requirements:

- The Code of Practice for Fire Fighting Water Supplies
- Manawatū District Council Water Supply By-Law 2015-2016 and any amendments
- Manawatū District Council District Plan

5.2 Objectives

The objectives of this section are to:

Ensure that the water reticulation system is functional and that the required quality and quantity of water is supplied to all customers within the Councils designated water supply area, and that the Councils requirements are satisfied. In designing a water reticulation system, the designer must take into account:

A. The Councils policies, customer charters, and contracts;
B. The hydraulic adequacy of the system;
C. The ability of the water system to maintain acceptable water quality;
D. The structural strength of water system components to resist applied loads;
E. The requirements of SNZ PAS 4509;
F. Environmental requirements;
G. The environmental and community impact of the works;
H. The 'fit-for-purpose' service life for the system;
I. Optimising the 'whole-of-life' cost; and
J. Each component's resistance to internal and external corrosion or degradation.

The design must ensure an acceptable water supply for each property including fire flows, depending on Council's Water Supply Bylaw, Water Supply Asset Management Plan (AMP), any conditions of consent on Council's water intake and any other relevant Council Policy by providing either:

A. A water main allowing an appropriate point of supply to each property; or
B. A service connection from the main for each property.

5.3 General Requirements

Design and construction of the water system must be in accordance with NSZ 4404:2010 except where modified by the provisions of these Standards, and must be such that a water supply connection can be readily provided to each allotment.

The Developer must provide mains and services to each residential, business or industrial lot. Where new connections off an existing main are required, the Developer must pay for the application fee, physical construction, pressure test, disinfection (including lab test) cost for new connections, including backflow prevention facilities, valves, manifolds and meters if applicable. Where an existing water service passes through any new lot being created, the Developer must provide and pay for a new service located in a position approved by the Manager.

Any existing water pipe (for example to a hose tap or detached building) crossing any proposed boundary between lots must be disconnected by the Developer.

The connection of new works to an existing water supply reticulation must be carried out by an approved waterworks contractor at the developers cost. A list of the approved waterworks contractors is available from the Council.

5.4 Manawatū District Standards

The following Standards and Codes of Practice are referred to in this part. The design, materials and method of construction must comply with these Standards and Codes as applicable.
The Standards used must incorporate the latest amendments. Standards superseding those listed and the latest version must automatically apply.

AS1628	Water Supply – Metallic Gate, Globe and Non-Return Valves
AS 1831	Ductile Cast Iron
AS 3571/AS 3572	Glass Filament Reinforced Thermosetting Plastics (GRP) Pipes – Polyester Based – Water Supply, Sewerage and Drainage Applications
AS/NZS 1477	PVC Pipes and Fittings for Pressure Applications
AS/NZS 2280	Ductile Iron Pipe and Fittings
AS/NZS 2566	Buried Flexible Pipelines – Structural Design and Installation
AS 2638	Sluice Valves for Waterworks Purposes
AS/NZS 4087	Metallic Flanges for Waterworks Purposes
AS/NZS 4129	Fittings for Polyethylene (PE) Pipes for Pressure Applications
AS/NZS 4130	Polyethylene (PE) Pipes for Pressure Applications
AS/NZS 4131	Polyethylene (PE) Compounds for Pressure Pipes and Fittings
AS/NZS 4158	Thermal-bonded Polymeric Coatings on Valves and Fittings for Water Industry Purposes
AS 4441	Blue series 2, Polyvinylchloride Oriented (PVC-O) pipe for Pressure Applications
NZS 4442	Welded Steel Pipes and Fittings for Water, Sewage and Medium Pressure Gas Applications
AS/NZS 4765	Modified PVC (PVC-M) Pipes for Pressure Applications
AS/NZS ISO9001	Quality Management Systems - Requirements
BS 381 C	Specification for Colours for Identification, Coding and Special Purposes
SNZ PAS 4509	Code of Practice for Firefighting Water Supplies
NZS 4404	Land Development and Subdivision Infrastructure
NZS 4442	Welded Steel Pipes and Fittings for Water, Sewage and Medium Pressure Gas
NZS 4501	Code of Practice for the Location Marking of Fire Hydrants
NZS 7643	Code of Practice for the Installation of unplasticised PVC Pipe Systems
NZS/AS 2033	Installation of Polyethylene Pipe Systems
NZS/AS 2638	Gate Valves for Waterworks Purposes – Resilient – Seated
NZS/AS 4087	Metallic Flanges for Waterworks Purposes
AS/NZS 4793	Mechanical Tapping Bands for Water Works Purposes, (for PVC-O pipes)
AS/NZS4998 and WA 105	Unrestrained Mechanical Couplings for Water Works Purposes.
NZS/BS 750	Specification for Underground Fire Hydrants and Surface Box Frames and Covers
NZS/BS 5154	Specification for copper alloy globe, globe stop and check, check and gate valves
AS 2544	Grey iron pressure pipes and fittings
WSA107.2001	Tapping bands

5.5 Design Requirements

The reticulation design must conform to the current Code of Practice for Fire Fighting Water Supplies.

The reticulation must be in accordance with NZS 4404 except where modified by the provisions of these Standards, and must be such that a water supply connection can be readily provided to each allotment.

Design and working delivery pressures including variations in pressure must be in accordance with the set in the current Water Supply Plan (above 250kPa and below 800kPa).
The water demand for business and industrial areas or for irrigation must be analysed and specifically allowed for in the design. Assessed flows are to be to the approval of the Utilities Manager. Such uses constitute extraordinary supplies as defined in the Water Supply By-Law and any amendments. The provision of initial or continuing supply is at Council's discretion.

Council may provide details of the working pressure or pressures at the point or points of connection to the existing reticulation, in which case these may be used for design purposes. The Developer must provide calculations to demonstrate how the water main sizes as proposed on the engineering plan have been determined.
All pipe sizes are nominal internal diameter (DN), unless specified otherwise. The reticulation must have a design life of at least 100 years.
The minimum pipe size for all watermains must be 150mm diameter.

5.6 System Design

5.6.1 Network Analysis

Where required by the Council, a network analysis of the system must be undertaken. The system must be analysed using a mathematical model of the network to ensure adequate water supply is available to all consumers connected to the system for all defined models of operation. The analysis must include all elements within the system and must address all demand periods including peak demand, low demand flows, and fire flows.

The demand (for public water supply) for business and industrial areas or for irrigation must be analysed and specifically allowed for in the design. Assessed flows need the approval from Council. Such supplies are defined as extraordinary supplies in the Water Supply Bylaw. The provision of initial or continuing supply is at the Council’s discretion.

5.6.2 Peak Flows

The design parameters for MDC water supply design are:
Average day demand – 290L day/head
Household occupancy rate – 2.8 head/household
Peak Day Demand (over a 12-month period) = Average Day Demand x PF
Unless specified otherwise by the Council:
PF = 1.5 for populations over 10,000;
PF = 2 for populations below 2,000.
Peak Hourly Demand = Average Hourly Demand (on peak day) x PF (over a 24-hour period)
Unless specified otherwise by the Council:
PF = 2 for populations over 10,000;

PF = 5 for populations below 2,000.

5.6.3 Minimum water demand

The minimum peak domestic demand must be specified by the Council, or:

a. Daily consumption of 250 L/p/day;
b. Peaking factor of up to 5;
c. Firefighting demands as specified in SNZ PAS 4509

5.6.4 Design Pressure

The design pressures are the limiting pressures for operation of a pipeline system including any allowance for variation of usage in the future.

The current minimum design pressure at the point of supply (at peak flow rate) is 350kPa.
Unless otherwise specified by the Council design pressure must be between 350 kPa and 8000 kPa (35m to 80m).

A minimum pressure rating of each pipeline component is to be provided to the Council with the as-built details.

5.7 Layout

5.7.1 General

- Water supply pipelines must be located in accordance with Standard Drawing 1.2, 5.1 and 5.2.
- Water supply pipelines must not be laid in the same trench as wastewater drainage or stormwater drainage nor pass through manholes.
- The trench may be widened to accommodate gas.
- A watermain of 150 mm (ID) diameter or greater is referred to as the principal main.
- A rider main is required to be laid in addition to the principal main on the opposite side of the carriageway.
- Rider mains must be supplied from the principal main at both ends, refer standard drawing 5.1 and 5.2. Principal and rider mains are to be located 500 mm behind the face of the kerb.
- Principal mains must be required on both sides of the street on all arterial, industrial and dual carriageway roads.
- Service pipes and services in accesses may be laid in a common trench provided the required clearances between services are maintained.

5.7.2 Mains Layout

In determining the general layout of mains, the following factors must be considered:

a. Main location to allow easy access for repairs and maintenance;
b. Whether system security, maintenance of water quality, and ability to clean mains meet operational requirements,
c. Location of valves for shut-off areas and zone boundaries;
d. Avoidance of dead ends by use of looped mains or rider mains;
e. Provision of dual or alternate feeds to minimise service risk.
f. Principal mains laid in cul-de-sacs must be carried through the adjoining lot or lots by way of easements or access ways and must be connected to a principal water main in another street. The minimum size of such through mains must be DN100. In addition, principal mains in cul-de-sacs must be ring-mained within the cul-de-sac length with a water main of DN50 or greater.

g. Dead end mains must only be used for servicing up to six rear residential lots.
h. Principal and rider mains must be laid after the placement of kerb and channel, 450mm behind the face of the kerb.
i. Where the alignment is governed by the street boundary, the water mains must be laid with reference to permanent land transfer pegs or temporary boundary marks placed by the registered surveyor responsible for the final land transfer pegging.
j. The alignment of water mains may be governed by a kerb line only when the setting out of the kerb line with reference to the land transfer pegs is verified and confirmed by the surveyor.
k. All water mains must generally be laid in straight lines. When water mains are laid on curves, the degree of deflection at joints must not exceed the manufacturer's recommendation.
l. Laying tolerances for both horizontal and vertical alignment must be no more that 50mm on straight streets, and up to 100mm on curves. The Developer must rectify any tolerances exceeding the maximum allowable to the satisfaction of the Manager. For pipes installed by directional drilling, cover and alignment must be plus or minus 100mm of that used for pipes installed by open excavation.

Design layout refers to Standard Drawing 5.1 and 5.2.

5.7.3 Water mains in private property

Water mains located within private property will require an appropriately sized and registered easement in accordance with the Council's requirements.

Note: An easement over private property is not the preferred option and may only be used as a temporary solution for landlocked subdivisions pending future permanent supply within a road.
A typical situation where the Council may approve water mains in easements is a fire main in a right of way.

5.7.4 Water mains near trees

Locating water mains within the root zone of trees should be avoided if possible. Where this is not practicable, careful attention to pipe material selection is necessary to minimise risk of pipe failure due to root growth. Extreme cautions need to be taken to avoid any damage to the trees.

5.7.5 Shared trenching

Where shared trenching is approved by the Council and utility service owners, a detailed design must be submitted for approval by those parties and must include the details set out in NZS 4404. Where approved by the Council and utility service owners, shared trenching may also be used for property service connections.

5.7.6 Rider mains and duplicate mains

A rider main must be laid along the road frontage of all lots not fronted by a principal main. Rider mains must have a maximum length of 200m and must service up to a maximum of 20 dwelling units. Minimum 350kPa working pressure must be maintained at all times. The Developer must consider a larger diameter rider main take-off from the principal main on the boundaries of staged development with future development sites to compensate for pressure loss.
Valves must be installed in locations as shown on Standard Drawings 5.1 and 5.2.
Duplicate mains are required to provide adequate fire protection in the following cases:

a. Arterial roads or roads with a central dividing island;
b. Roads with split elevation;
c. Roads with rail or tram lines;

d. Residential centres;
e. Parallel to large distribution mains that are not available for service connections;
f. Business and industrial areas nominated by the Council;
g. Where required by SNZ PAS 4509.

5.7.7 Trunk mains

Pipelines over DN250 are classified as trunk mains. Connections will only be permitted with the approval by the Council. Where a trunk main passes along the frontage of or through a subdivision, an additional principal or rider main must be installed to allow individual lot connections.

5.7.8 Crossings

Water main crossings of roads, railway lines, and underground services must, as far as practicable, be at right angles. Mains should be located and designed to minimise maintenance and crossing restoration. The Council may require extra mechanical protection for the pipes or different pipe materials to minimise the need or future maintenance.

5.7.9 Crossings of waterways or reserves

All crossings of waterways or reserves must be specific designs to suit the Council's requirement. Crossings must, as far as practicable, be at right angles to the waterway or reserve. Reference should be made to the Council to establish whether it prefers elevated crossings or below waterway invert crossings. When the pipeline is placed under the invert level of a waterway it may require mechanical protection by concrete encasement or steel or another acceptable pipe duct. Different pipeline materials may need to be used for the crossing.

5.7.10 Provision for Future Development

Where the subdivision adjoins a future development site, the pipe sizes must be determined in conjunction with the Utilities Manager and laid by the Developer at the time of construction.

5.7.11 "Through" Mains for Cul-de-Sacs

Principal mains laid in cul-de-sacs must be carried through the adjoining lot or lots by way of access ways or easements and must be connected to a principal water main in another street. The minimum size of such through mains must be DN150. In addition, principal mains in cul-de-sacs must be ring-mained within the cul-de-sac length with a water main of DN50 or greater.

5.7.12 "Dead End" Mains

Dead end mains must only be used for servicing up to six rear residential lots and must be no longer than 200m.

5.7.13 Setting Out

a. Principal and rider mains must be laid after the placement of kerb and channel 500 mm behind the face of the kerb.
b. Where the alignment is governed by the street boundary, the water mains must be laid with reference to permanent boundary pegs or temporary boundary marks placed by a Licensed Cadastral Surveyor responsible for the final boundary pegging.
c. The alignment of water mains may be governed by a kerb line only when the setting out of the kerb line with reference to the boundary pegs is verified and confirmed by the Surveyor.

d. All water mains must generally be laid in straight lines. When water mains are laid on curves, the degree of deflection at joints must not exceed the manufacturer's recommendation.
e. Laying tolerances for both horizontal and vertical alignment must be no more than 50 mm on straight streets, and up to 100 mm on curves. The Developer must rectify any tolerances exceeding the maximum allowable to the satisfaction of the Utilities Manager. For pipes installed by directional drilling, cover and alignment must be plus or minus 100mm of that used for pipes installed by open excavation.

5.7.14 Valves

a. Sluice valves with similar nominal diameter to the main must be provided at all junctions where watermains connect. Where required by the Utilities Manager, valves must be placed on all branches to limit the number of lots without water in the event of a shutdown. The maximum distance between valves on any watermain must not exceed 350m.
b. Valving arrangements must be such that less than the following number of dwelling units will be affected by shut offs.
c. All valves are to be located behind the kerb and channel. Sluice valves at intersections must be located opposite kerb tangent points.

Table 5.1 Shut off areas

Water main size DN	Number of property service connections (nominal)	Maximum spacing (m)
50	15	100
100	30	200
150	40	300*
≥200	60	350
	* In rural areas, the maximum spacing is 500 m.	

5.7.15 Hydrants

Fire hydrants must be provided on all watermains laid in streets, to comply with SNZ PAS 4509 - 2008 Code of Practice for Fire Fighting Water Supplies.

The layout of fire hydrants is subject to the approval of the New Zealand Fire Service who may require additional hydrants in areas where special fire risks call for a greater degree of protection (e.g. in some industrial areas).

Where a residential private way is more than 6m long a hydrant must be sited at the street end of the private way.

Hydrants must be located in the berm area at midpoint of the adjacent lot frontage to avoid vehicle crossings. Scouring and venting mains must have hydrants at either low or high points where it is possible.

Hydrants must be accessible for fire appliances. A fire hydrant is to be positioned at each intersection.

A hydrant or automatic air release valve approved by the Utilities Manager must be provided at all high points where the level differs by more than two metres from a constant grade.

Hydrants are required at all low points where the volume of water that cannot drain exceeds 15 cubic metres (15,000 litres) and at required scour points.

Residential hydrant spacing must be no greater than 135 metres.

5.7.16 Principal Mains

The minimum size must not be less than 150mm DN for residential areas and 150mm DN for Business and industrial areas.
The pipe sizes must be standardised as 150, 200, 250, 300, 375, 450, 525 and 575mm DN only.
The following pipes must be used for principal mains and comply with the relevant New Zealand or Australian Standards:

- MPVC AS/NZS4765 (Series 1 or Series 2 sizes)
- PE 80 Type B (Medium density PE) AS/NZS4130
- PE 100 (High Performance PE) AS/NZS4130

Pipes of differing compositions must not be mixed within a common pipe length, (i.e. valve to valve).

5.7.17 Rider Mains

Rider mains must be 50mm DN (min) and laid on the opposite side of the street to the principal main 500mm behind the face of the kerb. Refer Standard Drawing 5.2 and 5.3.

Rider mains must have a maximum length of 200m and must service up to a maximum of 20 dwelling units. Minimum 350kPa working pressure must be maintained at all times. The Developer must consider a larger diameter rider main take-off from the principal main on the boundaries of staged development with future development sites to compensate for pressure loss.
Valves must be installed in locations as shown on Standard Drawings 5.1, 5.2 and 5.3.

5.7.18 Service Connections

5.7.18.1 Service Pipe

Domestic service connection pipes must be blue PE 80 of minimum size 20mm NB DN25 PN12.5 AS/NZS4130. The size of the pipes must depend on the pressure available in the water main and the water supply demand of the building.

Only approved water supply fittings and pipe inserts must be used, and jointing must be carried out in accordance with the manufacturer's instructions.

Appropriate PTFE tape or Loctite 567 or 592 must be used with threaded joints to ensure leak free connection.

5.8 Construction

Tapping bands and ferrules on the water mains must be fitted when the mains are first laid. The ferrules must be tapped into the water main, and the service pipe must be laid to the point of supply.

In Industrial and Business subdivisions it is normal to omit tapping bands and service connections until the specific requirements of the consumer are known. If the type of development is known at the time of subdivision and the water demand determined, then it is the Developer's responsibility to provide the water connection to the point of supply.

The Developer must lay the service connection to each allotment boundary and place a gate valve and toby box at the boundary. Service connections must be laid at right angles to the frontage.

The placement of services, gate valve and toby box must be carried out after the electric power or any other reticulation between the water main and the boundary has been laid.

5.8.1 Tapping Band and Ferrule for 20mm Connections

A tapping band, ferrule and flow preventer must be used for each connection to either a principal or rider main up to 100mm dia. For connections to mains exceeding 150mm dia, a gibault joint with 50mm vertical takeoff and 90 degree bend must be used.
Tapping bands must be manufactured to WSA107.2001 from D/R copper alloy and must comply with the following:

- Bolts and nuts must be manufactured from D/R copper alloy or 316 Stainless Steel;
- Bolts must be positioned such that the nut is tightened from the top;
- Bands must have a nitrile rubber sealing ring, secured in a recess rated to 12 Bar;
- Tapped hold must have a standard BSP thread.
- Self-tapping ferrule straps must be Talbot or equivalent. Fittings must have a minimum pressure rating of PN 16.

5.9 Design Pressure

The design pressures are the limiting pressures for operation of a pipeline system including any allowance for variation of usage in the future.

The current minimum design pressure at the point of supply (at peak flow rate) is 250kPa.

Unless otherwise specified by the Council design pressure must be between 250kPa and 80kPa (25m to 80m).

A minimum pressure rating of each pipeline component is to be provided to the Council with the as-built details.

When designing sprinkler systems, Council cannot guarantee that the pressure of the watermains in the street will remain at current levels. Therefore, sprinkler systems should be designed based on an assumed maximum pressure in the main of 400kPa (40m) or the current pressure in the main (whichever is the lowest). Pipes from the mains to the sprinkler system must be designed for these pressures and include appropriate backflow prevention.

5.10 Trunk Mains

Pipelines over DN200 are classified as trunk mains. Connections may be permitted with the approval of the Utilities Manager. Where a trunk main passes along the frontage of or through a subdivision, an additional principal or rider main must be installed to allow individual lot connections.

5.11 Materials

5.11.1 Standard and minimum pipe sizes, pipe PN class and, design pressure

5.11.2 Standard pipe sizes

The principal main must be standardised as DN 100, 150, 200, 250, 300, 375, 450, 525, 575, or 600mm nominal diameter only. When larger pipes are required, the exact diameter will be determined by the Council.

5.11.3 Minimum pipe sizes

Minimum pipe diameters must be as follows, where DN is the nominal pipe diameter:

a. DN50 for rider mains in residential zones;

b. DN150 for residential zones;

c. DN150 for industrial or Business zones.

The Council may also specify minimum pipe diameters for other identified areas such as CBDs.

5.11.4 Pipe PN class (Pressure rating)

Pipe PN class is selected on the basis of the design pressure (head) calculated for the various sections of the reticulation network. This may be varied by specific operational requirements specified by the Council.

5.11.5 Design Pressure

The design pressure (head) for the mains must be based on NZS 4404 Clause 6.3.10.3.1.

5.11.6 Minimum PN for Pipes and Fittings

The minimum pipe PN to be used for water reticulation mains must be PN 12. The minimum fitting PN must be PN 16. Designers must verify the Council's minimum requirement before specifying the required pipe PN.

5.11.7 Principal mains and rider mains

The following pipes must be used for principal mains and rider mains and comply with the relevant New Zealand or Australian Standards:

- MPVC AS/NZS4765 (Series 1 or Series 2 sizes)
- PVC-O Pipes and fittings – AS4401
- PE 80 Type B (Medium density PE) AS/NZS4130
- PE 100 (High Performance PE) AS/NZS4130

Other materials, e.g. concrete lined steel pipe or ductile Iron pipe meeting relevant standards may be acceptable for particular applications which need to be agreed by the Council.

Pipes of differing compositions must not be mixed within a common pipe length, (i.e. valve to valve)

5.11.8 Medium Density Polyethylene (MDPE) Pipe

Medium density polyethylene pipe and fittings must comply with AS/NZS 4130 (Series 1) and AS/NZS 4131 in all respects. Pressure rating will be PE80 PN12.5 SDR 11 or greater.

All MDPE pipes must be coloured blue.

Pressure ratings must comply with Clause 5.9. i.e. 1200 kPa (PN12)

5.11.9 mPVC Pipe

Modified PVC (mPVC) pipe must comply with AS/NZS4765 Series 1 or Series 2 in all respects. The minimum pressure rating must be PN12. The pipe must have the following identification: Size (DN) Pressure rating Manufacturer Year, month, and day of manufacture Blue in colour.

5.11.10 PVC-O Pipe

Orientated unplasticised poly (vinyl chloride) (PVC-O) pipe must comply with AS 4441 Series 2 in all respects. The minimum pressure rating must be PN12.5. The pipe must have the following identification: Size (DN), Pressure rating, Manufacturer, Year, Month and Day of manufacture Blue in colour.

5.12 Pipe Fittings

5.12.1 Ductile Iron

All ductile iron fittings must be manufactured and supplied from an ISO 9001 accredited quality assurance supplier. All ductile iron fittings must be nylon coated inside and outside. Nuts and bolts must be made from 316 Stainless Steel. A nickel or molybendium based antigalling lubricant must be used.

5.12.2 “Gibault” Type Joints

Must be either cast iron from an approved manufacturer with a thermally bonded coating to AS/NZS 4158 Part 1 and be fitted with approved rubber rings and 316 Stainless steel engineered nuts and bolts, or Viking Johnson couplings or Victualic Joints maxifit couplers. All buried bolted joints, Gibaults etc. must be either wrapped in two layers of Denso Tape or nylon coated. The Utilities Manager may approve other types.

5.13 Sluice Valves

Must comply with AS/NZS2638. They must be standard waterworks pattern, double flanged with non-rising spindle. All sluice valves must be anticlockwise closing and have a 16 Bar pressure rating. If flanged valves are used, then flanges be to AS/NZS4087 Table D. All bolts and washers to be 316 stainless steel. The valves must be flanged when laid next to or in close proximity to other cast iron or ductile iron fittings. All sluice valves must be resilient seated. All surfaces of the body of the valve (inside and out) must be nylon coated or have a similar thermally bonded coating system in accordance with AS/NZS 4158 Part 1. The manufacture of the body must be from ductile iron, conforming to AS1831.

5.13.1 Gate and Manifold Valves

All valves used in 50-mm rider mains must be constructed as per AS1628. Valves in 20 to 50mm mains and service connections must be manifold valves. Gate valves must be forged brass to BS5154:1991 with a non-rising stem and be of approved manufacture. Manifold valves must be Gunmetal or dezincification resistant brass to BS1400-LG2 approved manufacture, (Davies Shepard, Aquaflo or other types as approved by the Utilities Manager).

5.13.2 Fire Hydrants

Must comply with NZS/BS750 and be of the tall pattern, screw down type. They must be clockwise closing, nylon coated, blue in colour, resilient seated and the valve face must be nitrile rubber coated. Frost plugs must not be fitted, or alternatively the plug must not be free draining. All bolts are to be 316 stainless steel.

The sealing cup washer must be of polyurethane (or nitrile rubber for high performance hydrants), and the gland seal must be either of braided PTFE yarn or a minimum of two captive 'O' sealing rings.
Valve body and bonnet components must have a thermally bonded coating system in accordance with NZS/AS 4158 Part 1.
The screwed outlet must be fabricated of LG2 gunmetal and secured to the body of the hydrant by at least two bolts.

5.13.3 Surface Boxes and Underblocks

Hydrant, valve and toby surface boxes and underblocks must be of a pattern approved by the Utilities Manager. Toby boxes must be Draper (or other types as approved by the Utilities Manager) universal heavy-duty surface box with "water" embossed in a blue lid. A strip of metal must be attached to the underside of the lid and attached to the box by galvanised chain. The top of hydrant boxes must be painted yellow, and the top of valve painted white. Carriageway marking of fire hydrants to comply with NZS4501. (See Standard Drawings 6.4 and 6.5). Hydrant boxes must be CI heavy duty type with minimum opening dimensions of 220mm x 380mm. The CI box lid must comply with the NZ Fire Service Code of Practice for firefighting supplies and NZS/BS 750.

Valve and Hydrant Markers
Refer Standard Drawing 5.4 and 5.5.

5.14 Construction

Item	Cover
Mains under carriageways	1000mm – 1500mm
Mains under berms and footpaths	750mm – 1000mm
Rider mains under carriageway and berms	750mm – 1000mm
Hydrant spindles	75mm – 225mm
Valve spindles	75mm – 400mm
Service pipes under carriageways	750 mm – 1000mm
Service pipes under berms and footpaths	600mm – 750mm
Service pipes at street boundary	300mm
Other areas	600mm

5.14.1 General

The Utilities Manager may require the use of materials other than those listed above under certain circumstances and all materials used must be approved by the Utilities Manager.

5.15 Pipe Laying and Testing

5.15.1 Pipes

Pipes must be laid in straight alignments, uniform grades and in smooth curves with maximum horizontal and vertical deflections not exceeding the manufacturer's recommendation. Special bends must be used where greater deflections are required.

5.15.2 Trenches

Trench widths must conform to the following but may be widened to accommodate gas and telecommunications.

Table 5.2 Width of Trenches

Nominal Pipe Diameter	Trench Widths
20 mm - 100 mm	D + 300 mm
150 mm - 200 mm	D + 300 mm
250 mm - 300 mm	D + 300 mm

5.15.3 Laying

Bedding and trench details for all pipelines be in accordance with the relevant standards and the manufacturers recommendations.

- mPVC pipe must conform with NZS 7643, AS/NZS 2033 and AS/NZS 2566 PE must conform with AS/NZS 2033

The internal bore of pipes and fittings must be inspected, and any foreign matter removed prior to laying. After laying, suitable temporary caps must be placed over all to avoid ingress of deleterious matter.

Joining of pipes and fittings must be in accordance with the manufacturer's instructions. Joint lubricant is to be used where recommended.

Where an unbalanced thrust is likely to occur on mains 50-mm diameter or greater, concrete thrust and/or anchor blocks must be provided. All thrust block design and positioning must be approved by the Utilities Manager prior to pouring of concrete. The design and positioning of the thrust blocks must include the following:

- the location of the block does not impede water main fittings
- the thickness of the inner face of the block must be greater than the diameter of the fittings
- concrete strength must be minimum 20.0MPa after 28 days
- block must bear against undisturbed ground
- protective membrane is to be placed between the pipe surface and concrete to deter abrasive damage, refer Standard Drawing 5.6.

Approved metallic detector tape must be laid along the full length of all waterman's and services. The tape must be laid at a depth of between 150mm and 250mm below the finished ground surface immediately above the pipe/service. The tape must have the inscription "Buried Water Line Below" in letters approximately 40mm high repeated along the total length at spacing's not exceeding 4.0 metres in length.

5.15.4 Connections to Existing Reticulation

The Developer must lay new mains up to the existing mains so that the final connections can be made by the Approved Waterworks Contractor.

5.15.5 Sluice Valves and Fire Hydrants

All valves and hydrants must be installed in accordance with manufacturer's instructions. Precast concrete under blocks must be installed to the depth indicated so that the pipework does not take the weight of the valve or hydrant. Surface boxes must be constructed in accordance with Standard Drawings 5.4 and 5.5. The valve or hydrant is to sit centrally within the surface box.

5.15.6 Air Valves

As required automatic air release valves must be located above ground level and inside a standard air valve box as per Standard Drawing 5.7. Surface or ground water must not be allowed to enter the air valve box.

5.15.7 Valve and Hydrant Markers

Markers must be installed on the street boundary at right angles to the valve or hydrant on both Principal and rider mains. Refer Standard Drawings 5.4 and 5.5 for details.

5.16 Manawatū District Flow Testing of Pipes

The completed water supply reticulation must be flow tested by the Technical Representative in the presence of the Utilities Manager. Where flows and/or pressures do not meet the approved design values, the Developer must undertake the necessary works to achieve approved design criteria.

5.16.1 Pressure Testing of Pipes

General

All pipes and services must be tested by the developer in the presence of the Utilities Manager.

Prior to Testing

a. The pipeline must be sufficiently backfilled to ensure it does not move during the test;
b. All thrusting must be completed. Thrust blocks must cure for minimum of seven days prior to testing;
c. Test ends (valves, blank ends, etc.) must be securely anchored;
d. All joints on fittings are to be uncovered and fully visible;

e. The main be filled with potable water at a steady rate;

f. All air must be expelled as the main is filled and the mains allowed to stabilise prior to testing

g. The Developer must provide a minimum of 24 hours' notice prior to the pressure test.

Testing Procedure (mPVC)

a. The test pressure must be 1.5 times the working pressure to a maximum test pressure of 1200 kPa;

b. The pressure must be raised at a steady rate without shock loading;

c. A pressure gauge capable of accurately reading 1% of the test pressure must be installed as close as practical to the lowest point under test;

d. The Utilities Manager may require the testing of valves and their thrusting by releasing pressure and draining the main on one side of the valve;

All leaks, weeps, drips, bursts and thrust block movements or failures must be made good by the Developer.

5.16.2 Disinfection and Testing

Disinfection and testing must comply with the Manawatū District Council Water Supply Mains Disinfection Code of Practice and must be carried out by an approved person. The Developer must complete the prescribed form "Certificate of Cleanliness and Disinfection of Water Supply Mains" at Appendix 5.

5.17 Connections

5.17.1 General

Services must be laid at right angles to the street boundary and located approximately midpoint of each lot. Corner residential lots with two dwelling units must require a service from each street.
All service connections must be terminated with a manifold toby of the same nominal size as the service pipe.
Connection to principal mains up to 150mm dia must be via a tapping band and ferrule.
A 'T' must be cut into either the face of the kerb at a position "square off" the connection or in the top of the nib directly above the connection.

5.17.2 Point of Supply to Consumer

The point of supply to the consumer will be determined by the Council in accordance with Council policy on metering of supply and on water mains in private property. Unless required otherwise by the Utilities Manager, the following must occur as per the Manawatū District Council Water Supply By-Law 2015 and its amendments.

5.17.3 Front Residential Lots

For front lots (or dwelling units with individual street frontage) the service connection must terminate at the street boundary with a 20mm manifold toby.
Manifold tobies are to be located 150 mm from the boundary within the road reserve.

A Council approved heavy duty universal surface box must be installed over the manifold and set flush with the final finished level of the surrounding ground.

Front lots on each side of an accessway must be serviced from the street.

5.17.4 Rear Residential Lots

For Single Lot
The service connection must extend from the main to the head of the entrance strip. The manifold must be located at the street boundary.

For 2 – 7 Lots (Rights of Way)
A service line must extend from the main to the centre of the last lot. The diameter of the service line must be as set out in Table 5.4. A "master toby" of similar diameter to the service line must be located at the street boundary. 20mm service connections must be provided at the midpoint of each lot terminating with a manifold toby contained in a Council approved heavy duty universal surface box located immediately behind the access.

For 8 or more Lots (Roads)
Service lines that serve more than seven lots must be looped or through (not dead-end) lines.

Table 5.4 Service Connections

Nominal Internal Diameter of Service Pipe (mm)	Maximum Number of Single Dwelling Units
20	1
25	2-3
32	4-5
40	6-7

5.17.5 Business and Industrial

In industrial developments, a water service lateral is not required to be installed to each lot at the time of the development construction.

5.17.6 Metered Services

Refer to Manawatū District Council Water Supply By-Law 2015 and its amendments.

5.18 Alternative Water Supply

The existence of alternative water supplies such as bores and piped irrigation supplies is to be notified. All requirements of the Water Supply Protection Regulations and Manawatū District Council requirements must be met at the Developers expense.

6. STORMWATER DRAINAGE

6.1 Introduction

6.1.1 Stormwater System

The Developer must design and construct a stormwater system that complies with the Manawatū District Council Stormwater Design Manual.

The Developer must give consideration to all available options to mitigate the risk of flooding in the event of exceptional rainfall intensity both within and downstream of the development. Options are to include detention facilities.

The Developer must design and construct all works in accordance with this document. The design requirements must also be read in conjunction with NZS 4404, Land Development and Subdivision Engineering. Any areas not covered by these documents must be designed in consultation with Council officers.

The Developer must meet all costs of new stormwater systems. The Council may consider, at its discretion, contributing to proposed works in cases where additional capacity or extensions to the system are required to serve areas outside the site and its upstream catchment. As part of any development proposal the Developer must identify areas with limited service, flood sensitivity, or other issues for which building restrictions may apply. The applicant must detail how these areas will be serviced. The system design must identify and incorporate downstream improvements required as a result of the proposed works.

6.1.2 Resource Management Act 1991

Authorisation from the Regional Council will be required for stormwater discharge, unless the discharge is to an existing stormwater drainage system and meets any conditions which apply to the existing system.

6.1.3 Objectives

The primary objective of a stormwater system is managing storm surface water run-off to minimise flood damage and adverse effects on the environment.

The Developer must apply an interdisciplinary approach to stormwater management that will ensure:

a. Compliance with the Manawatū District Council Stormwater Design Manual;

b. Adopts low impact design approaches, unless proven to be inappropriate;

c. Improves the quality of the stormwater runoff entering the receiving environment;

d. Reduces stormwater runoff volumes and peak flow rates;

e. Where possible, utilises natural systems and improves biodiversity by preserving and enhancing the integrity of ecological and biological systems of the environment;

f. Avoids adverse environmental and community effects;

g. Avoids potential adverse effects to aquatic ecosystems;

h. Complies with environmental requirements;

i. Provides adequate system capacity to service the fully developed catchment;

j. Ensures a long service life;

k. Identifies and incorporates downstream improvements required as a result of the proposed works;

l. Is economically efficient, taking into account maintenance and life-cycle costs;

m. Ensures stormwater management devices are fit for purpose, taking into account local characteristics;

n. Where possible, minimises the need to collection and conveyance.

6.2 General Requirements

- Any natural watercourse that will require piping as a result of the development be undertaken by and paid for by the Developer.
- The stormwater system must have a design life of at least 100 years.
- Where open water courses are to form part of the land drainage system this must be determined at the Development Concept Plan approval stage. The Developer must submit sufficient engineering design to enable Council to evaluate the proposals.
- All stormwater connections from developed lots must be capable of serving the whole building area of the lot.
- Where necessary the developer must incorporate measures to minimise stormwater runoff from the site and utilise sustainable development practices. This approach should consider the use of Water Sensitive Urban Design (WSUD), Low Impact Design (LID), the use of sustainable technologies such as rainwater harvesting and other Best Management Practices to reduce stormwater runoff volumes and peak flow rates and improve the quality of stormwater runoff entering the receiving environment.

Some Best Management Practices to be considered for implementation include:

- Rainwater harvesting – The use of rainwater tanks for the collection of roof runoff for non-potable uses such as toilet flushing, clothes washing and garden watering.
- Bush revegetation.
- Permeable paving
- Rain gardens
- Swales and filter strips
- Bio filtration trenches
- Green roofs
- Detention practices such as wet ponds, wetlands and detention tanks
- Contaminant filters and separators such as sand filters and oil and grease separators
- Litter control
- Proprietary devices.

6.3 Proprietary Stormwater Treatment Systems

Proprietary, modular stormwater treatment systems have become readily available. They are used primarily for settleable solids, floatables, oil and grease from stormwater runoff. These should be installed wherever there is potential for undesirable materials to collect and cause unnecessary pollution.

For vehicle maintenance yards, commercial warehouse sites etc. where there is a high probability that contaminants and pollutants may discharge into natural watercourses, such a filtration system is essential.

6.4 Layout

The stormwater system layout must ensure the following:

- Access to all parts of the reticulation for inspection and maintenance. Manholes, access points and access chambers must be provided to ensure access to pipelines by modern equipment for CCTV inspection, water jetting, root cutting and grouting
- Safety of the stormwater system operators should be maximised
- The potential for infiltration and exfiltration must be minimised (e.g. minimise the number of manholes and access points)

6.5 Standards

The following Standards and Codes of Practice are referred to in this part. The design, materials and method of construction must comply with these Standards and Codes as applicable. The Standards used incorporate the latest amendments. Standards superseding those listed and the latest version automatically apply.

AS/NZS 1260	PVC-U Pipes and Fittings for Drain, Waste and Vent Application
AS/NZS 4130	Polyethylene (PE) Pipes for Pressure Applications
NZS 3107	Specification for Precast Concrete Drainage and Pressure Pipes
NZS 4404	Land Development and Subdivision Engineering
NZS 4452	The Storage and Handling of Toxic Substances
NZS 7643	Code of Practice for the Installation of Unplasticised PVC Pipe Systems
NZS/AS 2033	Installation of Polyethylene Pipe Systems
NZS/AS 3725	Loads on Buried Concrete Pipes

6.6 Engineering Design

In planning and designing a stormwater system, the developer or contractor must provide a Design and Process Assessment. The Design and Process Assessment must:

1. Provide an assessment of how the proposed stormwater management system is consistent with the Objectives of this Chapter;
2. Provide details of the design process including but not limited to:

6.6.1 Site Assessment

Undertake an initial site evaluation. Matters to consider include:

- Bio-physical characteristics;
- Geotechnical characteristics;
- Socio-cultural characteristics;
- Identification of areas with limited service, flood sensitivity, or other issues for which building restrictions may apply;
- Topographical features

6.6.2 Project Objectives

The need to be clear about what is being designed for is important to inform decisions on the type of device and maintenance approach that is appropriate in a given context.

Clear and measurable project objectives (consistent with the Stormwater Objectives of this Chapter) should be developed at the early stages of the design process.

6.6.3 An Inter-Disciplinary Design Approach

Stormwater Management can provide an opportunity to deliver multiple benefits that meet both stormwater management objectives and other outcomes that are of importance to the Manawatū District (e.g. Quality residential environments, biodiversity, green space, traffic calming etc.). Application of LID principals requires an inter-disciplinary approach to planning and design because analysis and decision making needs to be informed by a wide range of topics (e.g. Hydrology, residential design, civil engineering etc.).

The design and process assessment should provide details of how an interdisciplinary approach has been adopted and how these are reflected through the project objectives and anticipated outcomes.

6.6.4 Stormwater Management Solution

Problems with the operation and maintenance of a device can occur when it is inappropriate for a given location or is undersized for its purpose. The respective position of the various components in the treatment train is an important consideration in ensuring the sustained effectiveness of the system.

The proper design and position of a stormwater solution (e.g. Product or device) within the stormwater treatment train is important. It is critical to select a device or product that is:

- Consistent with the achievement of the objectives of this Chapter;
- Fit for purpose;
- Robust; and
- Effective for delivering the project objectives over its design life.

The design and process assessment should provide details of how the stormwater management solution achieves the above requirements.

6.6.5 An Integrated Design Approach

Those who will become responsible for the ongoing operation and maintenance of stormwater solutions must be involved in the design process. This is critical to informing the development of a practical design that will enable ease of maintenance and develop ownership for ensuring the solution performs as it was intended.

The design and process assessment should provide details of how an integrated design approach has been adopted and how these are reflected through the project objectives and anticipated outcomes.

6.6.6 Design for Maintenance

Maintenance of devise must be considered early in the design process. This will assist in the identification of features that will facilitate the ease and efficiency of ongoing operation and maintenance of solutions. Elements to consider in the design for the maintenance and operation of the systems include:

- Access;
- Vegetation;
- Mulch;
- Sediment;
- Mechanical components;
- Vandalism;
- Safety.

The design and process assessment should provide details of how the stormwater management solution achieves the above requirements.

6.7 Manawatū District Open Watercourses

Natural watercourses where there is no requirement for piping must be retained and must be located in public or designated local purpose reserves-drainage. Easements must be provided on all piped/reticulated stormwater services. Improvement works where necessary must be carried out in natural watercourses to mitigate the effect of the development.

The Developer must provide protection works at all piped outlets into natural watercourses as a result of the development. The Developer must provide design details as part of the engineering approval process.

6.8 Hydraulic Design Of Pipelines

All sizes stated are nominal internal diameters. No pipe intended to become a public stormwater drain must be less than 300mm diameter.
The hydraulic design of stormwater pipelines must be based on approved engineering design practice. The hydraulic characteristics of the selected pipeline material must comply with the manufacturer's recommendations. The minimum and maximum design velocity for all pipework must be 0.7 metres per second and 3.0 metres per second, respectively.

The minimum gradients for respective pipe sizes must be as follows:

Table 6.1 Self Cleansing Gradient

Nominal Pipe Diameter	Minimum Allowable Gradient	% Conversion
150 mm	1 in 150	0.67%
225 mm	1 in 260	0.38%
300 mm	1 in 390	0.26%
375 mm	1 in 525	0.19%
450 mm	1 in 650	0.15%
525 mm	1 in 800	0.13%
600 mm	1 in 900	0.11%

Where a section of the stormwater reticulation carries flow from a watercourse or open drain, regard must be had in the selection of pipe size and its level in relation to the stream, to the depth of water in the stream and the head losses at the entry of the pipe.

The outlet of all stormwater reticulation discharging to a natural watercourse must be at bed level. Provision must be made in the design to reduce flow velocities at the point of discharge to non-scour levels. The outlet reticulation must be fully piped from the last stormwater collection structure or manhole to the outlet. Where the outlet is likely to be under water, the hydraulic gradients used in the design of the stormwater system must take this into account.

Where the outlet receives the flow from catchments larger than 1ha then an approved stormwater treatment device must be installed of the gross pollutant type or similar Best Management Practice devices as approved by the Utilities Manager.

6.9 Structural Design

6.9.1 Design

All pipelines must be designed in association with their bedding and backfill to have sufficient strength to safely support the loads that will be imposed, including the loading from heavy construction traffic and equipment. The design must comply with NZS/AS 3725: Loads on Buried Concrete Pipes including the pipe manufacturer's guidelines, and NZS 7643, Code of Practice for the Installation of Unplasticised PVC Pipe Systems including pipe manufacturer's guidelines.

6.9.2 Bedding

Maximum and minimum permitted trench widths are as follows:

Table 6.2 Maximum and Minimum permitted trench widths

Pipe Type	Minimum Width	Maximum Width
Concrete	Dia + 400mm	Dia + 600mm
uPVC	Dia + 200mm	Dia + 400mm

6.9.3 Cover

The minimum cover above the crown of the pipe be as follows:

Table 6.3 Minimum Cover

Location	Minimum Cover (mm)
Roads, berms, accesses and parking areas	750*
All other areas	600

* During construction, pipework may require ramped metal protection.

The manufacturers cover specification must be used where it is greater than the minimum stipulated in Table 6.2.

Where it is not possible to achieve minimum cover requirements, an approved protection system to the satisfaction of the Utilities Manager must be installed above the pipework.

Where pipeline gradients exceed 20% (1 in 5), cement bonded bedding and anti-scour blocks placed at 5.0 metre intervals and located midway along the pipe must be required.

6.10 Pipework

The following rubber ring jointed pipework has been approved by the Utilities Manager for use on stormwater reticulation that will become public drains including lateral connections beneath road reserves.

i. Concrete pipes to NZS 4058 - 2007.

ii. PVC Pipes to AS/NZS 1260.

iii. Other pipe types, e.g. steel, may be considered for specific applications.

iv. PE pipes to AS/NZS 4130.

6.11 Pipe Laying And Testing

6.11.1 Pipeline Location

Stormwater reticulation must be located within the road reserves as shown on Standard Drawing 1.2. Stormwater reticulation must not be laid in the same trench as wastewater drainage or water mains. Service pipes and services in accesses may be laid in a common trench provided the required clearances between services are maintained.

All new Public stormwater drainage pipes are to be laid in Council controlled land. Existing services are to be protected via a 3m (min) easement in gross, vested in Council. Manhole structures must be placed centrally within the easement. The Developer is to identify all drainage systems in the Development Concept Plan that are proposed to be located other than the road reserve.

6.11.2 Pipe Laying

All pipelines must be laid in accordance with the relevant standards and manufacturer's instructions.
Backfill for pipes must be as shown on Standard Drawing 4.1, 4.1.1 and .1.2.
Connections to the existing stormwater drainage system must be carried out by an approved person under the supervision of the appropriate Council staff.
All pipes must have an approved flexible sealed joint.

