# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GENERAL REQUIREMENTS</td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>Introduction</td>
<td>1</td>
</tr>
<tr>
<td>1.2</td>
<td>INTERPRETATION</td>
<td>2</td>
</tr>
<tr>
<td>1.3</td>
<td>DEVELOPERS TECHNICAL REPRESENTATIVE</td>
<td>3</td>
</tr>
<tr>
<td>1.4</td>
<td>ReQUERRY Engineering Standards For District Plan Zones</td>
<td>4</td>
</tr>
<tr>
<td>1.5</td>
<td>RESOURCE MANAGEMENT ACT 1991</td>
<td>4</td>
</tr>
<tr>
<td>1.6</td>
<td>BUILDING ACT</td>
<td>4</td>
</tr>
<tr>
<td>1.7</td>
<td>DEVELOPMENT CONCEPT PLAN</td>
<td>4</td>
</tr>
<tr>
<td>1.8</td>
<td>APPLICATION FOR CONSENT</td>
<td>5</td>
</tr>
<tr>
<td>1.9</td>
<td>DEVELOPMENT CONSENT</td>
<td>6</td>
</tr>
<tr>
<td>1.10</td>
<td>OTHER CONSENTS</td>
<td>7</td>
</tr>
<tr>
<td>1.11</td>
<td>GREENFIELD RESERVES DEVELOPMENT CRITERIA</td>
<td>8</td>
</tr>
<tr>
<td>1.12</td>
<td>NETWORK UTILITIES</td>
<td>10</td>
</tr>
<tr>
<td>1.13</td>
<td>ENGINEERING DRAWINGS, SPECIFICATIONS AND REPORTS</td>
<td>10</td>
</tr>
<tr>
<td>1.14</td>
<td>DRAUGHTING STANDARDS- ENGINEERING DRAWINGS</td>
<td>12</td>
</tr>
<tr>
<td>1.15</td>
<td>APPROVAL OF ENGINEERING DRAWINGS AND SPECIFICATIONS</td>
<td>13</td>
</tr>
<tr>
<td>1.16</td>
<td>VARIATIONS</td>
<td>13</td>
</tr>
<tr>
<td>1.17</td>
<td>Hours Of Work</td>
<td>14</td>
</tr>
<tr>
<td>1.18</td>
<td>WORKS IN ROADS OR ROAD RESERVES</td>
<td>14</td>
</tr>
<tr>
<td>1.19</td>
<td>NAMING OF DEVELOPMENTS</td>
<td>14</td>
</tr>
</tbody>
</table>
1.20. INSURANCE 15
1.21. CONSTRUCTION MONITORING 15
1.22. EMERGENCY PROCEDURE 17
1.23. SAMPLES FOR TESTING 17
1.24. SAMPLE TESTING REQUIREMENTS 17
1.25. TEMPORARY FENCING 17
1.26. TRENCHING 18
1.27. STOCKPILE SITES 18
1.28. “As Built” Drawings 18
1.29. FINAL INSPECTION 19
1.30. BONDS 20
1.31. ACCEPTANCE OR APPROVAL OF WORKS 20
1.32. MAINTENANCE OF WORKS 20
1.33. FINANCIAL CONTRIBUTIONS 20
1.34. ARBITRATION 21
1.35. PRECEDENCE 21
2. LAND SUITABILITY AND EARTHWORKS 22
  2.1. GENERAL 22
  2.2. OBJECTIVES 22
  2.3. STANDARDS 23
  2.4. LAND SUITABILITY 23
  2.5. EARTHWORKS 26
  2.6. SAMPLING AND TESTING 27
  2.7. CERTIFICATION 29
3. ROADING 30
  3.1. INTRODUCTION 30
  3.2. STANDARDS AND SPECIFICATIONS 30
3.3. CARRIAGEWAY WIDTHS 32

MINIMUM STANDARDS FOR URBAN SUBDIVISION 34

Notes 34

MINIMUM STANDARDS FOR NODAL, RURAL RESIDENTIAL AND RURAL SUBDIVISIONS 36

Notes 36

3.4. ROAD RESERVES 38
3.5. GEOMETRIC DESIGN OF CARRIAGEWAYS 38
3.6. STRUCTURAL DESIGN AND TESTING OF PAVEMENTS 48
3.7. PAVEMENT CONSTRUCTION AND TESTING 51
3.8. CONSTRUCTION OF KERB AND CHANNEL 55
3.9. FOOTPATHS 57
3.10. CROSSINGS 58
3.11. BUSINESS SERVICE LANES 59
3.12. Industrial Service Lanes 59
3.13. Parking Bays 59
3.15. Pedestrian/ Cycle Accessways 62
3.16. Cycle Facilities 63
3.17. Bus Bays 63
3.18. Rural/Rural Residential 64
3.19. ACCESS TO REAR LOTS 65
3.20. Access Standards (District Plan R20.3.9.1) 67
3.21. BRIDGES AND CULVERTS 75
3.22. TRAFFIC CONTROL AND CALMING DEVICES 75
3.23. RETAINING WALLS 75
3.24. STREETSCAPING (RESIDENTIAL) 75
3.25. STREET LIGHTING 78
4. PART 4 WASTEWATER DRAINAGE 82
   4.1. INTRODUCTION 82
   4.2. OBJECTIVES 82
   4.3. STANDARDS AND BYLAWS 82
   4.4. GENERAL REQUIREMENTS 83
   4.5. FLOW REQUIREMENTS 84
   4.6. HYDRAULIC DESIGN 84
   4.7. STRUCTURAL DESIGN 85
   4.8. PIPEWORK 86
   4.9. INFILTRATION CONTROL 87
   4.10. PIPE LAYING AND TESTING 87
   4.11. MANHOLES 90
   4.12. LATERAL CONNECTIONS 91
   4.13. PUMP STATIONS 92
   4.14. ALTERNATIVE DISPOSAL 94