6.11.3 Pipe Testing

Pressure testing of stormwater drainage pipelines must be at the discretion of the Utilities Manager. Pressure testing must be carried out in accordance with the methods set out for Wastewater Drainage Systems. Refer Clause 4.1.

6.12 Manholes

6.12.1 Location

Manholes are required on pipelines at:

- the head of the line,
- changes of gradient,

- changes of direction,
- changes of pipe size,
- junctions of all pipes in excess of 100mm diameter,
- spacings of not more than 100m on straight lengths.

6.12.2 Construction

Manholes must be constructed in accordance with the details shown on Standard Drawing 4.3. Cast in situ manholes are generally not permitted. Single flexible joints must be provided within 750mm of the manhole walls on each inlet and outlet main line. A circular manhole with internal diameter of 1050mm must be used for pipes up to 600mm but this will depend on the number of lines at the manhole. Manholes with internal diameter greater than 1050mm must be used to accommodate an excessive number of pipes or larger size pipes. All manholes must have heavy duty lids fitted with heavy duty frames and covers. Where manholes are more than 5.0m deep they must be specifically designed and must incorporate an intermediate landing platform or grill in order to prevent a free fall of more than 3.0 metres.
Where different sizes of pipe are built into a manhole, they must be positioned such that their hydraulic gradients are at the same level.
All manholes must be haunched as shown on Standard Drawing 4.3.
Pipelines of diameter 300mm or less must be provided with additional fall at manholes as following:

Table 6.4

Change of Direction	Additional Fall
5° - 15°	25 mm
15° - 75°	50 mm
75° - 90°	75 mm

6.12.3 Specials

Manholes on pipelines of 1050mm diameter and above may be constructed using intake bosses that may also be used in conjunction with bends. Any manhole or bend so specified must be constructed by the pipe manufacturer. See Standard Drawing 6.1.

6.12.4 Drop Connections

Drop connections must be avoided where possible. Where connections into manholes are at a height > 1m above the invert, the connection must be made via a drop structure. Drop inlets may be avoided by grading to the base of the manhole where possible.

6.12.5 Connections to manholes < 2 meters

All connections to manholes under 2 meters deep must be at the base of the manhole. Pipes 300mm diameter or less may discharge over existing benching.

6.13 Sumps

6.13.1 Construction

Sumps must be constructed in accordance with Standard Drawing 6.2 and 6.3 precast sumps of similar design may be used at the discretion of the Utilities Manager. The Utilities Manager may require the installation of approved pollutant filters within the sumps in specific circumstances or in catchments smaller than 1ha where there is direct discharge into an open water course.

6.13.2 Location

Sumps must be located:

i. At intervals of not greater than 100m where channel gradients do not exceed 1%. This spacing must be reduced on steeper grades to a maximum of 70m at gradients of 5%. At gradients in excess of 5%, double sumps must be constructed at 70m intervals.
ii. At the upstream tangent point of street intersections where the grade continues round or past the intersection. Refer Standard Drawing 3.2.
iii. At changes of channel crossfall where water would flow onto the street surface.
iv. At channel low points.
v. Double sumps must be constructed at low points where the length of channel drained exceeds 100m, (e.g. at vertical curves and cul-de-sac bulbs) The sumps must be interconnected with a 200mm minimum diameter pipe. Only one outlet must be provided for.

6.13.3 Subgrade Drains

Provision must be made in all sumps for the connection of subgrade drains. These drains must be connected into the sumps such that the drain invert is not lower than the outlet pipe soffit. Refer Standard Drawing 3.5.

6.13.4 Connection

All connections must be a minimum 200mm diameter and must join to the drainage system at a manhole.

6.14 Culverts

Culvert design must comply with the Manawatū District Council Stormwater Design Manual. The minimum nominal diameter for any culvert is 300mm.
Due consideration must be given to the effects of culvert design including profiles of watercourses, hydraulic profiles and scour. Where exit velocities are likely to cause erosion or scour, energy dissipaters must be included in the design and bank protection provided where necessary. All design details are to be submitted for Engineering approval.

Culvert inlets and outlets under carriageways must have headwalls as detailed in Standard Drawing 6.5 and suitable handrails/fences are to be provided where depths of inlets and outlets exceed 1000mm. Culverts under property access ways must have NZTA approved sloped ends where the drain depth does not exceed 1000mm. Standard headwalls are to be used where drains exceed 1000mm in depth.

6.15 Pipe Inlets And Outlets

The inlet and outlet to all culverts and piped systems must be provided with wing walls, headwalls, aprons, grills and detritus traps, contaminant filters or separators to prevent erosion, scour, blockage or unauthorised or accidental access. Wing walls and headwalls must be constructed to a level that will not allow material from the bank to erode. Permanent access must be provided to all pipe inlets and outlets on private property. Entrance gates and vehicle crossings must be provided to allow access for maintenance vehicles in areas outside the road reserve.

Where it is proposed to discharge a stormwater system into a water way which is subject to the back water flood effects of the Oroua River, Makino and Kiwitea Streams and other streams, an approved flap gate must be fitted to the headwall of the outfall structure and, in certain circumstances, an approved screw-down penstock may be required in a special manhole sited close to the outfall.

6.16 Lateral Connection

Each lot of a residential, business and industrial subdivision must comply with the following unless levels require a direct connection to the stormwater system or to an approved soakway system:

i. Each front residential lot must have a 100mm DN lateral, grading from 1m inside the property boundary to the kerb and channel. However, front lots on each side of an access may be drained to the stormwater drainage system in the access provided the necessary easements are granted.
ii. Corner residential lots must be provided with two such stormwater connections, one to each frontage.
iii. Rear lots with a common access must be serviced by a connection located in the main body of the lot and not at the road boundary.
iv. Single rear residential lots must be serviced by a 100mm DN lateral.
v. Provided necessary easements are granted, two or more rear residential lots must have appropriately sized lateral connections as determined by the Clause E1 Surface Water of the New Zealand Building Code with a minimum of 100mm DN. Where the size is determined to be 150mm DN or more this must be connected directly to the stormwater system and terminate in a manhole. See Standard Drawing 5.3 Inspection chambers are required at the junction. See Standard Drawing 5.5. Where no stormwater system is available a suitable design detail must be submitted for engineering approval.
vi. Lateral connections to sumps are only permitted if no other option is available.
vii. An approved plug, or cap of appropriate material must be installed on the last pipe of the lateral connection and securely fastened.
viii. Where a lateral is connected to a stormwater disposal system, a 75mm x 50mm marker painted green must extend from the top of the pipe to at least 300mm above ground at a point where each lateral terminates.
ix. An ‘X’ must be cut into either the face of the kerb at a position “square off” the end of lateral or in the top of the nib directly above the lateral.
x. Soakways, rain gardens, biofiltration trenches may be allowed for residential lots in those areas of the District which have the proven ability to effectively dispose of stormwater by soakage under all conditions of ground water level. Soakage tests will be required prior to subdivision consent. All proposals for onsite stormwater disposal by ground soakage must be supported by detailed calculations and drawings. Onsite disposal systems must be designed to have no adverse effects on ground stability or on downstream properties and must be constructed in accordance with requirements of the Building Act 2004. The developer must undertake detailed testing and calculations to determine that the proposed system is suitable for disposal

from a 10% AEP event. Secondary flow paths must be provided to cater for events exceeding the capacity of the primary system and on occasions when the primary system fails.

xi. Business and industrial lots must be provided with individual, appropriately sized stormwater drainage connections, connected to the main stormwater system. Kerb and channel connections or soakways will not be permitted. In specific cases on site detention may be considered and/or appropriate stormwater treatment devices.

6.16.1 Inspection

The Utilities Manager may require any lateral connections to be opened for inspection. All laterals must be constructed prior to Final Inspection.

6.17 Inspection And Handover Requirements

A formal inspection with the developer or his representative and a representative from the Council must take place prior to the issue of the Practical Completion Certificate. Prior to the issue of the certificate the following activities must be completed to Councils satisfaction.

i. Pond(s) cleaned and desilted and sediment disposed of at an approved site.

ii. Provision of an Operating and Maintenance Manual and other requirements as required by the consent conditions including a copy of the relevant Horizons Regional Council stormwater discharge consent if required.

6.18 Drainage Of Neighbouring Lots

The Developer must ensure that the drainage of existing lots adjoining the subdivision is not adversely affected, and that the requirements of the Building Act 1991 are fulfilled.

6.19 Drainage Of Rural Roads

The Developer must ensure that the design and construction of rural roads and adjoining lots does not adversely impact natural drainage patterns.

Road stormwater must be discharged into streams and valleys with appropriate energy dissipation and scour protection structures. The stormwater flows must be conveyed to the outfall by means of approved pipelines. Channels and flumes will not be permitted.

6.20 Headwalls

Headwalls must be designed and installed to provide for the hydraulic loading on the culvert and prevent any scouring at the entrance. See Standard Drawing 4.5.

7. DRAWING LIST

Drawing No.	Title
General	
1.1	Standard Symbols and G.I.S. Codes
1.2	Standard Location of Services in Road Reserve
1.3	Trench Cross Section for Existing Roads and Footpaths
Roading	
3.0	Trench Reinstatement for Existing Roads
3.1	Mobility Crossing & Corner Splay Details
3.2	Intersection Detail
3.2.1	Standard Rural/Village/Nodal Vehicle Crossing – Frequent Use by Heavy Vehicles
3.2.2	Standard Rural/Village Zone Vehicle Crossing
3.2.3	Standard Rural/Village Zone Vehicle Crossing
3.3	Rural/Rural Residential Road Intersection (0-500 VPD)
3.4	Rural Road/Accessway Entrance-Edge Protection Drain Depth >1.0m
3.4.1	Rural Road/Accessway Entrance-Edge Protection for Drain Depth <1.0m
3.5	Dish Channel & Subgrade Drainage
3.6	Minimum Cul-De-Sac Head Design
3.7	Rural Road - Typical Details
3.8	Rural Road Open Drain Typical Details
3.9	Rural Road (VPD 0-500) Typical Cross Section
3.9.1	Street Classification and Widths – Nodal and Rural Subdivisions
3.10	Standard 125mm Kerb & Channel and Nib Kerb Details
3.10.1	Kerb for Traffic Islands Roundabouts & Road Medians
3.11	Property Stormwater Discharge to Kerb
3.12	Concrete Footpath Details
3.13	Maximum Break over Angles for Vehicular Access to Property
3.14	Standard Concrete Residential Vehicle Crossing
3.15	Commercial/Industrial Vehicle Crossing
3.16	Heavy Duty Residential Vehicle Crossing – 2 or More Properties
3.17	Dish Vehicle Crossing – Channel Detail
3.18	Dish Vehicle crossings – Cross Sections
3.19	Plate Vehicle Crossing
3.20	Rural Vehicle Crossing – Channel Detail
3.21	Repair of Vehicle Crossing – General Position

3.22	Business & Industrial Access – Typical Cross Section
3.23	Residential & Village Private & ROW Access – 2 to 7 Lots
3.24	Private ROW Access to Rear Lots – 1 to 7 Lots For Nodal and Rural Subdivisions
3.25	Bus Bay Design
3.26	Typical Steel Lighting Columns for Street Lights
Wastewater	
4.1	Rigid Pipe Trenching Details – Wastewater and Stormwater
4.1.1	Flexible Pipe Trenching Details – Water, Wastewater and Stormwater
4.1.2	Grading Limits for Embedment Zone Materials
4.2	Anti-Scour Blocks for Steep Pipelines
4.3	Manhole – Wastewater and Stormwater
4.4	External Drop Manhole – Wastewater
4.5	Typical Inspection Chamber for 100mm Ø Pipe
4.6	Typical Wastewater Pump Station – Level Monitoring
4.7	Manhole for Large DIA Pipes 750 to 1050mm
Water Supply	
5.1	Layout of Valves and Fire Hydrants
5.2	Layout of Watermains in Cul De Sac
5.3	DN50mm Rider Main or R.O.W Service Connection
5.4	Sluice Valve and Marker Installation
5.5	Hydrant and Marker Installation
5.6	Water Main – Pipe Laying Details
5.6.1	Water Main – Thrust Block Details
5.7	Air Valves Box Block Details
5.8	Service Connection Details to Main and Ridermain
5.9	Meter, RPZ and Cage Standard Configuration
Stormwater	
6.1	Manhole for Large Diameter Concrete Pipes – 1050mm DIA. Plus
6.2	Street Sump Details
6.3	Standard Sump Grate Details
6.3.1	Footpath & Yard Sump Details
6.4	Vehicle Crossing (Heavy Duty & Standard) Well-Up-Sump
6.5	Standard Headwall Details
6.6	Standard Soak Pit Detail - Residential

8. APPENDICES

Appendix 1	Developer checklist for Development Concept Plan
Appendix 2	Developer checklist for Engineering Drawings, Specifications and Reports
Appendix 3	Application Checklist for Subdivision Consents
Appendix 4	Schedule 2A – Statement of Professional Opinion as to Suitability of Land for Building Construction. (NZS4404)
Appendix 5	Certificate of Cleanliness and Disinfection of Water Supply Mains
Appendix 6	Statement of Completion by Developers Technical Representative
Appendix 7	IPENZ Construction Monitoring Services

APPENDIX 1

DEVELOPMENT CONCEPT PLAN DEVELOPER CHECKLIST

This checklist is to ensure that the Developer has researched the development proposal prior to submitting the Development Concept Plan.

The Developer is required to complete this checklist prior to submitting the Development Concept Plan to Council. This completed checklist forms part of the documentation required to be submitted with the Development Concept Plan.

Actions Required	Yes	No	Comment
Has the District Plan been checked to see whether the development concept is a permitted activity			
If the development concept is not a permitted activity, has research been undertaken to see whether approval will be possible			
Has the Resource Management Act been checked to see whether the development concept complies			
If the development concept is not a permitted activity under the RMA, has research been undertaken to see whether approval will be possible			
Has the Development Concept Plan been compiled taking into account all the requirements of the Engineering Standards for Land Development			
Have discussions been held with appropriate Council staff to determine whether Council sees the development concept as a viable project			

APPENDIX 2

ENGINEERING DRAWINGS, SPECIFICATIONS AND REPORTS DEVELOPER CHECKLIST

This checklist is to ensure that the Developer has assessed and completed the requirements necessary to ensure all details contained in the engineering plans, specifications and reports are correct.

The Developer is required to complete this checklist prior to submitting the engineering plans, specification and report to Council. This completed checklist forms part of the documentation required to be submitted with the engineering documents.

Actions Required	Yes	No	Comment
Has the Application Plan been updated to show any amendments requested by Council when the Development Concept Plan was accepted.			
Earthworks Has a detailed assessment been carried out by a person qualified to determine the suitability of the land for development in its natural state. The assessment is to include erosion risk, flooding potential, suitability for building, chemical contamination and earthquake loadings.			
Has the report detailing the assessment process and calculations been completed. The report is to include all associated reports undertaken by consultants or others as well as drilling logs and test results.			
Has the proposed earthworks design been assessed to determine its acceptability in relation to the Engineering Standards for Land Development, all relevant standards and codes of practice.			
Have all landfill options being considered to ensure fill areas are minimised.			
Have all natural and surfaces been identified that are deemed unsuitable for development.			
Does all development land slope sufficiently towards the proposed road to provide for effective drainage runoff.			
Roading Has the District Plan and Table 3.1 of the Engineering Standards for Land Development being adhered to in relation to defining the Primary and Secondary Road Network			
Has a detailed calculation been made to determine the 'Estimated Dwelling Units in Catchment' (EDUC) and 'Estimated Personnel Employed' (EPE)			
Has the requirements for longitudinal gradients identified in the Engineering Standards for Land Development been adhered to.			

Actions Required	Yes	No	Comment
Has Austroads 'Guide t the Geometric Design of Major Urban Roads', the 'TNZ State Highway Geometric Design Manual and the Engineering Standards for Land Development where applicable been used in the development design. This includes vertical and horizontal alignment, superelevation, intersections, cul de sacs and cut/fill batters.			
Have there been any deviation from the required standards.			
Have the structural road pavement design been undertaken in accordance with the Austroads Guide to the Structural Design of Road Pavements including the New Zealand supplement (AP-G17/04) and the Engineering Standards for Land Development where applicable.			
Has a design life of 50 years been adopted for flexible pavements			
Kerb and Channel Have the Engineering Standards for Land Development and relevant drawings being adopted for all design work.			
Footpaths Has Table 3.1 of the Engineering Standards for Land Development being adhered to in relation to footpath requirements.			
Have all proposed footpaths been located In accordance with the Engineering Standards for Land Development and relevant drawings.			
Have services been designed to not protrude out into any footpath.			
Crossings Have all crossings been located in accordance with the Engineering Standards for Land Development.			
Business/Industrial Service Lanes Have all service lanes been designed in accordance with the Engineering Standards for Land Development.			
Parking and Bus Bays Have all parking bays been designed in accordance with the Engineering Standards for Land Development.			
Pedestrian Accessways and Cycleways Have all pedestrian and cycle accessways been designed in accordance with the Engineering Standards for Land Development.			
Access to all proposed Lots including Rear Lots			

Actions Required	Yes	No	Comment
Have all accessways being designed in accordance with the Engineering Standards for Land Development and District Plan. The design is to include specified distances from roads and intersections.			
Streetscape Does the design conform to all requirements of the Engineering Standards for Land Development for topsoiling, grassing, planting, street name plates and median strips.			
Have all the relevant standards being adhered to for street light design.			
Has street furniture been designed to conform to the Engineering Standards for Land Development.			

APPENDIX 3

APPLICATION CHECKLIST FOR SUBDIVISION CONSENTS

GENERAL DETAILS			
Applicant Name:			
Location of Subdivision		**Residential**	☐
		Rural	☐
Legal Description		**Nodal**	☐
Number of Lots		**SB No**	

Information Required to Assess Subdivision Consent Application

Schematic Plans Show:	Yes	No	N/A	Comments	Reviewer Initials
1. The position of all new boundaries.	☐	☐	☐		
2. *The location and size of any land below mean high water springs of the sea, or of any part of the bed of a river or lake, which is required under Section 237A of the Act to be shown on a survey plan as land to be vested in the Crown. * If required, GeoTech Consent Condition Required	☐	☐	☐		
3. The location and areas of land to be set aside as new road.	☐	☐	☐		
4. The extent to which connections to electricity, gas and telecommunication networks are available to service the needs of the development and/or subdivision.	☐	☐	☐		
5. The location of any proposed easement.	☐	☐	☐		
6. The balance area of the property to be subdivided showing proposals for future development (if known)	☐	☐	☐		
7. Contours or spot heights sufficient for the design of access and services, and to show the general topography of the area, particularly around proposed house sites.	☐	☐	☐		
8. The main topographic features, including water courses, trees and areas of filled ground.	☐	☐	☐		

9. Existing and proposed provision for stormwater and farm drainage, and sewage disposal. For unsewered areas, evidence may be required that sewage can be adequately disposed of in an environmentally acceptable manner, without risk to health.	☐	☐	☐		
10. Existing structures (including buildings), and whether such structures will be retained, shifted or removed.	☐	☐	☐		
Schematic Plans Shows:	**Yes**	**No**	**N/A**	**Comments**	**Reviewer Initials**
11. Existing and proposed roads, vehicle crossings, pedestrian accessways, and service lanes with relevant widths, areas and gradients.	☐	☐	☐		
12. In Residential situations, the proposed location, size and grades of all Utilities.	☐	☐	☐		
13. *Proposed areas of excavation and fill, with finished contours where significant alterations to the ground surface are proposed. * If required, GeoTech Consent Condition Required	☐	☐	☐		
14. *An overall development plan of the proposed new and any existing development must accompany infill subdivision proposals for the site. * If required, GeoTech Consent Condition Required	☐	☐	☐		
15. The availability of utilities for each new lot.	☐	☐	☐		
16. Suitable Building Site - Location of at least one suitable site where a dwelling could be erected and has been demonstrated to be free of land stability hazards?	☐	☐	☐		
17. Effluent Disposal - Demonstrated suitability for the disposal of effluent from a dwelling on the land?	☐	☐	☐		
18. Topographical to determine cut and fill requirements.	☐	☐	☐		
19. *The stability of the new lots, including the depth and compaction of any fill and the future likelihood of earth movement or erosion. * If required, GeoTech Consent Condition Required	☐	☐	☐		
20. Identification of any natural hazards?	☐	☐	☐		
Note: *Check Localmaps for existing infrastructure e.g. hydrants, manifolds, sumps, manholes etc.*					

SITE SPECIFICS

Easements

					Reviewer Initials
New Easements Required	Yes ☐	No ☐	Location of Easements		
Any Existing Easements	Yes ☐	No ☐	Location of Easements		

Vehicle Crossings

			Reviewer Initials
Retain Existing	☐	Lot No(s):	
Upgrade Existing	☐	Lot No(s):	
New	☐	Lot No(s):	
Surplus	☐	Lot No(s):	

Size of Entrance Way Required *(8m – 2 or less sites; 10m – 3/4 sites, 12m - 5+ sites)*

Adequate Sight Distance	Yes ☐	No ☐	Comments

WATER

						Reviewer Initials
Retain Existing	☐	Lot No(s):				
Upgrade Existing	☐	Lot No(s):				
New	☐	Lot No(s):				
Water Tank Required	☐	Lot No(s):				
Rural Water Supply	☐	Stanway/Halcombe	☐	Number of Units		
		Waituna West	☐	Number of Units		
		Kiwitea (Private Scheme)	☐	Number of Units		

		Oroua (Private Scheme)	☐	Number of Units	
Comments					

WASTEWATER			Reviewer Initials
Retain Existing	☐	Lot No(s):	
Upgrade Existing	☐	Lot No(s):	
New	☐	Lot No(s):	
Septic Tank Required	☐	Lot No(s):	
Effluent Disposal required	☐	Lot No(s):	
Greywater System *Current schemes -*Cheltenham, *Kimbolton and Mount Taylor (*plans on trapeze)*	☐	Lot No(s):	
Comments			

STORMWATER			Reviewer Initials
Retain Existing	☐	Lot No(s):	
Upgrade Existing	☐	Lot No(s):	

New	☐	Lot No(s):
Comments		

Schedule 1A – Design Certificate – Land Development/Subdivision

SCHEDULE 1A

DESIGN CERTIFICATE – LAND DEVELOPMENT/SUBDIVISION

ISSUED BY:.....
(Approved certifier firm/suitably qualified design professional)

TO: .....
(Developer/owner)

TO BE SUPPLIED TO:.....
(Territorial authority)

FOR: .....
(Description of land development/subdivision)

AT:.....

.....
(Address)

..... has been engaged by .....
(Consultant/designer) *(Developer/owner)*

to provide..... services for the land development and/or subdivision described above.

I .....have the qualifications and experience relevant to this project as set out herein and have designed the land development/subdivision and confirm that the design is to current engineering practice, and that I believe on reasonable grounds that it satisfies all relevant resource consent conditions, all relevant .....(insert name of authority) requirements and applicable codes and standards.

I / My practice holds professional indemnity insurance to the amount of $.....and includes run-off cover.

..... *Date* .....
(Signature of approved certifier on behalf of the approved certifier firm)

.....
(Name, title, and professional qualifications)

NOTE – This statement shall only be relied upon by the territorial authority named above. Liability under this statement accrues to the approved certifier firm only. The total maximum amount of damages payable arising from this statement and all other statements provided to the territorial authority on this land development/subdivision, whether in contract, tort, or otherwise (including negligence), is limited to the sum of $..... (insert)

Schedule 1B Contractor's Certificate Upon Completion of Land Development/Subdivision

SCHEDULE 1B

CONTRACTOR'S CERTIFICATE UPON COMPLETION OF LAND DEVELOPMENT/SUBDIVISION

ISSUED BY:.....
(Contractor)

TO: .....
(Principal)

TO BE SUPPLIED TO:.....
(Territorial authority)

FOR: .....
(Description of land development/subdivision)

AT:.....

.....
(Address)

..... has contracted to .....
(Contractor) *(Principal)*

to carry out and complete certain land development and/or subdivision construction in accordance with a contract, titled Contract No. ..... for .....('the contract').

I ..... a duly authorised representative of .....
(Duly authorised agent) *(Contractor)*

hereby certify that ..... has carried out and completed
(Contractor)

the construction, other than those outstanding works listed below, in accordance with the contract and in accordance with approved engineering drawings and specifications.

..... Date .....

(Signature of authorised agent on behalf of)

.....
(Contractor)

....
(Address)

Outstanding works

.....
.....
.....

Schedule 1C Certification Upon Completion of Land Development/Subdivision

SCHEDULE 1C

CERTIFICATION UPON COMPLETION OF LAND DEVELOPMENT/SUBDIVISION

ISSUED BY:.....
(Approved certifier firm)

TO: .....
(Developer/owner)

TO BE SUPPLIED TO:.....
(Territorial authority)

FOR: .....
(Description of land development/subdivision)

AT:.....

.....
(Address)

..... has been engaged by .....
(Consultant/designer) *(Developer/owner)*

to provide construction observation review and certification services for the above subdivision which is described in the specification and shown on the drawings numbered

.....approved by.....
(Territorial authority)

I have sighted the ..... consent and conditions of subdivision
(Territorial authority)

and the approved specification and drawings.

On the basis of periodic reviews of the construction and information supplied by the contractor in the course of the construction, I believe on reasonable grounds that the infrastructure other than those outstanding works listed below, is complete and has been constructed in accordance with:

(a) The approved engineering drawings and specifications and any approved amendments;
(b) The Council's Engineering Standards; and
(c) The manufacturer's instructions

..... Date .....
(Signature of approved certifier on behalf of the approved certifier firm)

.....
(Name, title, and professional qualifications)

NOTE – This statement shall only be relied upon by the territorial authority named above. Liability under this statement accrues to the approved certifier firm only. The total maximum amount of damages payable arising from this statement and all other statements provided to the territorial authority in relation to this land development/ subdivision, whether in contract, tort, or otherwise (including negligence), is limited to the sum of $..... (insert).

Outstanding works

.....

Schedule 1D As-Built Plans

SCHEDULE 1D

AS-BUILT PLANS

Information given on as-built drawings, whether submitted electronically or as paper plans, shall include but shall not be limited to:

(a) Stormwater and wastewater reticulation – including the coordinated positions of manholes, manhole inverts, inverts of pipes and lid levels, measurements to house connections, and laterals and their length and position. Positions of connections and laterals shall be both coordinated and referenced to adjacent manhole lids and boundary pegs. All levels shall be in terms of datum approved by the TA;

(b) Stormwater management devices – as-built plans for low impact stormwater management devices and non-reticulated components;

(c) Flood and secondary flow information, flood water levels and the extent of any overland secondary flows shall be shown where these have been obtained or derived during the design;

(d) Water reticulation – including the position of mains, location of hydrants, valves, tees, reducers, connections, tobies, water meters, and specials. All features shall be accurately dimensioned, coordinated, and referenced so that they can be accurately relocated in the field;

(e) Ducts – measurements to ducts installed by the developer for utilities;

(f) Labelling of pipes and ducts to cover diameter, pipe material and class, year laid, jointing type;

(g) Road names where available – as approved by the TA;

(h) Coordinates and levels of all utility surface features to be taken over by the TA, including tobies, and water meters;

(i) The coordinates of at least two points on each plan in terms of an appropriate geodetic or cadastral datum and the origin of the plan level datum;

(j) Geotechnical completion report and as-built drawings as detailed in 2.6.1 and 2.6.2 of NZS 4404:2010. As-built surface contours covering all areas of disturbed and cut/fill ground;

(k) Road construction, including location, structural details, and details of road marking, signals, lighting, and signs, landscape features, seating, and other amenities and features;

(l) Road pavement and surfacing information;

(m) Landscape features, seating, and other amenities and features.

APPENDIX 4

Schedule 2A (NZS 4404:2010)

STATEMENT OF PROFESSIONAL OPINION AS TO SUITABILITY OF LAND FOR BUILDING CONSTRUCTION

Development .....

Developer .....

Location .....

I ..... of ……..
(full name) (name and address of firm)

Hereby confirm that:

1. I am a geotechnical engineer as defined in Section 1.2.2 of NZS 4404 and was retained by the Developer as the geotechnical engineer on the above development.
2. The extent of my inspections during construction, and the results of all tests carried out areas described in my geotechnical completion report dated .....
3. In my professional opinion, not to be construed as a guarantee, I consider that (delete as appropriate)
   The earth fills shown on the attached Plan No ..... have been placed in compliance with the requirements of the Manawatū District Council and my specification.
   The completed works give due regard to land slope and foundation stability considerations.
   The original ground not affected by filling is suitable for the erection thereon of buildings designed according to NZS 3604 provided that:
   (i)
   .....
   (ii)
   .....
   The filled ground is suitable for the erection thereon of buildings designed according the NZS 3604 provided that:
   (i)
   .....
   (ii)
   .....
   The original ground not affected by filling and the filled ground are not subject to erosion, subsidence or slippage in accordance with the provisions of Section 106 of the resource Management Act 1991 provided that:
   (i)
   .....
   (ii)
   .....
   NOTE – The sub-clauses in clause 3 may be deleted or added to as appropriate.
4. This professional opinion is furnished to the Manawatū District Council and the Developer for their purposes alone on the express condition that it will not be relied upon by any other person and does not remove the necessity for the normal inspection of foundation conditions at the time of any building.
5. This certificate shall be read in conjunction with my geotechnical report referred to in Clause 2 above and shall not be copied or reproduced except in conjunction with the full geotechnical completion report.

Signed: ..... Date: ……

.....
Professional Qualification

APPENDIX 5

CERTIFICATE OF CLEANLINESS AND DISINFECTION OF WATER SUPPLY MAINS

Development	
Developer	
Developer's Technical Representative	
Location of Development	

I ..... of .....

confirm that:

1. I am a registered engineer experienced in the public health field including residential water supply
2. I was engaged by the Developer responsible for the above development to oversee disinfection and cleanliness of the new water supply mains and connection to the existing water supply.
3. Water quality sampling has been carried out under my direction. Testing has been undertaken

   by.....

   which is a I.A.N.Z. registered laboratory for the required tests.

4. The physical works of connection to the existing water supply system and the cleanliness and disinfection of the new water supply mains was undertaken by

   Full name: .....

   Company: .....

who holds a current certificate in 'mains disinfection' recognised by the Manawatū District Council.

5. I confirm that the cleanliness, disinfection and connection to the existing main have been carried out in accordance with the Disinfection Code of Practice.
6. In my professional opinion the completed disinfection and connection gives due regard to the existing reticulation, consumers and the water supply operation.
7. In my professional opinion the completed and commissioned installation will convey water in accordance with the Water Supply Protection Regulations1961 and the current New Zealand Ministry of Health Drinking Water Standards.
8. I attach my report of the disinfection and connection procedures, laboratory results and plans showing disinfection points, scouring points and connection details.
9. I acknowledge that final and complete connection to the existing water supply system (opening the valve) will be by the Manager upon satisfactory completion of physical works, testing and certification.

Signed:..... Date: .....

APPENDIX 6

STATEMENT OF COMPLETION BY DEVELOPER'S TECHNICAL REPRESENTATIVE

Development	
Developer	
Developer's Technical Representative	
Location of Development	
Primary Contractor	
Sub-Contractors	

I ..... Developer's Technical Representative for the above development, certify that all the construction works required by the Resource Consent have been completed, or a bond to cover any uncompleted work has been signed by all parties in accordance with the engineering plans and all details submitted to, and approved by Council.
The Council has a complete and accurate set of final "As Built" drawings showing all works that were carried out as required by the Resource Consent and approved engineering plans.
Monitoring was carried out in accordance with the Engineering Standards for Land Development and all required tests were undertaken and all records of the tests forwarded to Council. All construction work was carried out using sound and acceptable engineering practice.

Developer's Technical Representative

..... Date ……..

Qualification

.....

APPENDIX 7

CONSTRUCTION MONITORING SERVICES

Construction monitoring is a service which provides the client with independent verification (to the extent of the consultant's engagement) that the work has been completed in accordance with specified requirements.

Most construction projects are unique, but unlike manufactured products which are often thoroughly tested and evaluated during construction and prior to being brought into service, the completed project is rarely for all design requirements. Construction works are also complex in detail and skilled professional involvement is necessary for the successful executive of such projects.

Five levels of construction monitoring service are defined. The decision as to which level is appropriate will be project dependent.

Factors influencing the level of construction monitoring for a project are:

- The size of the project
- The importance of the project
- The complexity of the construction works
- The experience and demonstrated skill in quality management of the constructor

The primary responsibility for completing the contract works in accordance with the requirements of the plans and specifications is the constructor's.

The involvement of the consultant is important during the construction phase to ensure that:

- The design is being correctly interpreted,
- The construction techniques are appropriate and do not reduce the effectiveness of the design and;
- The work is completed generally in accordance with the plans and specifications

The risk of non-compliance can be reduced by increasing the involvement of the consultant. Because the cost of monitoring increases with increasing levels of service the client should consider all factors before deciding upon the most appropriate level of construction monitoring for the project.

Table 1 sets out the five levels of construction monitoring, describes the types of review and indicates where a particular level of monitoring is appropriate.

Tables 2 and 3 provide rating values for various aspects of a project to enable an assessment of an appropriate monitoring level to be made.

An increase in the quality monitoring of the project works by the consultant significantly reduces the risk that the materials or components do not meet specified requirements, the design has been incorrectly interpreted, and/or poor quality workmanship has been incorporated in the project.

Table 1

CONSTRUCTION MONITORING SERVICE		
LEVEL	**REVIEW**	**COMMENT**
CM1	Monitor the outputs from another party's quality assurance programme against the requirements of the plans and specifications. Visit the works at a frequency agreed with the client to review important materials of construction critical work procedures and/or completed plant or components. Be available to advise the constructor on the technical interpretation of the plans and specifications	This level is only a secondary service. It may be appropriate where: - For the design consultant when another party is engaged to provide a higher level of construction monitoring or review during the period of construction or; - When the project works are the subject of a performance based specification and performance testing is undertaken and monitored by others.

CONSTRUCTION MONITORING SERVICE		
LEVEL	**REVIEW**	**COMMENT**
CM2	Review, preferable at the earliest opportunity, a sample of each important work procedure, material of construction and component for compliance with the requirements of the plans and specifications and review a representative sample of each important completed work prior to enclosure or completion as appropriate. Be available to provide the constructor with technical interpretation of the plans and specification.	This level of service is appropriate for smaller projects of a routine nature being undertaken by an experienced and competent constructor and where a higher than normal risk of non-compliance is acceptable. It provides for the review of a representative sample of work procedures and materials of construction. The assurance of compliance of the finished work is dependent upon the constructor completing the work to at least the same standard as the representative sample reviewed.
CM3	Review, to an extent agreed with the client, random samples of important work procedures, for compliance with the requirements of the plans and specifications and review important completed work prior to enclosure or on completion as appropriate. Be available to provide the constructor with technical interpretation of the plans and specifications.	This level of service is appropriate for medium sized projects of a routine nature being undertaken by an experienced constructor when a normal risk of non- compliance is acceptable.
CM4	Review, at a frequency agreed with the client, regular samples of work procedures, materials of construction and components for compliance with the requirements of the plans and specifications and review the majority of completed work prior to the enclosure or on completion as appropriate.	This level of services is appropriate for projects where a lower than normal risk of non-compliance is required.
CM5	Maintain personnel on site to constantly review work procedures, materials of construction and components for compliance with the requirements of the plans and specifications and review completed work prior to enclosure or on completion as appropriate.	This level of service is appropriate for: -Major projects - Projects where the consequences of failure are critical - Projects involving innovative or complex construction procedures. The level of service provides the client with the greatest assurance that the completed work complies with the requirements of the plans and specifications.

SELECTION OF AN APPROPRIATE LEVEL OF CONSTRUCTION MONITORING

The level of construction monitoring suitable for a project can be obtained as follows:

1. Select value of KA to KD from Table 2 and sum total. A value for each K Factor must be included

Table 2

CRITERIA	K	ASSESSMENT				SELECTED VALUE
Project Status	KA	Small 1	Medium 2	Large 3	Major 4	
Complexity of work procedures	KB	Routine 2	Difficult 4	Complex 6		
Relevant experience of constructor	KC	Inexperienced 6	Experienced 2	Certified ISO 9000 1		
Consequences of non-compliance	KD	Minor 1	Moderate 4	Serious 6	Critical 12	
KTOTAL = KA + KB + KC + KD						

2. Use K Total to select the level of construction monitoring appropriate from Table 3.

Table 3

	LEVEL OF CONSTRUCTION MONITORING				
KTOTAL	CM1	CM2	CM3	CM4	CM5
5-6		Sampling only	-	-	-
7-8		N/A	Weekly	-	-
9-10	A	N/A	Twice Weekly	-	-
11-12	Secondary	N/A	N/A	Twice Weekly	-
13-14	Service	N/A	N/A	Every second day	-
15-16		N/A	N/A	Daily	-
17-		N/A	N/A	N/A	Constant

N/A = Not Appropriate

Secondary Service - This level of service is only appropriate when another party is responsible for undertaking the primary review of construction standards.

Table 3 indicates the frequency of review considered to be appropriate for the project concerned. Not indicated is the time input requirement at each review. The time on each occasion will increase with the increased size and complexity of the construction works and should be agreed with the consultant at the time of engagement.

Frequency of inspection is intended to be indicative of involvement with actual frequency dependent on the rate of progress of the works.

STANDARD DRAFTING SYMBOLS

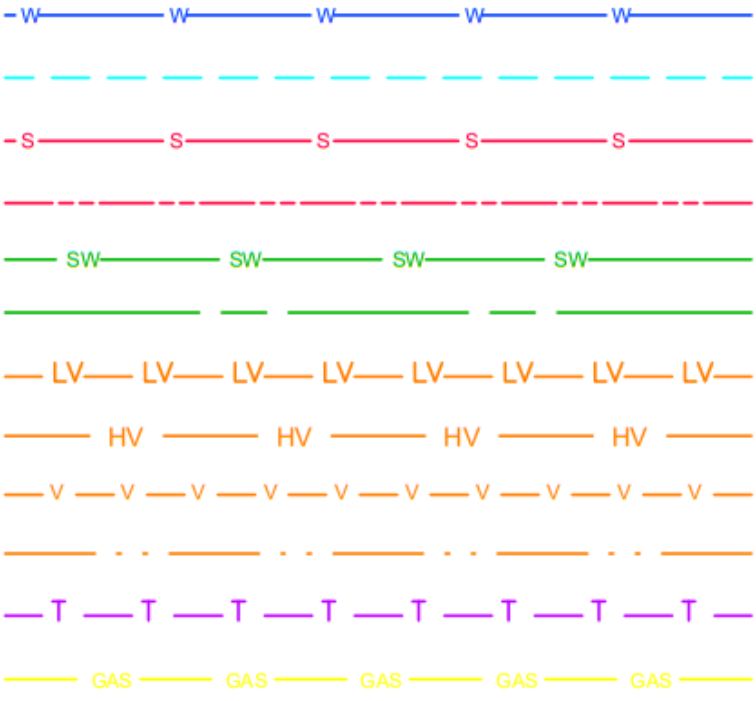
STANDARD DRAFTING SYMBOLS:

- Proposed Manhole
- Existing Manhole
- Existing Valve
- Existing Fire Hydrant
- Existing Water Toby
- Existing Sump
- Proposed Street Lights
- Existing Street Lights
- Existing Survey Marks
- Proposed Power Pole
- Existing Power Pole

GIS POINT CODES

POINT DESCRIPTION:	
SSMH	Wastewater Drainage Manhole
SSLAT	Wastewater Lateral
SWMH	Stormwater Manhole
SUMP	Sump
SWTK	Stormwater Drainage to Kerb
SWLAT	Stormwater Lateral
VALVE	Water Valve
FH	Fire Hydrant
TOBY	Water Toby
WMETER	Water Meter
WMAIN	Points Along Water Main
KERB	Points Along Kerb Line
EOP	Edge Of Seal
WMSP	Water Main Swabing Pont

LINE TYPES:



- Proposed Water
- Existing Water
- Proposed Wastewater
- Existing Wastewater
- Proposed Stormwater
- Existing Stormwater
- Existing Power (Low Voltage)
- Existing Power (High Voltage)
- Existing Power Ducts
- Existing Street Light Wiring
- Existing Telecommunication Providers
- Existing Gas

TYPICAL DRAFTING SYMBOLS AND LINE TYPES

MANAWATU DISTRICT COUNCIL		Scale:	Not to Scale
Designed	Infrastructure	Plan No.	1.1
Drawn	Infrastructure		
Checked	GY		
Revised	08/05/2017	Sheet 1 of 1 Sheets	

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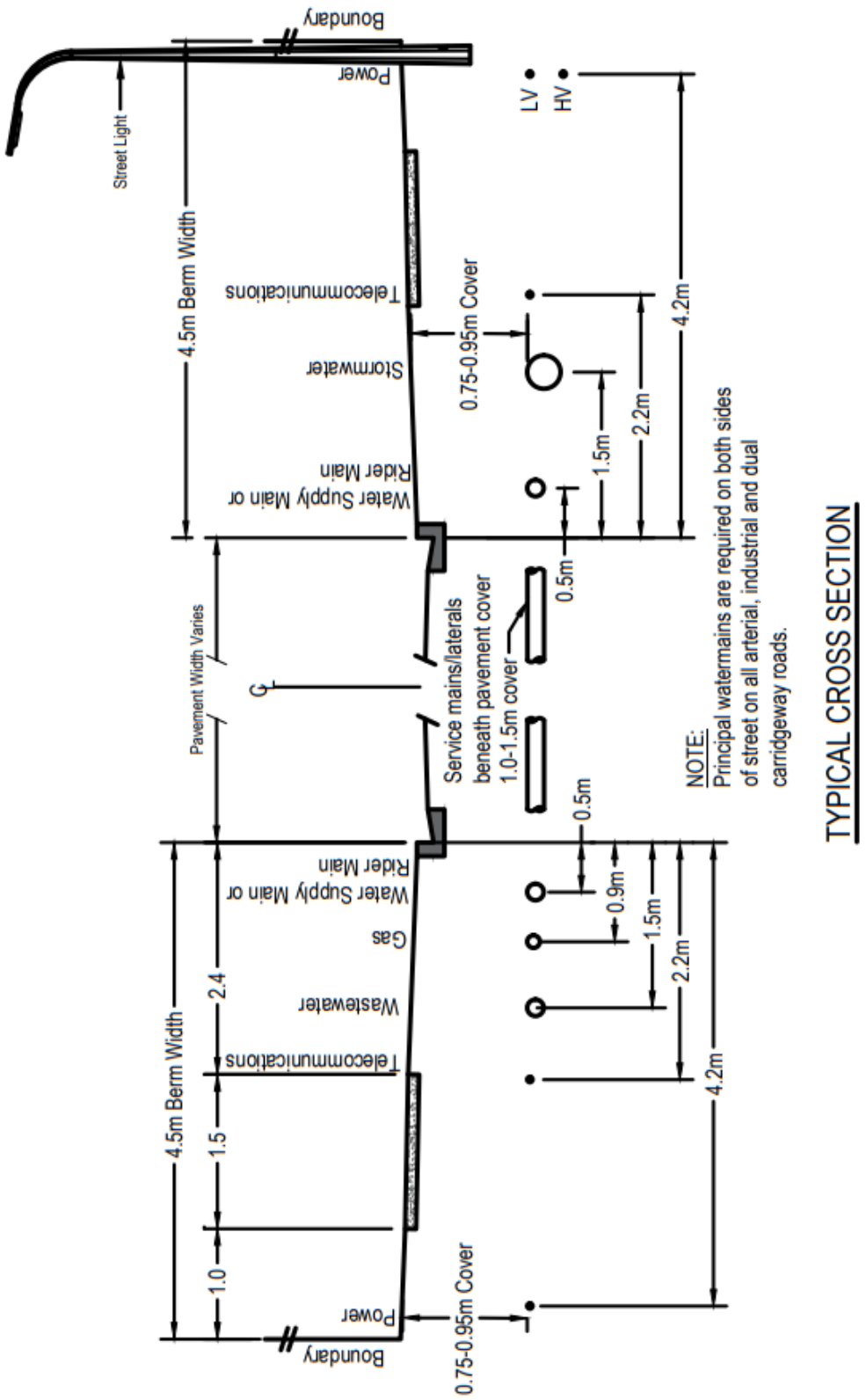

TYPICAL CROSS SECTION

GENERAL LOCATION OF SERVICES IN ROAD RESERVE

MANAWATU DISTRICT COUNCIL		Scale:	Not to Scale
Designed	Infrastructure	Plan No.	1.2
Drawn	Infrastructure		
Checked	GY		
Revised	09/05/2017	Sheet 1 of 1 Sheets	

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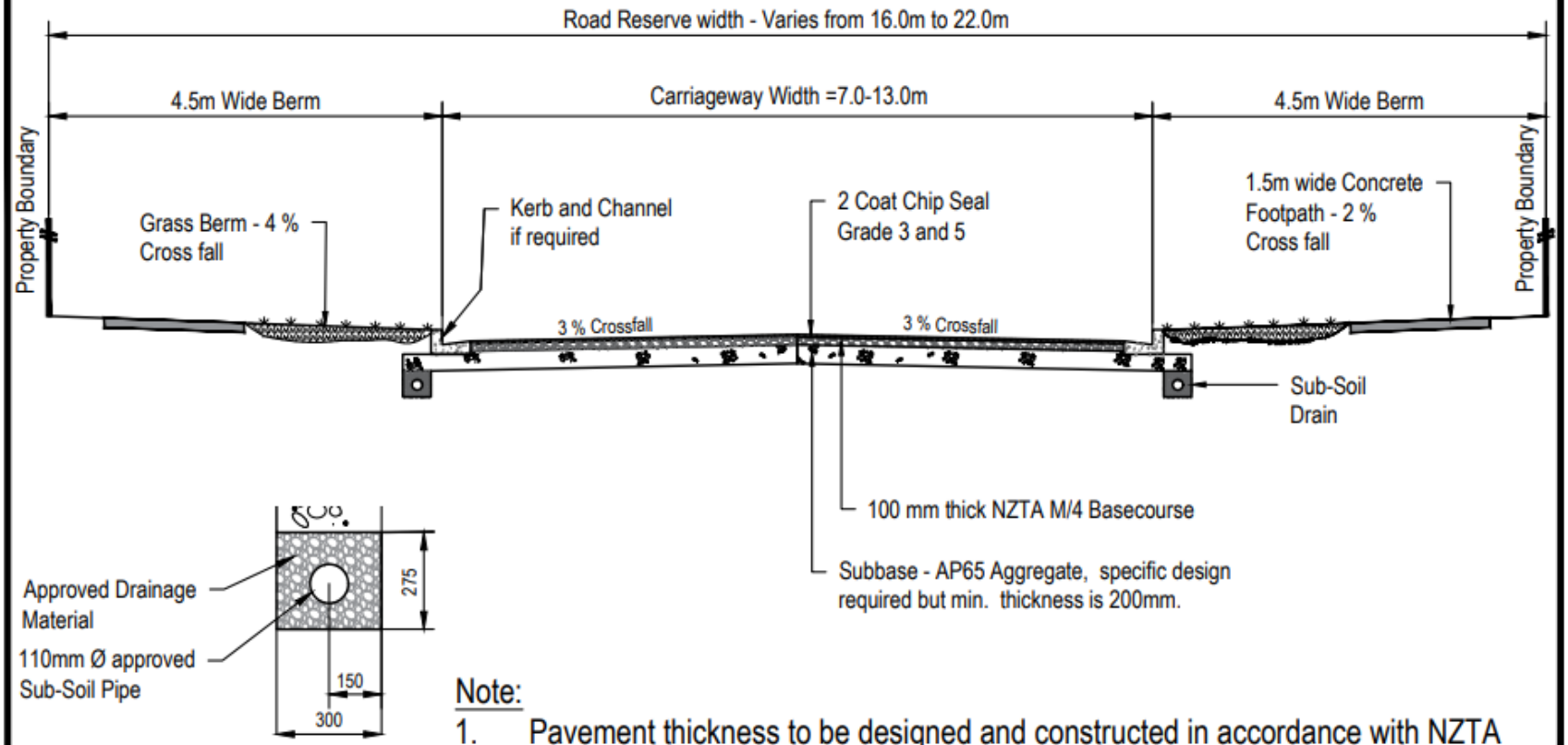
URBAN STREETS - TYPICAL CROSS SECTION



SUB-SOIL DETAIL

Note:

1. Pavement thickness to be designed and constructed in accordance with NZTA specification.
2. Footpath Details
   - 75mm thick compacted M/4 AP40 aggregate bedding, minimum Clegg Impact Value of 30,
   - 100mm thick of concrete, minimum compressive strength after 28 days - 20MPa
   - Expansion joint at 3.0m intervals

MANAWATU DISTRICT COUNCIL

Designed	Infrastructure	Scale: Not to Scale
Drawn	Infrastructure	Plan No. 1.2.1
Checked	GY	Sheet 1 of 1 Sheets
Revised	09/05/2017	

STREET CLASSIFICATIONS & STREET WIDTHS - RESIDENTIAL VILLAGE & INDUSTRIAL									
Area Served(Zoning)	Lots/Dwelling Served	Classification	Legal Road/ROW Width (Minimum)	Carriageway Width (Minimum)	Footpath	Total Berm Width	Max./Min. Grade	Normal Camber	Notes
Residential	2-3	Private ROW/Access Lot	3.5m	3.5m (U1)	N/A		12.5% / 0.4%	3%	Approved stormwater control
Village	Upto 4	Private ROW/Access Lot	3.0m	3.0m	N/A		12.5% / 0.4%	3%	Passing opportunities may be required (as per MDC District Plan)
Residential	4-5	Private ROW/Access Lot	6.0m (U2) (U3) (U4)	5.0m (U5)	(U2)	1.0m	12.5% / 0.4%	3%	Min. kerb and channel one side . Turning area required.
Village	5-7	Private ROW/Access Lot	6.0m (U4)	6.0m	N/A	N/A	12.5% / 0.4%	3%	Passing opportunities may be required (as per MDC District Plan).
Residential/Village Cul-de-Sac	Upto 12 Lots of 12 DU. Max length = 150m	Local Roads (Public Roads)	16.0m (U3) (U4)	7.0m (U5)	1 @ 1.5m	9.0m	12.5% / 0.4%	3%	Kerb and channel both sides. Cul-de-Sac turning head required.
Residential/Village	12-20 Lots	Local Roads (Public Roads)	17.0m	8.0m (U5)	2 @ 1.5m	9.0m	12.5% / 0.4%	3%	Kerb and channel both sides. Cul-de-Sac turning head required.
Residential/Village	>20 Lots	Local Roads (Public Roads)	20.0m	11.0m (U5)	2 @1.5m	9.0m	12.5% / 0.4%	3%	Road connectivity required
Industrial		Local Roads (Public Roads)	20.0m	11.0m (U5)	2 @1.5m	9.0m	10% / 0.4%	3%	Road connectivity required
Residential		Collector	20.0m	11.0m	2 @1.5m	9.0m	10% / 0.4%	3%	Road connectivity required
Industrial		Collector	22.0m	13.0m	2 @1.5m	9.0m	10% / 0.4%	3%	Road connectivity required
All roads		Arterial	22.0m	13.0m	2 @1.5m	9.0m	10% / 0.4%	3%	Road connectivity required

NOTE:

All cut and fill batters including retaining structures shall be located clear of the Legal Road / ROW.

U1: Approve carriageway construction either : chipseal, concrete, asphaltic concrete or paving. Passing Bay required where visibility is limited or if ROW is over 75m long.

U2: Where ROW / Access Lot exceeds 75m in length a 1.5m wide footpath is required on one side.

U3: Council may require additional "On Street" Parking where Lot sizes are less than 500 sq. m. (Typically, one car park per two lots).

U4: The Legal Road / ROW width shall be widened to maintain the standard berm widths at all turning heads and cul-de-sacs.

U5: All vehicular turning heads to be paved with asphaltic concrete.

*Carriageway formations includes kerb and channel /nibs/ stormwater

STREET CLASSIFICATION AND WIDTHS - RESIDENTIAL, VILLAGE & INDUSTRIAL SUBDIVISIONS

MANAWATU DISTRICT COUNCIL

Designed	Infrastructure
Drawn	Infrastructure
Checked	GY
Revised	06/2017

Scale: Not to Scale

Plan No. 1.2.2

Sheet 1 of 1 Sheets

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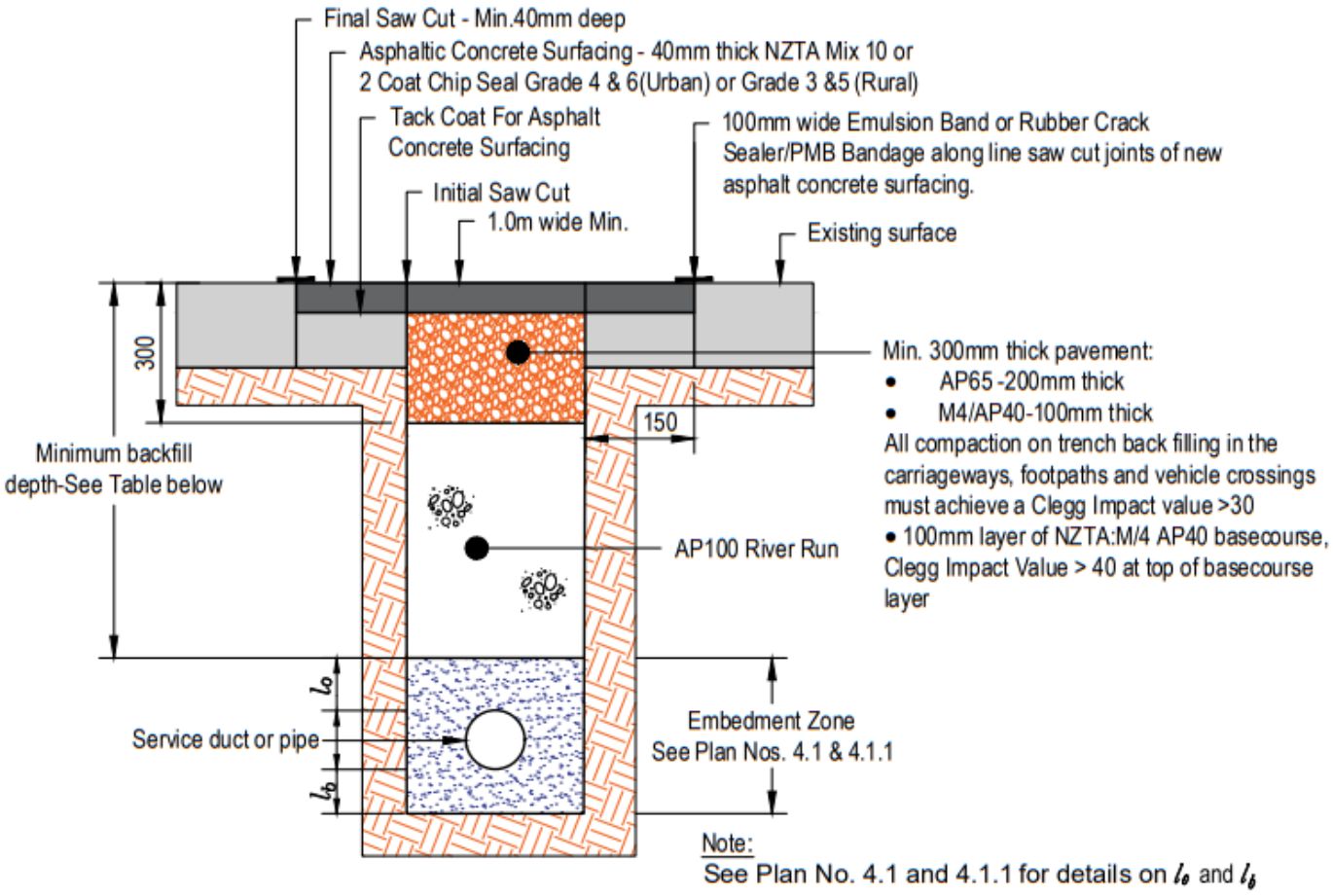

Minimum Backfill Depth (mm)					
Service	Road Pavement	Berm	Vehicle Access	Parking Areas	Other
Wastewater					
- Mains	900	750	900	900	750
- Service	900	750	900	900	750
Water Supply					
- Mains	900	750	900	900	750
- Service	900	750	900	900	750
Stormwater					
- Mains	900	750	900	900	750
- Service	900	750	900	900	750
Other Utilities					
- Fibre	600	450	600	600	600

TRENCH REINSTATEMENT FOR EXISTING ROADS

MANAWATU DISTRICT COUNCIL		Scale: Not to Scale
Designed	Infrastructure	Plan No. 3.0
Drawn	Infrastructure	
Checked	GY	
Revised	08/05/2017	Sheet 1 of 1 Sheets

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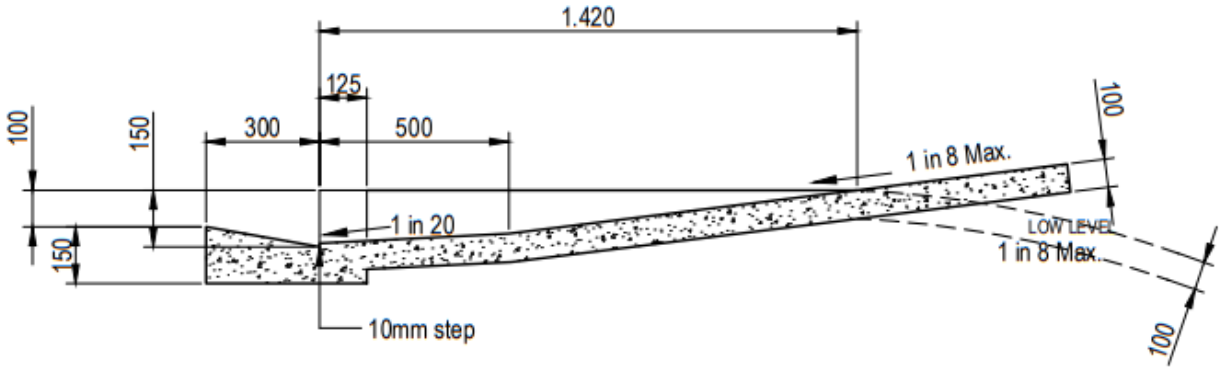
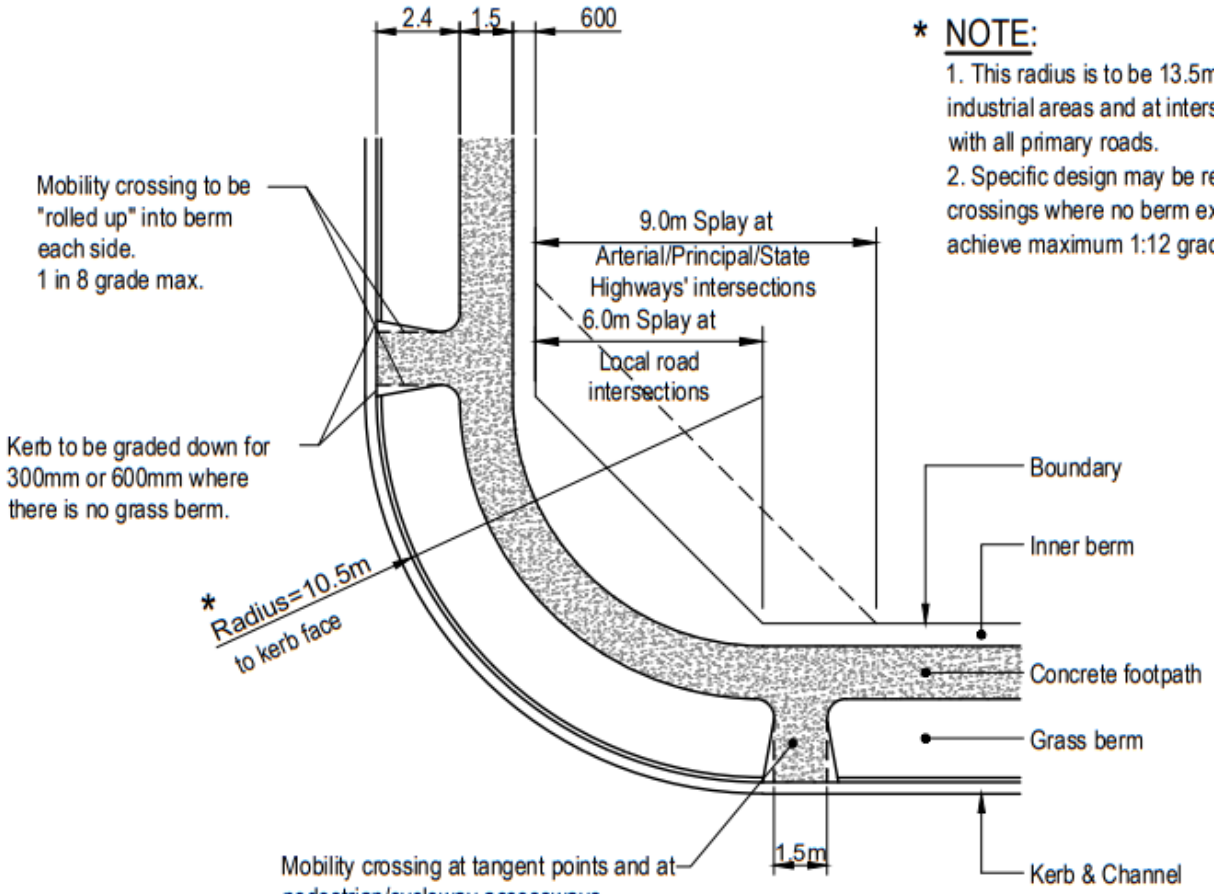


Note:
100mm thick 20 MPa concrete on 100mm thick compacted NZTA:M4 AP40

SECTION OF PRAM CROSSING

Scale 1:20



* NOTE:
1. This radius is to be 13.5m for industrial areas and at intersections with all primary roads.
2. Specific design may be required for crossings where no berm exists, to achieve maximum 1:12 grade.

LAYOUT OF MOBILITY CROSSING & CORNER SPLAY

MOBILITY CROSSING & CORNER SPLAY DETAILS

MANAWATU DISTRICT COUNCIL

Designed	Infrastructure
Drawn	*.*
Checked	*.*
Revised	03/ 017

Scale: 1:200

Plan No.
3.1

Sheet of Sheets

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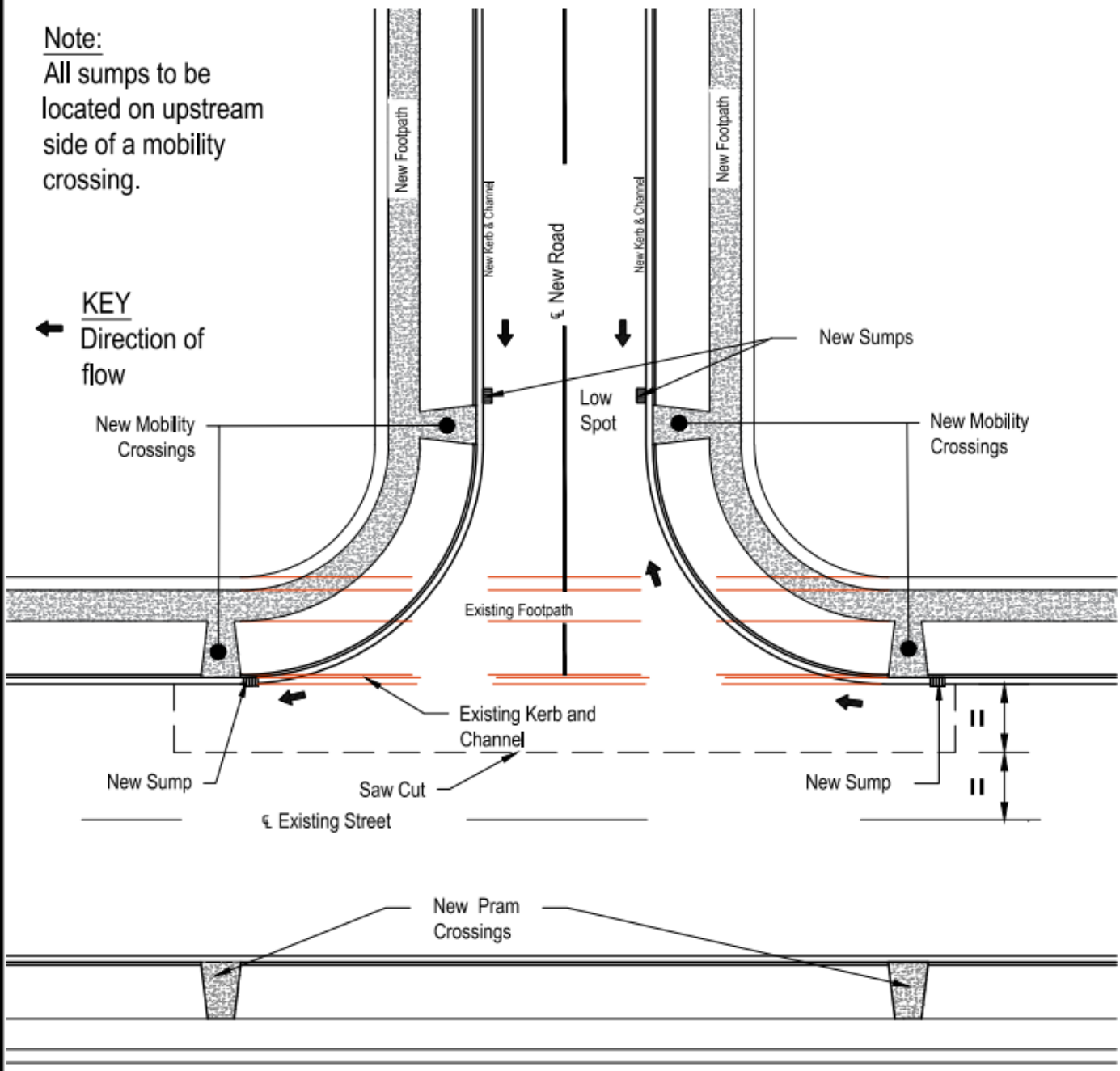
Note:
All sumps to be located on upstream side of a mobility crossing.



NOTE:
This detail applies where footpath, kerb and channel is to be removed from the existing street.

INTERSECTION DETAIL

MANAWATU DISTRICT COUNCIL	
Designed	Infrastructure
Drawn	Infrastructure
Checked	GY
Revised	05/2017

Scale: Not to Scale

Plan No. 3.2

Sheet 1 of 1 Sheets

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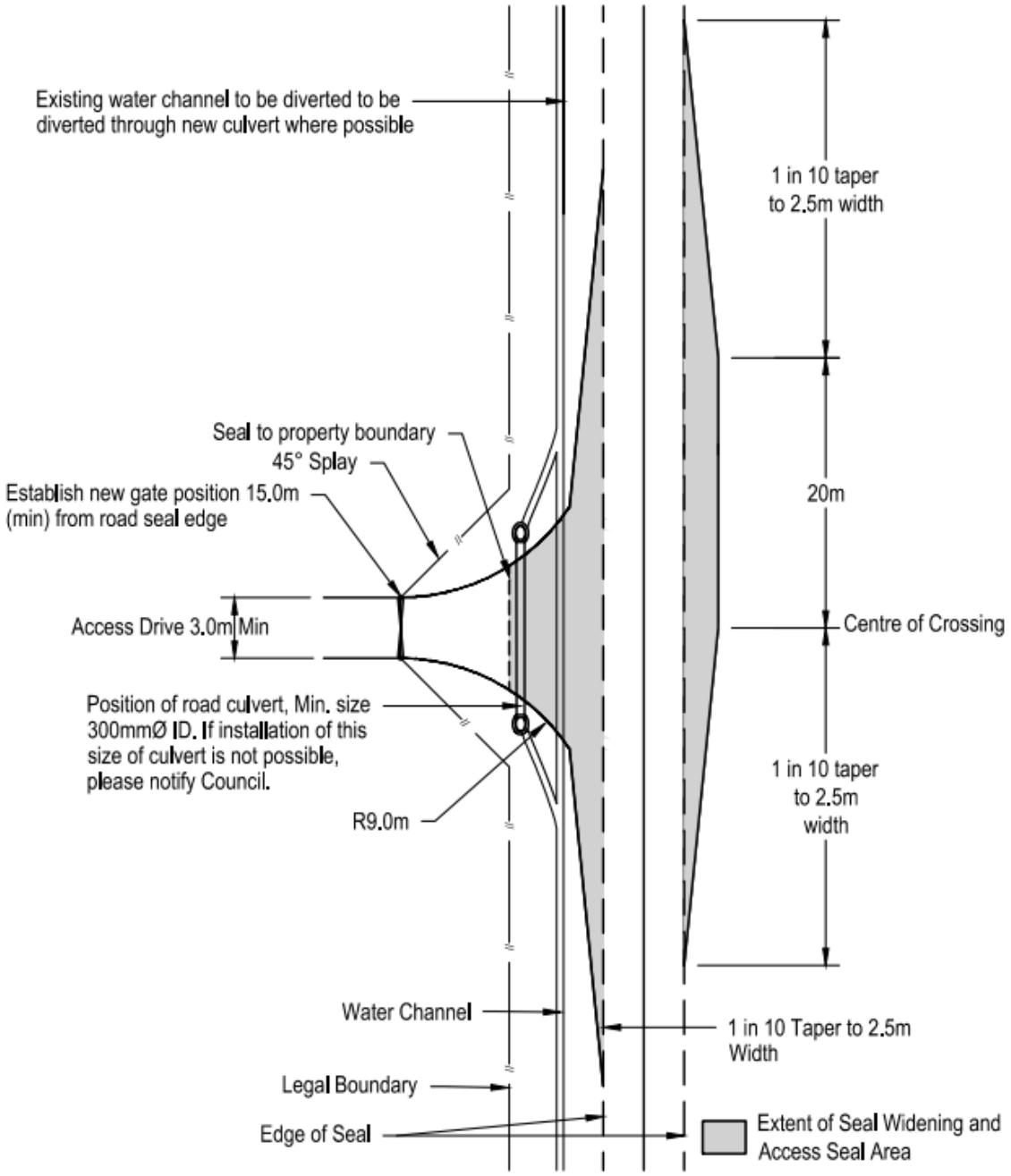

Note:

1. The constructed vehicle crossing's surface shall be similar to the adjoining carriageway.
2. All new vehicle crossing surfaces on unsealed roads shall be sealed with a two coat Grade 3 and 5 chip seal.

STANDARD RURAL/VILLAGE/NODAL VEHICLE CROSSING-FREQUENT USE BY HEAVY VEHICLES

MANAWATU DISTRICT COUNCIL		Scale:	Not to Scale
Designed	Infrastructure	Plan No.	3.2.1
Drawn	Infrastructure		
Checked	GY		
Revised	05/2017	Sheet 1 of 1 Sheets	

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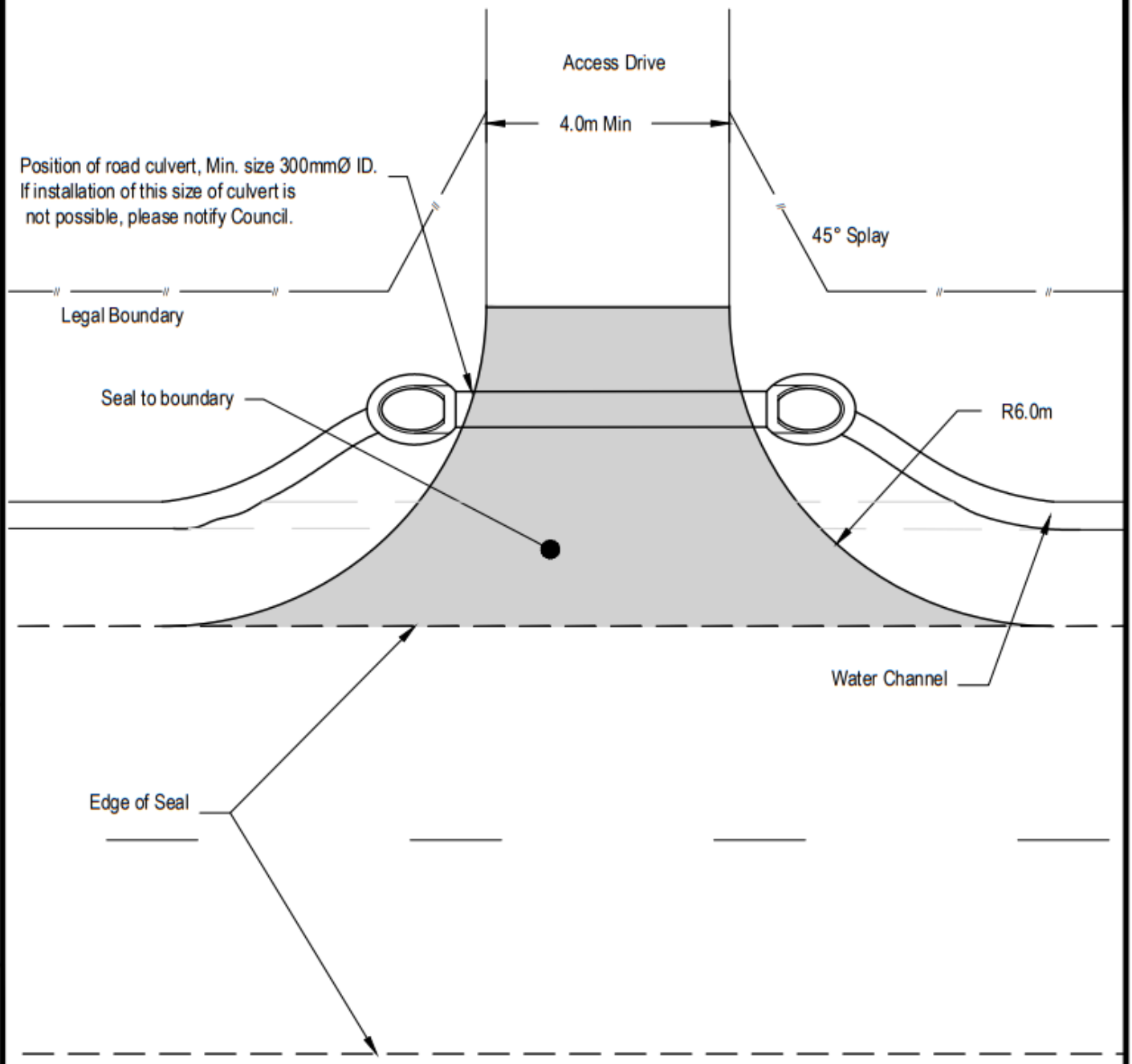

STANDARD RURAL/VILLAGE ZONE VEHICLE CROSSING

MANAWATU DISTRICT COUNCIL		Scale: Not to Scale
Designed	Infrastructure	Plan No. 3.2.2
Drawn	Infrastructure	
Checked	GY	
Revised	08/05/2017	Sheet 1 of 1 Sheets

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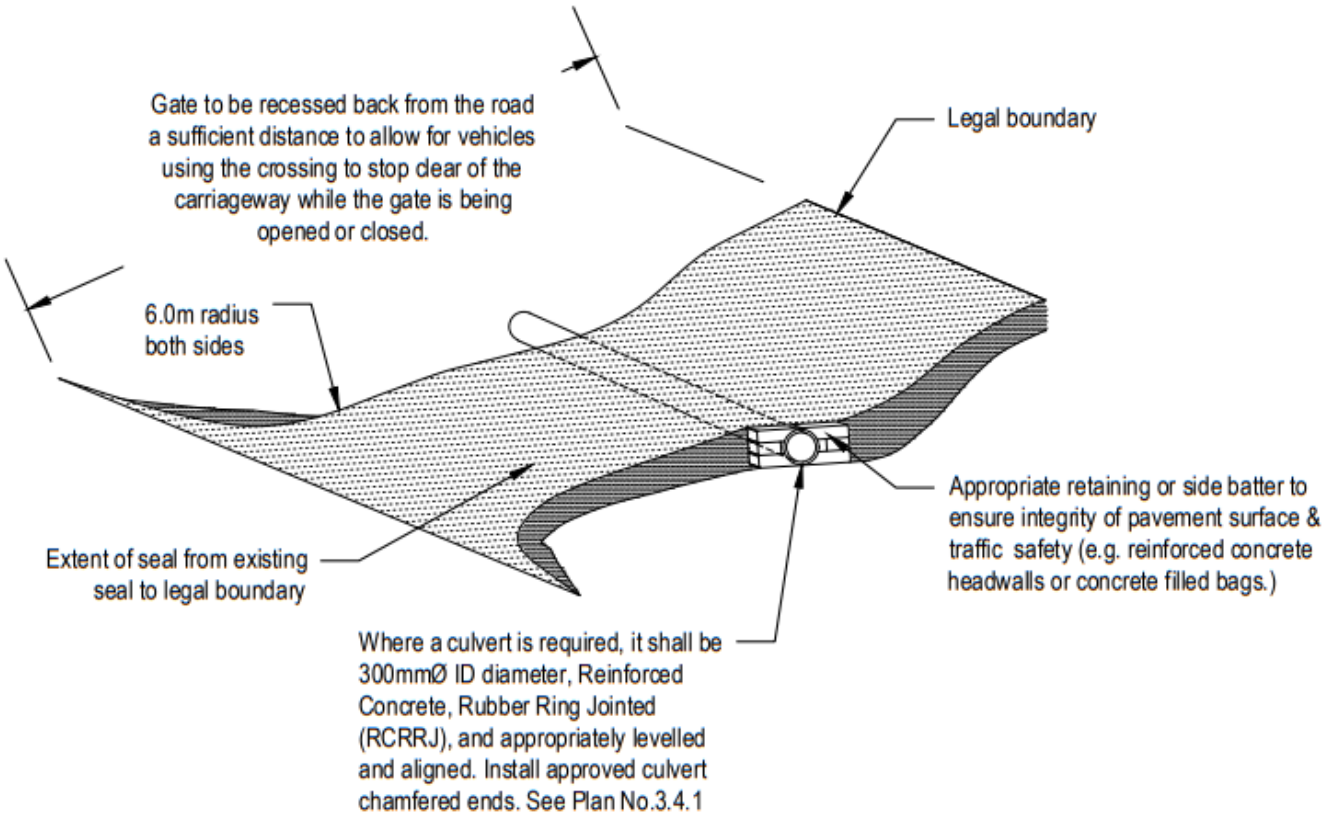

Notes:

1. This drawing applies to standard rural residential vehicle crossings only. For heavy duty vehicle crossings, shared access, or State Highway requirements, please contact the District Council.
2. The minimum width of a residential vehicle crossing is 3.0m with 7.0m at the road edge and allowing for 6.0m radius on each side. In addition, the crossing shall be of sufficient width to ensure that vehicles can both enter and exit from the correct side without crossing the road centre line.
3. The existing ground is to be excavated down to solid bearing and backfilled with a minimum of 300mm of metal placed and compacted.
4. Where the existing carriageway is sealed or paved, the vehicle crossing is to be sealed with a two coat seal coat, Grade 3 and 5 seal coat, to the legal boundary from the existing road edge. Where practical, the crossing shall be dished to avoid runoff from the road into the property, or vice versa.
5. Where the road environment dictates (such as steep gradients, etc.), specific design is required. Please consult with the Council's Roading Manager.
6. The locations of all new vehicle crossings must be approved by Council to ensure that site distances stipulated in the District Plan are met.
7. Public Safety: A Corridor Access Request and a Traffic Management Plan are required, and Council's approval must be obtained before any work can begin. All work is to be carried out in accordance with the Health and Safety at Work Act 2015. Every effort is to be made to protect the safety of both the pedestrians and vehicular traffic including the provision of appropriate signage and barricading.
8. Contact Telecommunications, Power and Gas companies and the District Council for the locations of services prior to commencing any works.

STANDARD RURAL/VILLAGE ZONE VEHICLE CROSSING

MANAWATU DISTRICT COUNCIL

Designed	Infrastructure
Drawn	Infrastructure
Checked	GY
Revised	05/2017

Scale: Not to Scale

Plan No. 3.2.3

Sheet 1 of 1 Sheets

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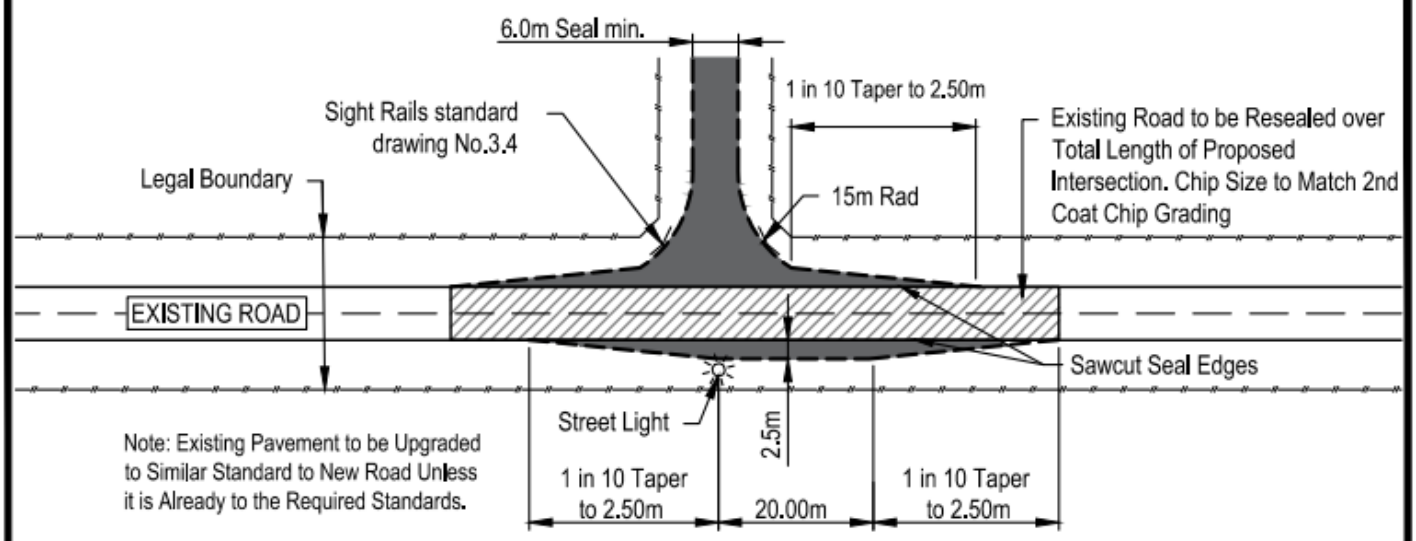
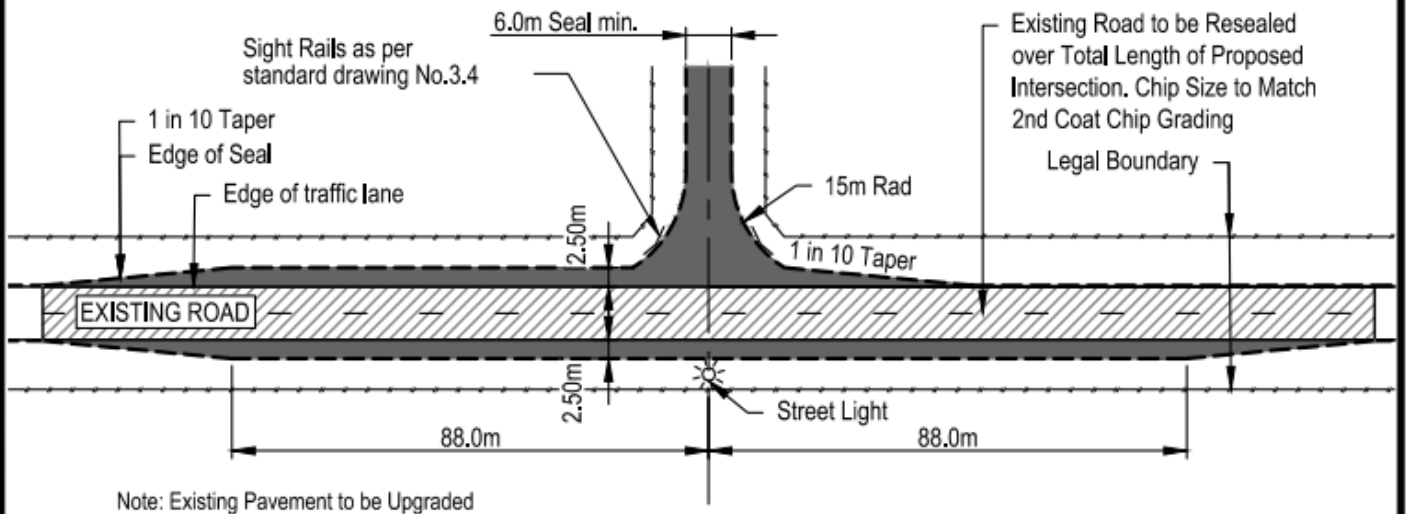


JUNCTION WITH SECONDARY ROADS



JUNCTION WITH PRIMARY ROADS

Seal widening and access sealing

Road marking to NZTA's MOTSAM Standard

RURAL/RURAL RESIDENTIAL ROAD INTERSECTION (0-500 VPD)

MANAWATU DISTRICT COUNCIL		Scale: Not to Scale
Designed	Infrastructure	Plan No. 3.3
Drawn	Infrastructure	
Checked	GY	
Revised	05/2017	Sheet 1 of 1 Sheets

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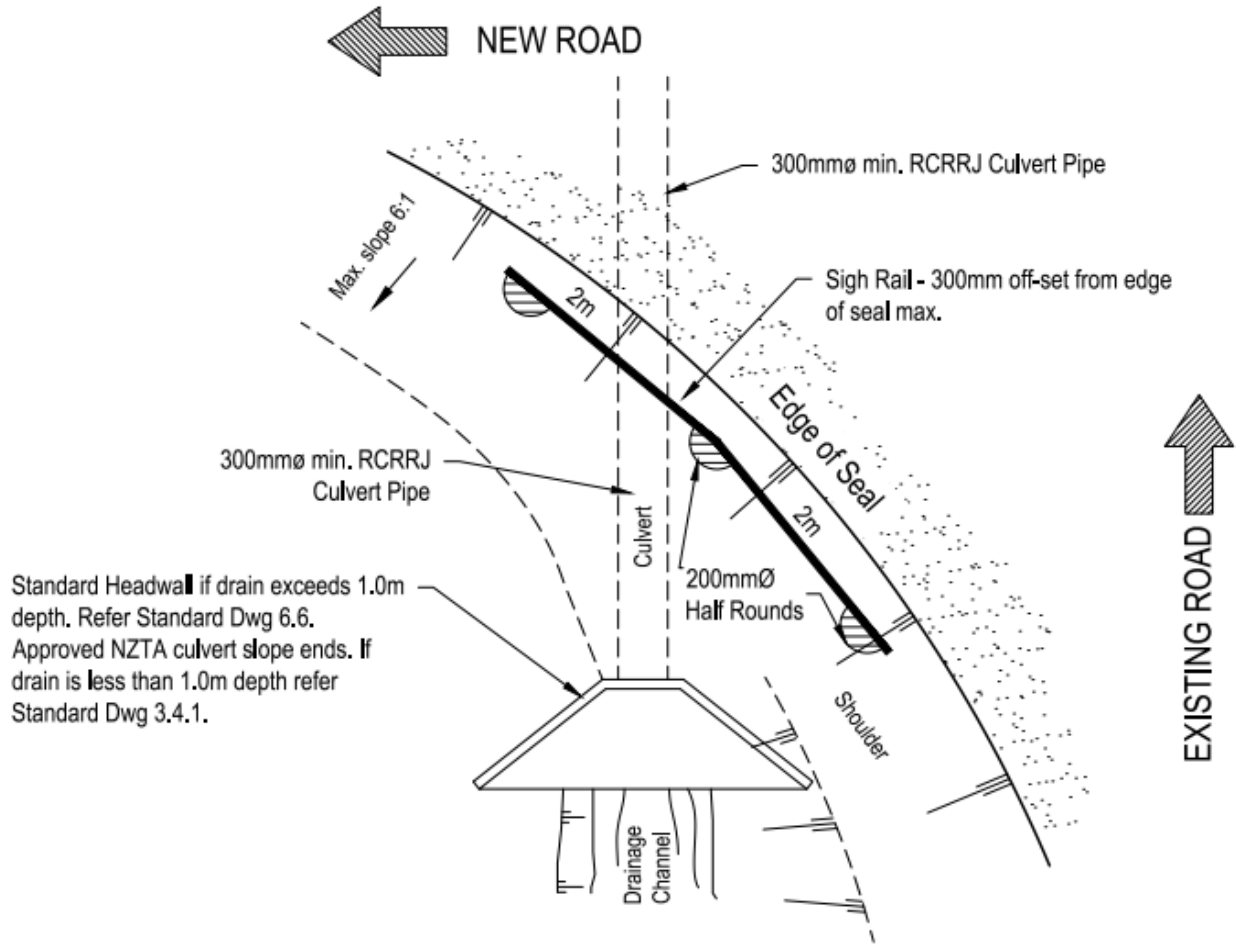

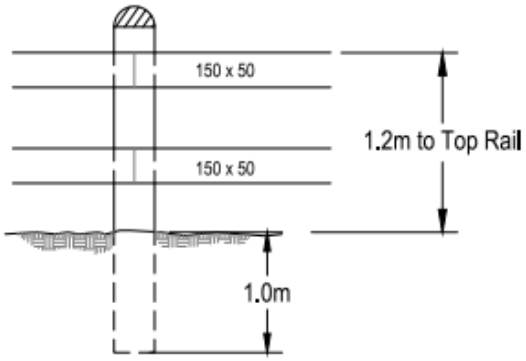

SIGHT RAIL DETAIL

NOTES:

1. Refer also to standard Drawing No. 3.2.2 & 3.2.3
2. Timber Post to be treated to hazard class H5 & painted twice with white paint.
3. Timber rails to be treated hazard class H3.2 & painted twice with white paint.