5. PART 5 WATER SUPPLY 96
   5.1. INTRODUCTION 96
   5.2. Manawatu District Council GENERAL REQUIREMENTS 96
   5.3. Manawatu District STANDARDS 96
   5.4. DESIGN REQUIREMENTS 98
   5.5. LAYOUT 98
   5.6. Construction 102
   5.7. Design pressure 102
   5.8. Trunk mains 103
   5.9. MATERIALS 103
   5.10. Pipe Fittings 104
   5.11. Sluice Valves 104
1. GENERAL REQUIREMENTS

1.1. INTRODUCTION

The Engineering Standards for Land development (the Standards) ensure compliance with the objectives and policies set out in Section 7 of the Manawatu District Council’s District Plan. The Standards contain all the relevant criteria to ensure Developers provide all the information necessary when seeking engineering approval for land development.

The Standards have been compiled to ensure a high degree of uniformity. Consistency and effective operational management is maintained in all development projects, not only during the construction but for the long term. The criteria contained within the Standards have been compiled from proven and established publications which are used extensively in engineering works throughout New Zealand.

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 are positive throughout the development process.

The design standards and procedures detailed in the Standards must be used for all development work. However there will be circumstances where alternative methods could be used and to this end the Standards reflect where this may be possible. 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 in the first instance if the Developer wishes to adopt alternative criteria. The Utilities Manager reserves the right to not approve such requests.
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 Developer is required to complete a design check list prior to presenting all engineering documents to Council. This will enable Council management to rapidly ascertain whether all requirements of the Standards have been met. Refer Appendix 1 and 2.

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 will be issued to registered holders of this document who must ensure that they keep up-to-date with such amendments. All copies of the document are numbered for this purpose.

The Utilities Manager has the authority to deviate from any of the conditions identified in the Standards providing it is in the interests of all parties.
LAND DEVELOPMENT PROCESS ELEMENTS

**Engineering Standards for Land Development Requirements**

1. **Developer identifies project**
2. **Developer appoints Technical Representative (Tech Rep)**
3. **Tech Rep assess requirements of District Plan, RMA, Acts & Regs, Engineering standards for Land Development**
4. **Tech Rep compiles Development Concept Plan**
5. **Tech Rep completes checklist to ensure all requirements of the Development Concept Plan have been met**
6. **Tech Rep submits Development Concept Plan or approval**
7. **Council assess Development Concept Plan**
8. **Tech Rep compiles new Development Concept Plan to meet Council Requirements**
9. **Council accepts Development Concept Plan with/without amendments**
10. **Tech Rep submits application for consent**
11. **Council approves consent with/without conditions**
12. **Tech Rep submits detailed engineering drawings, specifications & reports and development plan checklist**
13. **Council approves engineering drawings, specifications & reports with/without amendments**
14. **Tech Rep supervises construction work**
15. **Council audits construction works to ensure compliance with plans, specifications & reports**
16. **Complies**
17. **Council issues Practical completion**
18. **Council issues Section 224 certificate**
19. **Tech Rep responsible for 12 months defects liability period on construction works**
20. **Does not comply**
21. **Tech Rep rectifies works to comply**
22. **Project abolished**