RURAL ROAD/ACCESSWAY ENTRANCE-EDGE PROTECTION DRAIN DEPTH >1.0m

MANAWATU DISTRICT COUNCIL		Scale:	Not to Scale
Designed	Infrastructure	Plan No.	3.4
Drawn	Infrastructure		
Checked	GY		
Revised	05/2017	Sheet 1 of 1 Sheets	

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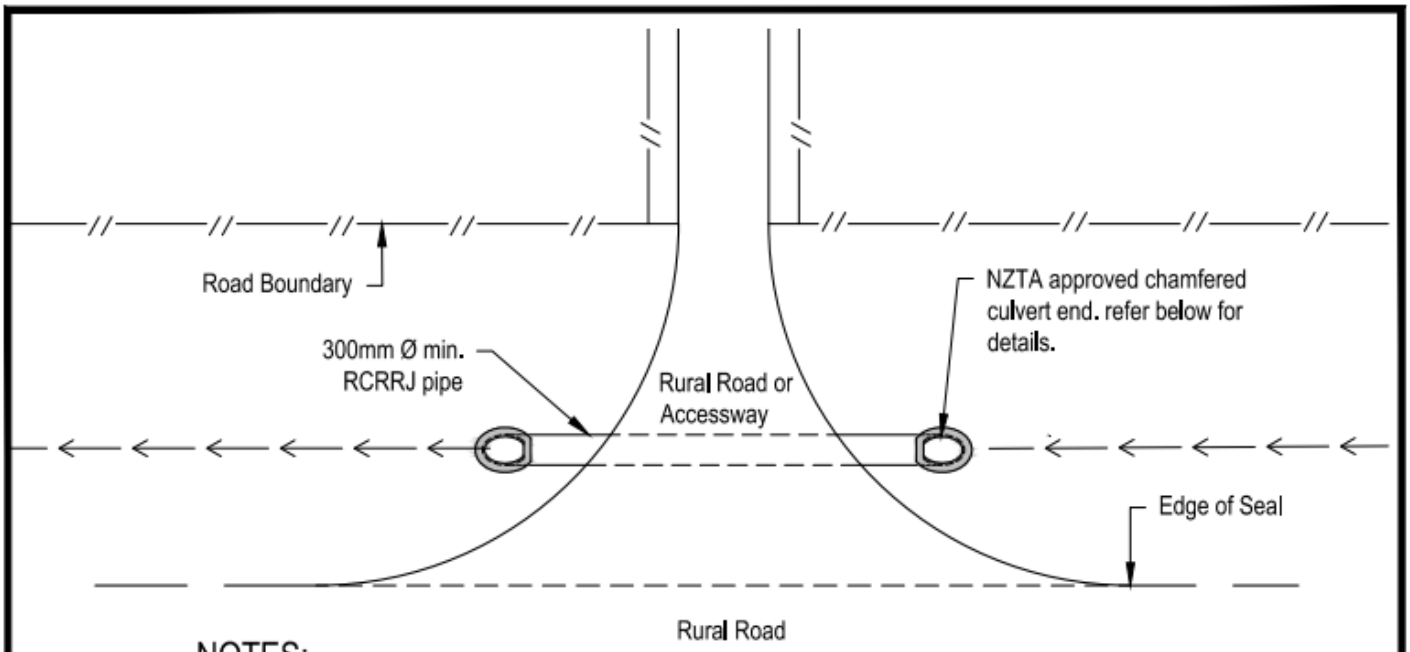
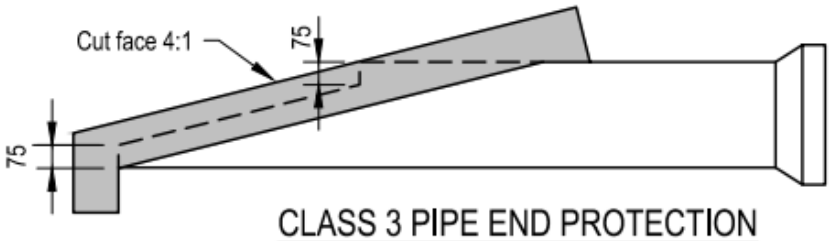


NOTES:

1. Only concrete pipes are to be used in the construction of water table culverts. Minimum diameter 300mm.
2. There are various standards currently available for the construction and completion of water table culverts. In order to standardise procedures, all culverts up to a diameter of 425mm shall be constructed as follows:



CLASS 3 PIPE END PROTECTION

NOTES:

1. The exposed end of the pipe is to be encased in hand formed reasonably dry concrete to form a 150mm thick by 200mm wide "collar" to retain any backfill and to reduce the amount of grass overhanging the end of the pipe. This collar may be omitted where it would normally be placed on the pipe collar.
2. Where the length of the cut face is greater than the length of the pipe excluding the collar, suitable precast inlet and outlet structures are to be used.
3. Concrete filled bags culvert headwalls may be used with the approval of Council's Roading Manager.

RURAL ROAD/ACCESSWAY ENTRANCE-EDGE PROTECTION FOR DRAIN DEPTH < 1.0m

MANAWATU DISTRICT COUNCIL		Scale: Not to Scale	
Designed	Infrastructure	Plan No. 3.4.1	
Drawn	Infrastructure		
Checked	GY		
Revised	05/2017	Sheet 1 of 1 Sheets	

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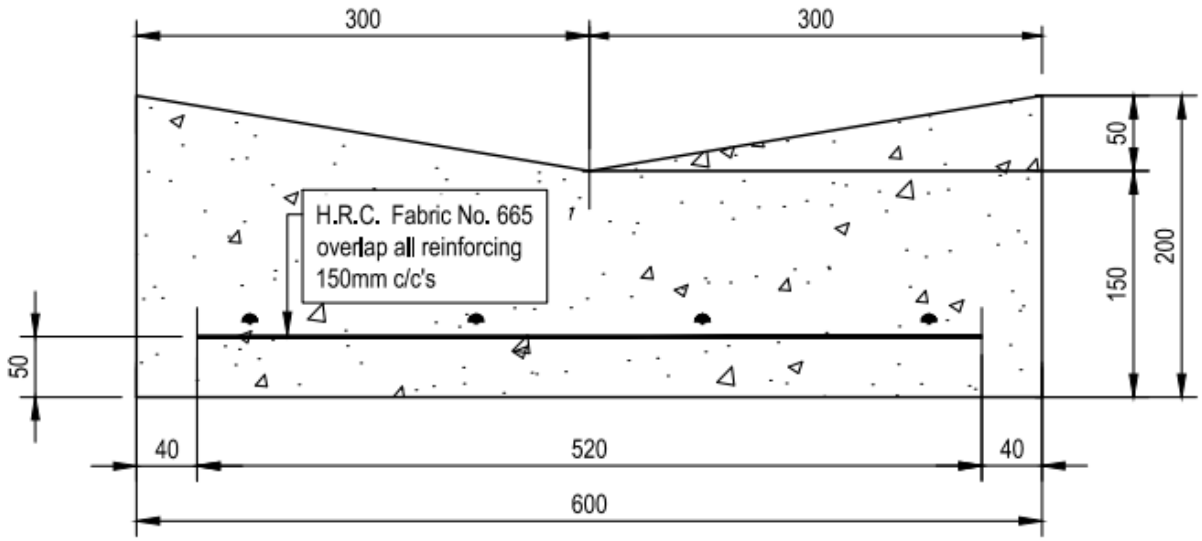
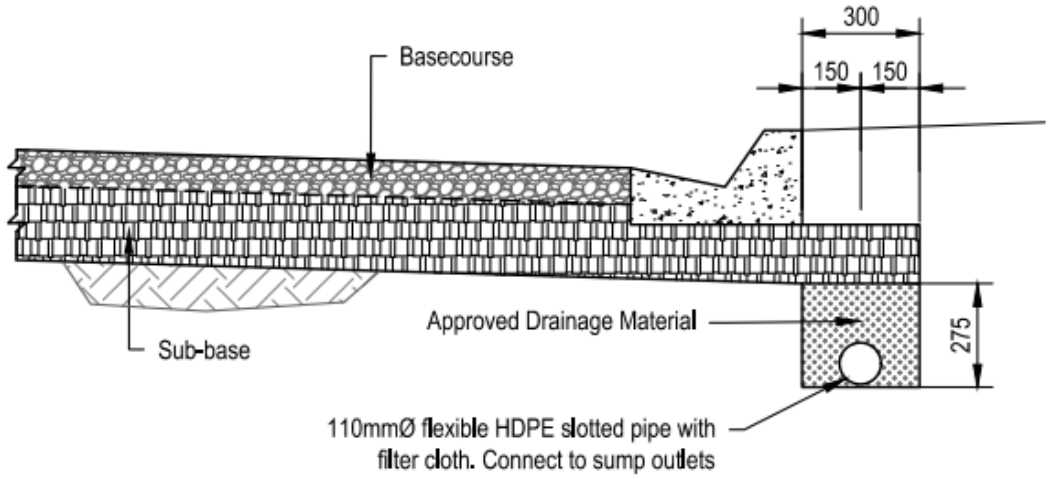


DISHED CHANNEL

20 MPa Concrete



SUBGRADE DRAINAGE DETAIL AT KERB

DISH CHANNEL & SUBGRADE DRAINAGE

		MANAWATU DISTRICT COUNCIL	Scale: Not to Scale
		Designed: Infrastructure	Plan No. 3.5
		Drawn: Infrastructure	
		Checked: GY	
		Revised: 05/2017	Sheet 1 of 1 Sheets

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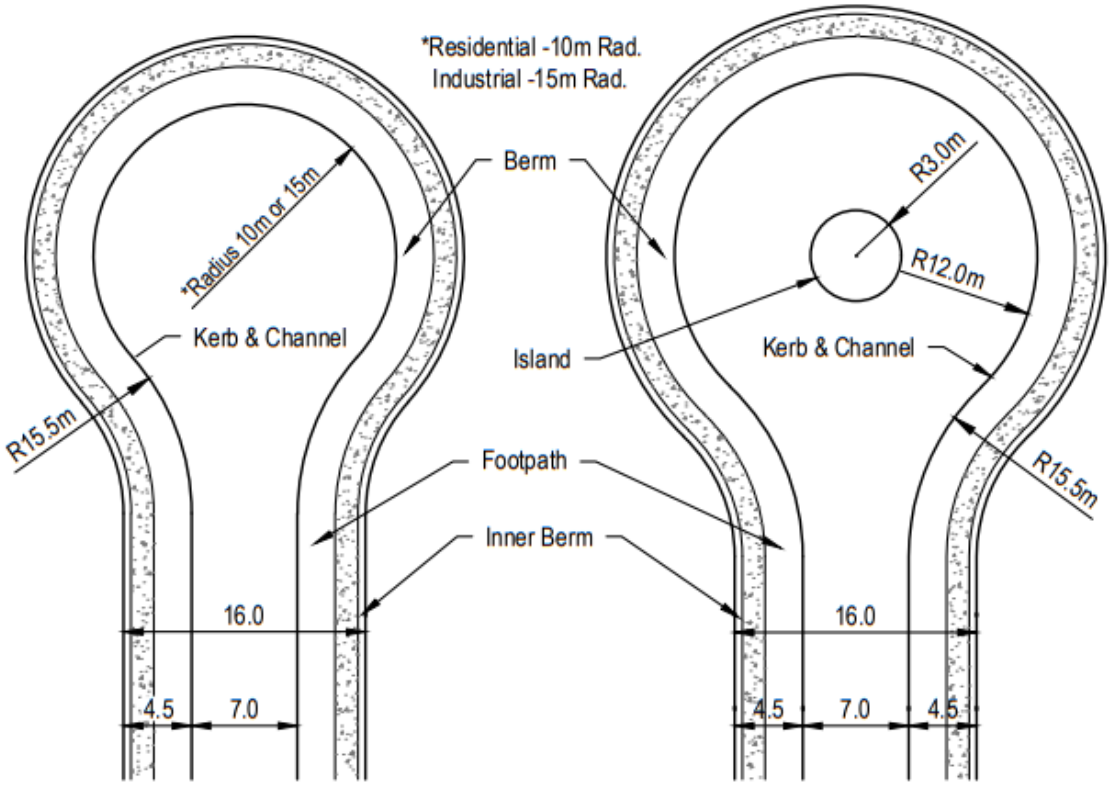

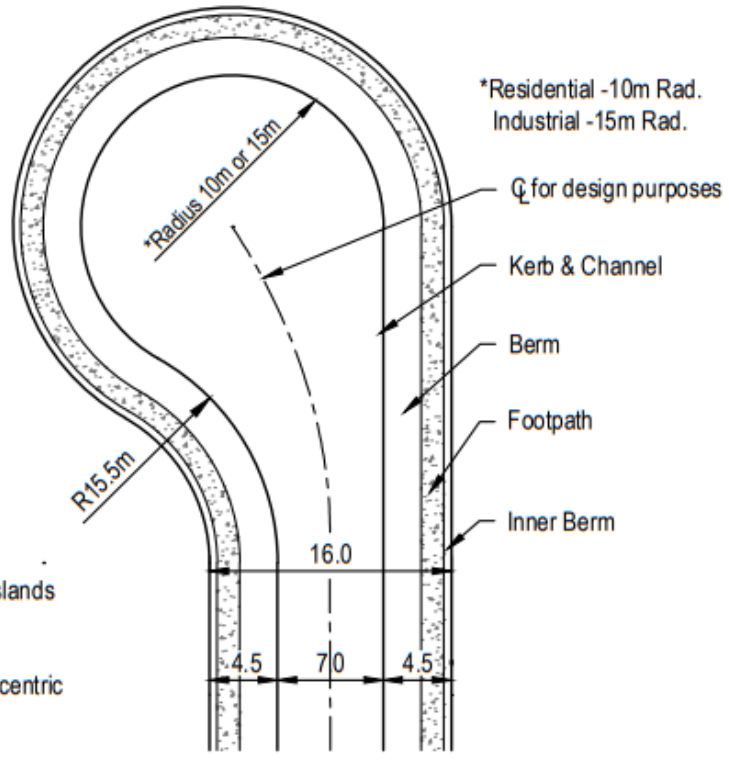

Note:

1. Industrial Cul de Sac min. radius 15m. Islands are not permitted
2. Carriageway width vary
3. Footpath and boundary need not be concentric with kerb.
4. All radii shown are minimum radii.

MINIMUM CUL-DE-SAC HEAD DESIGN

MANAWATU DISTRICT COUNCIL		Scale: Not to Scale
Designed	Infrastructure	Plan No. 3.6
Drawn	Infrastructure	
Checked	GY	
Revised	05/2017	Sheet 1 of 1 Sheets

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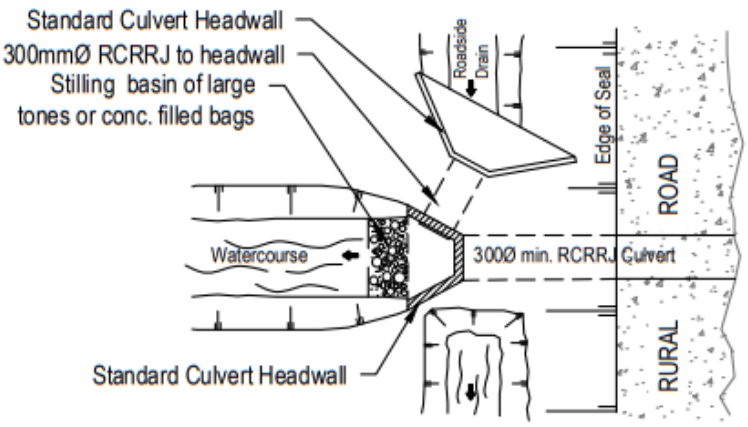
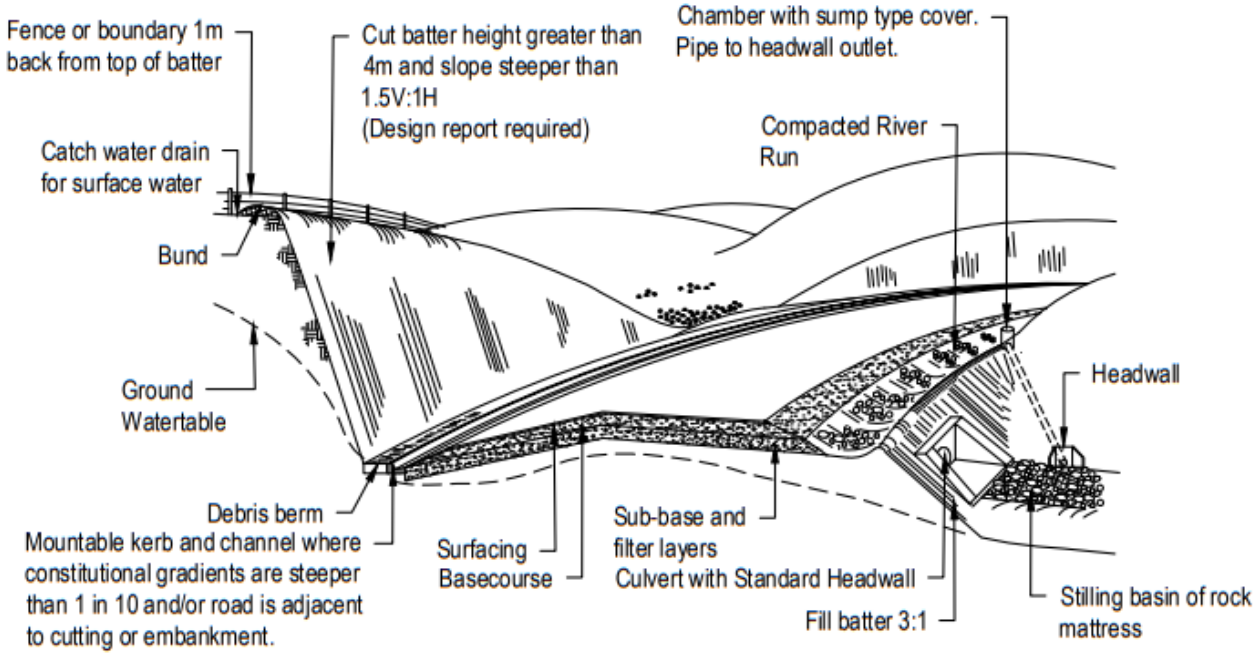


ROADSIDE DRAINAGE
SMALL CULVERT DETAIL



Note:
Pavement design depth to be approved by Council.
Signage and road markings to be installed in accordance with NZTA-MOTSAM guidelines and approved by Council.

RURAL ROAD - TYPICAL DETAILS

MANAWATU DISTRICT COUNCIL		Scale:	Not to Scale
Designed	Infrastructure	Plan No.	3.7
Drawn	Infrastructure		
Checked	GY		
Revised	05/2017	Sheet 1 of 1 Sheets	

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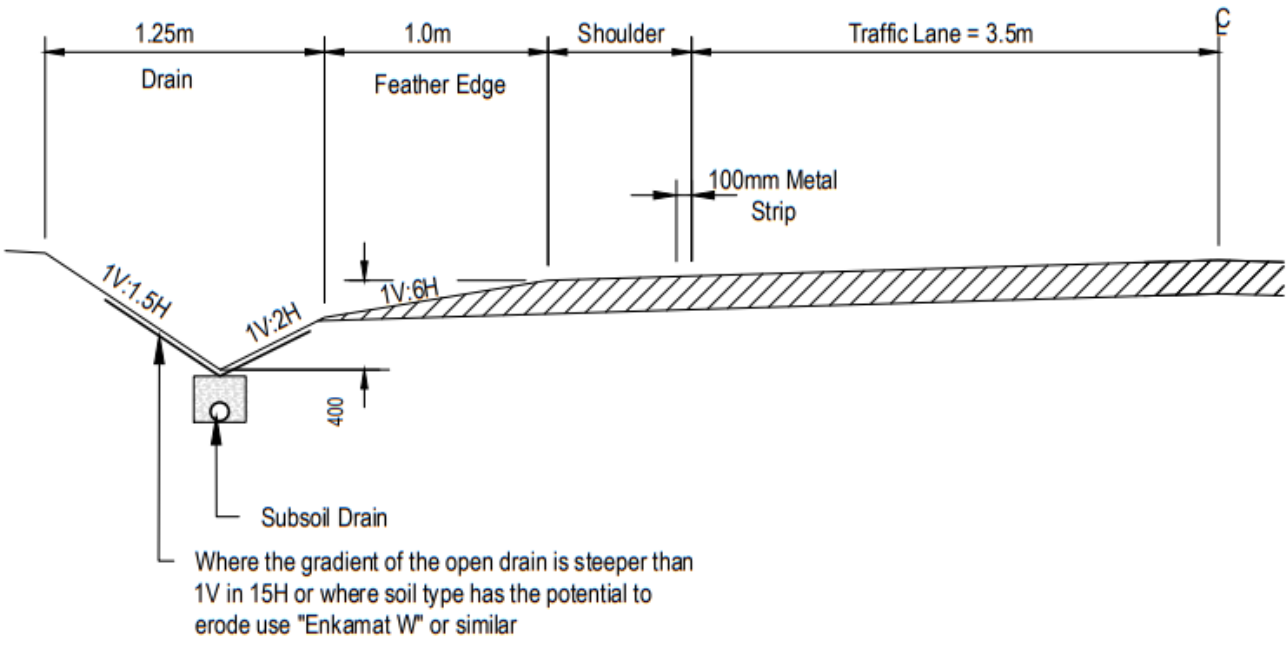

NOTE:
"Enkamat W" or similar to be installed to manufacturers instructions.

RURAL ROAD OPEN DRAIN TYPICAL DETAILS

MANAWATU DISTRICT COUNCIL		Scale:	Not to Scale
Designed	Infrastructure	Plan No.	3.8
Drawn	Infrastructure		
Checked	GY		
Revised	05/2017	Sheet 1 of 1 Sheets	

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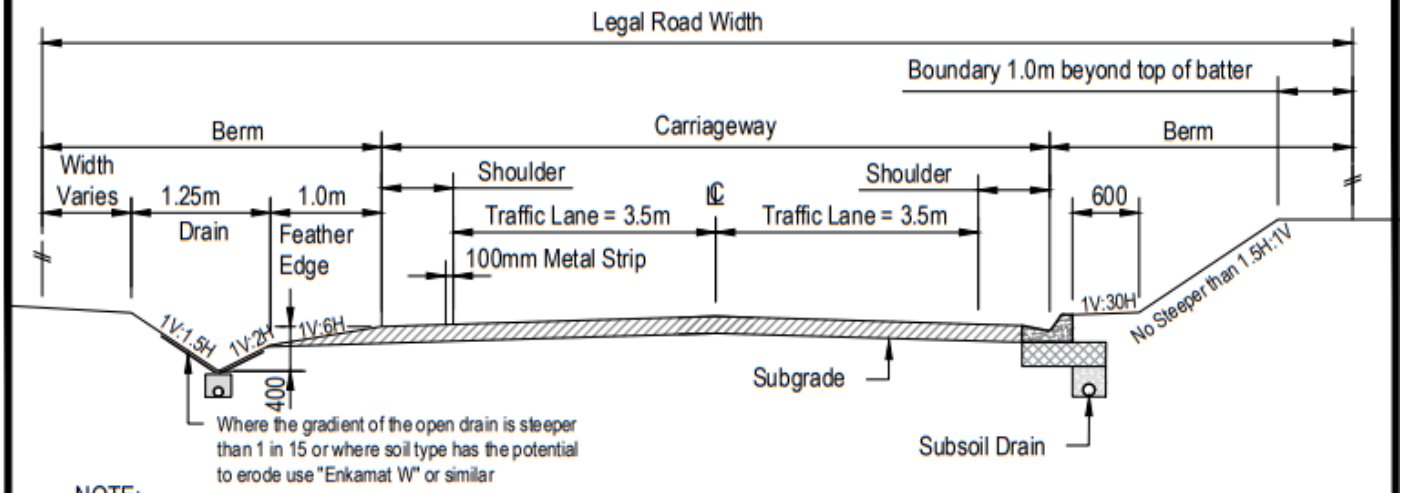
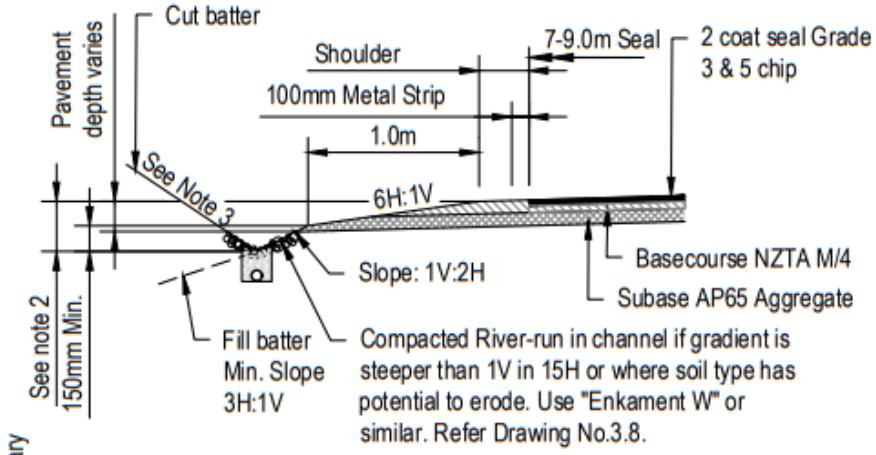
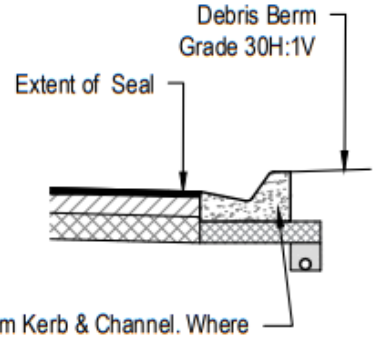


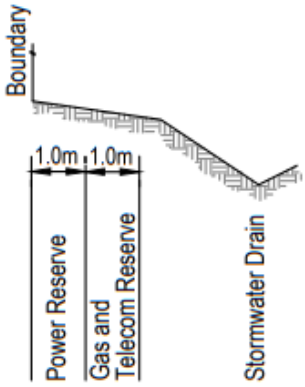
NOTE:
"Enkamat W" or similar to be installed to manufacturers instructions.

ROAD TYPICAL CROSS SECTION





SIDE SLOPE DETAIL



DESIRED SERVICE LOCATION (for both sides)

NOTES:
1. Pavement depth to be designed
2. V-Drain invert, adopt which ever provides the greater depth:
   - 400mm below the seal edge or
   - 150mm below the pavement subbase and subgrade interface
3. For batter slopes steeper than 1.5V:1H engineering design will be required.

RURAL ROAD (VPD 0-500) TYPICAL CROSS SECTION

MANAWATU DISTRICT COUNCIL		Scale: Not to Scale
Designed	Infrastructure	Plan No. 3.9
Drawn	Infrastructure	
Checked	GY	
Revised	05/2017	Sheet 1 of 1 Sheets

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STREET CLASSIFICATIONS & STREET WIDTHS - NODAL AND RURAL SUBDIVISIONS										
Area Served/Zoning)	Lots/Dwelling Served	Classification	Legal Road/ROW Width (Minimum)	Carriageway Width (Minimum)	Seal Width	Traffic Lane / Shoulder Width	Total Berm Width	Max./Min. Grade	Normal Camber	Notes
Nodal / Rural	1-2	Private ROW/Access Lot	8.0m	4.0m	N/A	To be designed				Approved stormwater control
Nodal / Rural	3- 4	Private ROW/Access Lot	10.0m	4.0m	4.0m	To be designed				Approved stormwater control
Nodal / Rural	5-7	Private ROW/Access Lot	12.0m	7.0m	6.0m (R3)	N/A	6.0m	12.5% / 0.4%	3%	Two coat chip seal and turning head required.
Nodal / Rural	≥ 8-12	Local Roads (Public Roads)	16.0m	9.0m	7.0 m	3.5m/1.0m	9.0m	12.5% / 0.4%	3%	Two coat chip seal and turning head required.
Nodal / Rural	>12 (120-200 vpd)	Local Roads (Public Roads)	20.0m	10.0m	8.0m	3.5m/1.5m	10.0m	12.5% / 0.4%	3%	Two coat chip seal and turning head required.
Nodal / Rural	>2 0 (greater 200 vpd)	Local Roads (Public Roads)	20.0m	11.0m	9.0m	3.5m/2.0m	9.0m	10% / 0.4%	3%	Two coat chip seal and turning head required.

NOTE:

All cut and fill batters including retaining structures shall be located clear of the Legal Road / ROW. Fences may be located inside road reserve subject to Council approval.

R1: If the ROW / Access Lot exceeds 150m in length or when the minimum safe stopping distance cannot be provided, then 6m wide passing bays must be constructed at intervals not exceeding 150m.

R2: Roads and ROWs in new Rural Residential / Nodal subdivisions must be sealed with a two coat Grade 3 and 5 chipseal.

R3: The Legal Roads / ROWs widths are based on the provision of swale drains for stormwater drainage. These widths may be reduced if kerb and channel and a suitably designed stormwater reticulated system is proposed.

STREET CLASSIFICATION AND WIDTHS - NODAL AND RURAL SUBDIVISIONS

MANAWATU DISTRICT COUNCIL

Designed	Infrastructure
Drawn	Infrastructure
Checked	GY
Revised	05/2017

Scale: Not to Scale

Plan No. 3.9.1

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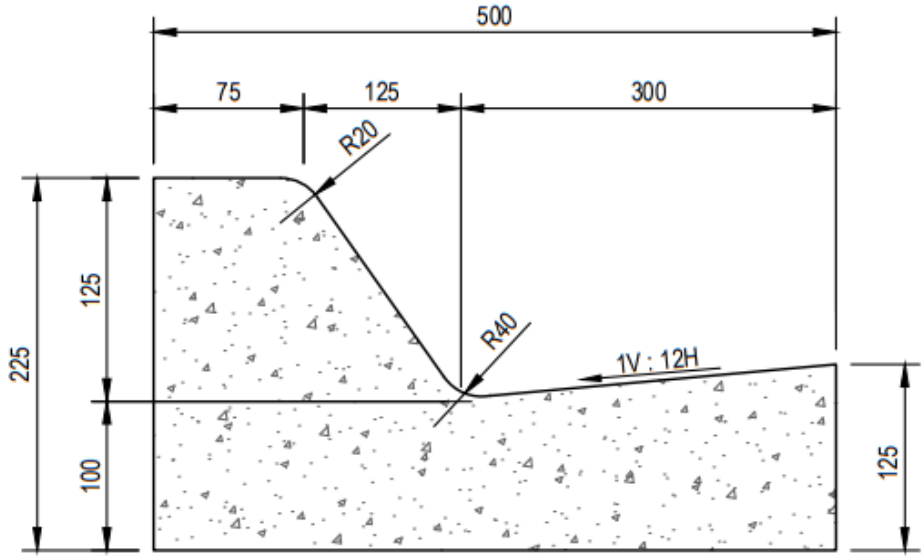
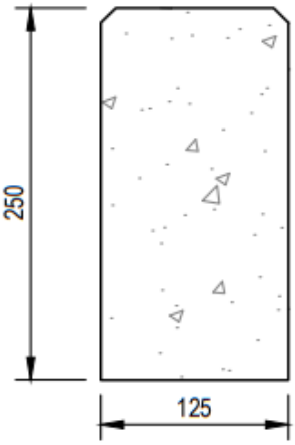
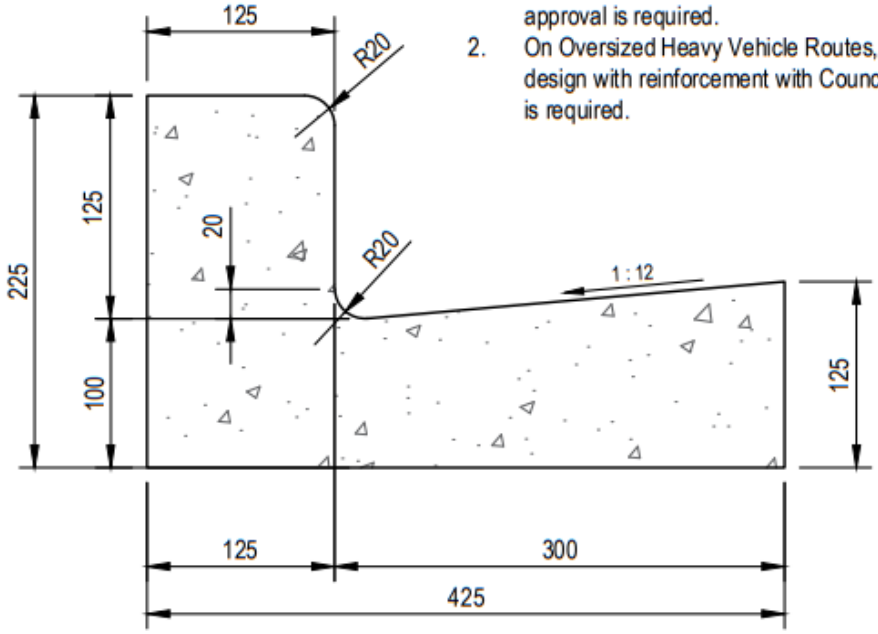


125mm SLOPING KERB & CHANNEL



STANDARD NIB KERB

Note:
1. Sloping kerb and channel is only to be used at intersections and narrow streets. Council approval is required.
2. On Oversized Heavy Vehicle Routes, specific design with reinforcement with Council approval is required.



125mm VERTICAL KERB & CHANNEL

20 MPa Concrete

STANDARD 125mm KERB & CHANNEL AND NIB KERB DETAILS

		MANAWATU DISTRICT COUNCIL	Scale: Not to Scale
		Designed: Infrastructure	Plan No. 3.10
		Drawn: Infrastructure	
		Checked: GY	
		Revised: 06/2017	Sheet 1 of 1 Sheets

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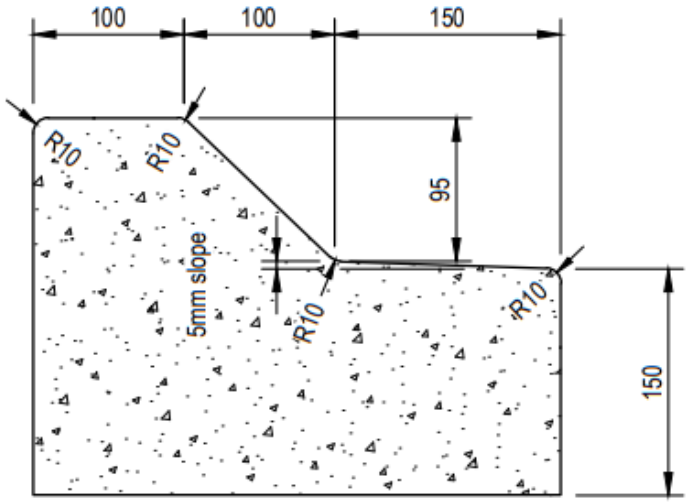
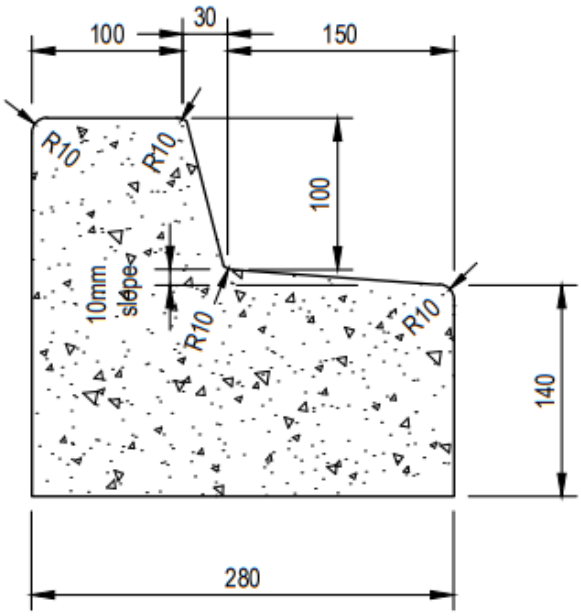


STANDARD MOUNTABLE KERB



20 MPa Concrete

STEEP MOUNTABLE KERB

KERB FOR TRAFFIC ISLANDS ROUNDABOUTS & ROAD MEDIANS

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		Designed: Infrastructure	Plan No. 3.10.1
		Drawn: Infrastructure	
		Checked: GY	
		Revised: 06/2017	Sheet 1 of 1 Sheets

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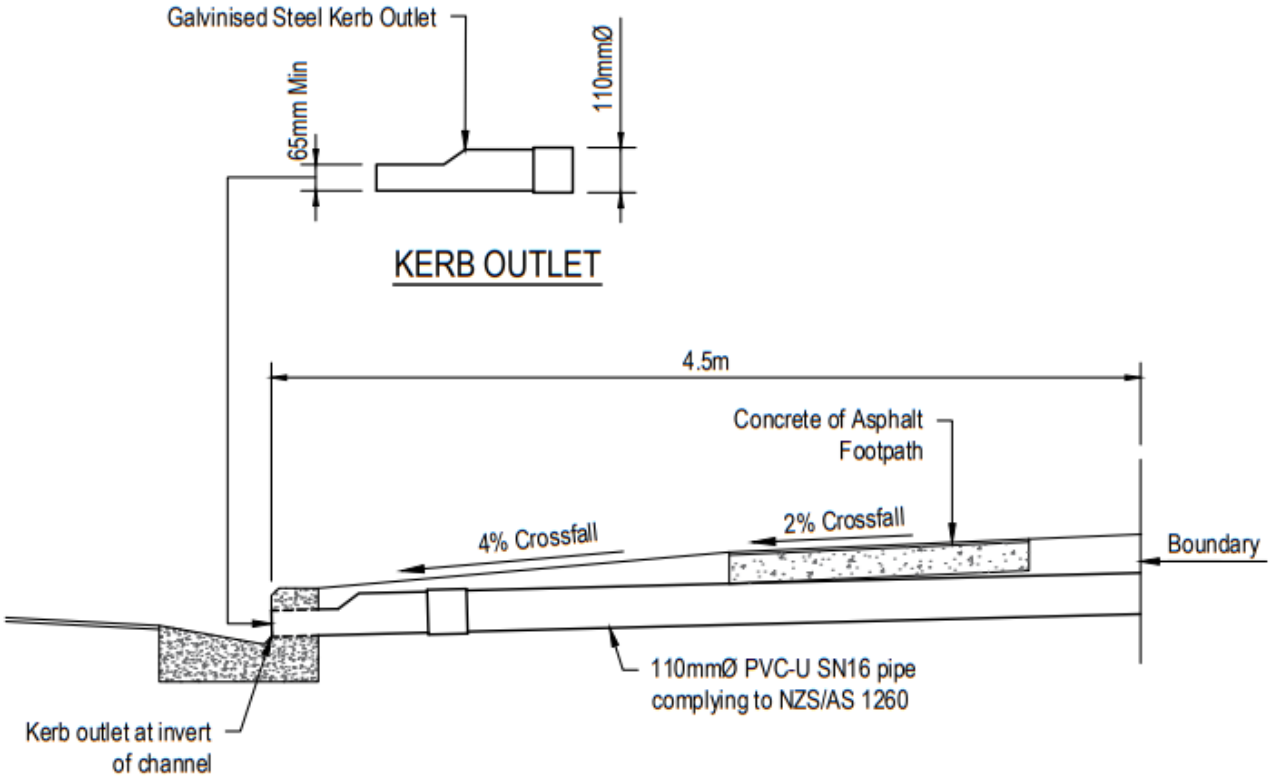
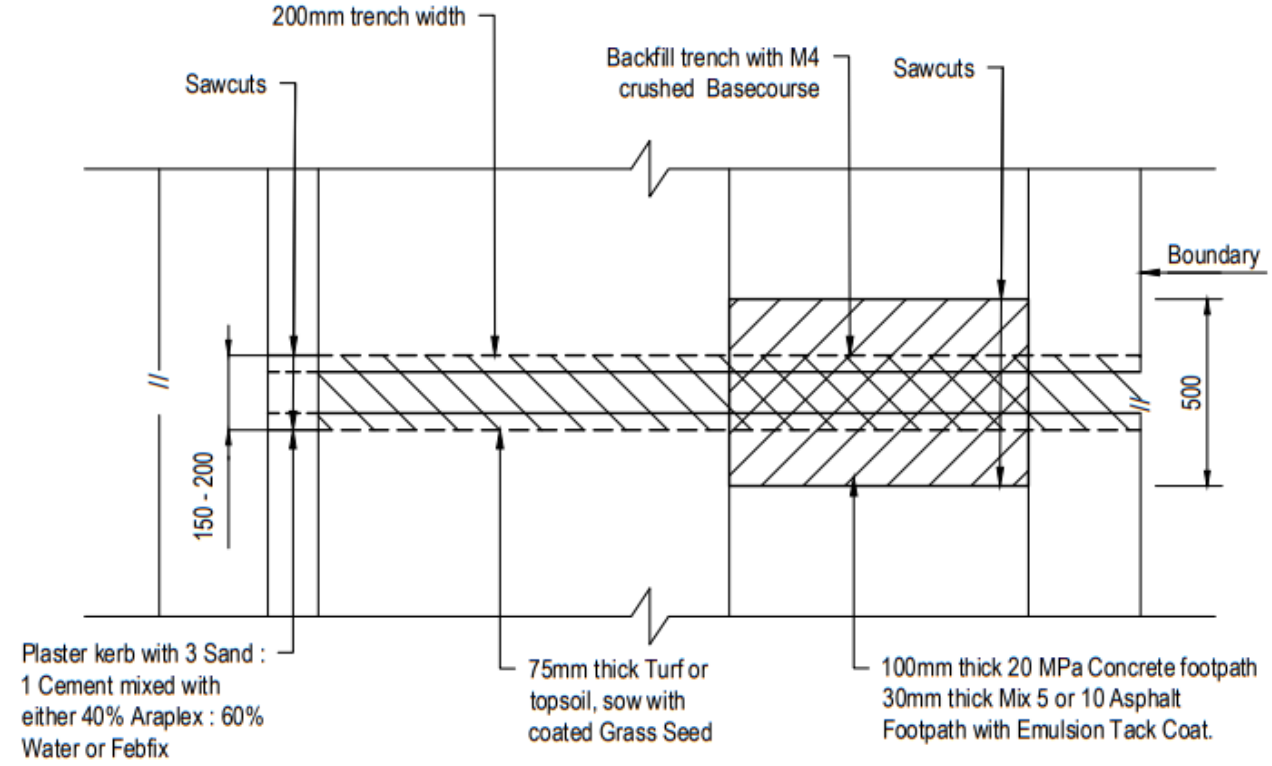


KERB OUTLET



PROPERTY STORMWATER DISCHARGE TO KERB

MANAWATU DISTRICT COUNCIL		Scale: Not to Scale
Designed	Infrastructure	Plan No. 3.11
Drawn	Infrastructure	
Checked	GY	
Revised	05/2017	Sheet 1 of 1 Sheets

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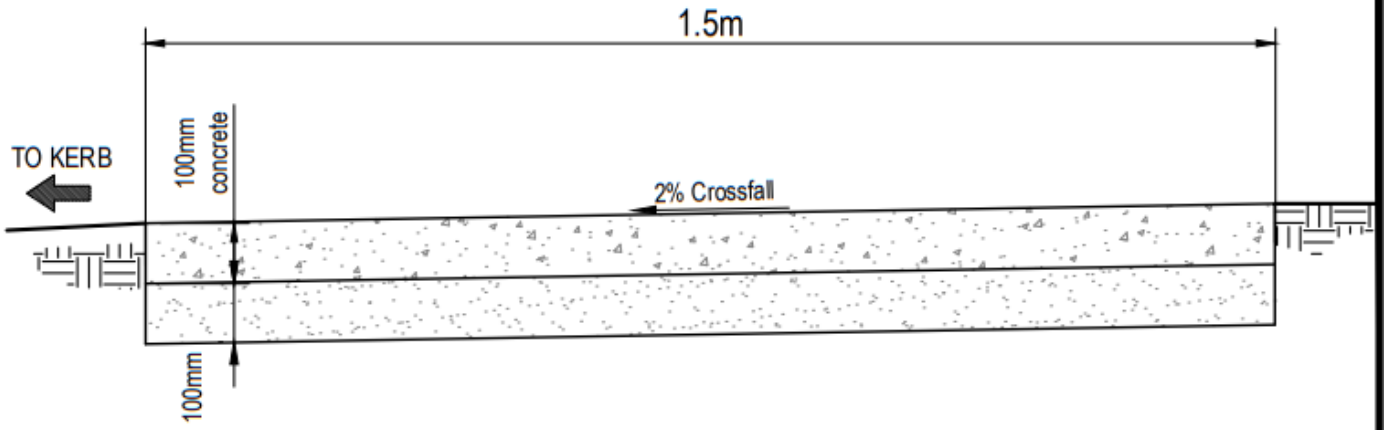
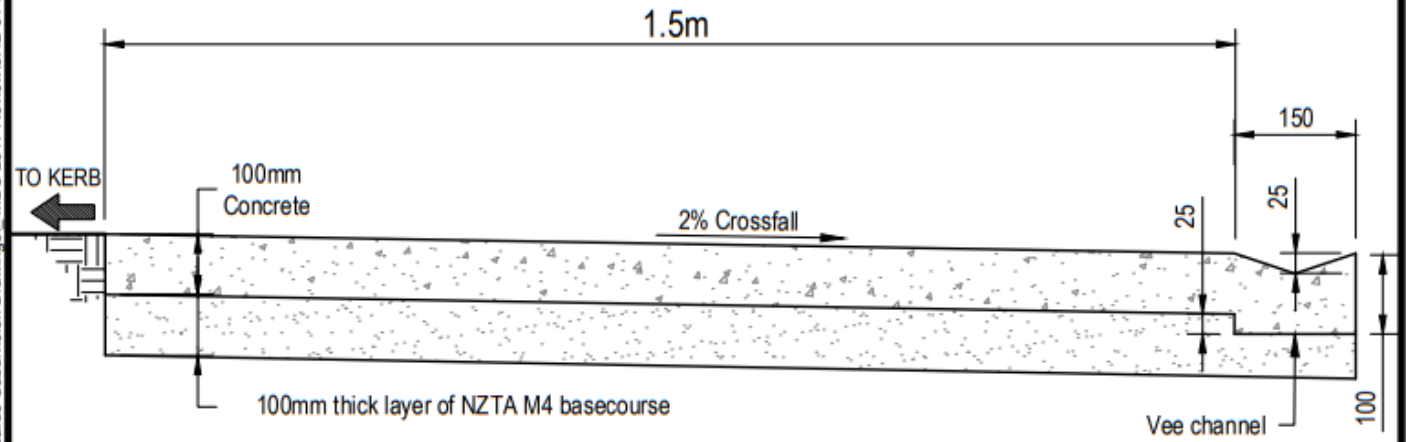


DETAIL OF CONCRETE FOOTPATH

(Excluding Vehicle Crossings)

Note:

1. All footpaths must be constructed on a 100mm (min.) thick layer of compacted NZTA M/4 basecourse on sound foundation (compacted to 95% Standard Compaction).
2. Footpath Concrete - use 20MPa Ready Mix Concrete



SECTION OF LOW LEVEL FOOTPATH

(Excluding Vehicle Crossings)

CONCRETE FOOTPATH DETAILS

MANAWATU DISTRICT COUNCIL		Scale:	Not to Scale
Designed	Infrastructure	Plan No.	3.12
Drawn	Infrastructure		
Checked	GY		
Revised	06/2017	Sheet 1 of 1 Sheets	

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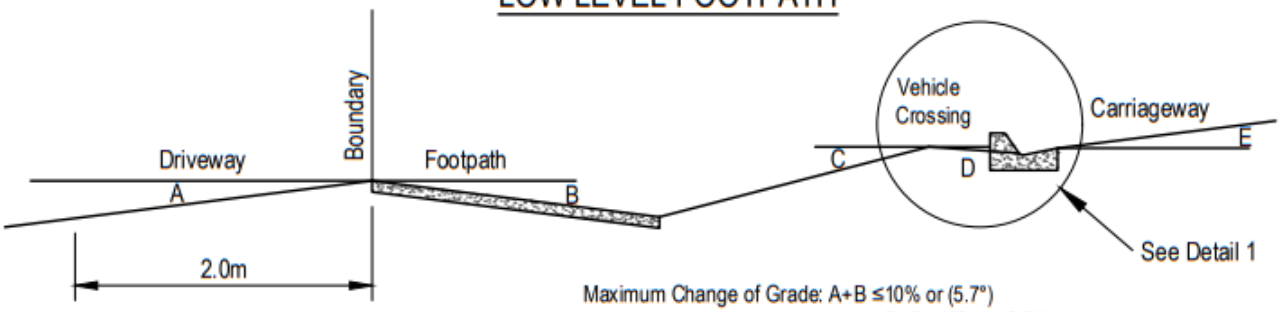
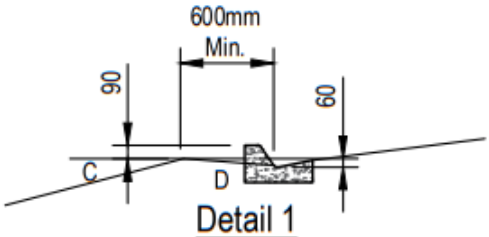
LOW LEVEL FOOTPATH



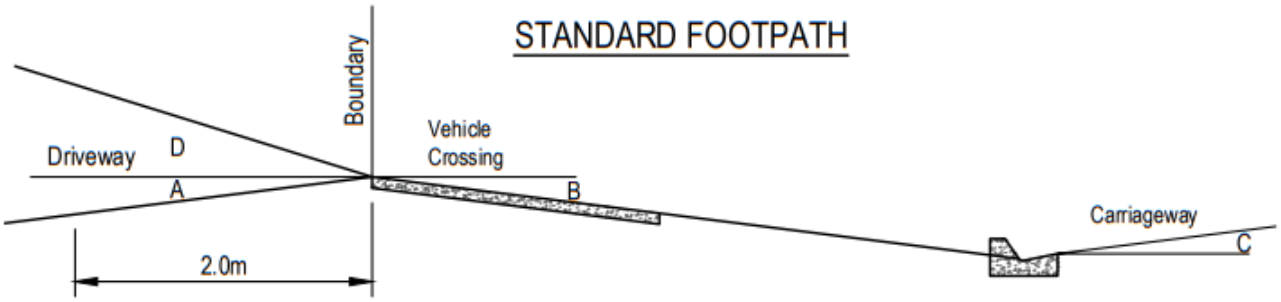
Maximum Change of Grade: A+B ≤10% or (5.7°)
B+C ≤17% or (9.6°)
C+D ≤10% or (5.7°)
C-E ≤10% or (5.7°)

(Ref. Dwg 3.17)



Detail 1

STANDARD FOOTPATH



Maximum Change of Grade: A+B ≤10% or (5.7°)
D-B ≤17% or (9.6°)
B+C ≤17% or (9.6°)

(Ref. Dwg 3.17)

NOTE:

1. A, B, C D & E refer to the gradients expressed either as a percentage or in degrees.
2. Low slung cars with ground effect features may not meet the criteria assumed in this design guide.
3. LTSA document "Light Vehicle Sizes and Dimensions: Street Survey Results and Parking Space Requirements - Road and Traffic Standards Information No. 35 (June 1994)" contains more information about the 90th and 99th percentile vehicles.
4. Buses are permitted to have lower clearance value of (A+B) of 6% or 3.4°.