Manawatu District Council  Draft for consultation
### 1.2. INTERPRETATION

Unless the context specifies otherwise:-

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access</td>
<td>Includes Right of Ways, access lots and any private land area for the purpose of access</td>
</tr>
<tr>
<td>Approved</td>
<td>Shall mean approved by the General Manager - Infrastructure</td>
</tr>
<tr>
<td>Council</td>
<td>Shall mean the Manawatu District Council</td>
</tr>
<tr>
<td>Development Concept Plan</td>
<td>Shall 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.</td>
</tr>
<tr>
<td>Developer</td>
<td>Technical Representative also referred to as the applicant</td>
</tr>
<tr>
<td>Engineering Approval</td>
<td>Shall mean ALL plans, specifications and reports for development works are approved by the General Manager – Infrastructure and that construction works can proceed.</td>
</tr>
<tr>
<td>Geotechnical Specialist</td>
<td>Shall 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.</td>
</tr>
<tr>
<td>H and S Act 2015</td>
<td>Shall mean the Health and safety in Employment Act 2015</td>
</tr>
<tr>
<td>Manager</td>
<td>The General Manager – Infrastructure, or such persons duly authorised to act on his behalf.</td>
</tr>
<tr>
<td>Developers Technical</td>
<td>The person or persons appointed by the developer in accordance with Clause 1.3.</td>
</tr>
<tr>
<td>Representative</td>
<td></td>
</tr>
<tr>
<td><strong>Regional Council</strong></td>
<td>Shall mean the Manawatu-Wanganui Regional Council trading as Horizons.</td>
</tr>
<tr>
<td>---------------------</td>
<td>---------------------------------------------------</td>
</tr>
<tr>
<td><strong>Recognised</strong></td>
<td>New Zealand Tranverse Mercator 2000. Levels in terms of Wellington Mean Sea</td>
</tr>
<tr>
<td><strong>Coordinate System</strong></td>
<td>Level 1953.</td>
</tr>
<tr>
<td><strong>Rural</strong></td>
<td>Any development on land zoned for that purpose under the District Plan</td>
</tr>
<tr>
<td><strong>Rural Residential</strong></td>
<td>Any development on the land identified as Rural Zone in the District Plan and to which the Rural Residential Overlay applies.</td>
</tr>
<tr>
<td><strong>Services</strong></td>
<td>Shall mean and include water, wastewater, storm water, power, gas, telecommunications /data, whether below, on or above ground.</td>
</tr>
<tr>
<td><strong>Developer</strong></td>
<td>Shall mean the person/company responsible for the land to be subdivided</td>
</tr>
<tr>
<td><strong>NZTA</strong></td>
<td>New Zealand Transport Agency</td>
</tr>
<tr>
<td><strong>Subdivision Consent</strong></td>
<td>Shall have the same meaning as set out in the section 87(b) of the Resource Management act 1991.</td>
</tr>
<tr>
<td><strong>Urban</strong></td>
<td>Means any land zoned Residential, Business, Industrial, Institutional and Recreational.</td>
</tr>
<tr>
<td><strong>Period of Defects Liability</strong></td>
<td>Shall have the meaning assigned to it as Clause 11.1 NZS 3910, Conditions of Contract for Building and Civil Engineering Construction</td>
</tr>
<tr>
<td><strong>Practical Completion Certificate</strong></td>
<td>Shall have the meaning assigned to it as Clause 10.4 NZS 3910, Conditions of Contract for Building and Civil Engineering Construction</td>
</tr>
</tbody>
</table>

### 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 surveyor or a NZ Chartered Professional Engineer or a person with experience and qualifications acceptable by Council.

The Developers Technical Representative will be responsible for:

(i) Coordinating with all Network Utilities companies (Refer Clause 1.11,12)
Part 1 – General Requirements

(ii) All compliances with the requirements of the Resource Management Act 1991 (Refer Clause 1.5)

(iii) The preparation of Engineering Drawings and Specifications in accordance with the Engineering Standards for Land Development. (Refer Clause 1.12).

(iv) Obtaining all consents and approvals (Refer Clause 1.10)

(v) Construction Monitoring (Refer Clause 1.20.1)

(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. (Refer Clause 1.28) (ix) Final Inspection (Refer Clause 1.29)

(ix) Completing the requirements of Clause 1.31

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 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 Council.

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 additional 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 subdivision consent being made, the Developer must forward a Development Concept Plan to Council for approval. The Development Concept Plan (DCP) is to include the following details where relevant to the application:
Part 1 – General Requirements

(i) Total area of the development
(ii) Total number of allotments to be developed
(iii) Programme / timeframe for development including stages
(iv) Residential / commercial / industrial / recreational mix
(v) Design & 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) Walkways and cycleways
(x) Disabled facilities
(xi) Infrastructural network servicing requirements
(xii) Appendix 9A – 9C of the District Plan “Structure plan Growth precinct 1, 2 and 3”, Appendix 10: Subdivision design guidelines
(xiii) Allowance of infrastructure capacity for future development extensions
(xiv) Effects on the surrounding environment
(xv) Geotechnical feasibility report (preliminary assessment only)
(xvi) Request for Council contributions (if applicable)
(xvii) Approval in principle, that all external agencies including such as New Zealand Transport Agency, Regional Council, and Department of Conservation etc. are in agreement with the proposed development.
(xviii) Completed Development Concept Plan Checklist

The Developer is responsible for including and funding walkways, cycleways and disabled facilities within the proposed development. 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. 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.

Council will assess the Development Concept Plan and either accept the proposal with or without amendments/conditions or reject the proposal. No application for subdivision will be considered until the Development Concept Plan has been approved by Council Officers.

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 are 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 Part 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

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 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 supervisions 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

At the Utilities Manager’s discretion, a peer review of any design or technical report may be required prior to granting a consent. The Utilities Manager must select, or approve, the reviewer. 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 and 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 formal advice has been received.

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 Liability 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 authorization 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 to the conditions of this consent, including all costs.

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

1.11. GREENFIELD RESERVES DEVELOPMENT CRITERIA

Where a subdivision proposal is for a greenfield development, the Developer shall discuss subdivision proposals with Council to identify requirements for provisions of whether any reserves or walkway connections are required to be provided.