MAXIMUM BREAKOVER ANGLES FOR VEHICULAR ACCESS TO PROPERTY

MANAWATU DISTRICT COUNCIL		Scale: Not to Scale
Designed	Infrastructure	Plan No. 3.13
Drawn	Infrastructure	
Checked	GY	
Revised	06/2017	Sheet 1 of 1 Sheets

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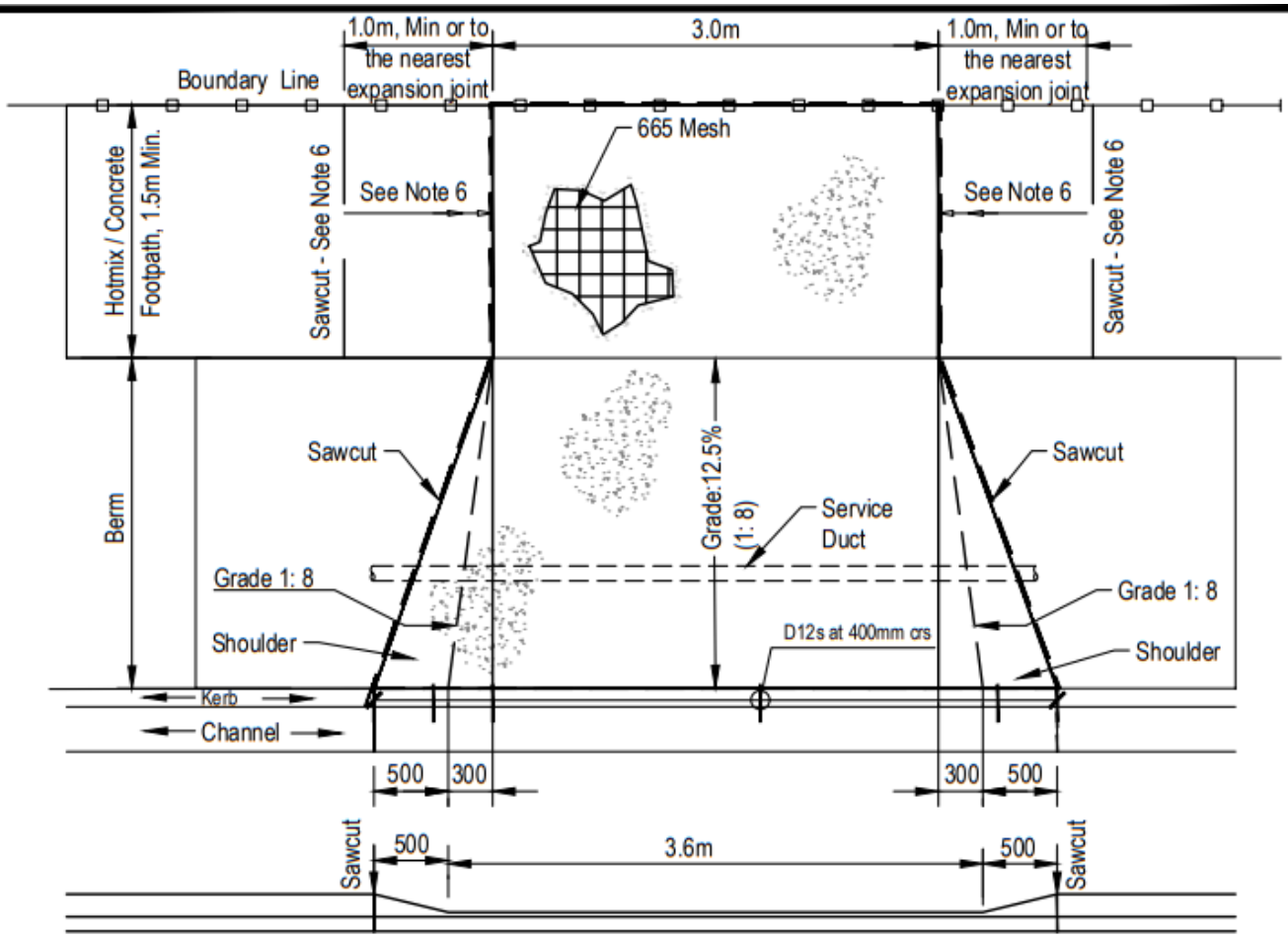

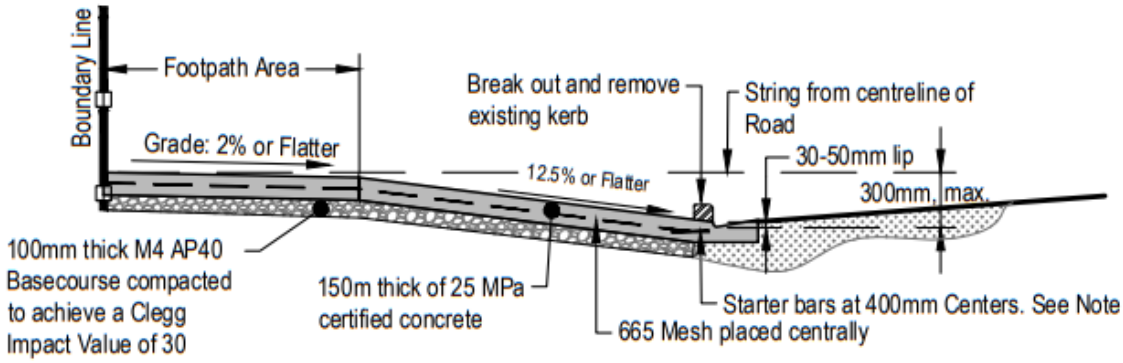

Note:

1. All concrete used for the construction of the 150mm thick residential vehicle crossing must have a minimum compressive strength of 25 MPa after 28 days.
2. All new concrete surface to have a broom finish.
3. If asphalt concrete(AC) reinstatement is required, all excavated areas must be completely coated with an application of bitumen prior to paving with Mix 15 AC.
4. At the channel face, install 250mm long D12 deformed starter bars at 400mm centres, drill 100mm (min.) deep and grout with Sika 212 or approved equivalent.
5. Height from channel invert to string line from road centreline must not exceed 300mm.
6. The existing footpath is to be sawcut. The minimum distance from the new vehicle crossing is 1.0m or to the nearest expansion joint. The reinstated footpath next to the vehicle crossing is for pedestrians which must be built to match the crossfall of the adjacent footpath but the finished crossfall is not to exceed 2%. If this cannot be achieved, the adjacent footpath must be re-constructed at a grade no steeper than 1:12.5 (8%) to tie in with the new crossing. This design will require the approval of the Manager.
7. New residential vehicle crossing wider than 3.0m will require a consent from the Manager.

STANDARD CONCRETE RESIDENTIAL VEHICLE CROSSING

MANAWATU DISTRICT COUNCIL

Designed	Infrastructure
Drawn	Infrastructure
Checked	GY
Revised	06/2017

Scale: Not to Scale

Plan No. 3.14

Sheet 1 of 1 Sheets

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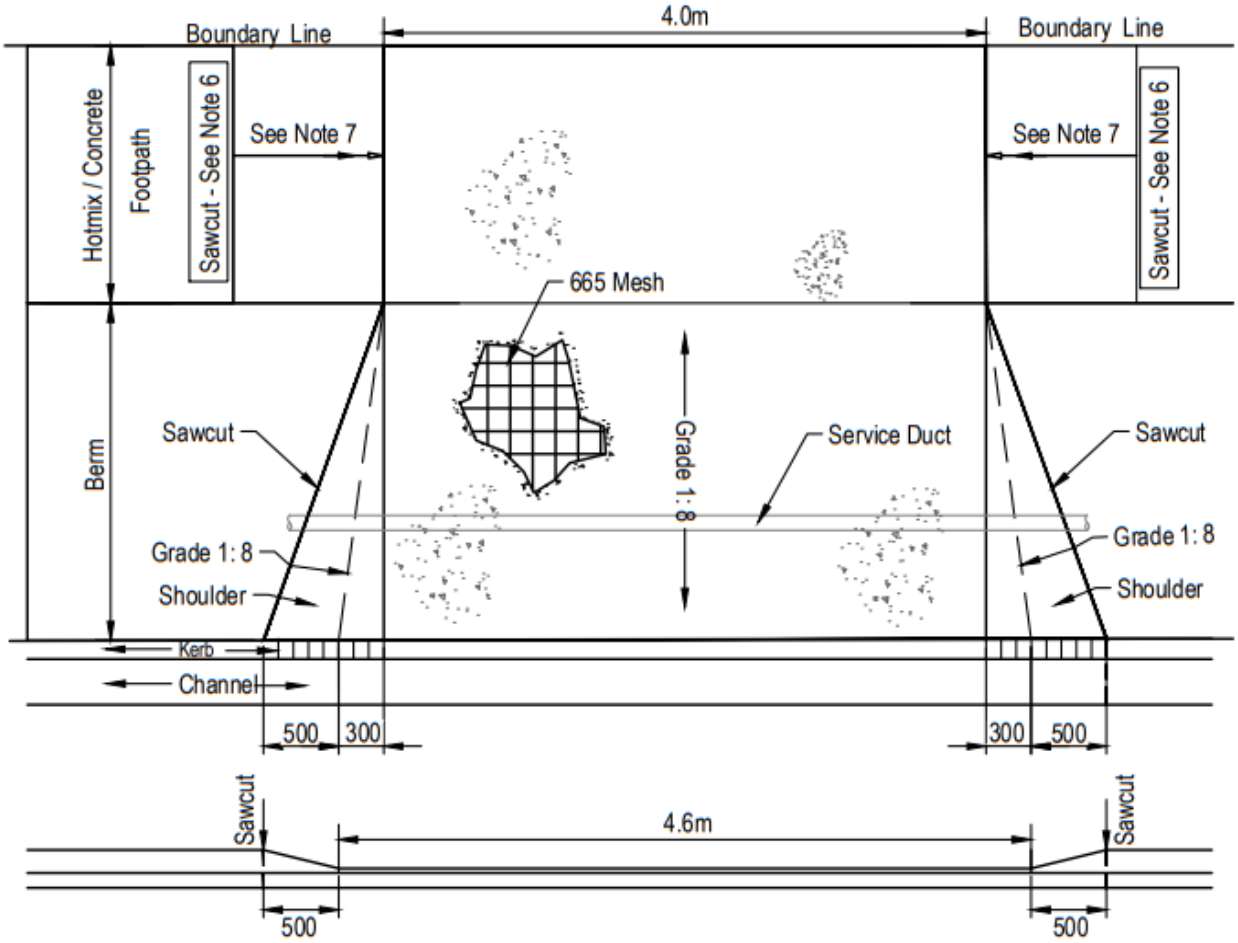

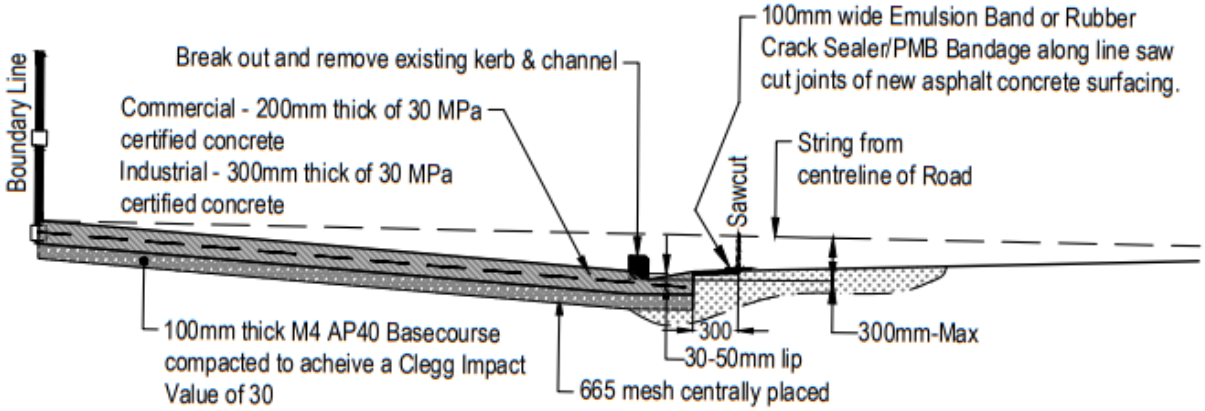

Note:

1. All concrete used for the construction of the 200mm thick commercial/industrial vehicle crossing must have a minimum compressive strength of 30 MPa after 28 days.
2. All new concrete surface to have a broom finish.
3. If asphalt concrete(AC) reinstatement is required, all excavated areas must be completely coated with an application of bitumen prior to paving with Mix 15 AC.
4. Height from channel invert to string line from road centreline must not exceed 300mm.
5. The new footpath next to the vehicle crossing is for pedestrians which must be built to match the crossfall of the adjacent footpath but the finished crossfall is not to exceed 2%. If this cannot be achieved, the adjacent footpath will be re-constructed at a grade no steeper than 1:12 (8%) to tie in with the new crossing. This design will require the approval of the Manager
6. New commercial or industrial vehicle crossing wider than 4.0m will require a consent from the Manager.

COMMERCIAL / INDUSTRIAL VEHICLE CROSSING

		MANAWATU DISTRICT COUNCIL	Scale: Not to Scale
		Designed: Infrastructure	Plan No. 3.15
		Drawn: Infrastructure	
		Checked: GY	
		Revised: 06/2017	Sheet 1 of 1 Sheets

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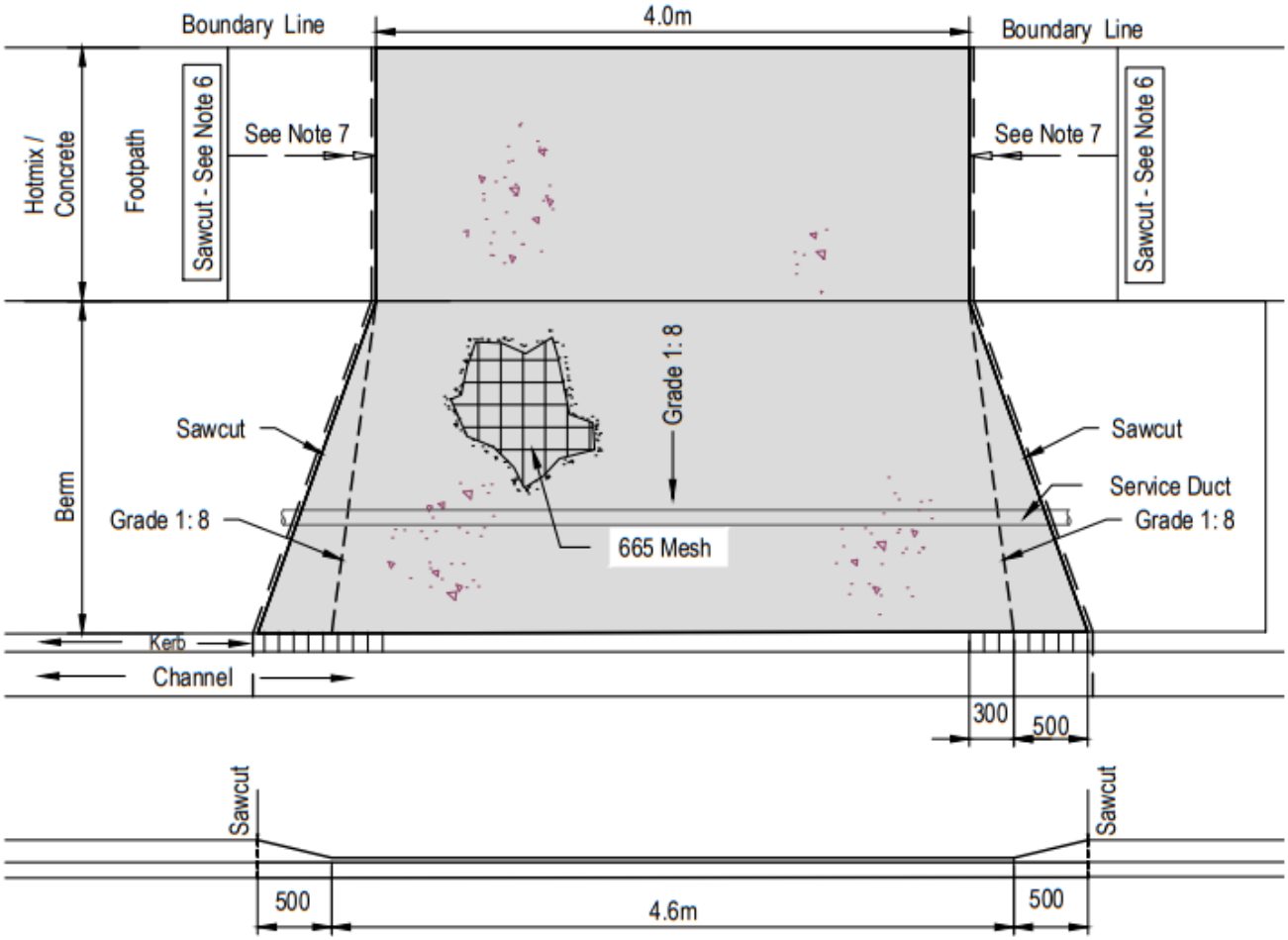

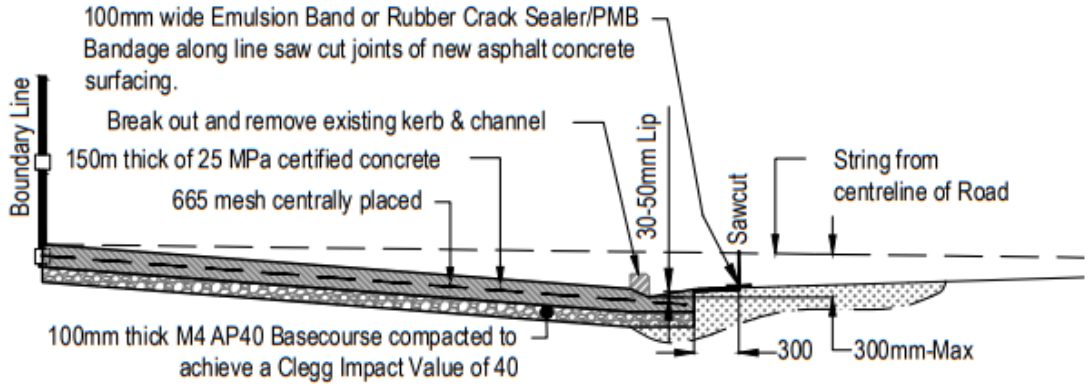

Note:

1. All concrete used for the construction of the 150mm thick residential vehicle crossing must have a minimum compressive strength of 25 MPa after 28 days.
2. All new concrete surface to have a broom finish.
3. If asphalt concrete(AC) reinstatement is required, all excavated areas must be completely coated with an application of bitumen prior to paving with Mix 15 AC.
4. At the channel face, install 250mm long D12 deformed starter bars at 400mm centres, drill 100mm (min.) deep and grouted with Sika 212 or approved equivalent.
5. Height from channel invert to string line from road centreline must not exceed 300mm.
6. The new footpath next to the vehicle crossing is for pedestrians which must be built to match the crossfall of the adjacent footpath but the finished crossfall is not to exceed 2%. If this cannot be achieved, the adjacent footpath will be re-constructed at a grade no steeper than 1:12.5 (8%) to tie in with the new crossing. This design will require the approval of the Manager
7. New residential vehicle crossing wider than 3.0m will require a consent from the Manager.

HEAVY DUTY RESIDENTIAL VEHICLE CROSSING - 2 OR MORE PROPERTIES

MANAWATU DISTRICT COUNCIL

Designed	Infrastructure
Drawn	Infrastructure
Checked	GY
Revised	06/2017

Scale: Not to Scale

Plan No. 3.16

Sheet 1 of 1 Sheets

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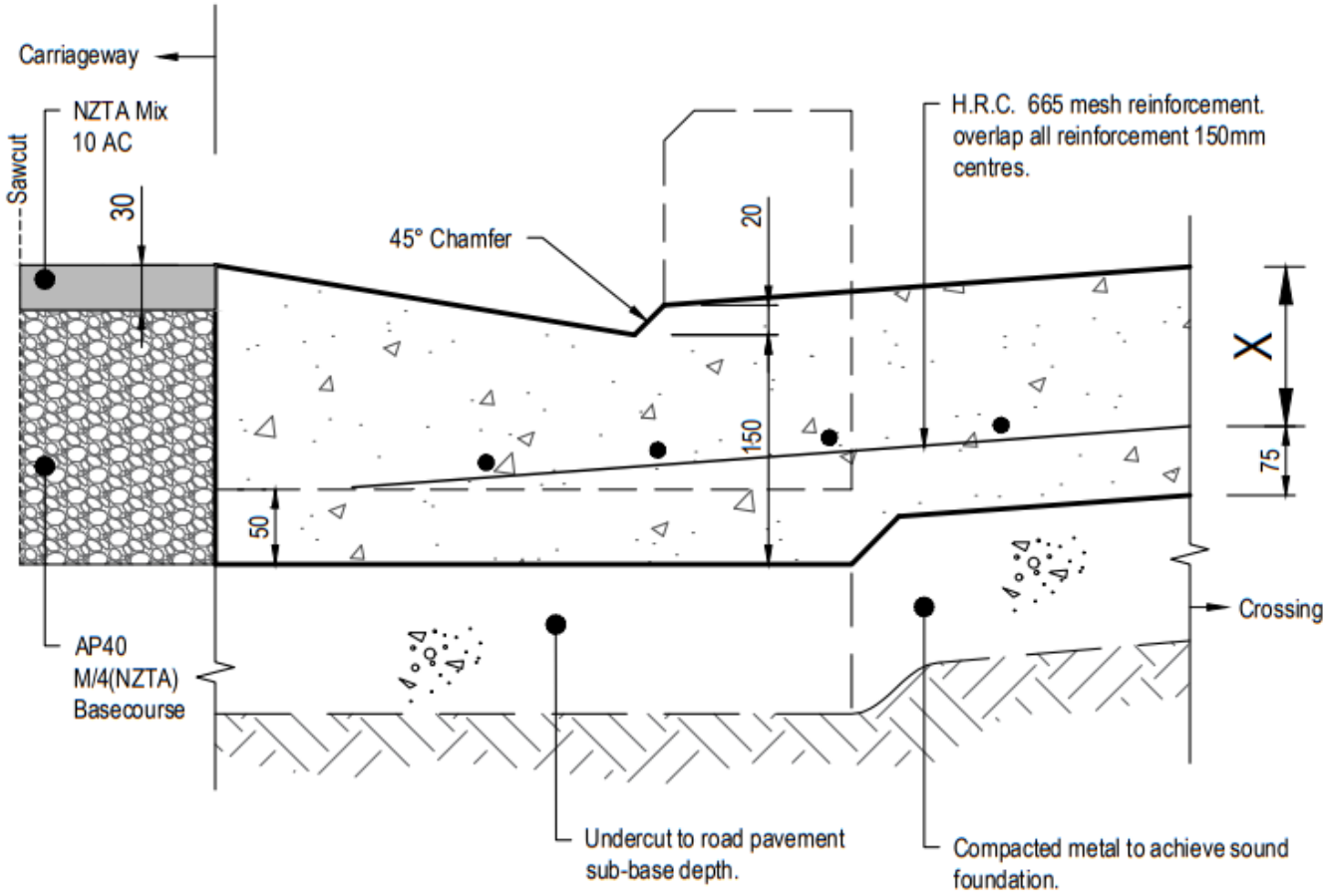

Note:
All steel to have 50mm min. cover

SECTION 'A'-'A'

Note:	
Residential	25MPa, X=150mm thick certified concrete only.
Commercial	30MPa, X=200mm thick certified concrete only.
Industrial	30MPa, X=300mm thick certified concrete only.

DISH VEHICLE CROSSING - CHANNEL DETAIL

MANAWATU DISTRICT COUNCIL		Scale: Not to Scale
Designed	Infrastructure	Plan No. 3.17
Drawn	Infrastructure	
Checked	GY	
Revised	06/2017	Sheet 1 of 1 Sheets

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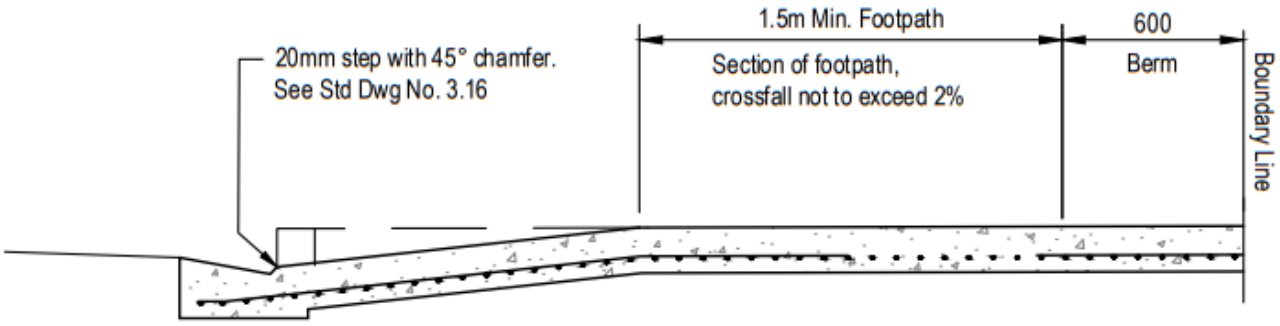
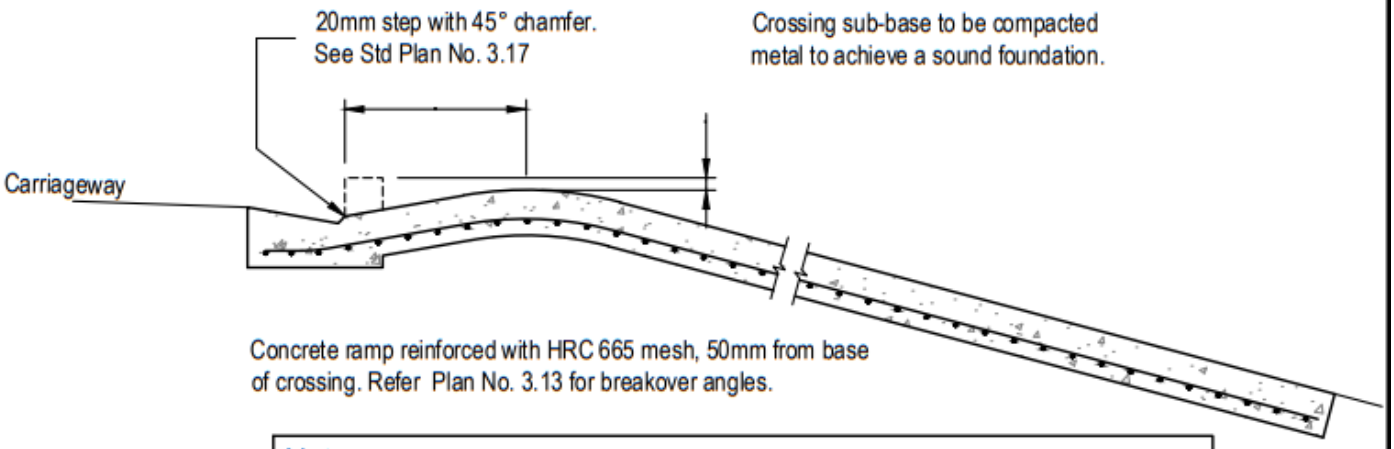
STANDARD CONCRETE VEHICLE CROSSING



Concrete ramp reinforced with HRC 665 mesh,
50mm from bottom of crossing.

Crossing sub-base to be compacted metal to achieve a sound foundation.

LOW LEVEL CONCRETE VEHICLE CROSSING



Concrete ramp reinforced with HRC 665 mesh, 50mm from base of crossing. Refer Plan No. 3.13 for breakover angles.

Note:

1. Residential 25MPa, 150mm thick certified concrete only.
2. Commercial 30MPa, 200mm thick certified concrete only.
3. Industrial 30MPa, 200mm thick certified concrete only.

DISH VEHICLE CROSSINGS - CROSS SECTIONS

MANAWATU DISTRICT COUNCIL		Scale: Not to Scale
Designed	Infrastructure	Plan No. 3.18
Drawn	Infrastructure	
Checked	GY	
Revised	06/2017	Sheet 1 of 1 Sheets

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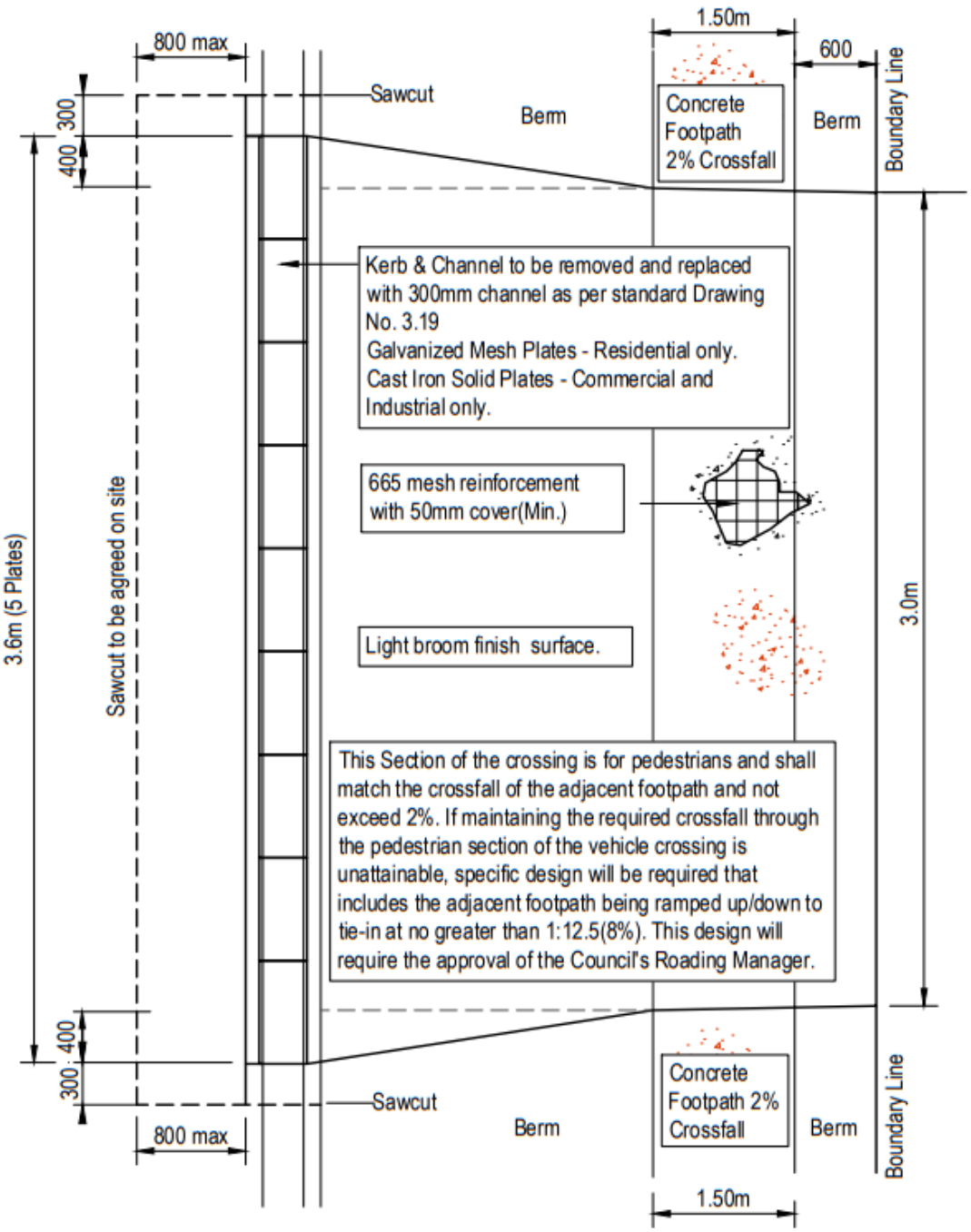

Note:

1. Residential 25MPa, 150mm thick certified concrete only.
2. Commercial 30MPa, 200mm thick certified concrete only.
3. Industrial 30MPa, 300mm thick certified concrete only.

Note:

1. Crossings greater than 3.0m may require separate resource consent
2. Crossing sub-base to be compacted to achieve a sound foundation

PLATE VEHICLE CROSSING

MANAWATU DISTRICT COUNCIL		Scale: Not to Scale
Designed	Infrastructure	Plan No. 3.19
Drawn	Infrastructure	
Checked	GY	
Revised	06/2017	Sheet 1 of 1 Sheets

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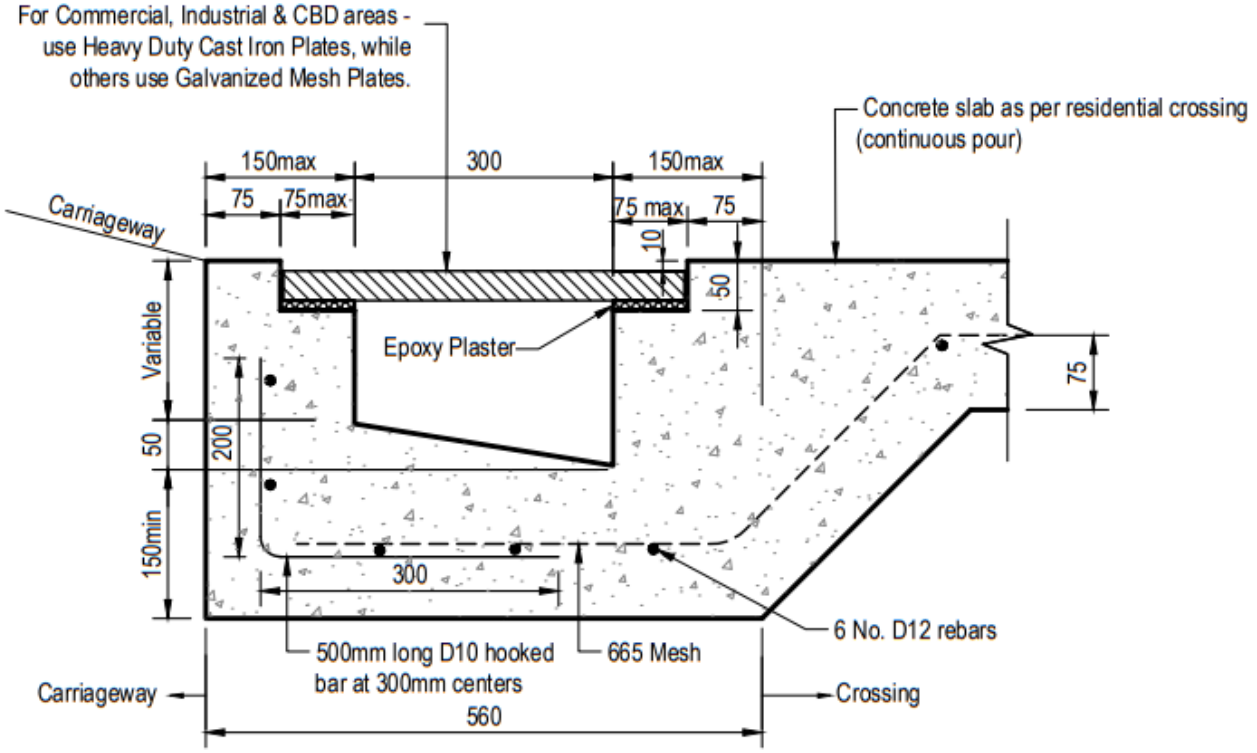

NOTES

a. All plates to be 760mm long x 410mm wide x 30mm thick.
b. Plates to be plastered into place with epoxy at 10mm below concrete surface.
c. Provide 50mm (Min.) cover to reinforcing steel.
d. Residential - Use Heavy Duty galvanised mesh plate.
e. Commercial / Industrial - Use Heavy Duty Cast Iron solid plate

Note:

1. Residential 25MPa, 150mm thick certified concrete only.
2. Commercial 30MPa, 200mm thick certified concrete only.
3. Industrial 30MPa, 300mm thick certified concrete only.

PLATE VEHICLE CROSSING - CHANNEL DETAIL

MANAWATU DISTRICT COUNCIL		Scale: Not to Scale
Designed	Infrastructure	Plan No. 3.20
Drawn	Infrastructure	
Checked	GY	
Revised	06/2017	Sheet 1 of 1 Sheets

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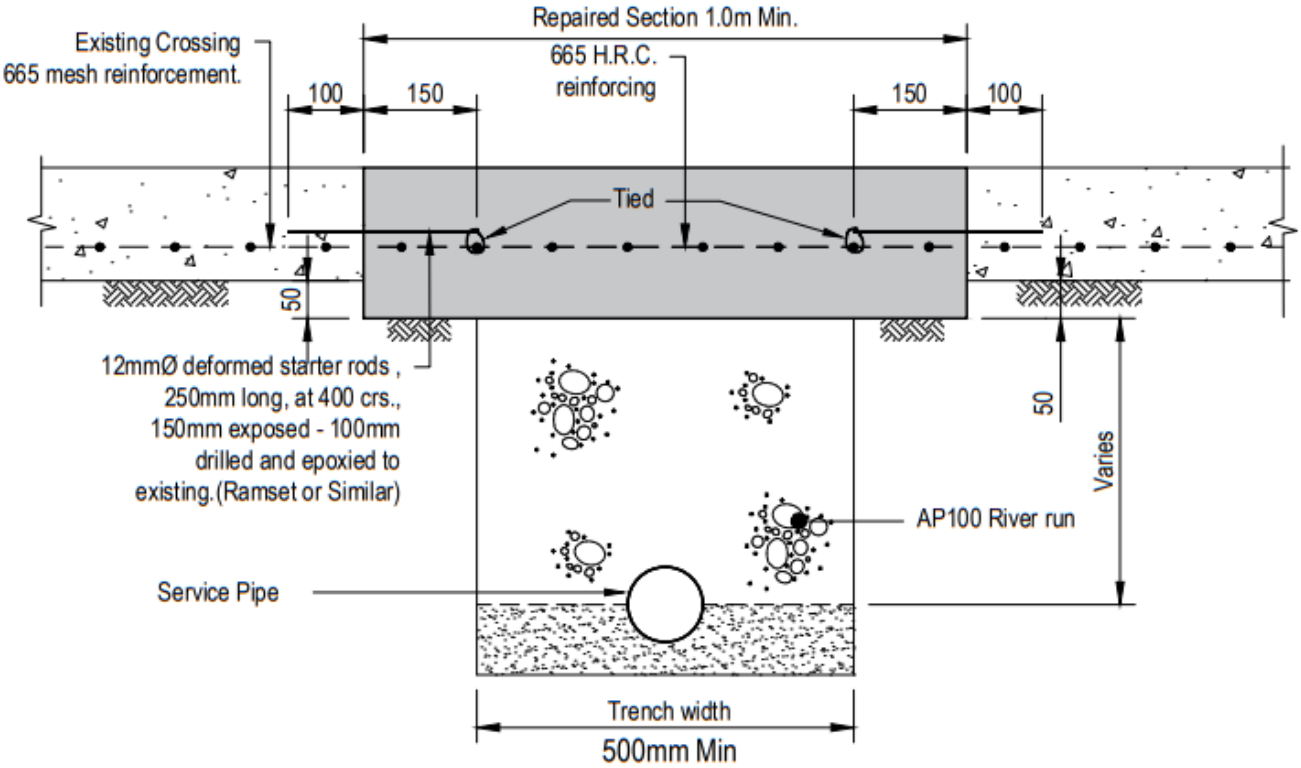

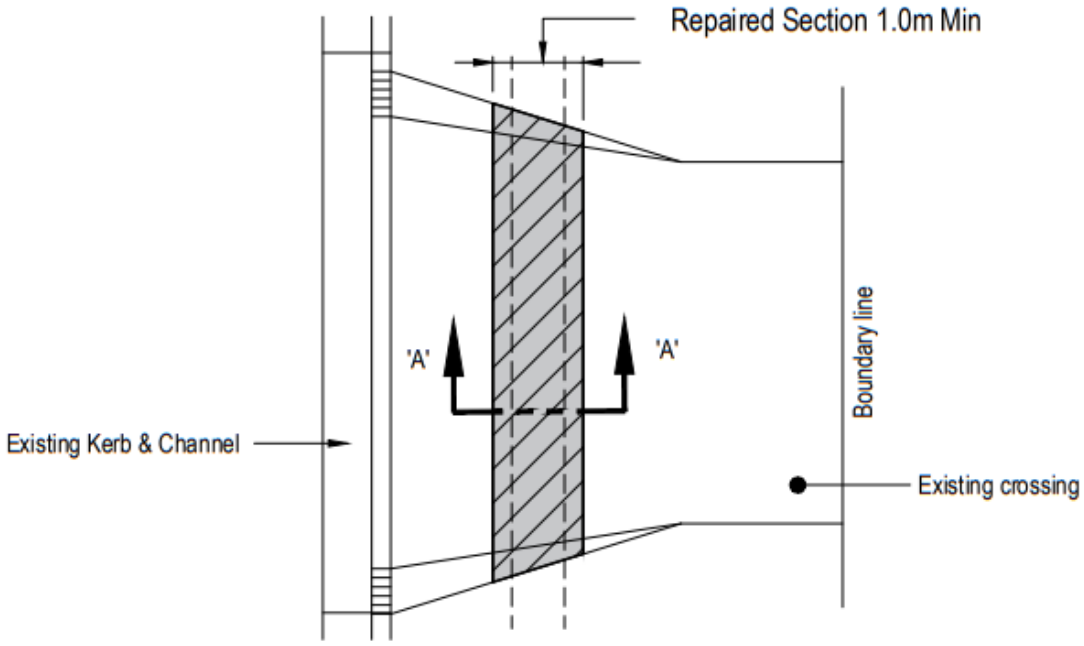

Note:

1. Residential 25MPa, 150mm thick certified concrete only.
2. Commercial 30MPa, 200mm thick certified concrete only.
3. Industrial 30MPa, 300mm thick certified concrete only.

REPAIR OF VEHICLE CROSSING - GENERAL POSITION

MANAWATU DISTRICT COUNCIL		Scale:	Not to Scale
Designed	Infrastructure	Plan No.	3.21
Drawn	Infrastructure		
Checked	GY		
Revised	06/2017	Sheet 1 of 1 Sheets	

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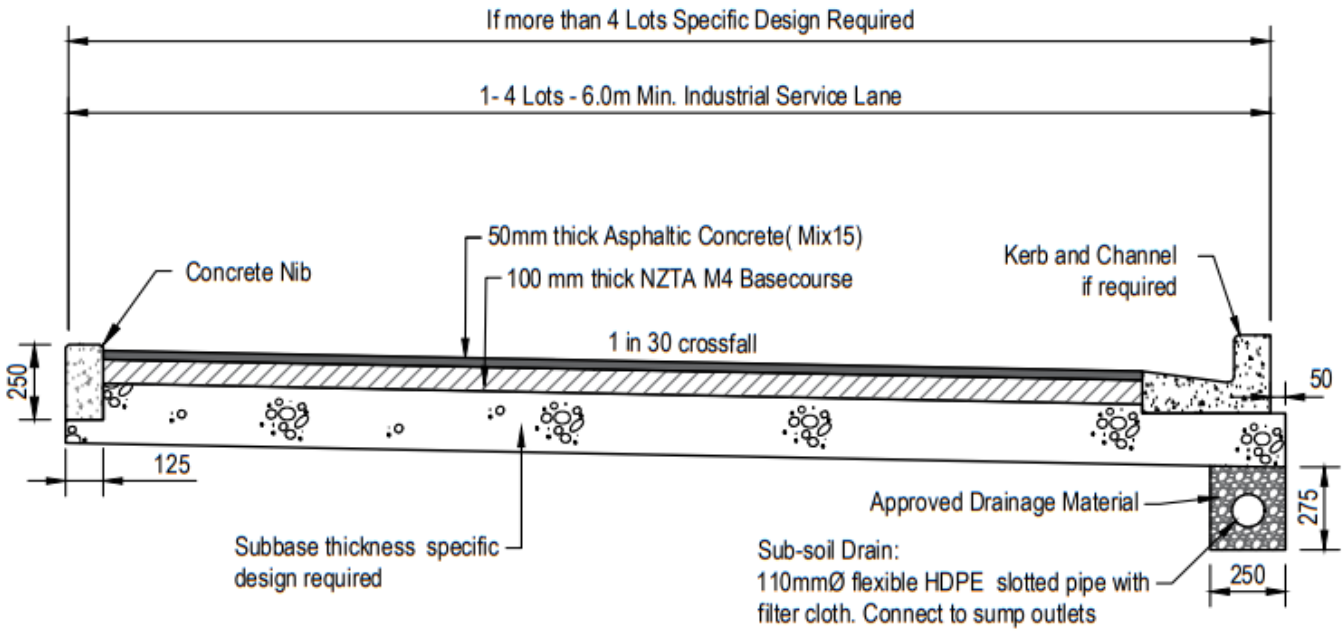

NOTES:

1. Pavement thickness to be designed and constructed in accordance with NZTA specifications
2. If required, retain edges of pavement surface.
3. Wastewater, Stormwater and Water services may be laid in a common trench provided the required clearances between services are maintained.

BUSINESS & INDUSTRIAL ACCESS -TYPICAL CROSS SECTION

MANAWATU DISTRICT COUNCIL		Scale:	Not to Scale
Designed	Infrastructure	Plan No.	3.22
Drawn	Infrastructure		
Checked	GY		
Revised	05/2017	Sheet 1 of 1 Sheets	

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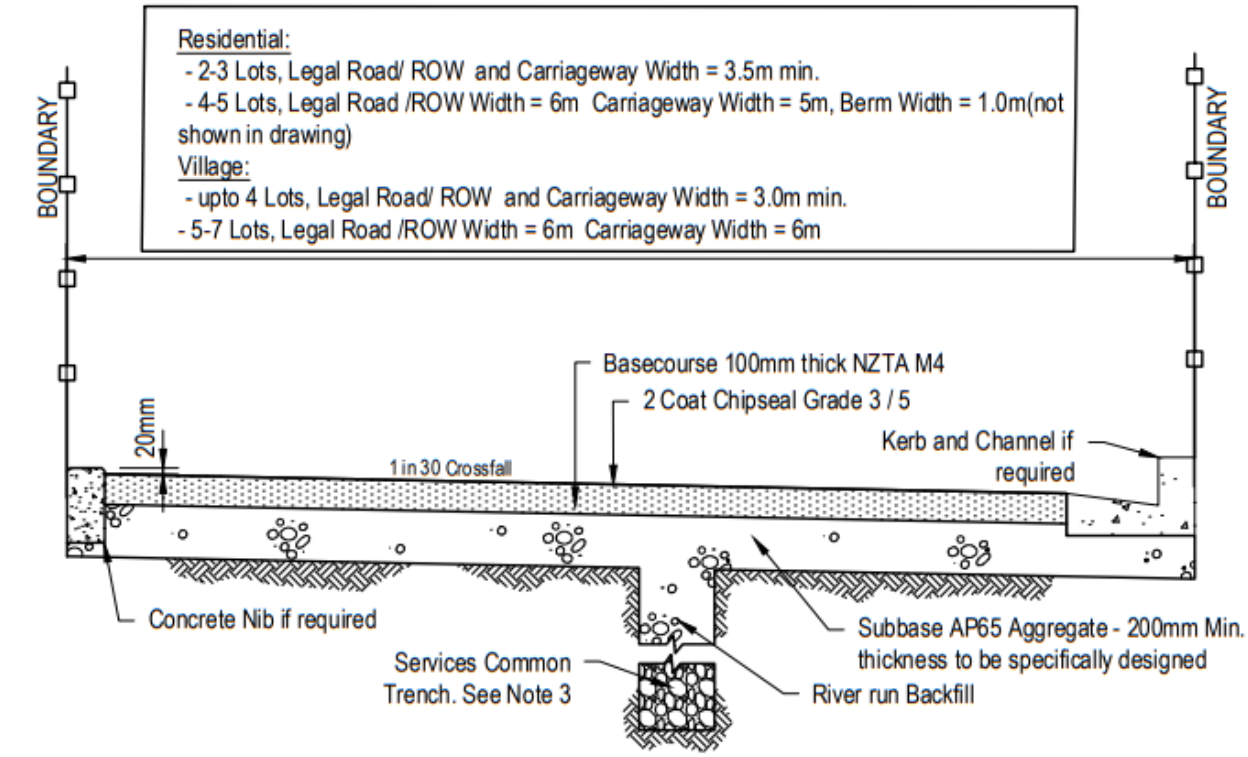

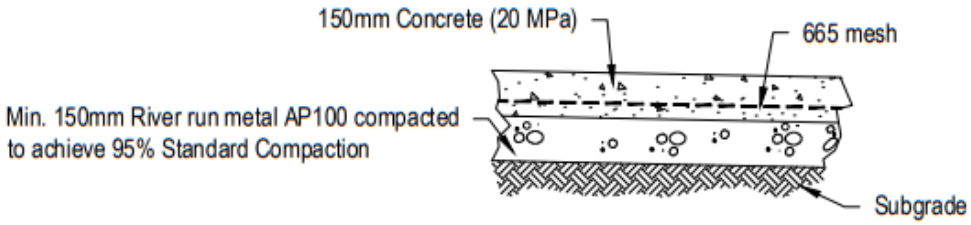

CONCRETE ALTERNATIVE

Note:
Concrete ROW's may be drained to the centre.

Note
1. Pavement formation depths to be designed.
2. Surfacing - 2 coat chip seal, sizes 4 & 6 in Urban Areas or 25mm of Mix 10 asphaltic concrete on a first coat chip seal chip size 4
3. Wastewater, stormwater and water services must be appropriately sized. All services may be laid in a common trench provided the required clearances between services are maintained

RESIDENTIAL & VILLAGE PRIVATE & ROW ACCESS - 2 TO 7 LOTS

MANAWATU DISTRICT COUNCIL		Scale:	Not to Scale
Designed	Infrastructure	Plan No.	3.23
Drawn	Infrastructure		
Checked	GY		
Revised	06/2017	Sheet 1 of 1 Sheets	

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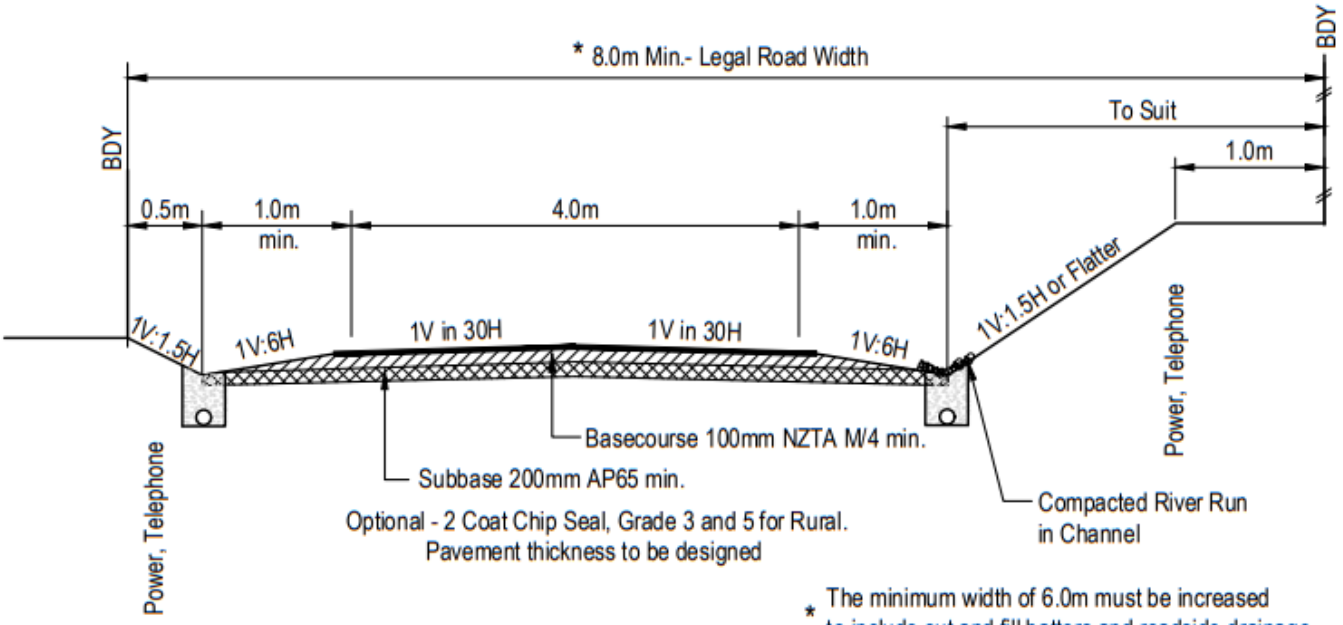
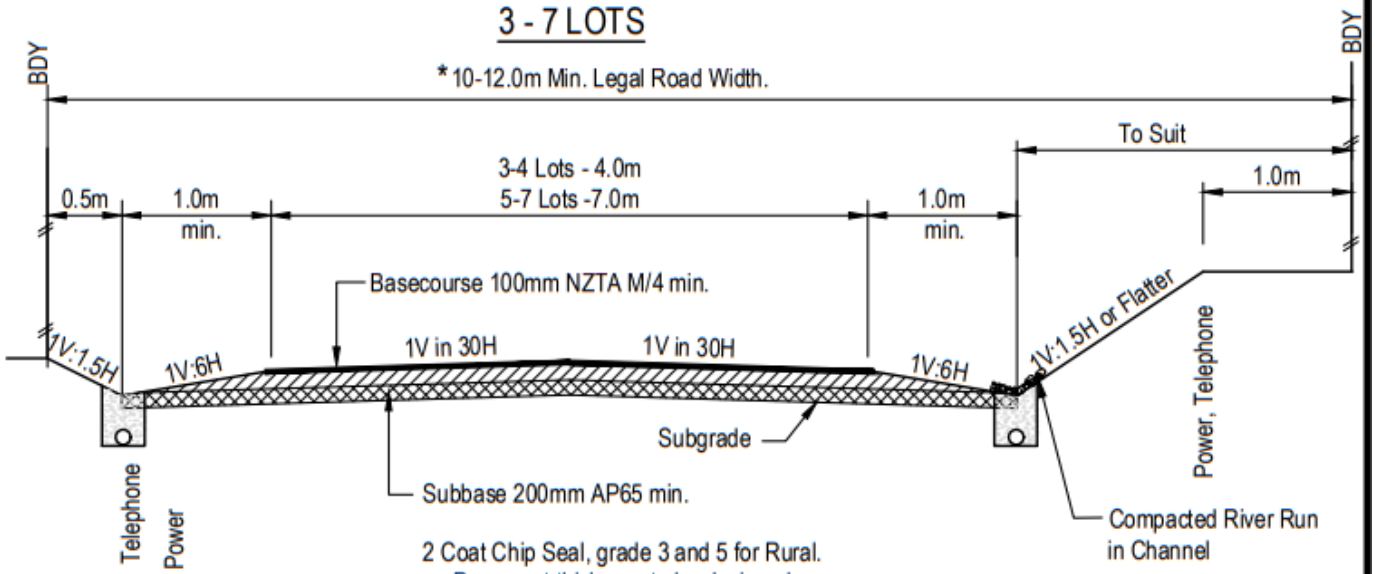
1 -2 LOTS



3 - 7 LOTS



Notes:

1. For batter slopes steeper than 1V:1.5H, Engineering design report will be required.
2. Drainage details as for rural road requirements. Refer to Drawing No.3.4 and 3.7

PRIVATE ROW ACCESS TO REAR LOTS - 1 TO 7 LOTS FOR NODAL AND RURAL SUBDIVSIONS

MANAWATU DISTRICT COUNCIL		Scale:	Not to Scale
Designed	Infrastructure	Plan No.	3.24
Drawn	Infrastructure		
Checked	GY		
Revised	06/2017	Sheet 1 of 1 Sheets	

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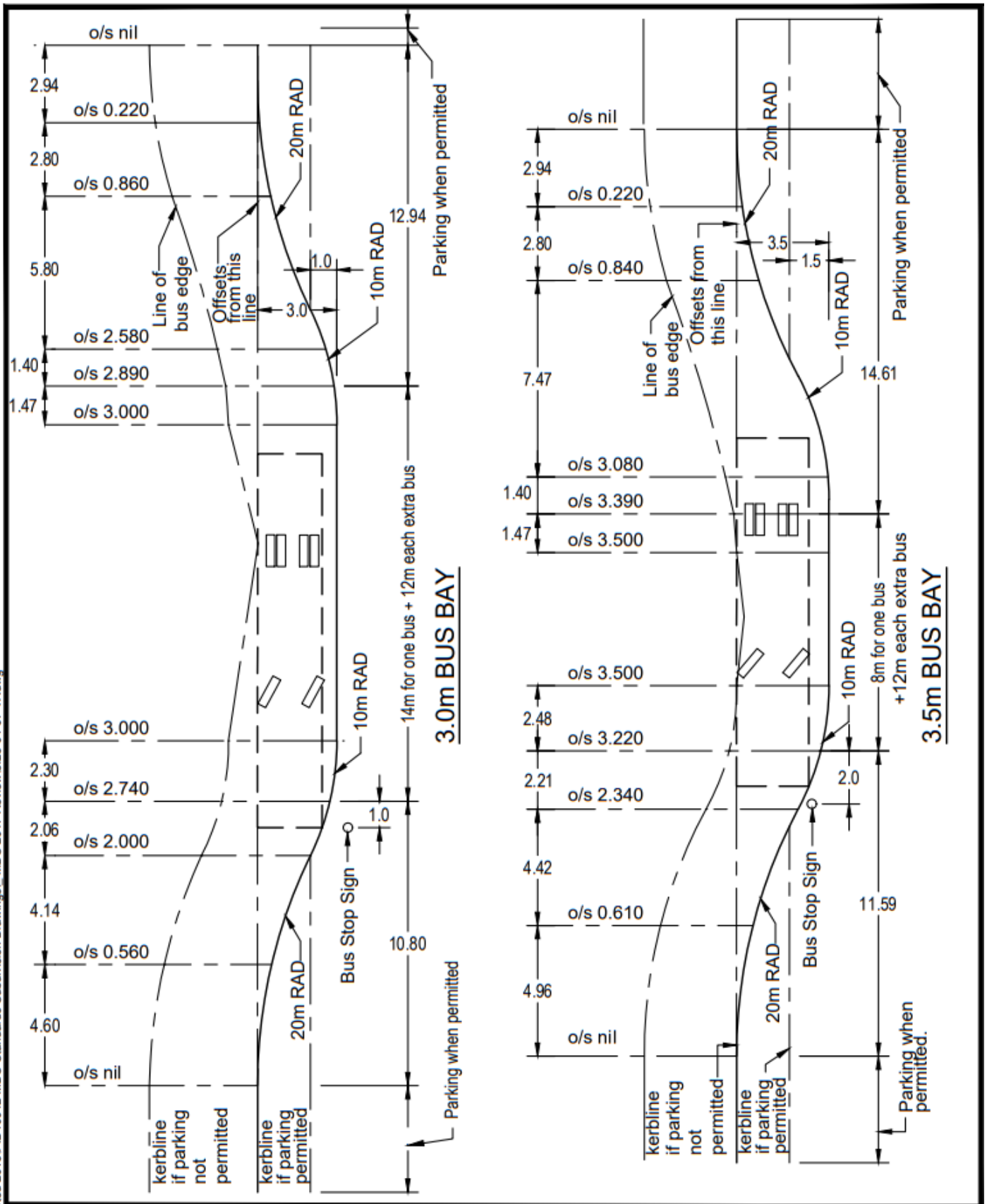

BUS BAY DESIGN

MANAWATU DISTRICT COUNCIL	
Designed	Infrastructure
Drawn	Infrastructure
Checked	GY
Revised	06/2017

Scale: Not to Scale

Plan No. 3.25

Sheet 1 of 1 Sheets

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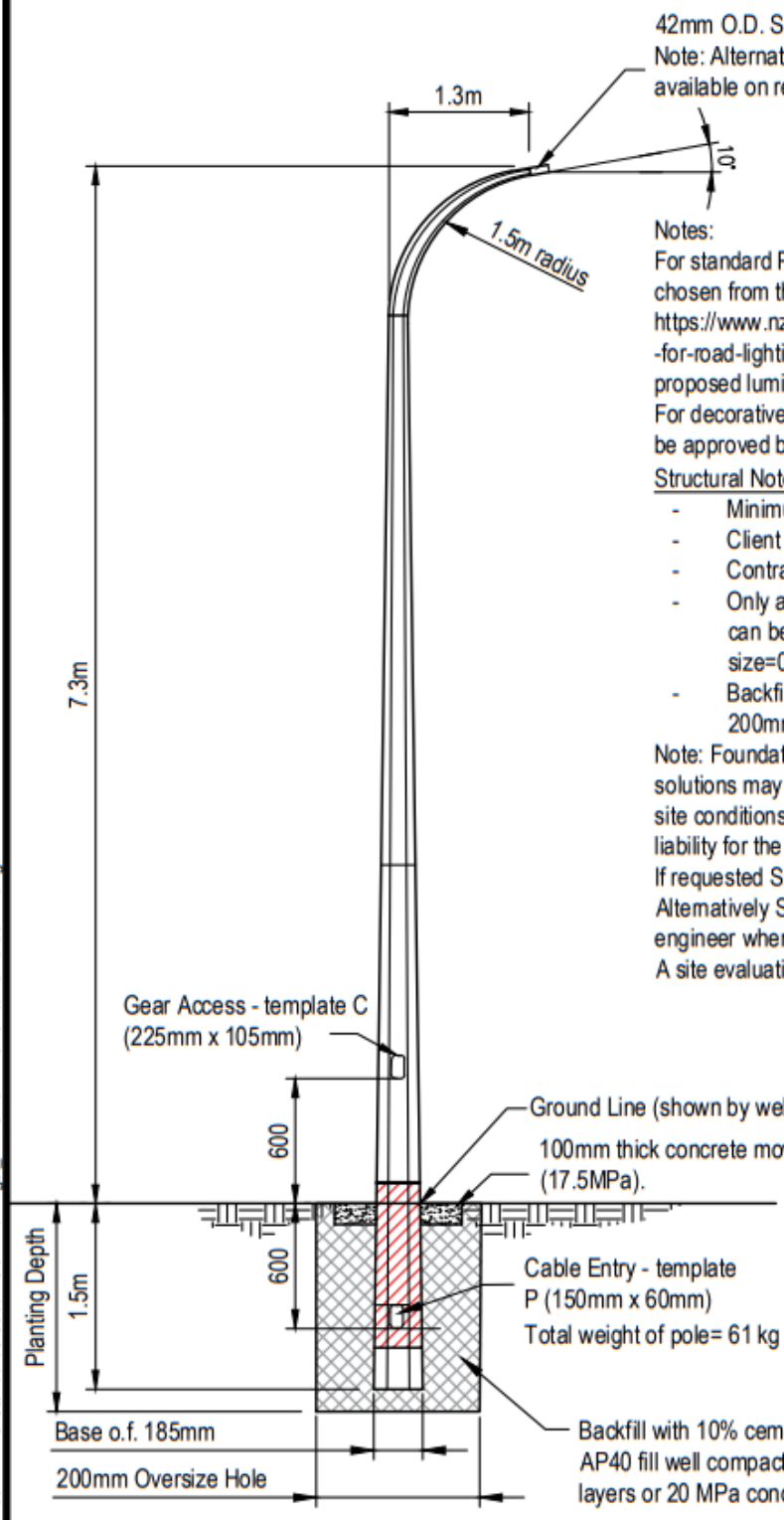

Notes:
For standard P category installations, LED luminaires to be chosen from the NZTA Approved M30 list details at https://www.nzta.govt.nz/assets/resources/specifications-and-guidelines-for-road-lighting-design/docs/m30-accepted-luminaires.pdf, proposed luminaire to be approved by MDC.
For decorative installation proposed luminaires and poles to be approved by MDC.

Structural Notes:

- Minimum allowable ground bearing pressure shall be 100 kPa
- Client to provide location and orientation
- Contractor to check location of all services before commencing work.
- Only approved light fittings may be used , no additional attachments can be placed on pole without Spunlite's approval. (maximum light size=0.2m^{2}with a cd=1.0, maximum light weight=15kg
- Backfill fill hole with cement stabilised AP40 fill well compacted 200mm layer of concrete.

Note: Foundation design information is supplied as a guide only. Other solutions may be more appropriate for specific situations. Due to variations in site conditions and installation procedures Spunlite does not accept legal liability for the use of this information.
If requested Spunlite will design specific foundations for each project . Alternatively Spunlite recommends the engagement of a registered consulting engineer where upon Spunlite supply all loadings.
A site evaluation by a qualified Structural/Geotechnical Engineer is advisable.

Notes:
Complete in ground installation to be coated with manufacturers's corrosion inhibiting system
For full installation details see https ://www.spun;ite.co.nz/uploads/Install%20Guide.pdf
Pole and Luminaire details for new Category P3 and P4 Residential Lighting

TYPICAL STEEL LIGHTING COLUMNS FOR STREET LIGHTS

MANAWATU DISTRICT COUNCIL		Scale: Not to Scale
Designed	Infrastructure	Plan No.
Drawn	Infrastructure	3.26
Checked	GY	
Revised	06/2017	Sheet 1 of 1 Sheets

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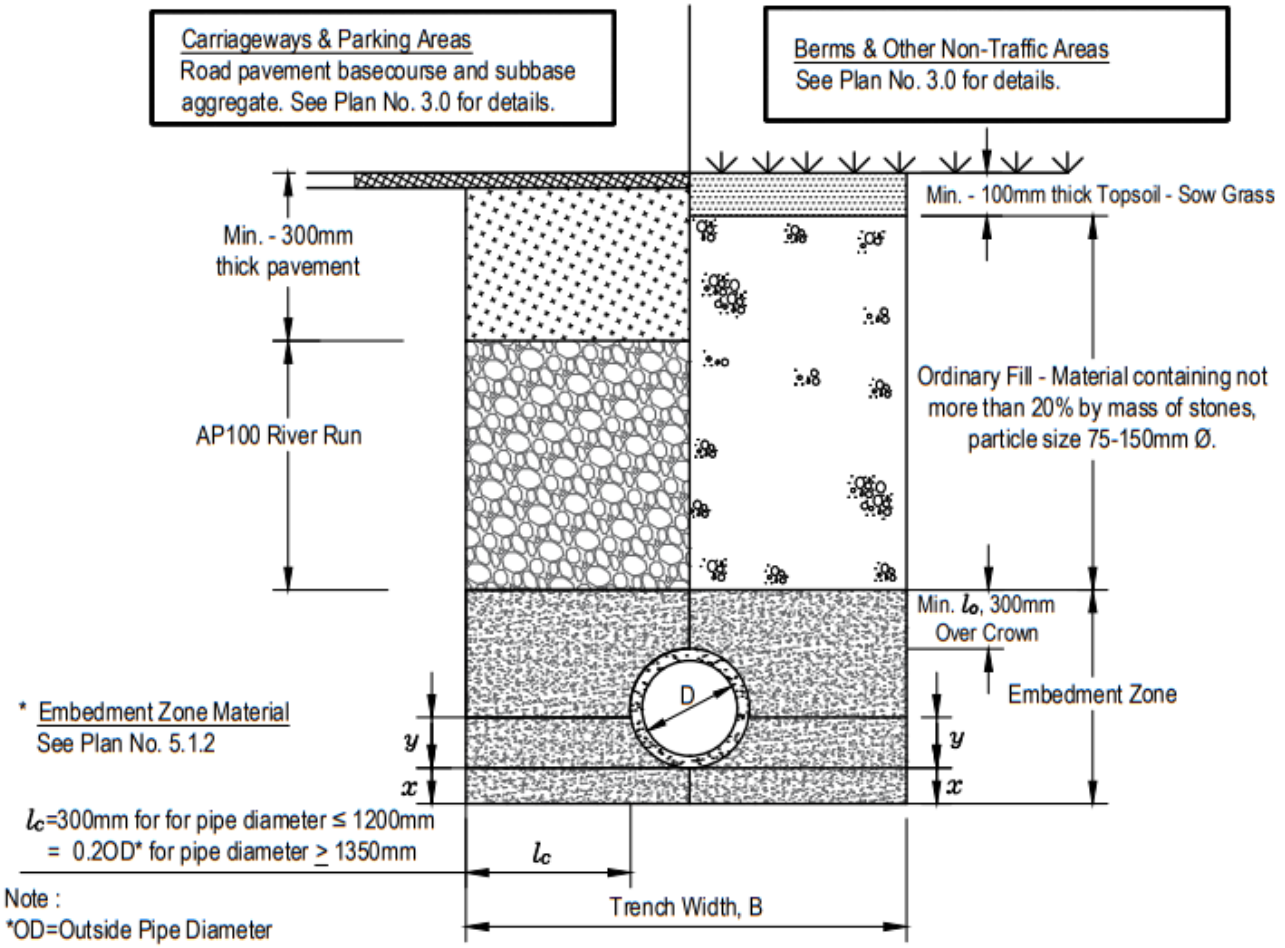

CONCRETE OR CERAMIC PIPES

EMBEDMENT ZONES DIMENSIONS FOR RIGID PIPELINES				
Nominal Diameter (mm)	Bedding Zone, x (mm)	Haunch Zone, y (mm)	Overlay Zone, l_o (mm)	Trench Width, B (mm)
≤1200	100	$\frac{D}{3}$	300	880-1975
1350-1800	150	$\frac{D}{3}$	300	2135-2810

RIGID PIPE TRENCHING DETAILS - WASTEWATER & STORMWATER

MANAWATU DISTRICT COUNCIL		Scale: Not to Scale
Designed	Infrastructure	Plan No. 4.1
Drawn	Infrastructure	
Checked	GY	
Revised	06/2017	Sheet 1 of 1 Sheets

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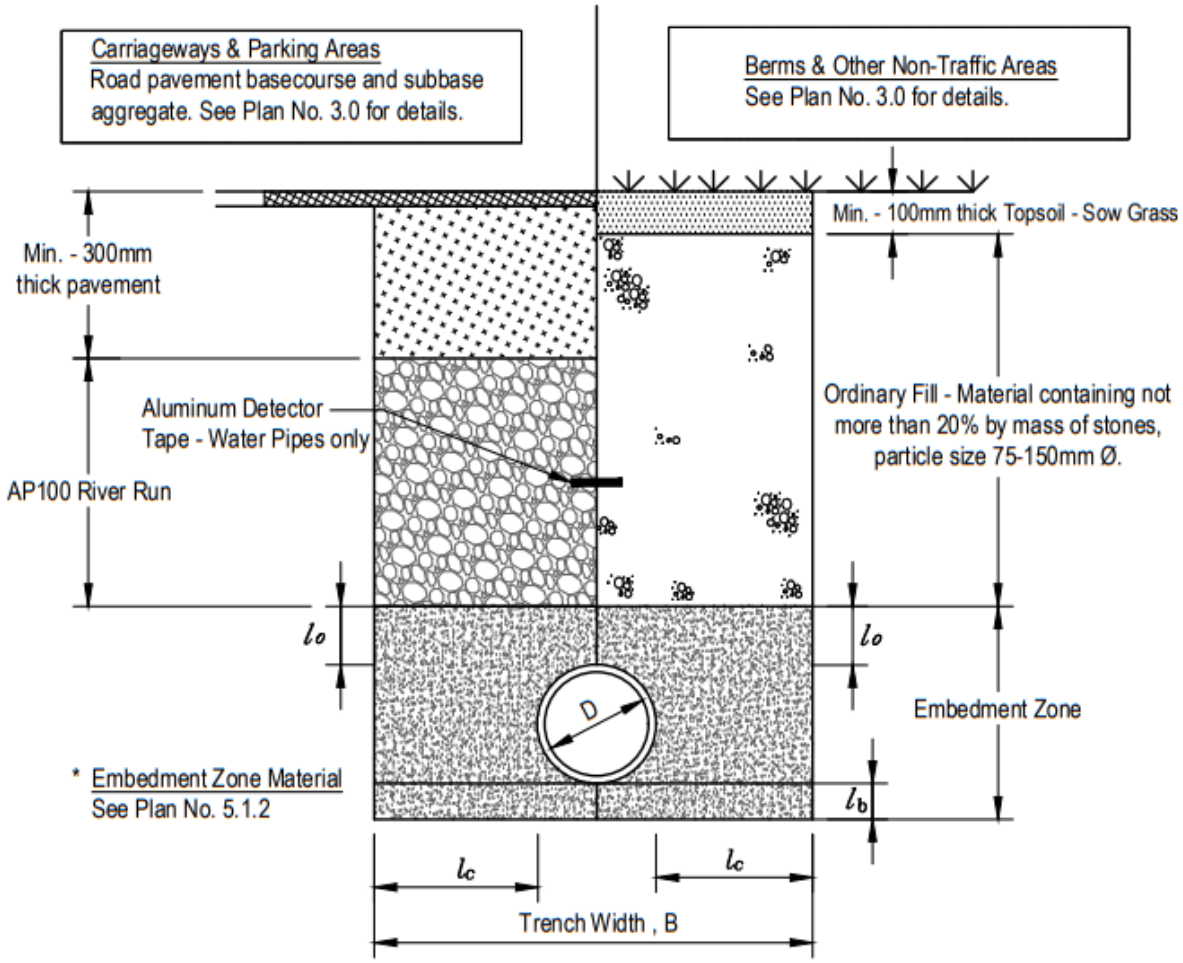

PVC PIPES

EMBEDMENT ZONES DIMENSIONS FOR FLEXIBLE PIPELINES				
Nominal Diameter (mm)	Bedding Zone, l_b (mm)	Horizontal Distance between spring line and trench line, l_c (mm)	Overlay Zone, l_o (mm)	Trench width, B (mm)
100	75	100	100	310
150-225	100	150	150	460-550
300-375	100	200	150	715-800
475-525	150	300	150	1100-1230

FLEXIBLE PIPE TRENCHING DETAILS - WATER, WASTEWATER & STORMWATER

MANAWATU DISTRICT COUNCIL

Designed	Infrastructure
Drawn	Infrastructure
Checked	GY
Revised	06/2017

Scale: Not to Scale

Plan No. 4.1.1

Sheet 1 of 1 Sheets

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AS/NZS 3725 TABLE 6 and AS/NZS 2566.2 TABLE G2	
GRADING LIMITS FOR ACCEPTABLE EMBEDMENT MATERIALS	
Sieve Size (mm)	Mass of Sampe Passsing (%)
19	100
2.36	50-100
0.6	20-90
0.3	10-60
0.15	0-25
0.075	0-10

GRADING LIMITS FOR EMBEDMENT ZONE MATERIALS

MANAWATU DISTRICT COUNCIL

Designed	Infrastructure
Drawn	Infrastructure
Checked	GY
Revised	06/2017

Scale: Not to Scale

Plan No. 4.1.2

Sheet 1 of 1 Sheets

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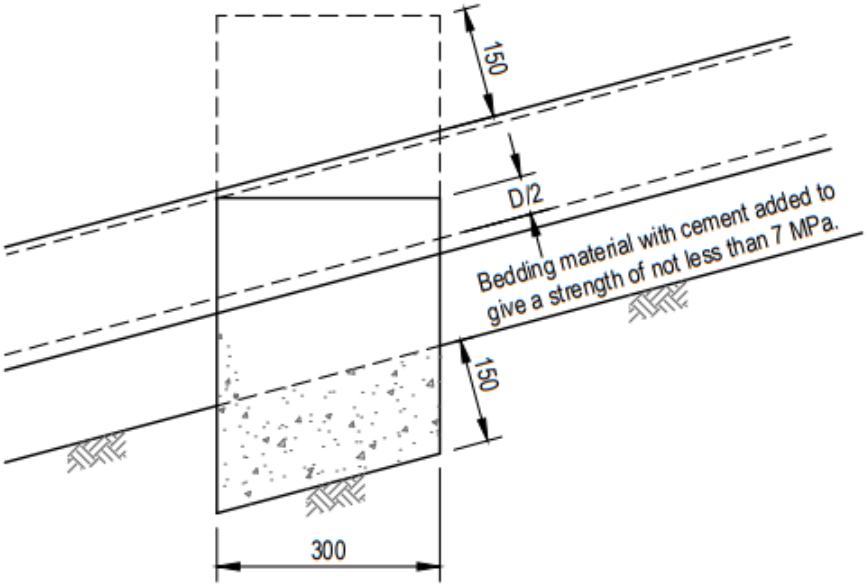
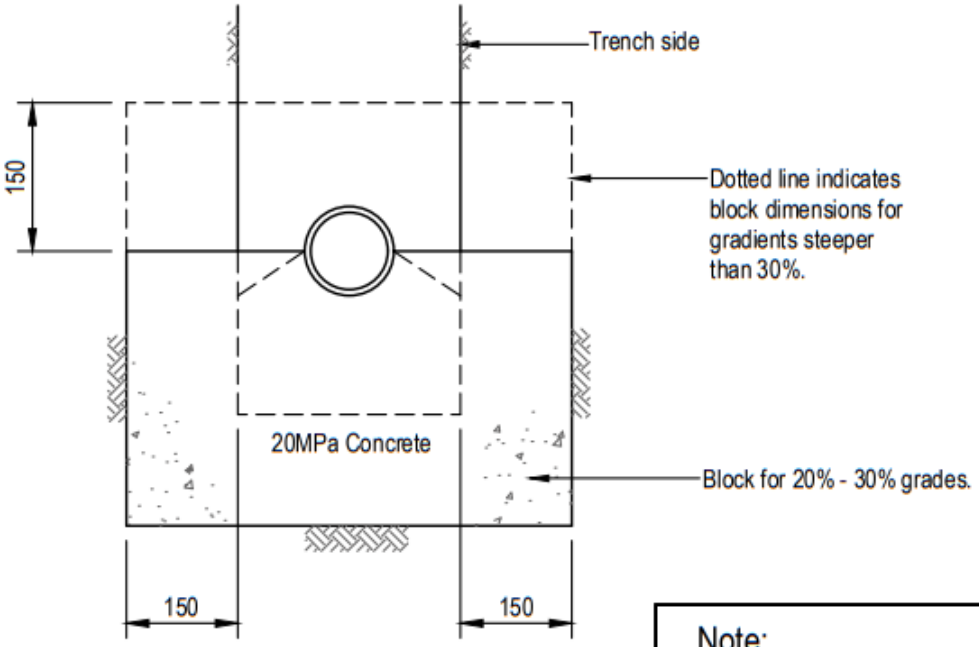


LONGITUDINAL SECTION



CROSS SECTION

Note:
Spacing of anti-scour blocks is subject to Engineer's design.

ANTI-SCOUR BLOCKS FOR STEEP PIPELINES

MANAWATU DISTRICT COUNCIL		Scale:	Not to Scale
Designed	Infrastructure	Plan No.	4.2
Drawn	Infrastructure		
Checked	GY		
Revised	06/2017	Sheet 1 of 1 Sheets	

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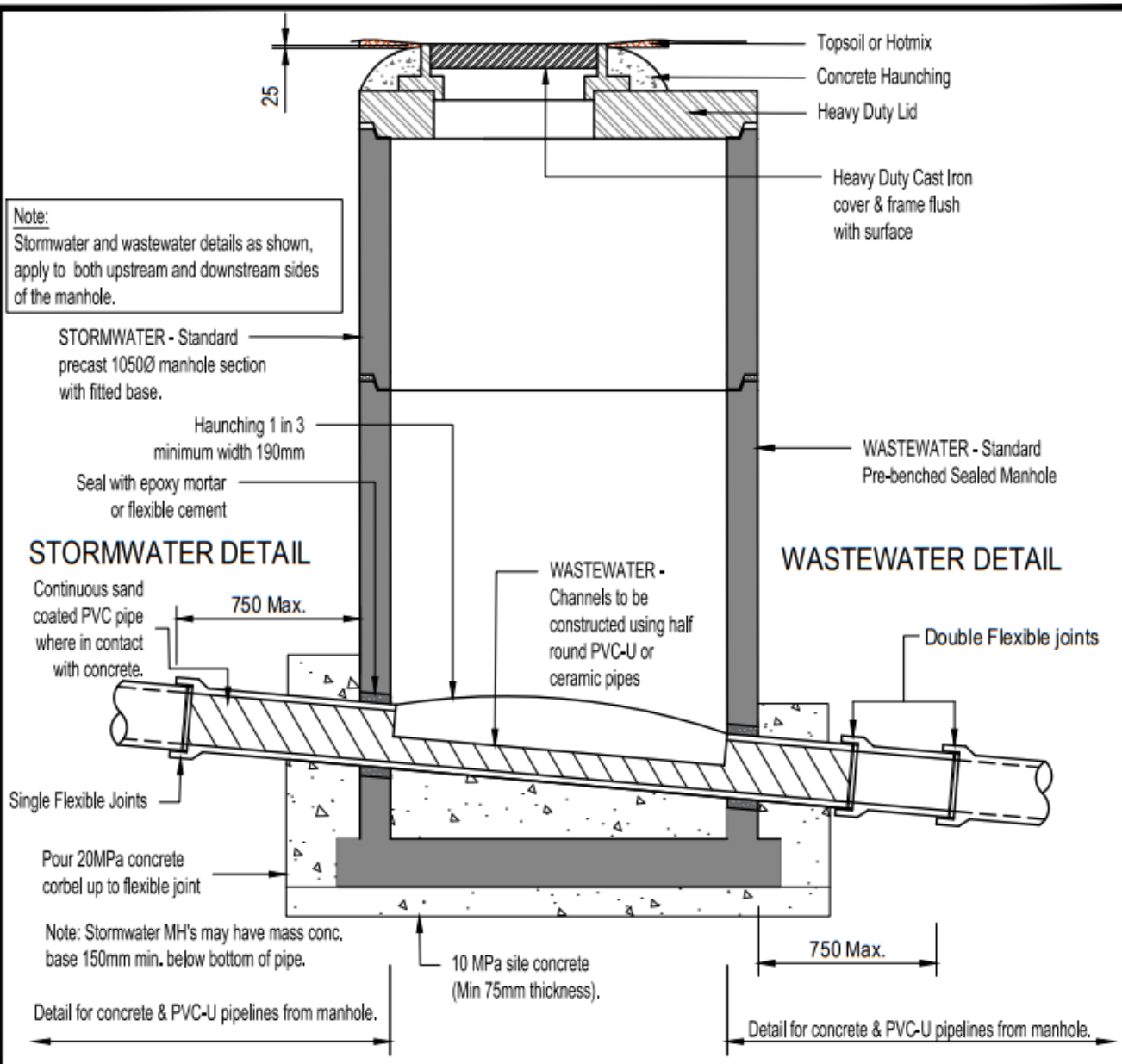

MANHOLE - WASTEWATER & STORMWATER

MANAWATU DISTRICT COUNCIL		Scale: Not to Scale
Designed	Infrastructure	Plan No. 4.3
Drawn	Infrastructure	
Checked	GY	
Revised	06/2017	Sheet 1 of 1 Sheets

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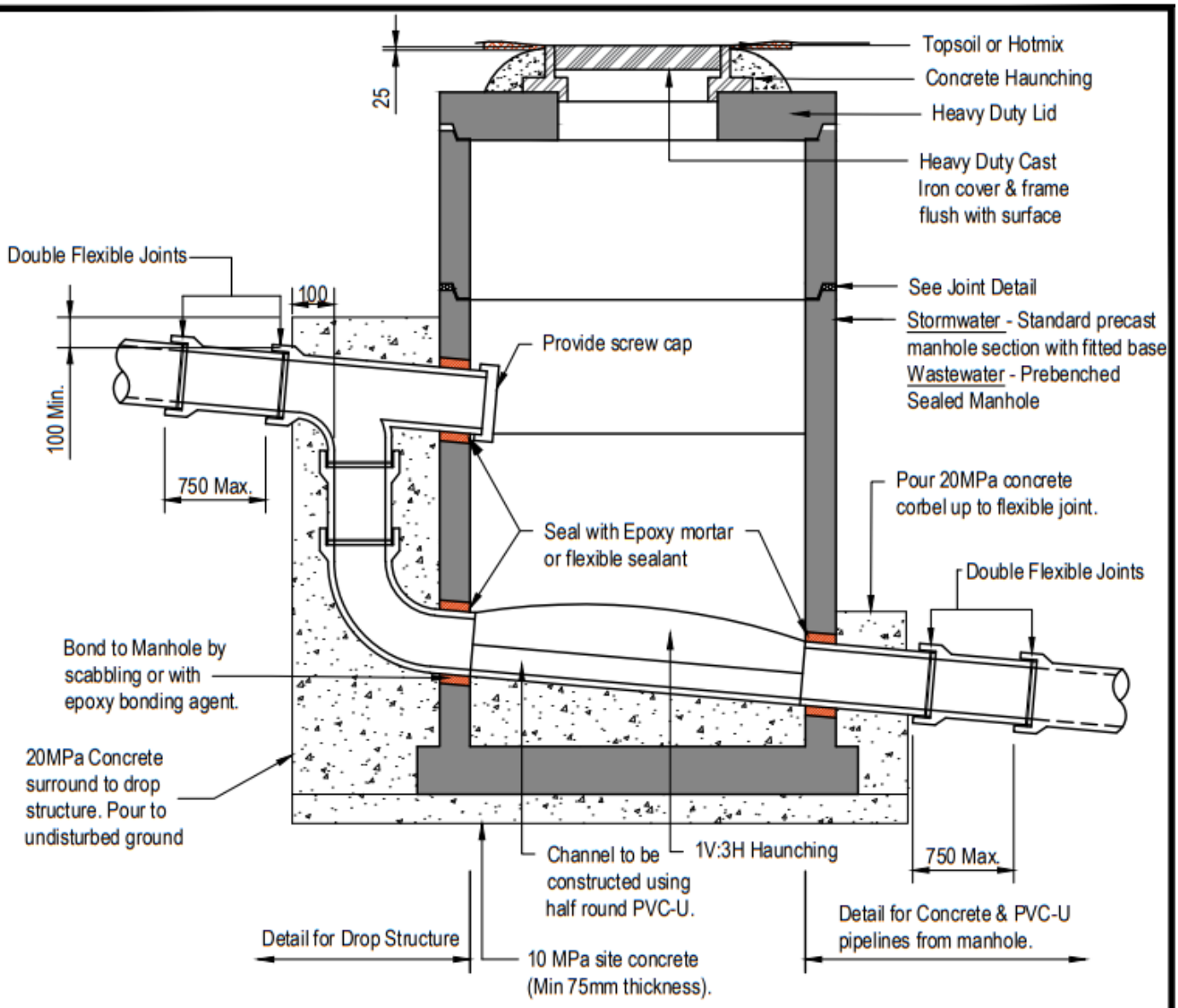

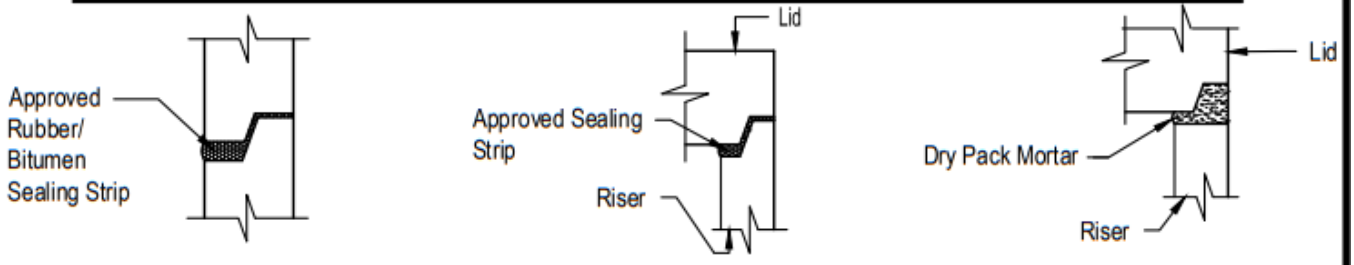

JOINT DETAIL

RISER-LID DETAIL
(Full height riser)