The Council will make an assessment based on the following tables:

**ASSESSMENT OF LOCAL AREA UNIT RESERVE NEEDS IS BASED ON A FULLY DEVELOPED GREENFIELD AREA SCENARIO:**

<table>
<thead>
<tr>
<th>Quantitative Criteria</th>
<th>Benchmark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum threshold of reserves in area unit</td>
<td>A minimum of 2% of total residential land area.</td>
</tr>
<tr>
<td>Minimum threshold of flat 'neighbourhood' reserves in area unit</td>
<td>A minimum of 0.8% (40% of the minimum threshold reserve area) of total residential land area.</td>
</tr>
<tr>
<td>Minimum reserve size</td>
<td>A minimum reserve size of 2,500m²</td>
</tr>
<tr>
<td>Level of access</td>
<td>Reserve must have at least two access points</td>
</tr>
<tr>
<td>Disabled access</td>
<td>Topography of reserve must enable disabled access</td>
</tr>
</tbody>
</table>

In addition to the quantitative criteria above, it is recognised that there are two distinct types of ‘local’ reserve provision in any given area unit; flat, neighbourhood reserve provision, and walkway reserve provision. Each type has distinct qualitative requirements over and above the specified quantitative requirements. These are outlined in the following tables.

**FLAT, NEIGHBOURHOOD RESERVES:**
### Part 1 – General Requirements

<table>
<thead>
<tr>
<th>Quantitative Criteria</th>
<th>Benchmark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walkable distance and distribution of reserve</td>
<td>A maximum distance of not more than 500 metres from reasonable access to a reserve taking into account major barriers to access such as major roads, railway lines and water courses.</td>
</tr>
<tr>
<td>Land, soil type, and drainage</td>
<td>After contouring 300mm of approved topsoil to be reinstated. Adequate drainage of reserve to prevent excessive surface ponding where possible (unless specific dual function exists).</td>
</tr>
<tr>
<td>Topography</td>
<td>Minimum of 50% of reserve area must be flat (camber of no more than 7 degrees).</td>
</tr>
<tr>
<td>Level of access, safety, and openness</td>
<td>At least one of the required access points is to be road frontage of not less than 10 continuous metres onto a road no more major than a ‘collector road’ (as defined by the District Plan). All other access points are to be at least 5 metres in width, no longer than 40 metres in length, and preferably provide a straight line access to a road or another reserve.</td>
</tr>
<tr>
<td>Quality of reserves (trees/equipment/links/function &amp; variety)</td>
<td>A variety of recreational choice based on other recreation opportunities in the area (including playground facilities and the use of natural vegetation.</td>
</tr>
<tr>
<td>Non-exclusivity</td>
<td>Unrestricted public access to a reserve at all times.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Quantitative Criteria</th>
<th>Benchmark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topography, Land, soil type, and drainage</td>
<td>Interesting topography avoiding flat, straight walkway provision where possible. Preference for walkways that maximise the natural physical environment while providing suitable lateral gradient for construction of walkway. land and soil type to be sufficient to support anticipated pedestrian traffic. No specific drainage requirements.</td>
</tr>
<tr>
<td>Level of access, safety, links and openness</td>
<td>Road frontage minimised while multiple access points provided to eliminate single direction ‘loop tracks’. Links provided to neighbourhood and other reserves to provide shortest, safest route to and from reserves and to join with other walkways.</td>
</tr>
<tr>
<td>Quality of reserves (trees/equipment/links/function &amp; variety)</td>
<td>Vegetation cover with any plantings to be consulted with Council Reserves staff to ensure appropriate species and location (refer planting and design guidelines as an example). Reserves to be free of noxious weeds (refer to pest management strategy from Horizons Regional Council).</td>
</tr>
<tr>
<td>Non-exclusivity</td>
<td>Unrestricted public access to a reserve at all times.</td>
</tr>
</tbody>
</table>
1.12. NETWORK UTILITIES

Prior to lodging an application for consent, the Developer must forward all subdivisional proposals to all public utility providers. This will enable each service provider to design and allow for their utilities to be installed with the 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 Urban areas and Rural Residential 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.

1.13. 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:

1.13.1. 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 within the development that are considered to be unstable are identified and excluded.

1.13.2. Roadworks

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

(ii) Pavement construction including design details.

(iii) Kerb and channel.

(iv) Surfacing.

(v) Footpath construction.

(vi) Treatment of areas outside carriageway.
(vii) Traffic Services including but not limited to roadmarking, traffic signs and street name plates.

(viii) Street lighting.

(ix) Streetscape including feature walls

(x) Walkways and cycleways.

1.13.3. Drains

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

(ii) Layout and details of wastewater drains and ancillary work.

1.13.4. Water Supply

(i) Layout and details of watermains and ancillary work.

1.13.5. Gas Reticulation

(i) Layout and details of gas mains and ancillary work.

1.13.6. Power Reticulation

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

1.13.7. Telecommunications network

(i) Layout and details of telephone cables and ancillary work.

1.13.8. Miscellaneous

(i) Any associated structure, pumps, special manholes, penstocks, retaining walls, bridges etc.

1.13.9. General

(i) The drawings must show sufficient details and levels to allow the Utilities Manager/delegated officer 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.

(ii) When approved, the Developer is to provide two complete sets with all the required amendments to Council.

(iii) 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.
(iv) 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.

1.13.10. Services

(i) 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.

1.13.11. Development of Existing Residential Allotments

(i) Where any existing occupied or single residential allotment is subdivided into one or more additional allotment(s), new wastewater, water supply and storm water services are must be provided for each new lot from the Council’s point of supply. Extension of existing allotment services must not be permitted. Where existing services are provided to a vacant allotment, all copper, ceramic and asbestos cement materials are to be replaced. The Utilities Manager will require evidence of materials servicing existing allotments prior to subdivision approval.

(ii) Access to all new allotments must be in accordance with clauses 3.10.2 and 3.17.2

1.13.12. Subdivision and Servicing of Properties with existing multiple Dwelling Units

(i) 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 will be permitted provided that:

(ii) All shared underground services are covered by suitable easements.

(iii) Additional manholes or inspection chambers are constructed in the shared length of wastewater and storm water to facilitate maintenance.

(iv) All services including access, water supply, wastewater and stormwater may require upgrading at the discretion of the Utilities Manager.

1.14. DRAUGHTING STANDARDS- ENGINEERING DRAWINGS

Engineering drawings are to be provided on both a hard copy standard A1 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 on separate drawings.
Council’s standard symbols must be used. Refer Standard Drawing 1.1.

The following scales must be used:

<table>
<thead>
<tr>
<th></th>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plans</td>
<td>1 in 500</td>
</tr>
<tr>
<td></td>
<td>1 in 200</td>
</tr>
<tr>
<td>Long Sections</td>
<td>1 in 500 Horizontal</td>
</tr>
<tr>
<td></td>
<td>1 in 50 Vertical</td>
</tr>
<tr>
<td>Cross Sections</td>
<td>1 in 100</td>
</tr>
<tr>
<td></td>
<td>1 in 50</td>
</tr>
<tr>
<td>Details</td>
<td>As required</td>
</tr>
</tbody>
</table>

All plans must be produced with the following requirements:

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

1.15. 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 amendment of any required detail. Should corrections or amendments are made immediately on receipt of same.

Final approval of the Engineering drawings and specifications will have deemed to be completed when written approval under Section 88 of the Resource Management Act 1991 have been sighted by the Utilities Manager.

All approvals are due to expire within one year of the date of the Utilities Manager’s approval if construction work has not commenced within one year of the date of the Utilities Manager’s approval. The Developer must not proceed with any works until all plans and specifications have been resubmitted to the Utilities Manager for approval and approval with any amendments that has been given.

1.16. 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 works must not commence without the approval from the Utilities Manager.

1.17. HOURS OF WORK

The hours of work in residential, commercial, inner and outer business, village identified frontage and industrial subdivisions must be:

- Weekdays: 6.30am - 8.00pm
- Saturdays: 7.30am - 6.00pm
- Sundays/ Public Holidays: No Work

The Utilities Manager’s approval must be obtained before any work outside of these hours.

There is no limitation on the hours of work in Rural or Rural Residential Nodal subdivisions unless there is specific requirement.

1.18. WORKS IN ROADS OR ROAD RESERVES

1.18.1. Corridor Access Request

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

1.18.2. Traffic Management Plans

An approved Traffic Management Plan is required prior to the commencement of any works in an existing road or road reserve.

1.18.3. Development adjacent to existing infrastructure

Where a proposed development is adjacent to an existing road and 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.

1.18.4. Feature Walls

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

1.19. NAMING OF DEVELOPMENTS
The naming of all proposed developments other than approved suburban/rural names must be at the discretion of the Utilities Manager.

### 1.20. 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.

<table>
<thead>
<tr>
<th>Insurance Type</th>
<th>Coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Liability</td>
<td>$2,000,000</td>
</tr>
<tr>
<td>Professional Indemnity</td>
<td>$5,000,000</td>
</tr>
<tr>
<td>Motor Vehicle/ Plant Insurance</td>
<td>For all vehicles and for plant over $50,000</td>
</tr>
<tr>
<td>Contract Works Insurance</td>
<td>80% of the value of the works</td>
</tr>
</tbody>
</table>

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.

### 1.21. CONSTRUCTION MONITORING

#### 1.21.1. 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. The level will usually be CM3 or CM4 and will be specified on the Subdivision Consent.

#### 1.21.2. Council & 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 are required at the following points:
1.21.3. Roading

(i) Completion of earthworks

(ii) Completion of subgrade preparation for road pavement, kerb & channel, vehicle access ways and footpaths

(iii) Completion of subbase compaction

(iv) Completion of basecourse compaction (includes finished level)

(v) Surface prior to sealing

1.21.4. 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

1.21.5. 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

1.21.6. Storm water

(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

1.21.7. Notice Prior to an Inspection

(i) The Developers Technical Representative must give at least 24 hours notice to Council prior to an inspection. Requests from Contractors and/or Sub Contractors will not be considered.

The Utilities Manager reserves the right to make inspections at any time.
1.21.8. **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.

1.22. **EMERGENCY PROCEDURE**

If during the course of construction, any situation that arises whereby the safety of public or private property 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.

1.23. **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 which it represents. Samples taken from bulk must be obtained by a approved sampling procedure and tested by an I.A.N.Z registered laboratory.

1.24. **SAMPLE TESTING REQUIREMENTS**

The Developer is responsible for ensuring all tests required in the standards are carried out by an I.A.N.Z registered 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.

1.25. **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 H&S at Work Act 2015 and amendments. Appropriate warning signage must be erected. The use of barbed wire is not permitted.

Any damage to any infrastructure within existing road reserves including but not limited to road pavement, kerb & 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 works must be undertaken as soon as practicable, if not so completed. 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 developer's 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.

Failure to comply with Clause 1.25 will result in the Utilities Manager arranging appropriate remedial works. The Developer will be responsible for all costs including Council’s Officers time managing the remedial work.