RISER-LID DETAIL
(Riser shortened)

EXTERNAL DROP MANHOLE - WASTEWATER

MANAWATU DISTRICT COUNCIL

Designed	Infrastructure
Drawn	Infrastructure
Checked	GY
Revised	06/2017

Scale: Not to Scale

Plan No. 4.4

Sheet 1 of 1 Sheets

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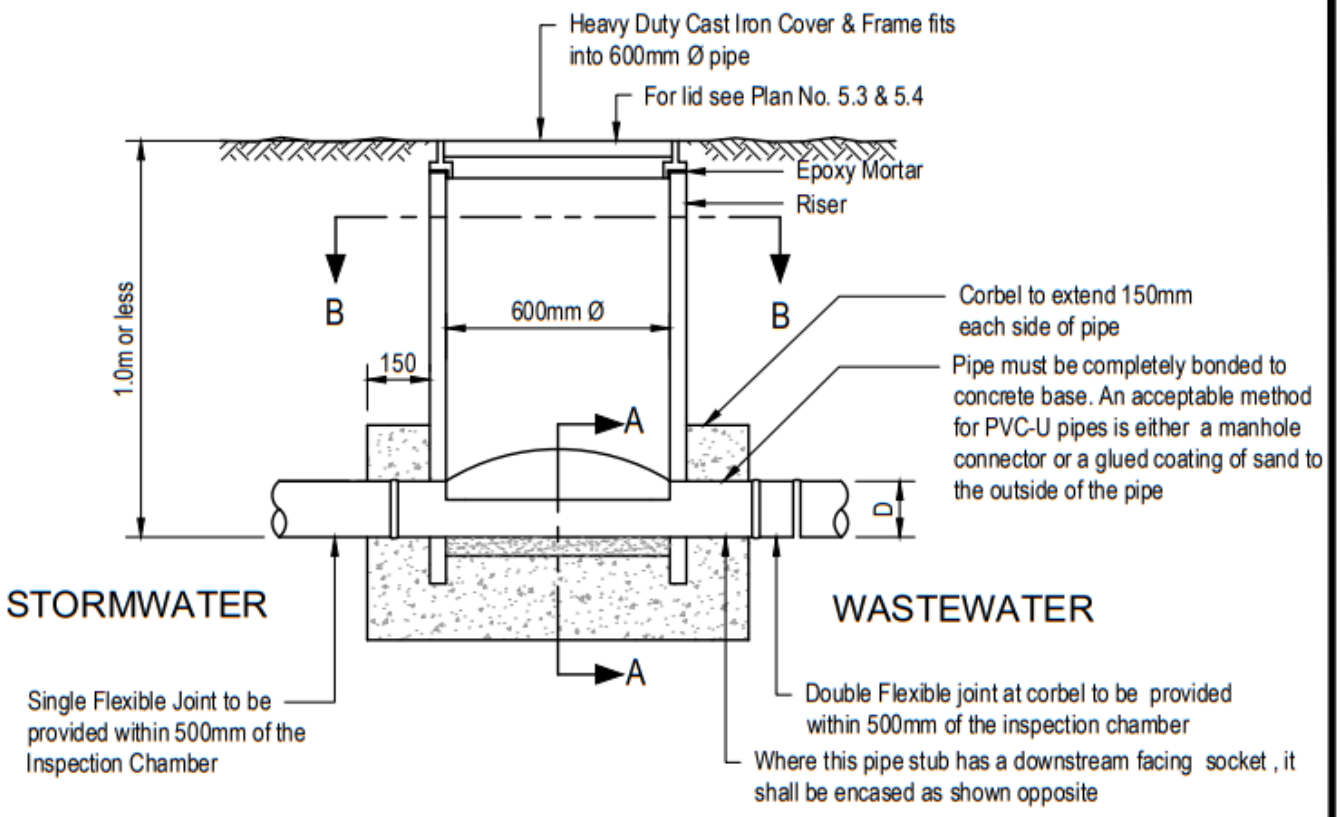
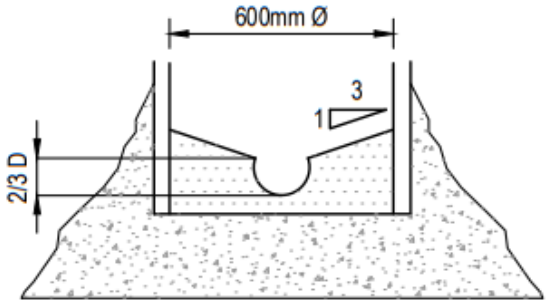
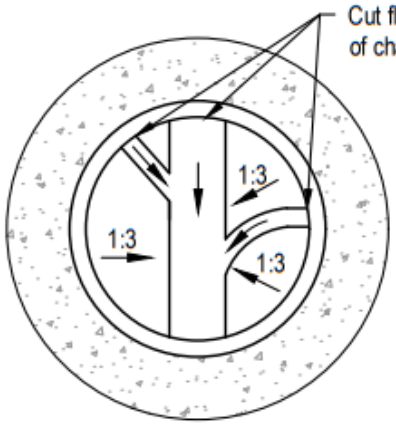




SECTION A-A



SECTION B-B

Note:
Chambers to be installed clear of trafficable areas

TYPICAL INSPECTION CHAMBER FOR 100mmØ PIPE

MANAWATU DISTRICT COUNCIL		Scale: Not to Scale
Designed	Infrastructure	Plan No. 4.5
Drawn	Infrastructure	
Checked	GY	
Revised	06/2017	Sheet 1 of 1 Sheets

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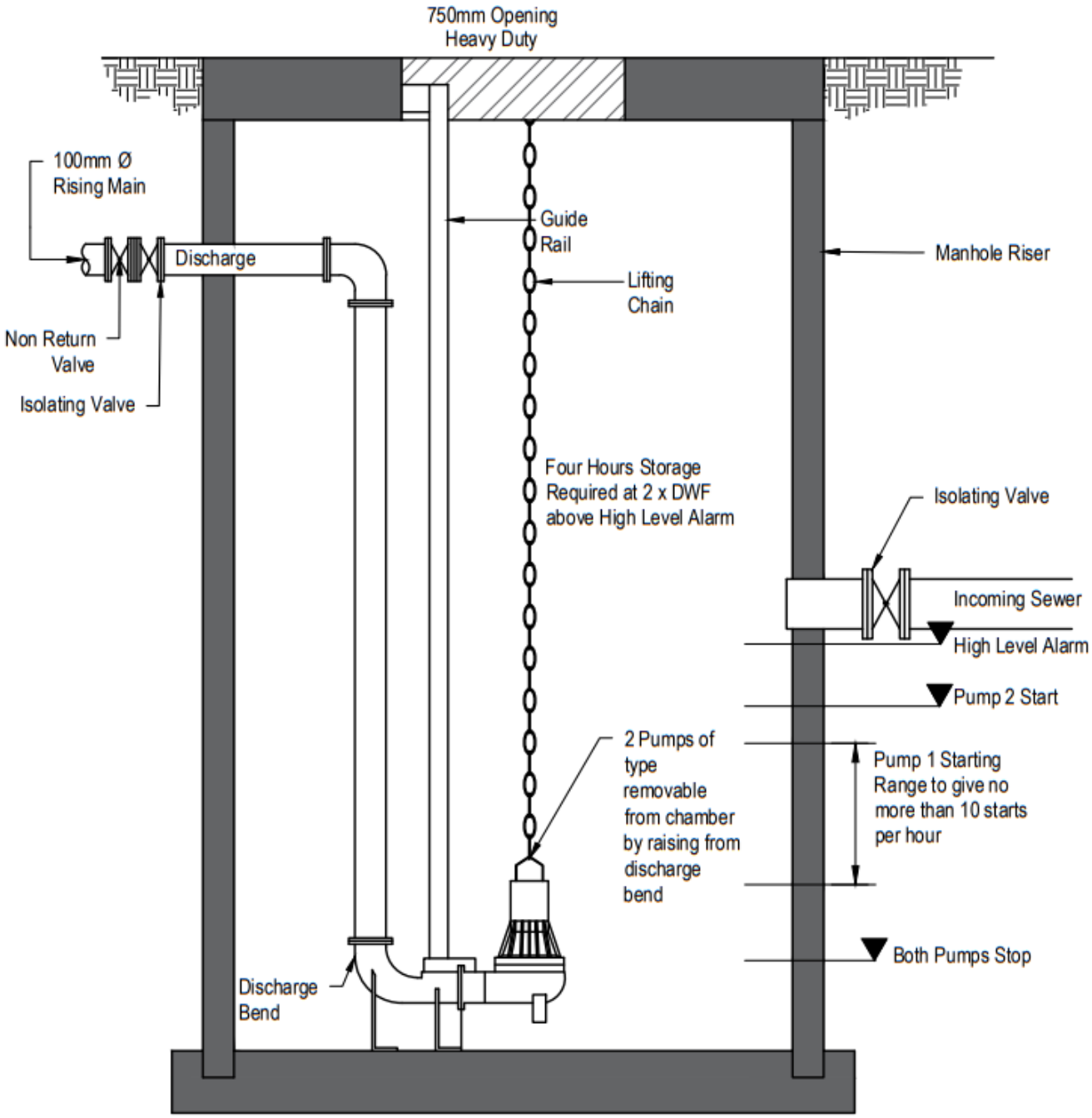

TYPICAL WASTEWATER PUMP STATION - LEVEL MONITORING

MANAWATU DISTRICT COUNCIL		Scale: Not to Scale
Designed	Infrastructure	Plan No. 4.6
Drawn	Infrastructure	
Checked	GY	
Revised	06/2017	Sheet 1 of 1 Sheets

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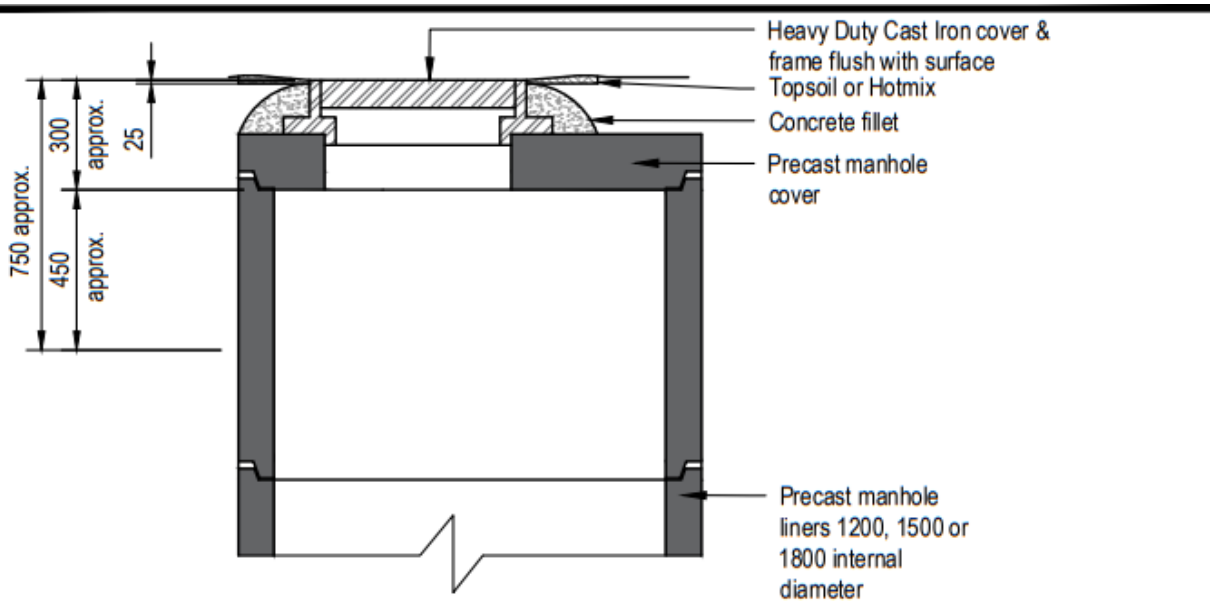
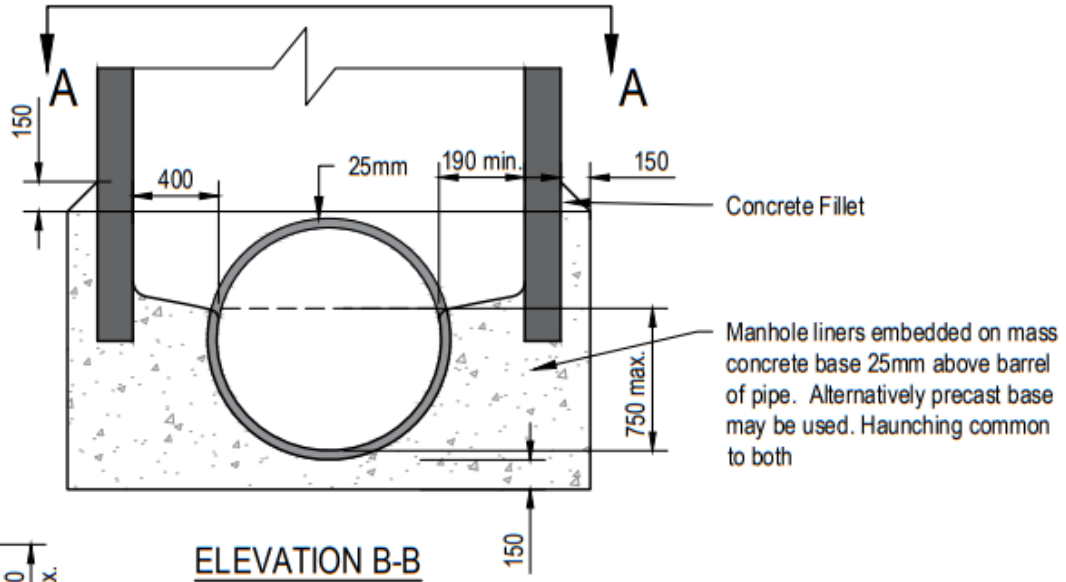
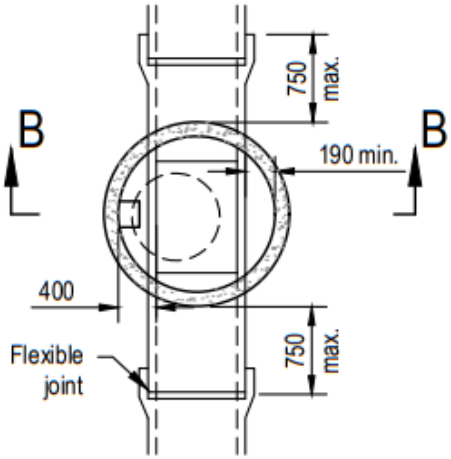




ELEVATION B-B



PLAN A-A

NOTES:

1. 1200, 1500 OR 1800 dia. liners should be selected, having regard to the configuration of bends and junctions within the manhole.
2. The chosen size of liners may need to be offset from the centreline of the pipe to accommodate bends or junctions.

MANHOLE FOR LARGE DIA. PIPES - 750 to 1050mm

MANAWATU DISTRICT COUNCIL		Scale: Not to Scale
Designed	Infrastructure	Plan No. 4.7
Drawn	Infrastructure	
Checked	GY	
Revised	06/2017	Sheet 1 of 1 Sheets

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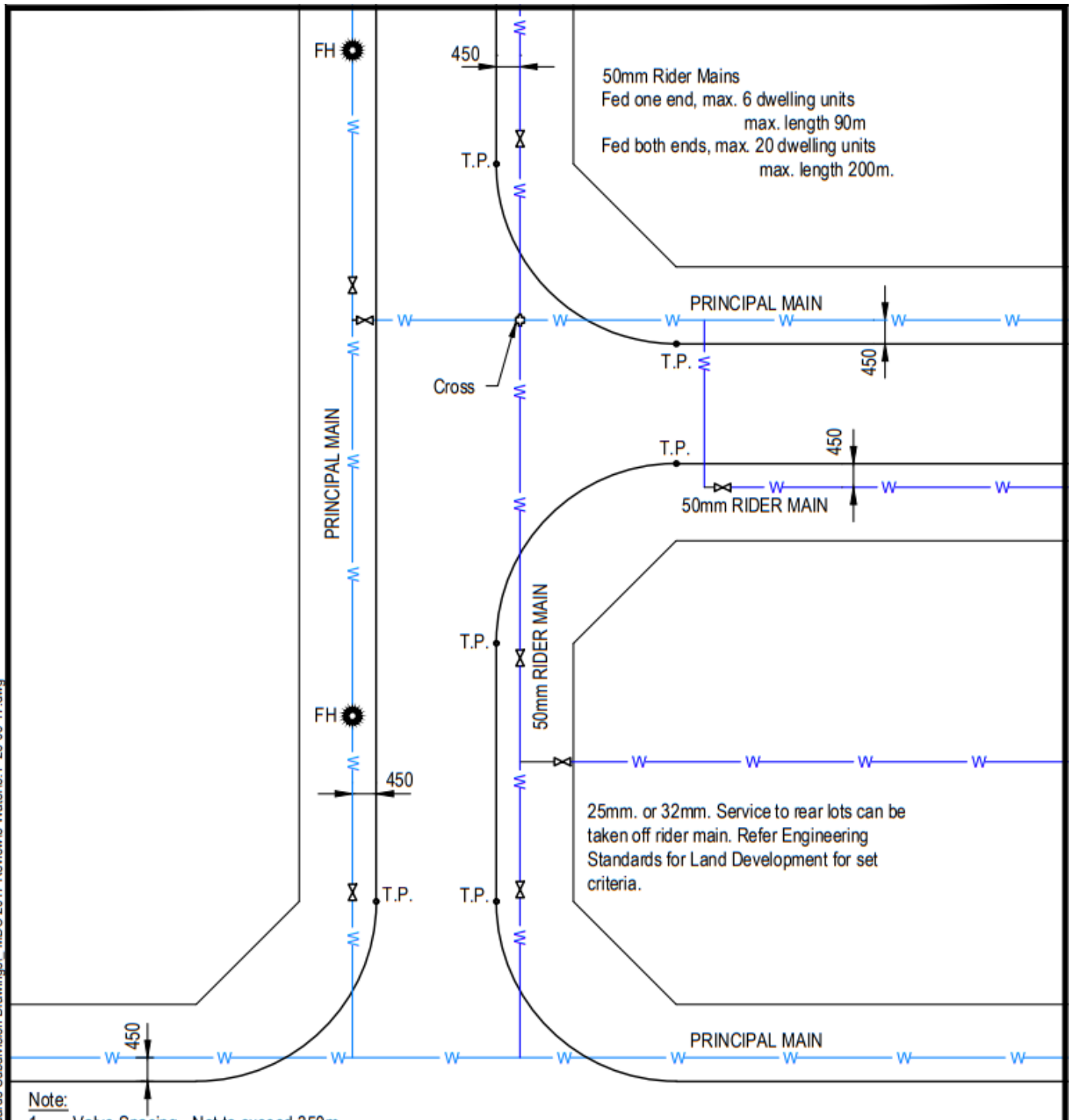

Note:

1. Valve Spacing - Not to exceed 350m.
2. Fire Hydrant Spacing to Comply with SNZ PAS 4509:2008 New Zealand Fire Service Firefighting Water Supplies Code of Practice
3. Fire Hydrant Spacing
   - Not exceeding 135m in Residential Streets
   - Not exceeding 90m Business and Industrial Street
4. A Fire Hydrant is required at the end of a Residential Right of Way if it is longer than 65m.

LAYOUT OF VALVES AND FIRE HYDRANTS

MANAWATU DISTRICT COUNCIL

Designed	Infrastructure
Drawn	Infrastructure
Checked	GY
Revised	06/2017

Scale: Not to Scale

Plan No. 5.1

Sheet 1 of 1 Sheets

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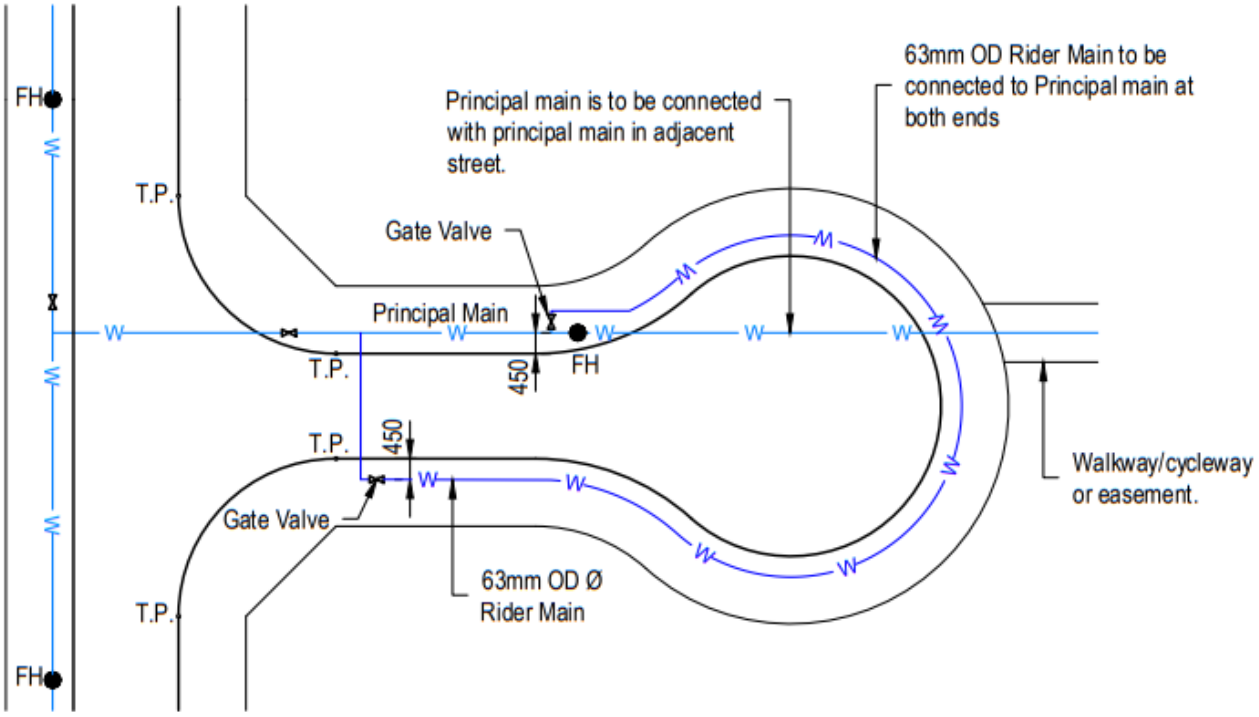

LAYOUT OF WATERMAINS IN CUL DE SAC

MANAWATU DISTRICT COUNCIL		Scale:	Not to Scale
Designed	Infrastructure	Plan No.	5.2
Drawn	Infrastructure		
Checked	GY		
Revised	06/2017	Sheet 1 of 1 Sheets	

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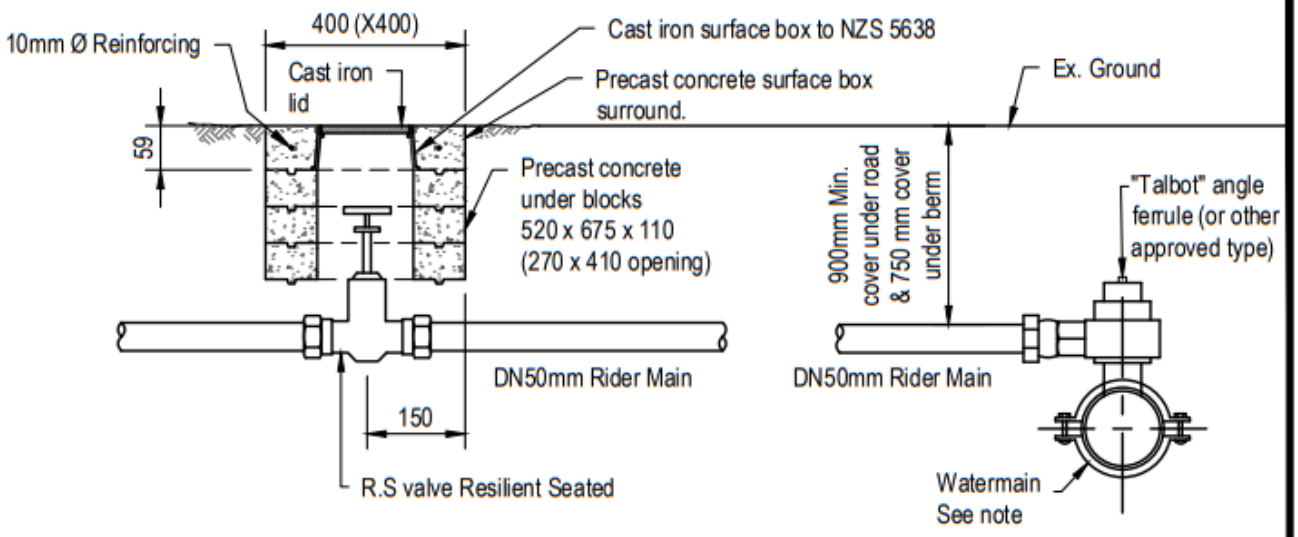
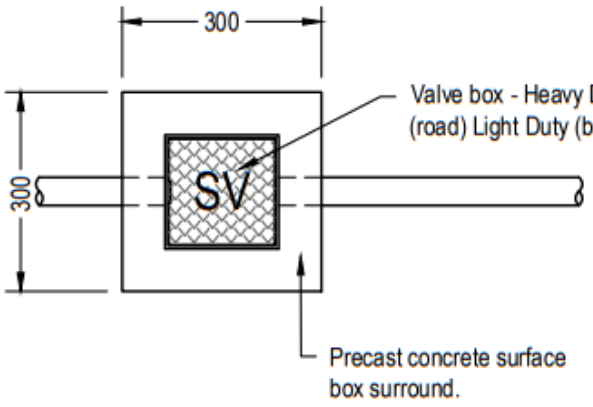
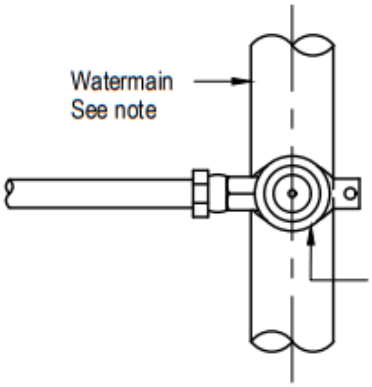


Note:
Nominal service cover depth shown only. Depth of cover to pipes to conform with manufacturer's requirements.

SECTIONAL ELEVATION



PLAN



NOTE:

Principle Main connections:
150mm: As Shown

200mm:
225mm:
250mm:
} Use Gibault joint with 50mm take off placed vertical. 90° bend required.

DN50mm RIDER MAIN OR R.O.W. SERVICE CONNECTION

MANAWATU DISTRICT COUNCIL		Scale: Not to Scale
Designed	Infrastructure	Plan No. 5.3
Drawn	Infrastructure	
Checked	GY	
Revised	06/2017	Sheet 1 of 1 Sheets

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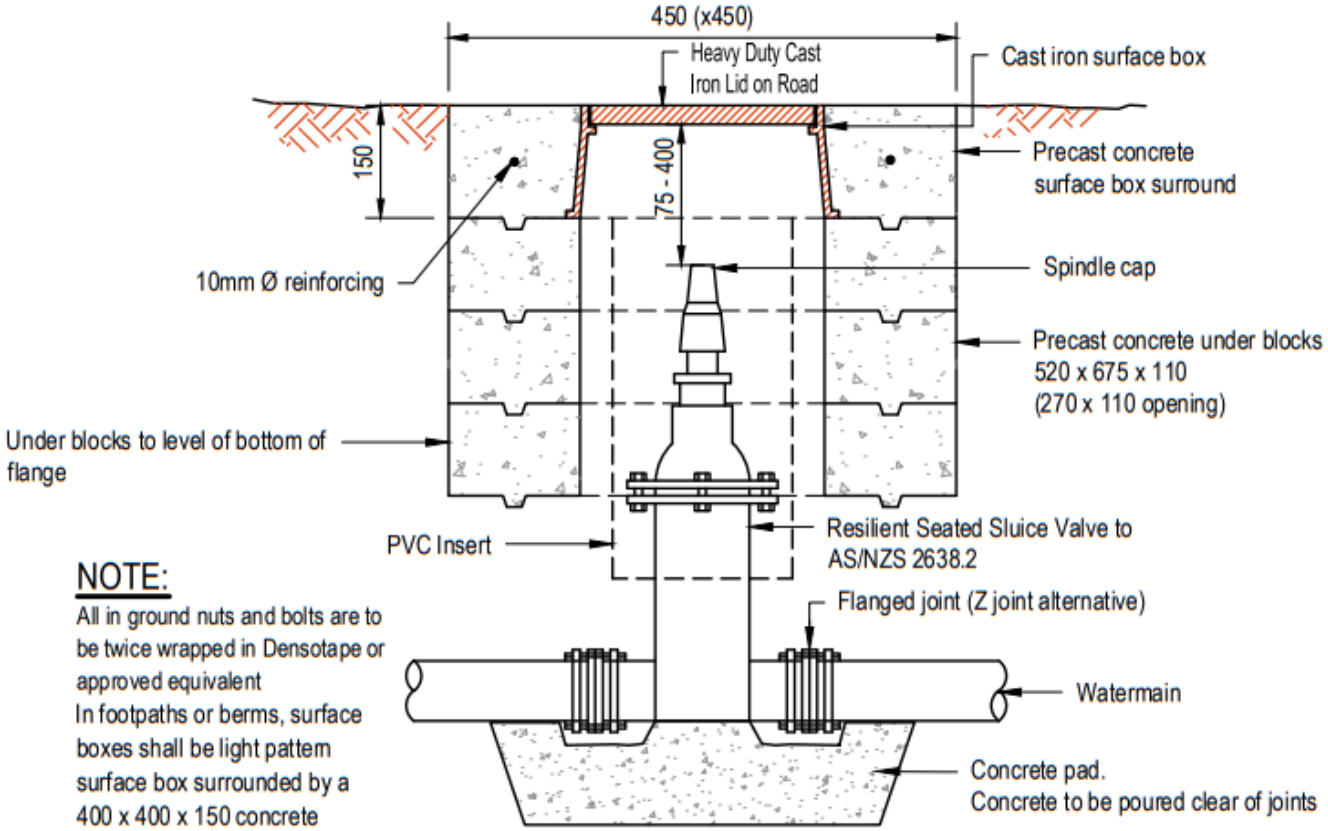
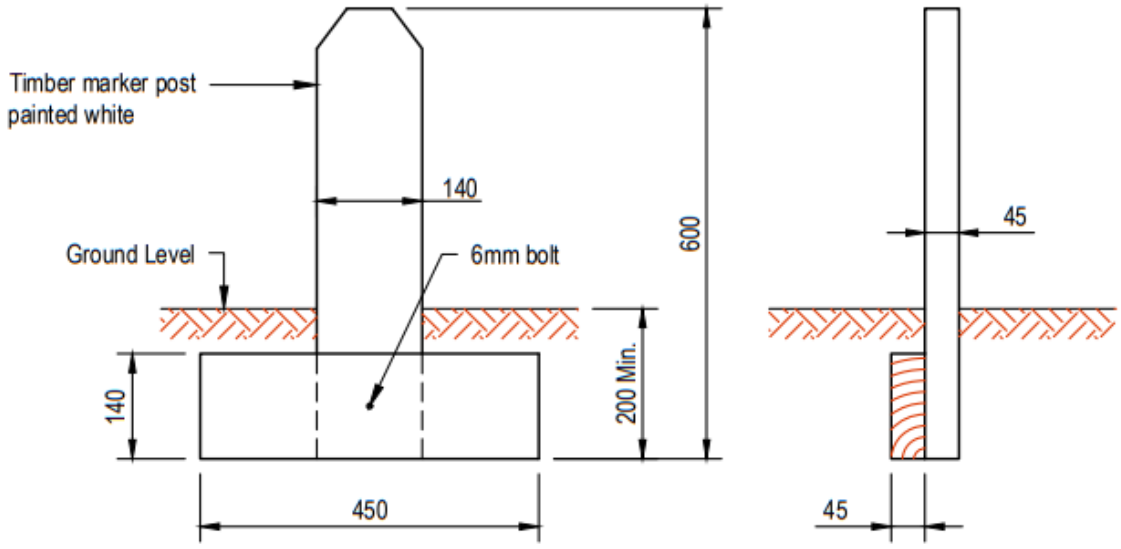


NOTE:

All in ground nuts and bolts are to be twice wrapped in Densotape or approved equivalent

In footpaths or berms, surface boxes shall be light pattern surface box surrounded by a 400 x 400 x 150 concrete surround.

SLUICE VALVE INSTALLATION FOR CARRIAGEWAYS



VALVE MARKER INSTALLATION

SLUICE VALVE AND MARKER INSTALLATION

		MANAWATU DISTRICT COUNCIL	Scale: Not to Scale
		Designed: Infrastructure	Plan No. 5.4
		Drawn: Infrastructure	
		Checked: GY	
		Revised: 06/2017	Sheet 1 of 1 Sheets

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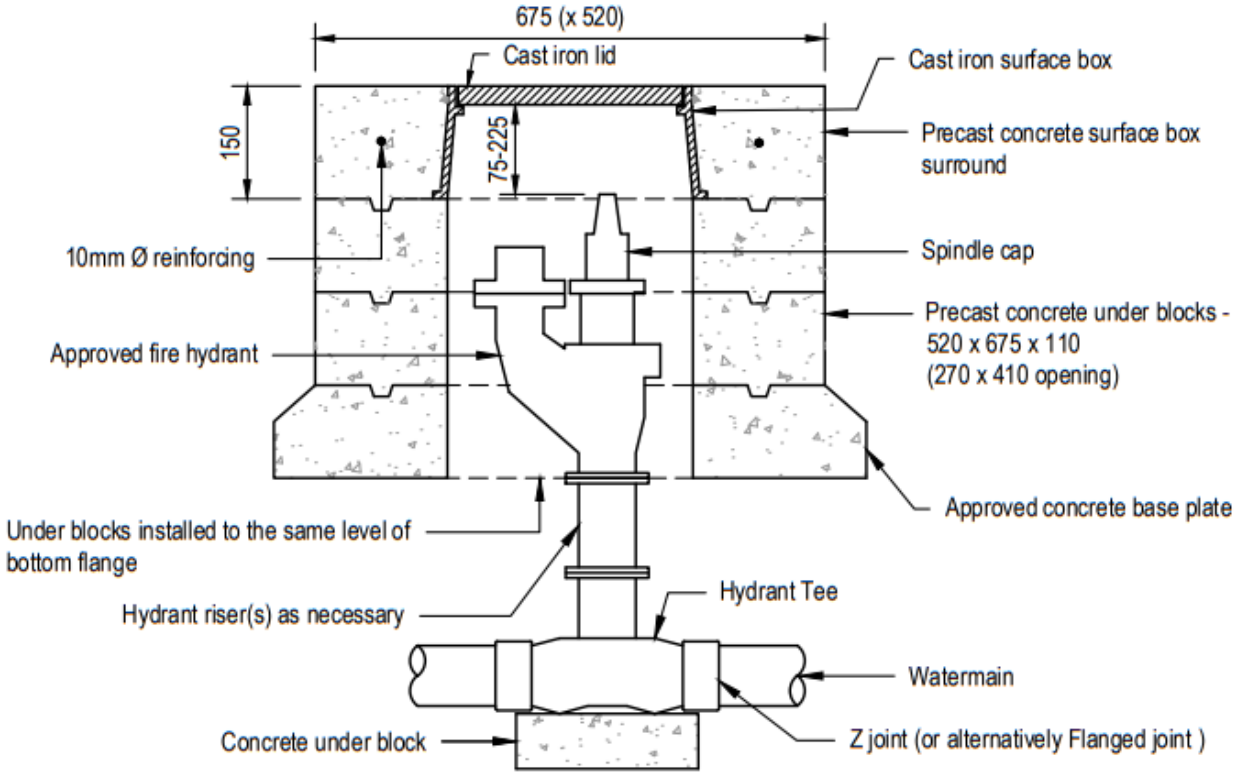
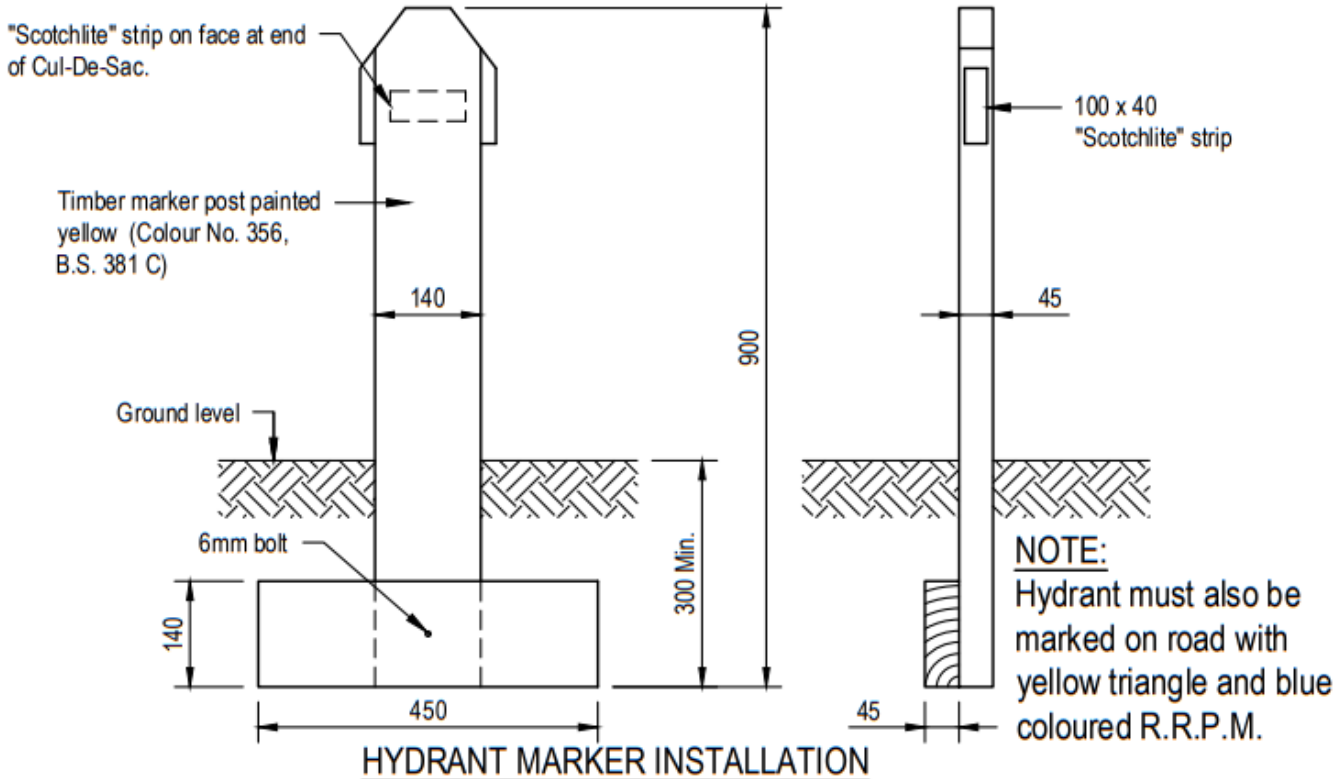


HYDRANT INSTALLATION



NOTE:
Hydrant must also be marked on road with yellow triangle and blue coloured R.R.P.M.

HYDRANT MARKER INSTALLATION

HYDRANT AND MARKER INSTALLATION

		MANAWATU DISTRICT COUNCIL	Scale: Not to Scale
		Designed: Infrastructure	Plan No. 5.5
		Drawn: Infrastructure	
		Checked: GY	
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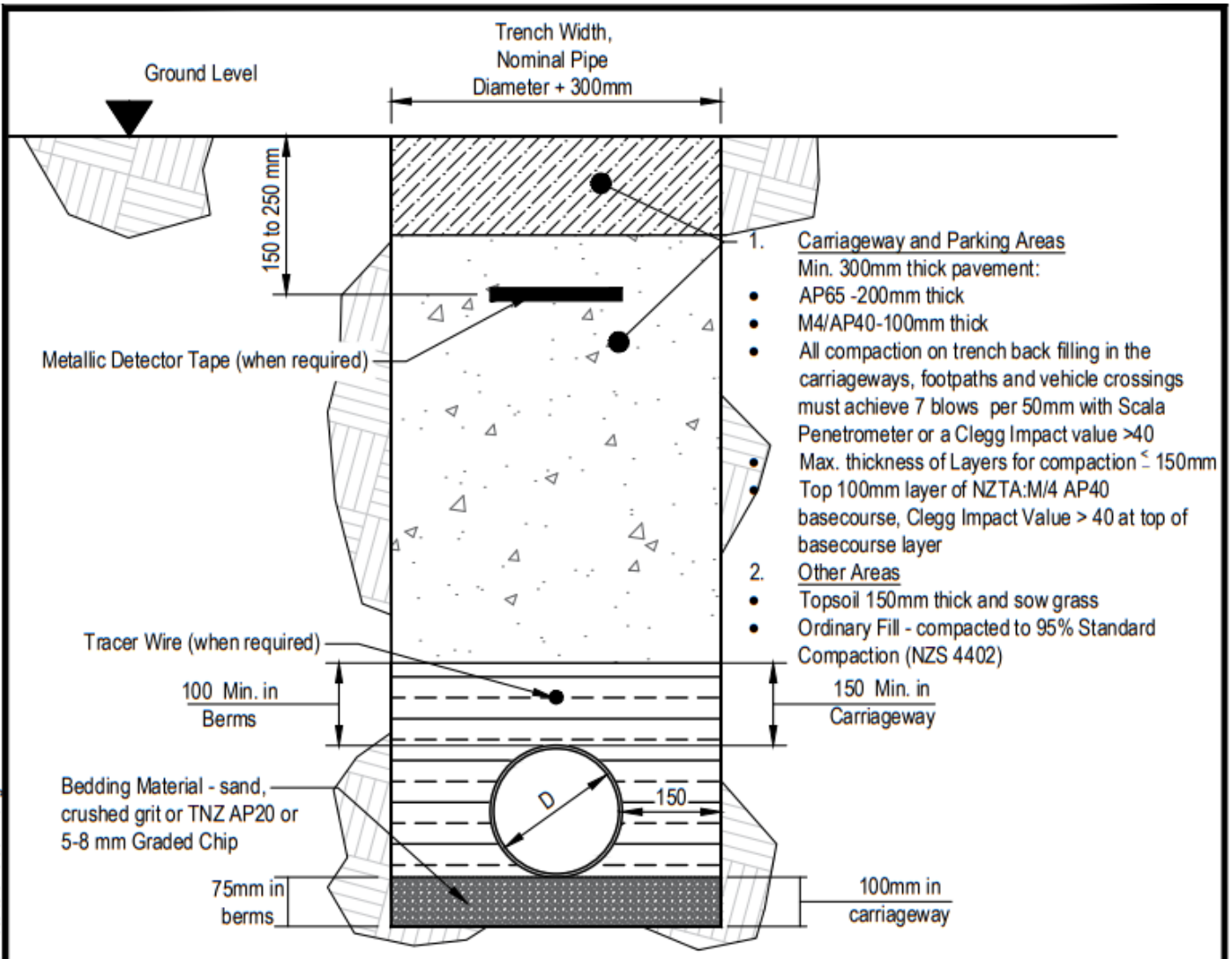

1. Carriageway and Parking Areas

Min. 300mm thick pavement:

- AP65 -200mm thick
- M4/AP40-100mm thick
- All compaction on trench back filling in the carriageways, footpaths and vehicle crossings must achieve 7 blows per 50mm with Scala Penetrometer or a Clegg Impact value >40
- Max. thickness of Layers for compaction ≤ 150mm
- Top 100mm layer of NZTA:M/4 AP40 basecourse, Clegg Impact Value > 40 at top of basecourse layer

2. Other Areas

- Topsoil 150mm thick and sow grass
- Ordinary Fill - compacted to 95% Standard Compaction (NZS 4402)

STANDARD WATER MAINS LAYING DETAILS

ITEM	COVER
Mains under carriageways	900mm (Min.)
Mains under berms and footpaths	750mm (Min.)
Rider mains under carriageways and berms	750mm (Min.)
Hydrant spindle	75mm (Min.) and 225mm (Max.)
Valve spindle	75mm (Min.) and 400mm (Max.)
Service pipes under carriageways	900mm (Min.)
Service pipes under berms and footpath	750mm (Min.)
Service pipes at road boundary	300mm (Max.)