1.26. TRENCHING

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


- AS/NZS 2566: Buried flexible pipelines
- AS/NZS2033 2008 Installation of polyethylene pipe systems

Trenching works must conform to the following document:


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 Practical Completion Certificate, the Developer must amend all drawings and necessary documents to represent the true ‘As Built’. The amendments must be made on the standard hard copy A1 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.
Part 1 – General Requirements

(i) New Zealand Transverse Mercator 2000 (NZTM2000) coordinates with levels in terms of Wellington Mean Sea Level 1953 (WMSL 1953) 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.

The Developer is responsible for the accuracy of the information given on the ‘As Built’ plans and for any extra costs which may arise as a result of incorrect information shown.

1.29. FINAL INSPECTION

Prior to the issue 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 1.32).
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 control of the Developer. Any such bond shall include a 25% contingency and bond admin fee.

1.31. **ACCEPTANCE OR APPROVAL OF WORKS**

Prior to the issue of Practical Completion Certificate (eg. Schedule 1C NZS4404) of, the Developer must supply to Council:

(i) “As Built” drawings as detailed in clause 1.28

(ii) A certificate regarding earth fills and compaction. Refer Appendix 4

(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 1.21 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.

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 Practice Completion Certificate.

1.33. **FINANCIAL CONTRIBUTIONS**

1.33.1. To Council

Any or all financial contributions relating to engineering works required to be paid by the Developer to Council will be set out in the Subdivision Consent. The instances where financial contributions are required are set out in the Long Term Council
Part 1 – General Requirements

Community Plan (LTCCP). The time for payment will be set out in the Subdivision consent.

1.33.2. From Council

Payment to the Developer for any financial contribution relation to engineering works required by Council will be by separate agreement outside of the Subdivision Consent.

1.34. ARBITRATION

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 is to occur no later than 10 working days to resolve the conflict. The contents 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 Utilities Manager must decide the final outcome of the dispute.

1.35. PRECEDENCE

Where conflict arises between documents associated with the development the Engineering Standards for Land Development must take precedence unless agreement can be reached between both parties.
2. LAND SUITABILITY AND EARTHWORKS

2.1. GENERAL

Part 2 of the Engineering Standards for the Land Development management of earthworks, excavation, soil disturbance and 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.

All natural land surfaces considered to be unstable must be identified and specifically excluded from new allotments within “no build” areas and appropriately located building platforms must be utilised to ensure the development involving any land disturbance works. The standards are designed to ensure that any disruption associated with earthworks is minimised, that soil loss and sedimentation are controlled to avoid adverse off-site effects, that development sites are safe and stable, and that finished landscapes are rehabilitated. Poorly managed earthworks and development can result in soil loss, erosion and instability.

2.2. OBJECTIVES

All earthworks and land disturbance activities in the Manawatu District area, regardless of the scale and size of the activity, compliance with permitted activity standards and conditions, or resource consent conditions, 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 Part 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 4404 Land Development and Subdivision Infrastructure

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:

(i) Landform – Risk of erosion and slippage

(ii) Location – Flood prone or swampy land
(iii) Bearing capacity and settlement in areas of building foundations

(d) Chemical contamination

(iv) The presence of Hazardous Activities and Industries (HAIL)

(v) 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 and 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, 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 and 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 land form. 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 policy.

2.4.3. Location

The District Plan has identified areas of flood prone land. All localized 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 and 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 must be. Site investigations may be required depending on whether the site has been identified and 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 earthfills, 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 Earthfill 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 the 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 NZS 4402.

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

Cut and fill batter slopes are to be specially designed in accordance with the Land Stability Guidelines.

For cut and fill batter slopes within the road reserve, refer Section 3.5 of this Engineering Standards for Land Development.

2.6.7. Drainage

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

The Developer is responsible for insuring 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 that 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 plantings 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

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,
- stormwater drainage pipelines and associated structures,
- traffic and street signage & street furniture, street lighting, roadmarking
- and street landscaping, including street trees,

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.

The above utilities and street-scaping infrastructure that are to be incorporated into the development project must be specifically designed and constructed to cope with the traffic volumes and loadings but also provide a functional and safe environment for the users over the design life of the development.

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 Bitumens |
| 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 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 GeometricPavement Technology |
| NZTA | Cycle Network and Route Planning Guide |
3.3. CARRIAGEWAY WIDTHS

3.3.1. General

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

Table 3.1- Part 3 Roading 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 Table 3.1. The Developer would be advised of any changes to Table 3.1 and the reasons when the Development Concept Plan was submitted.

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.

On primary roads and roads with a design speed of greater than 80km/h, the pavement must be of sufficient width to must ensure that all left hand vehicle turning movements exiting from properties must not encroach across restricted to the left hand side of 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 District Plan and APPENDIX 2B – Manawatu District Road Hierarchy

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.

3.3.3.1. Estimated Dwelling Units In Catchment (EDUC)

3.3.3.2. 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”.

---

Manawatu District Council

Draft for consultation
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.

3.3.3.3. Vehicles Per Day (VPD)

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

3.3.3.4. 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.
### Table 3.1  
Street Classification and Street Width

<table>
<thead>
<tr>
<th>Classification</th>
<th>Type</th>
<th>Traffic Volume</th>
<th>Area Served</th>
<th>Legal Road/ROW Width (minimum)</th>
<th>Carriageway Width (Minimum)</th>
<th>Footpath</th>
<th>Total Berm Width</th>
<th>Max/Min Grade</th>
<th>Normal Camber</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROW / Access Lot</td>
<td>2-3 Lots</td>
<td>3.5m</td>
<td>3.5m (U1)</td>
<td>N/A</td>
<td>12.5% 0.4%</td>
<td>3%</td>
<td></td>
<td>Approved stormwater control</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ROW / Access Lot</td>
<td>4-6 Lots</td>
<td>6.0m (U3) (U4)</td>
<td>5.0m (US)</td>
<td>(U2) 1.0m</td>
<td>12.5% 0.4%</td>
<td>3%</td>
<td></td>
<td>Min kerb and channel one side. Turning Area required.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local Roads (Public Roads)</td>
<td>Cul-de-sac</td>
<td>Up to 12 Lots or 12 du Max length 150m</td>
<td>16.0m (U3) (U4)</td>
<td>7.0m (US)</td>
<td>1 @ 1.5m</td>
<td>9.0m</td>
<td>12.5% 0.33%</td>
<td>Kerb and Channel both sides. Cul-de-sac turning head required</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residential &lt;750 vpd</td>
<td>&gt;12 Lots</td>
<td>17.0m</td>
<td>8.0m (US)</td>
<td>2 @ 1.5m</td>
<td>9.0m</td>
<td>12.5% 0.33%</td>
<td>3%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residential &gt;750 vpd</td>
<td>&gt;12 Lots</td>
<td>20.0m</td>
<td>11.0m (US)</td>
<td>2 @ 1.5m</td>
<td>9.0m</td>
<td>10% 0.33%</td>
<td>3%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industrial</td>
<td></td>
<td>20.0m</td>
<td>11.0m (US)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Subject to specific design</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industrial/Business</td>
<td>All roads</td>
<td>20.0m</td>
<td>11.0m (US)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distributor/Collector</td>
<td>Residential</td>
<td>20.0m</td>
<td>11.0m (US)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industrial</td>
<td></td>
<td>22.0m</td>
<td>13.0m (US)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arterial/Strategic</td>
<td>All roads</td>
<td>22.0m</td>
<td>13.0m (US)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTES**
du = Dwelling Units.

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 limited or if ROW over 75m long.
U2. Where the ROW / Access Lot exceeds 75m in length a 1.4m 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.
## MINIMUM STANDARDS FOR NODAL, RURAL RESIDENTIAL AND RURAL SUBDIVISIONS

<table>
<thead>
<tr>
<th>Classification</th>
<th>Legal Road/ROW Width</th>
<th>Carriageway Width</th>
<th>Seal Width</th>
<th>Traffic Lane / Shoulder Width</th>
<th>Total Berm Width</th>
<th>Max / min grade</th>
<th>Normal Camber</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROW / Access Lot 2 Lots - Rural and Rural Residential only</td>
<td>8m</td>
<td></td>
<td></td>
<td></td>
<td>4.0m</td>
<td>12.5%</td>
<td>0.4%</td>
<td>Approved stormwater control</td>
</tr>
<tr>
<td>ROW / Access Lot 2 Lots – Nodal only</td>
<td>8m</td>
<td>4.0m</td>
<td>4m (R1) (R2) (R3)</td>
<td>N/A</td>
<td>4.0m</td>
<td>12.5%</td>
<td>0.4%</td>
<td>Approved stormwater control</td>
</tr>
<tr>
<td>ROW / Access Lot 3 to 4 Lots</td>
<td>10m</td>
<td>4.0m</td>
<td>4m (R1) (R2) (R3)</td>
<td>N/A</td>
<td>6.0m</td>
<td>12.5%</td>
<td>0.4%</td>
<td>Approved stormwater control. Turning head required.</td>
</tr>
<tr>
<td>ROW / Access Lot 5 to 7 Lots</td>
<td>12m</td>
<td>7.0m</td>
<td>6m (R3)</td>
<td>N/A</td>
<td>6.0m</td>
<td>12.5%</td>
<td>0.4%</td>
<td>Approved stormwater control. Turning head required.</td>
</tr>
<tr>
<td>Local</td>
<td>20m</td>
<td>9.0m</td>
<td>7.0m (R3)</td>
<td>3.5m/1.0m</td>
<td>11.0m</td>
<td>10%</td>
<td>0.4%</td>
<td>Two-coat chipsealing and turning head required.</td>
</tr>
<tr>
<td>Distributor/Collector</td>
<td>20m</td>
<td>10.0m</td>
<td>8.0m (R3)</td>
<td>3.5m/1.5m</td>
<td>10.0m</td>
<td>10%</td>
<td>0.4%</td>
<td>Two-coat chipsealing and turning head required.</td>
</tr>
<tr>
<td>Arterial</td>
<td>20m</td>
<td>11.0m</td>
<td>9.0m (R3)</td>
<td>3.5m/2.0m</td>
<td>9.0m</td>
<td>10%</td>
<td>0.4%</td>
<td>Two-coat chipsealing and turning head required.</td>
</tr>
</tbody>
</table>

**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. Nodal subdivisions shall be two-coat chipsealed, otherwise sealing is optional.
3.4 ROAD RESERVES

3.4.1 Reserve widths

The minimum widths must be as shown in Table 3.1. 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.