WATER MAIN - PIPE LAYING DETAILS

MANAWATU DISTRICT COUNCIL		Scale: Not to Scale
Designed	Infrastructure	Plan No.
Drawn	Infrastructure	5.6
Checked	GY	
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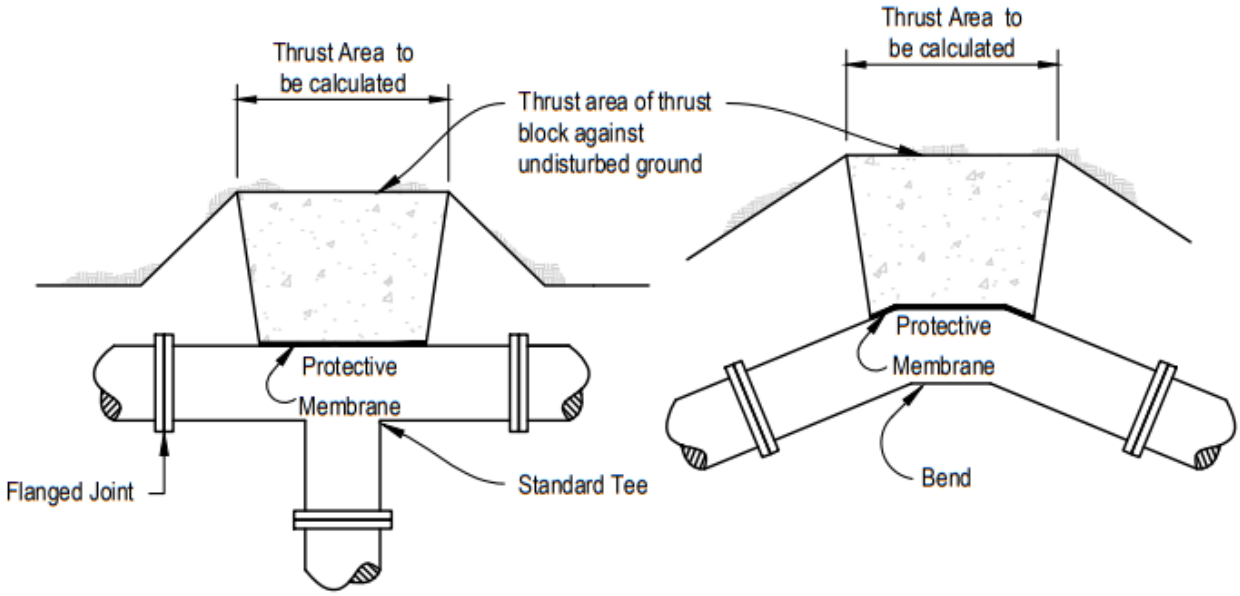
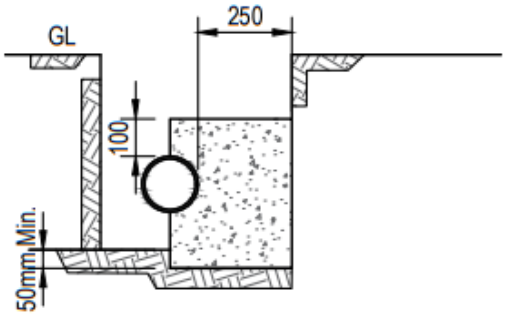
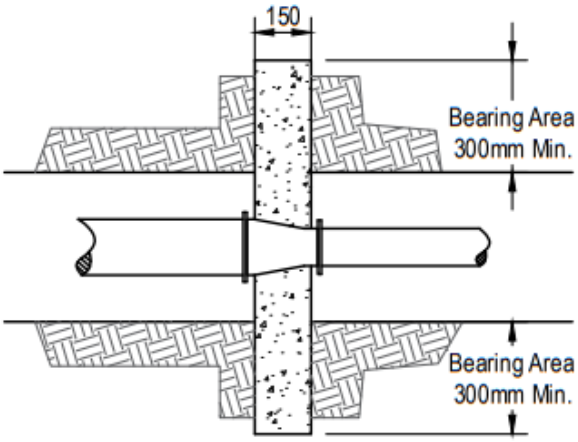


STANDARD HORIZONTAL THRUST BLOCKS FOR WATERMAIN



HORIZONTAL THRUST BLOCK FOR BENDS - ELEVATION



TAPER HORIZONTAL THRUST BOCK

WATER MAIN THRUST BLOCK DETAILS

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		Designed: Infrastructure	Plan No. 5.6.1
		Drawn: Infrastructure	
		Checked: GY	
		Revised: 06/2017	Sheet 1 of 1 Sheets

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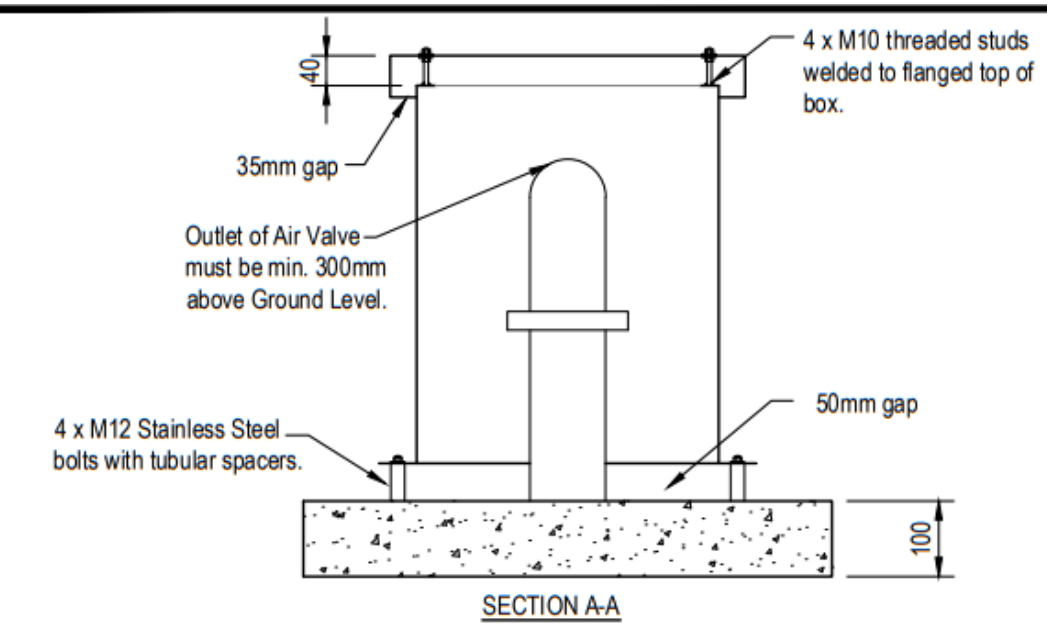
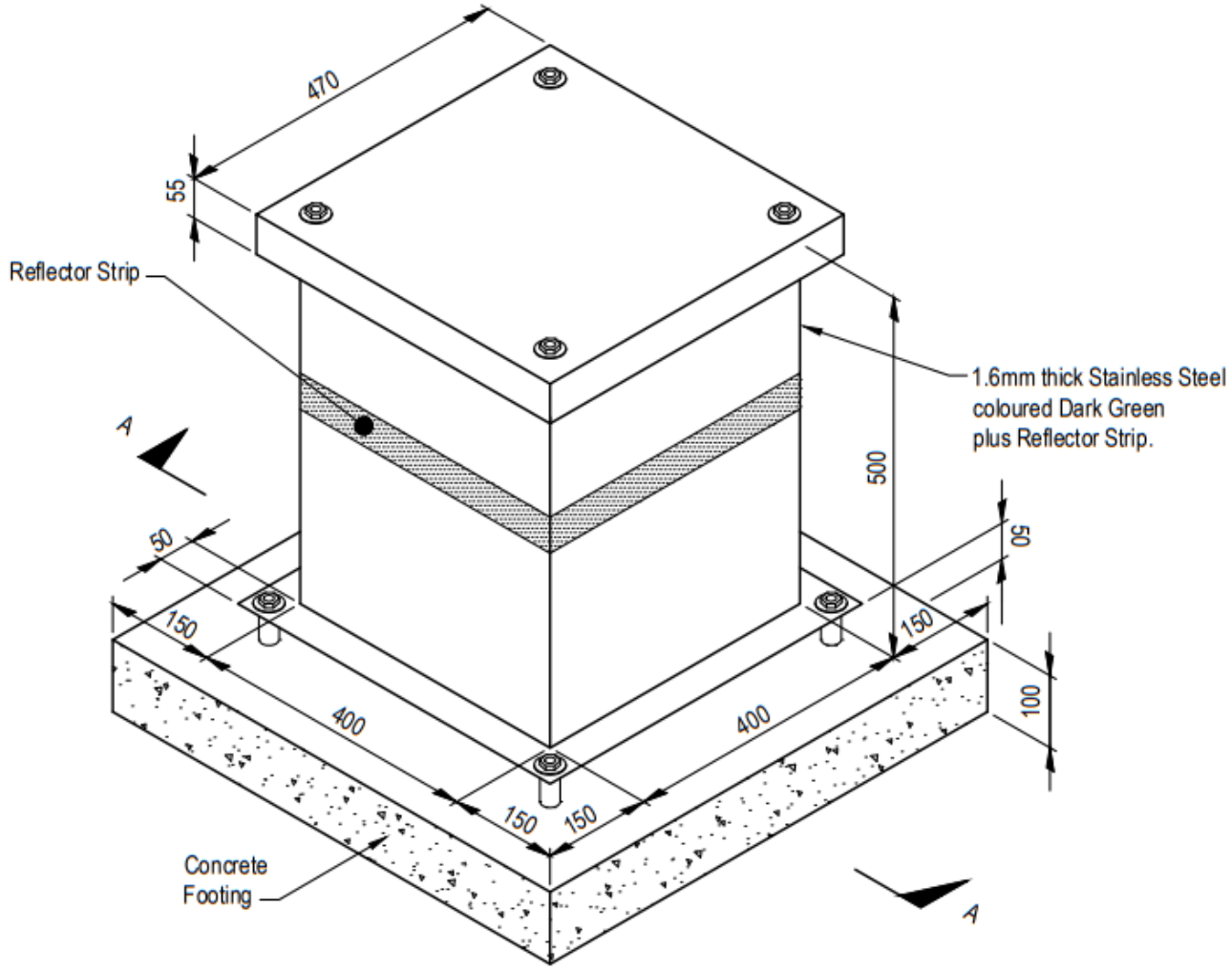


SECTION A-A



AIR VALVES BOX BLOCK DETAIL

		MANAWATU DISTRICT COUNCIL	Scale: Not to Scale
		Designed: Infrastructure	Plan No. 5.7
		Drawn: Infrastructure	
		Checked: GY	
		Revised: 06/2017	Sheet 1 of 1 Sheets

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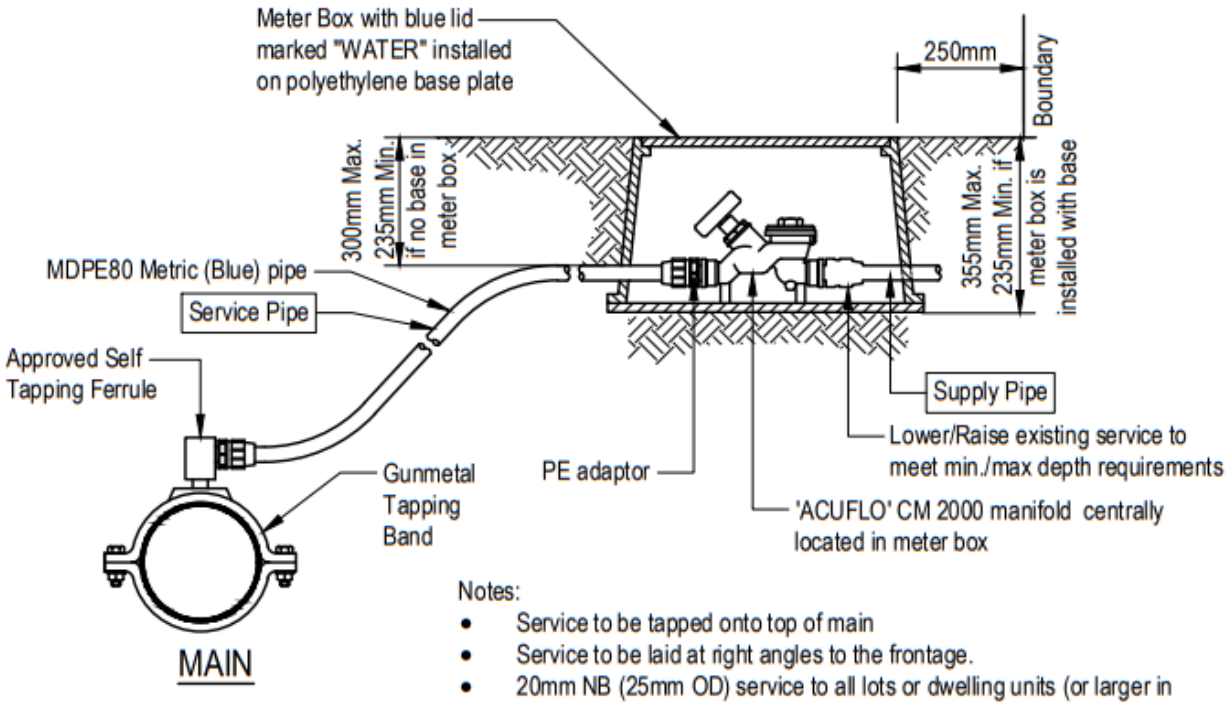

Notes:

- Service to be tapped onto top of main
- Service to be laid at right angles to the frontage.
- 20mm NB (25mm OD) service to all lots or dwelling units (or larger in special cases)

SERVICE CONNECTION TO MAIN AND RIDERMAIN

MANAWATU DISTRICT COUNCIL		Scale:	Not to Scale
Designed	Infrastructure	Plan No.	5.8
Drawn	Infrastructure		
Checked	GY		
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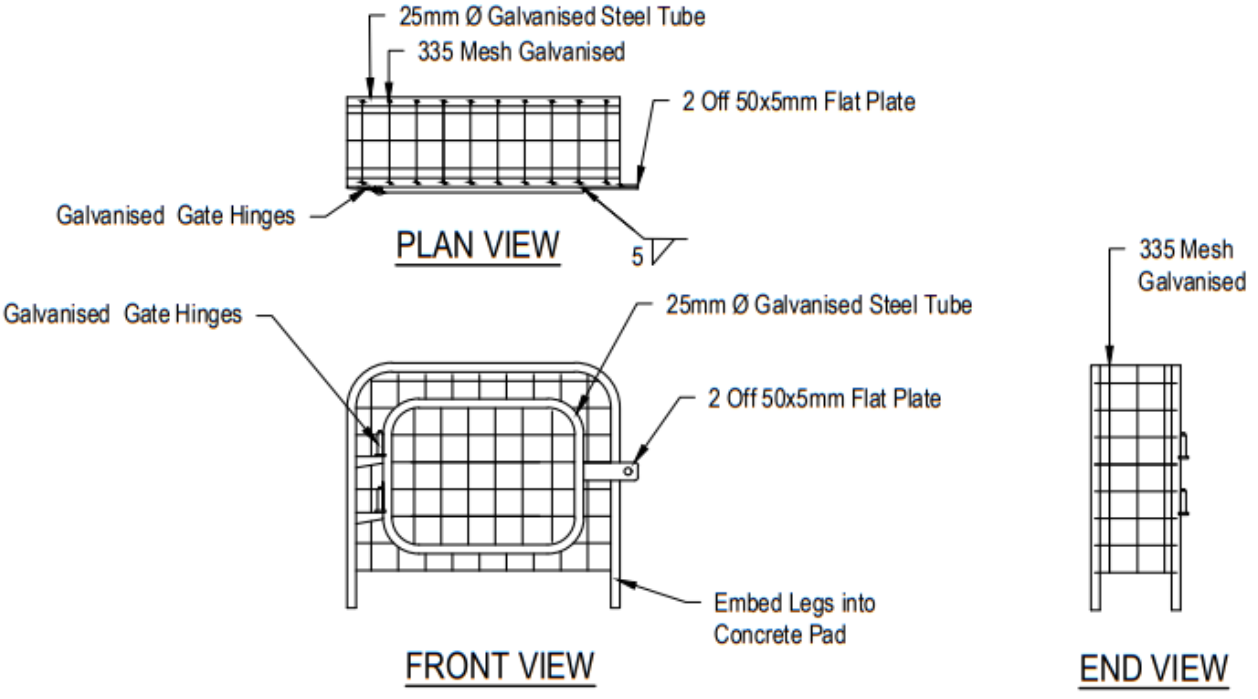

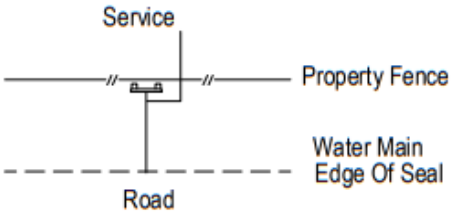

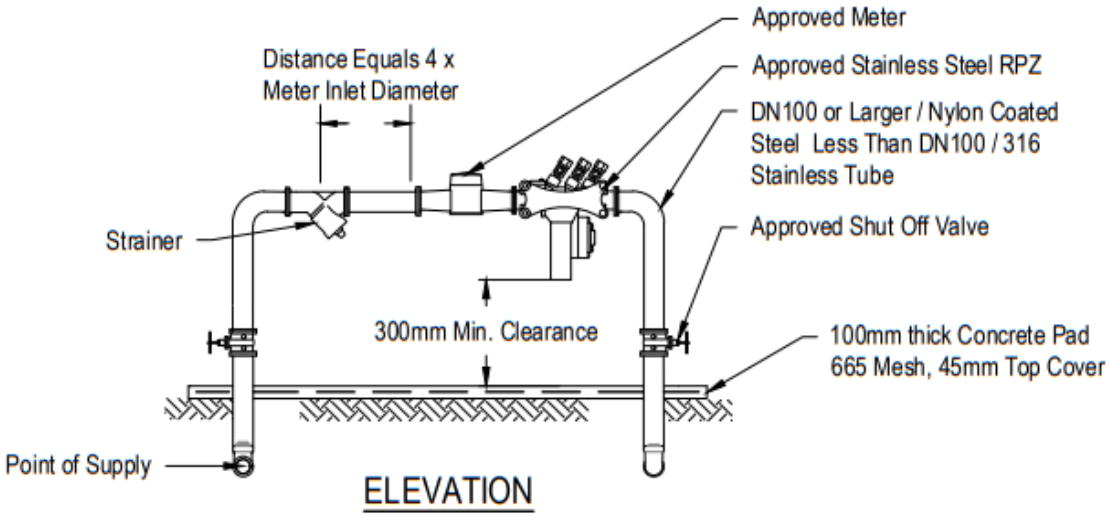

METER, RPZ AND CAGE STANDARD CONFIGURATION

		MANAWATU DISTRICT COUNCIL	Scale: Not to Scale
		Designed: Infrastructure	Plan No. 5.9
		Drawn: Infrastructure	
		Checked: GY	
		Revised: 06/2017	Sheet 1 of 1 Sheets

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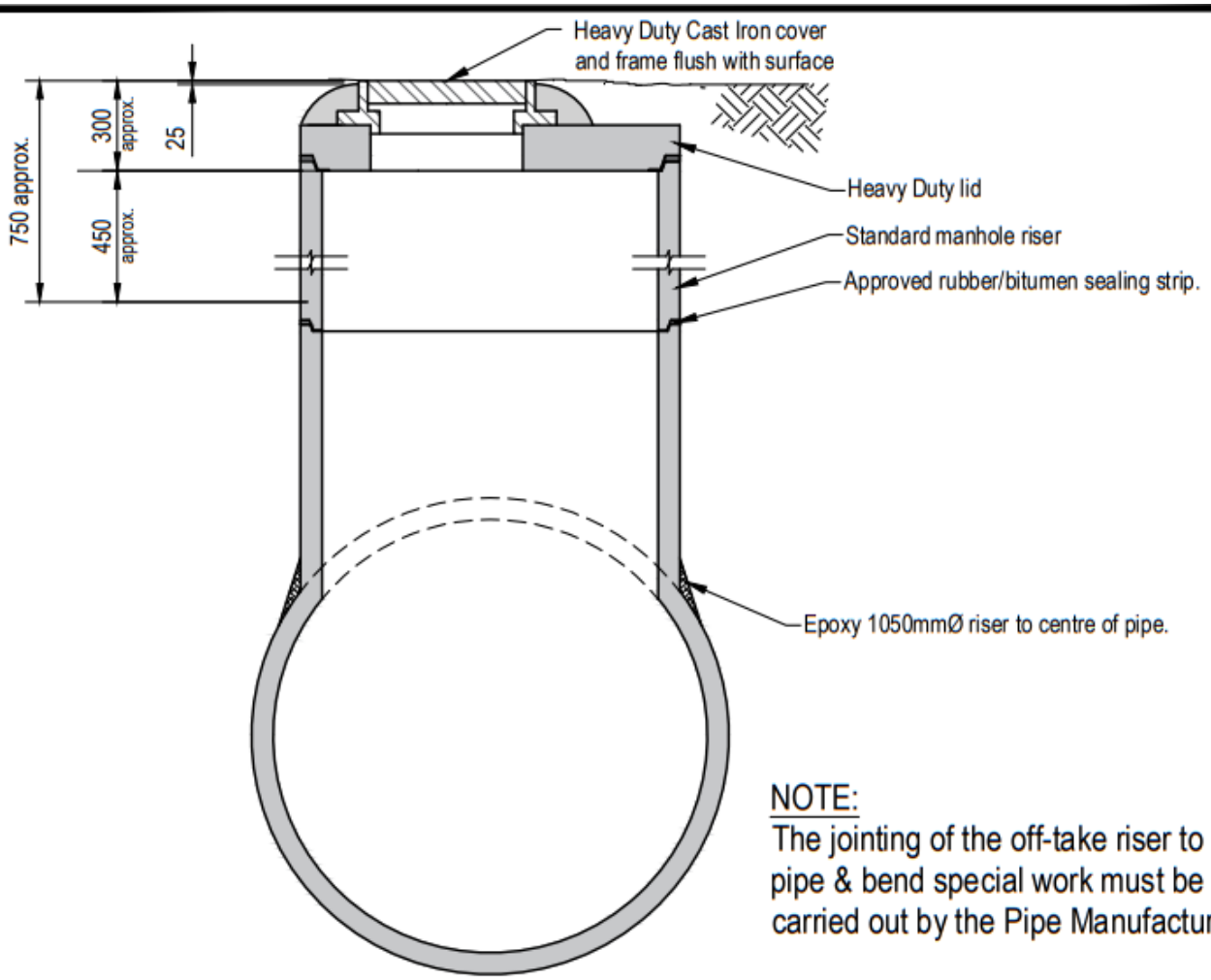
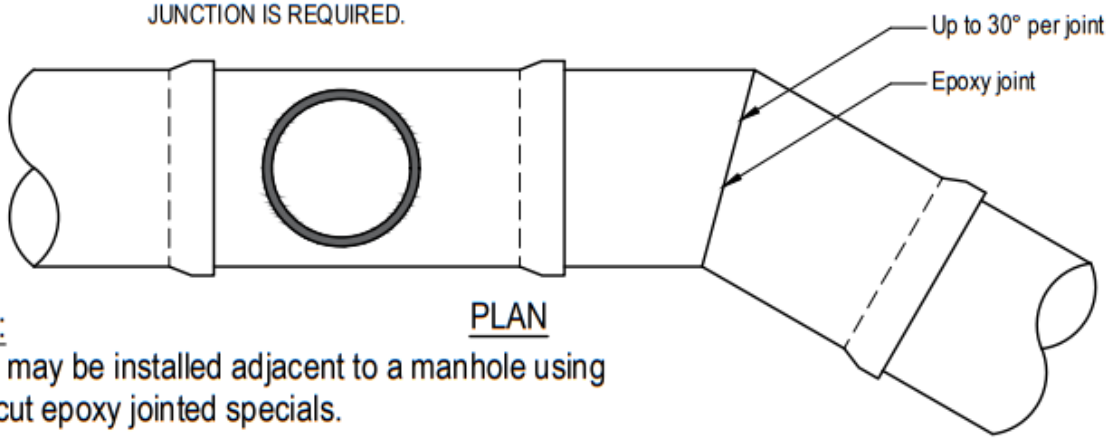


NOTE:
The jointing of the off-take riser to pipe & bend special work must be carried out by the Pipe Manufacturer

SECTION

FOR USE WITH PIPES OF 1050mmØ & OVER INTERNAL DIA. WHERE NO JUNCTION IS REQUIRED.



PLAN

NOTE:
Bends may be installed adjacent to a manhole using splay cut epoxy jointed specials.

MANHOLE FOR LARGE DIAMETER CONCRETE PIPES - 1050mm DIA. PLUS

MANAWATU DISTRICT COUNCIL		Scale:	Not to Scale
Designed	Infrastructure	Plan No.	6.1
Drawn	Infrastructure		
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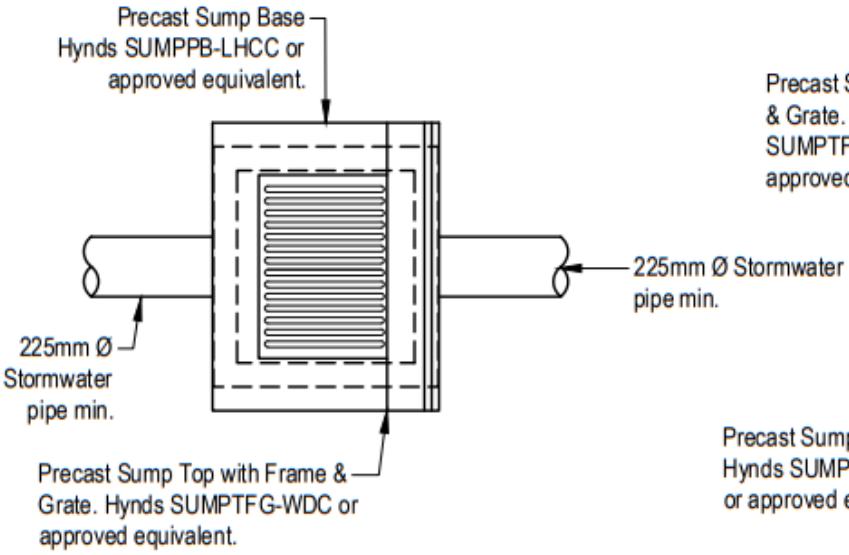
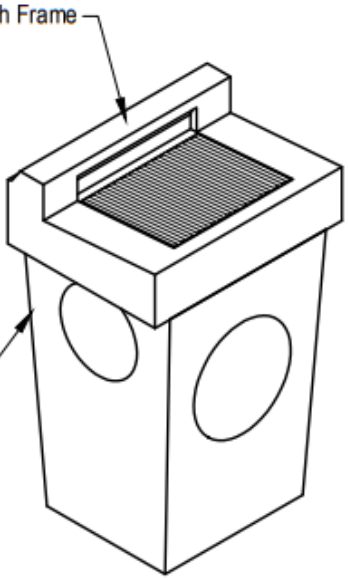


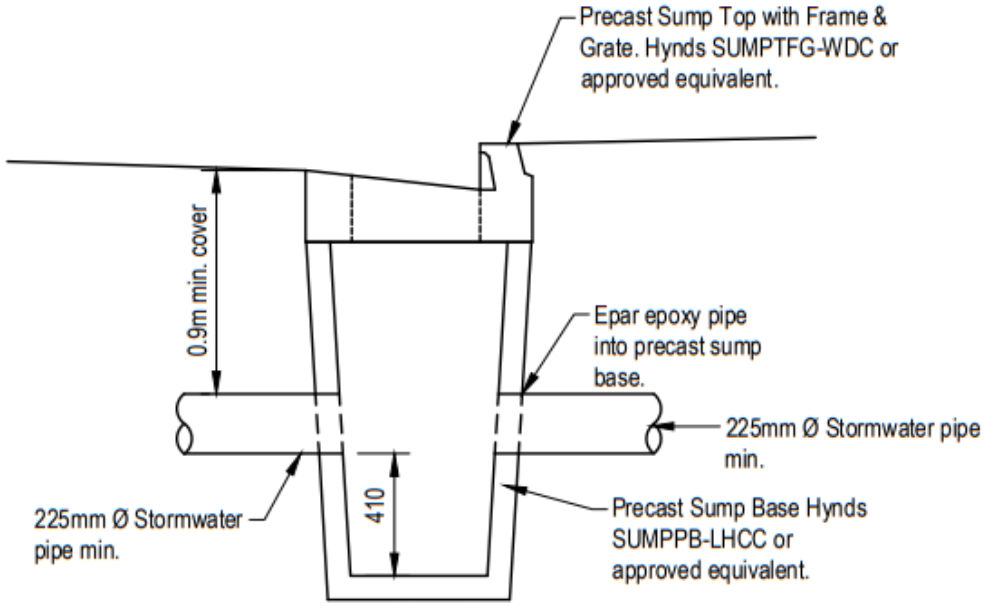
PLAN

Not To Scale



ISOMETRIC VIEW

Not To Scale



STREET SUMP

Not to Scale

STREET SUMP DETAILS

MANAWATU DISTRICT COUNCIL		Scale:	Not to Scale
Designed	Infrastructure	Plan No.	6.2
Drawn	Infrastructure		
Checked	GY		
Revised	06/2017	Sheet 1 of 1 Sheets	

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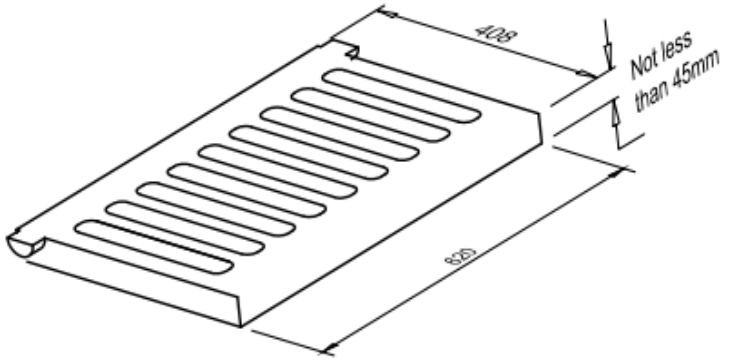

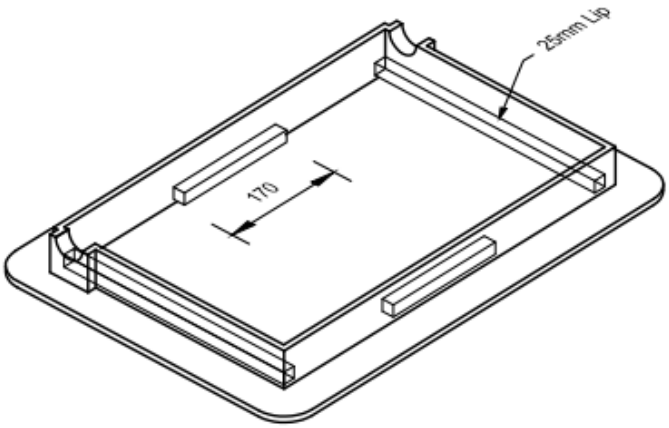

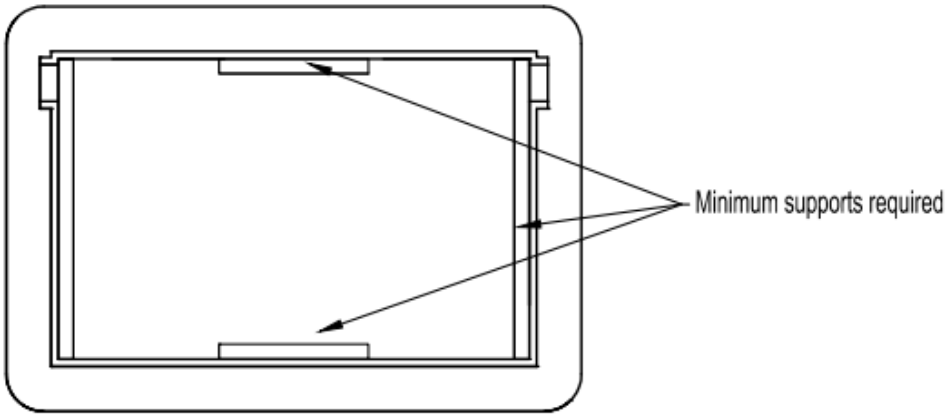

Note

Where grates are replaced on frames with no centre supports the grate should have deeper sections, ie greater than 45mm to distribute loading.

STANDARD SUMP GRATE DETAILS

MANAWATU DISTRICT COUNCIL

Designed	Infrastructure
Drawn	Infrastructure
Checked	GY
Revised	06/2017

Scale: Not to Scale

Plan No. 6.3

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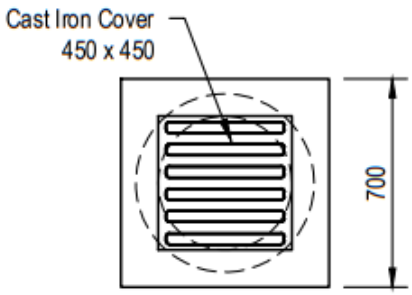
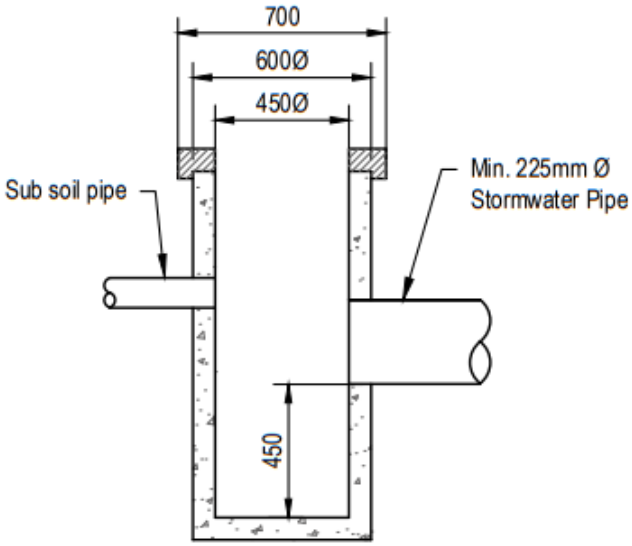
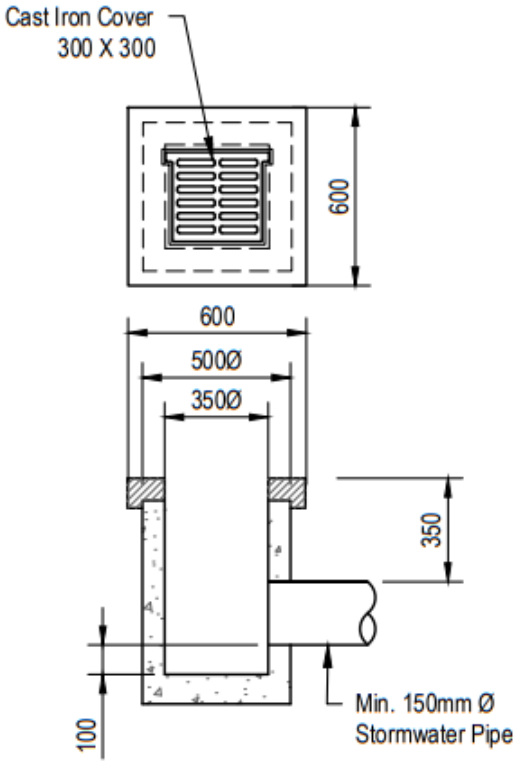




YARD SUMP



FOOTPATH/SMALL SUMP

Note:
Nominal grate size shown.
To conform with manufacturer's dimensions.

FOOTPATH & YARD SUMP DETAILS

MANAWATU DISTRICT COUNCIL		Scale:	Not to Scale
Designed	Infrastructure	Plan No.	6.3.1
Drawn	Infrastructure		
Checked	GY		
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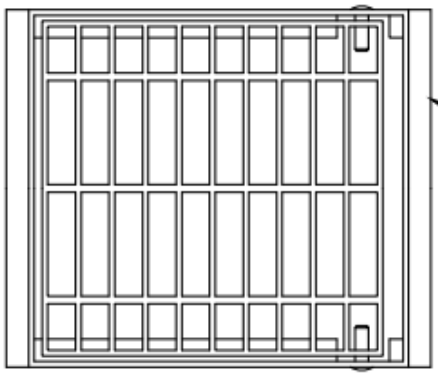

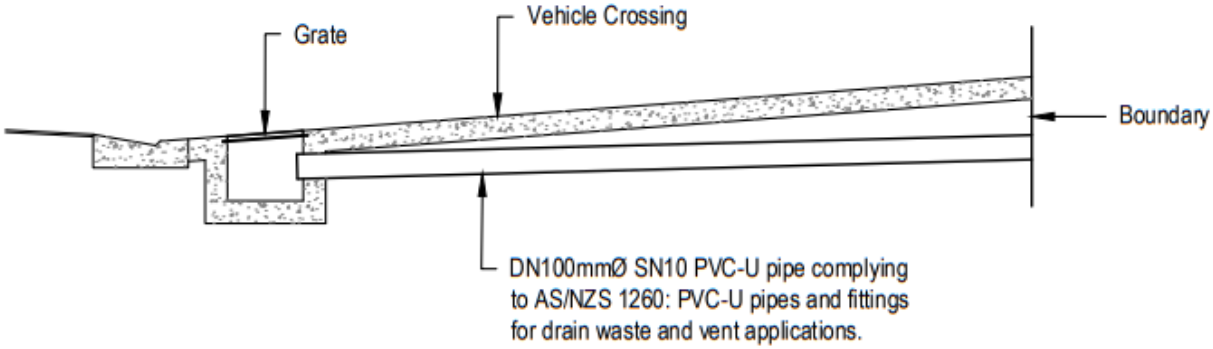

VEHICLE CROSSING (HEAVY DUTY & STANDARD)
WELL-UP - SUMP

MANAWATU DISTRICT COUNCIL		Scale: Not to Scale
Designed	Infrastructure	Plan No.
Drawn	Infrastructure	6.4
Checked	GY	
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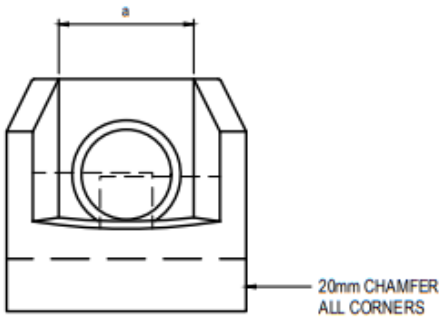
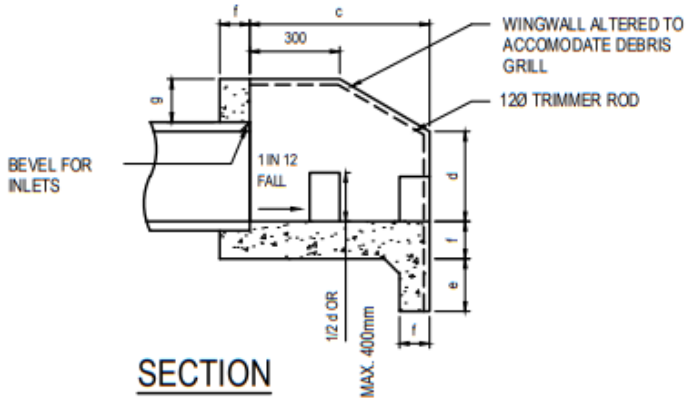
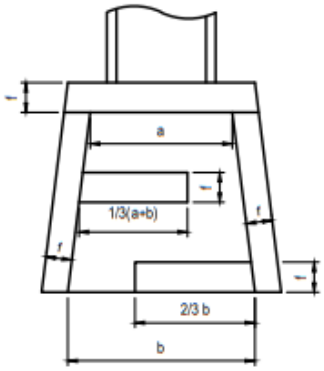


END ELEVATION

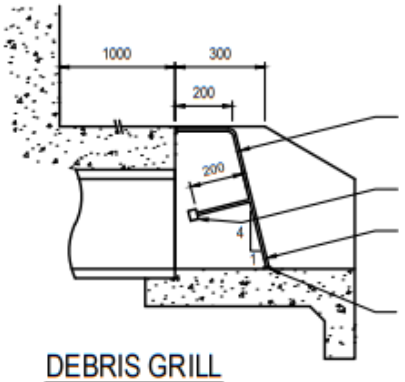


SECTION



PLAN

PRINCIPAL DIMENSIONS (mm.)							
Ø of PIPE	a	b	c	d	e	f	g
150	300	450	600	200	150	100	150
230	380	600	700	250	200	100	150
300	450	750	750	300	200	100	150
375	550	900	850	400	200	100	150
450	630	1100	900	450	230	150	230
525	700	1200	1000	550	230	150	230
600	800	1400	1100	600	230	150	230
750	1000	1700	1200	650	300	150	300
900	1170	2000	1450	750	300	150	300
1050	1380	2300	1700	750	450	150	300
1200	1520	2600	2100	750	450	150	450
1350	1680	2800	2400	750	450	150	450



DEBRIS GRILL

1. REINFORCE FLOOR & WALLS WITH:
   150 - 375 665 MESH
   450 - 600 663 MESH OR 10Ø RODS @ 250 CRS
   675 - 900 12Ø RODS @ 250 CRS
   1050 - 1350 12Ø RODS @ 150 CRS
2. ALL REINFORCEMENT SHALL BE PLACED CENTRALLY IN WALLS AND FLOOR, AND SHALL BE CONTINUOUS BETWEEN WALLS AND FLOOR.
3. LAPS IN STRUCTURAL GRADE BARS TO BE 300mm MIN.
4. THERE SHALL BE AT LEAST TWO BARS - WHETHER MESH OR M.S. OVER THE TOP OF THE PIPE.
5. CONCRETE IS TO BE ORDINARY GRADE (17.5MPa) IN ACCORDANCE WITH NZS 3109.
6. BAFFLES ARE TO BE CONSTRUCTED AS SHOWN WHEN OUTLET VELOCITIES AND SOIL CONDITIONS DICTATE. IN EXTREME CASES SPECIFIC DESIGN MAY BE REQUIRED BY THE ENGINEER.
7. INLET STRUCTURES SHALL HAVE REVERSE APRON FALL AND NO BAFFLES.
8. DIMENSIONS b,c & d MAY BE VARIED TO SUIT SITE CONDITIONS.
9. DEBRIS GRILL TO BE SPECIFICALLY DESIGNED.

STANDARD HEADWALL DETAILS

MANAWATU DISTRICT COUNCIL

Designed	Infrastructure
Drawn	Infrastructure
Checked	GY
Revised	06/2017

Scale: Not to Scale

Plan No. 6.5

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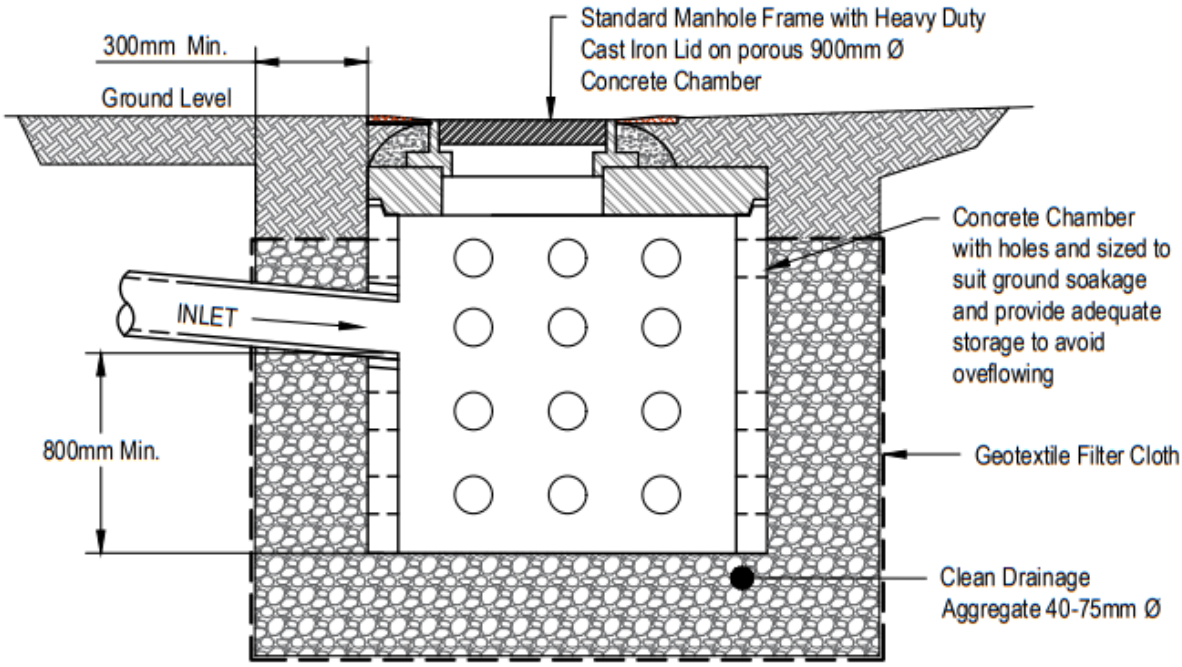

NOTE:

1. Soakage devices must be sized for a 10% AEP(1 in 10 year) storm.
2. Conduct percolation tests as per Building Code Part E1 to determine if soils within property is suitable for soakage. Consult a professional for advice on appropriate percolation rates suitable for soakage devices.
3. Soak pits must NOT be located:

- within 2.0m of any services
- within 3.0m of any building foundations

3. The clearance distance from retaining wall must be equal to the height of the wall plus 1.5m if wall is less than 2.0m high. If the retaining wall is higher 2.0m, professional advice should be sought for clearance distances.
4. For properties adjacent to water courses or in peat soils, professional consultation is advised.
5. Soak pits are not recommended to be constructed in proximity of hillside banks for stability reasons.
6. Soak pits should ideally be constructed above the winter water table level which is is to be confirmed by test bores at the appropriate time of the year.
7. Silts traps must be constructed for every soak pit for draining surface water. Construct silt traps at appropriate locations to enable drainage of surface water.
8. Soakways, rain gardens biolfitration devices:

- The above soakage devices may be permissible for residential lots in area of the District which have in the past proven to be able to dispose of stormwater via soakage in all ground water conditions.
- On site soakage disposal systems must be designed in a manner that ground stability and downstream properties are not adversely affected.
- These soakage disposal systems must also be constructed in accordance with the Building Act 2004.
- The Developer must provide detailed documentation, drawings and calculations to verify that these conditions are complied with.
- Secondary flow paths must be provided and identified to allow for storm events greater than originally designed or in the event failure of the primary systems.

STANDARD SOAK PIT DETAIL - RESIDENTIAL

MANAWATU DISTRICT COUNCIL		Scale: Not to Scale
Designed	Infrastructure	Plan No.
Drawn	Infrastructure	6.6
Checked	GY	
Revised	06/2017	Sheet 1 of 1 Sheets

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