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

To ensure positive traffic functions within subdivisions, the permissible maximum number of dwellings within a cul-de-sacs must serve a maximum of:

(i) 20 dwellings with a maximum length of 100m* in urban areas; and
(ii) 25 dwellings with a maximum length of 300m.* in rural 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 3.15).

3.5 GEOMETRIC DESIGN OF CARRIAGEWAYS

3.5.1 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 0.3% (1 in 300)

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.

3.5.2 Design Speeds

The design speed for the geometric design of urban 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, superelevation, 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

<table>
<thead>
<tr>
<th>Road Type</th>
<th>Environment</th>
<th>Rural</th>
<th>Urban</th>
<th>Terrain</th>
<th>Flat</th>
<th>Rolling</th>
<th>Mountainous</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two Lane</td>
<td>Low Volume¹</td>
<td>80</td>
<td>60</td>
<td>40²</td>
<td>50</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Secondary road</td>
<td>100</td>
<td>80</td>
<td>60</td>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Primary</td>
<td>120</td>
<td>110</td>
<td>100</td>
<td>70</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dual Carriageway</td>
<td>Subject to specific design</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes:
1. Low volume – Low volume roads where AADT is less than 200 vpd.
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.

#### 3.5.3. 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.
3.5.4. 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

<table>
<thead>
<tr>
<th>Design Speed (km/h)</th>
<th>Grade Change (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>1.0</td>
</tr>
<tr>
<td>50</td>
<td>0.9</td>
</tr>
<tr>
<td>60</td>
<td>0.8</td>
</tr>
<tr>
<td>70</td>
<td>0.7</td>
</tr>
<tr>
<td>80</td>
<td>0.6</td>
</tr>
<tr>
<td>90</td>
<td>0.5</td>
</tr>
<tr>
<td>100</td>
<td>0.4</td>
</tr>
<tr>
<td>110</td>
<td>0.3</td>
</tr>
<tr>
<td>120</td>
<td>0.2</td>
</tr>
</tbody>
</table>

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 urban area as defined in the District Plan.

The curve length can be determined using the formula below:

\[ L = K \times A \]

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

<table>
<thead>
<tr>
<th>Design Speed (km/h)</th>
<th>Comfort Considerations</th>
<th>Sight Distance (m)</th>
<th>K</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>General Design a = 0.5 g</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>3</td>
<td>1</td>
<td>50</td>
</tr>
<tr>
<td>50</td>
<td>4</td>
<td>2</td>
<td>65</td>
</tr>
<tr>
<td>60</td>
<td>6</td>
<td>3</td>
<td>85</td>
</tr>
<tr>
<td>70</td>
<td>8</td>
<td>4</td>
<td>105</td>
</tr>
<tr>
<td>80</td>
<td>10</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

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

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

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.

3.5.5. **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 on urban curves.

**Table 3.6  Widening on Curves**

<table>
<thead>
<tr>
<th>Radius (m)</th>
<th>Curve Widening per lane (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rigid Truck or Bus</td>
</tr>
<tr>
<td>30</td>
<td>1.03</td>
</tr>
<tr>
<td>40</td>
<td>0.82</td>
</tr>
<tr>
<td>50</td>
<td>0.71</td>
</tr>
<tr>
<td>60</td>
<td>0.59</td>
</tr>
<tr>
<td>70</td>
<td>0.52</td>
</tr>
<tr>
<td>80</td>
<td>0.46</td>
</tr>
<tr>
<td>90</td>
<td>0.41</td>
</tr>
<tr>
<td>100</td>
<td>0.36</td>
</tr>
<tr>
<td>120</td>
<td>0.32</td>
</tr>
<tr>
<td>140</td>
<td>0.28</td>
</tr>
<tr>
<td>160</td>
<td>0.24</td>
</tr>
<tr>
<td>180</td>
<td>0.20</td>
</tr>
<tr>
<td>200</td>
<td>0.20</td>
</tr>
<tr>
<td>250</td>
<td>0.20</td>
</tr>
<tr>
<td>300</td>
<td>0.30</td>
</tr>
<tr>
<td>350</td>
<td>0.26</td>
</tr>
<tr>
<td>400</td>
<td>0.22</td>
</tr>
</tbody>
</table>

**Table**

<table>
<thead>
<tr>
<th>Radius of Curvature</th>
<th>Widening (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carriageway Width</td>
<td></td>
</tr>
<tr>
<td>7.00 m</td>
<td>8.00 m</td>
</tr>
</tbody>
</table>
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.

### 3.5.6. 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.

### 3.5.7. Superelevation

Superelevation is determined using the following equation:

\[
e_t = \frac{V^2 e_{\text{max}}}{127R(e_{\text{max}} + f_{\text{max}})}
\]

Where:

- \( R \) = curve of the radius (m)
- \( V \) = vehicle speed (km/hr)
- \( e_{\text{max}} \) = maximum superelevation (m/m)

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

The corresponding coefficient of side friction is calculated from:

\[ f_1 = \frac{V^2}{127R} - e^{-\frac{E}{127R}} \]

### Table 3.7 Maximum Coefficient of Side Friction Factor, \( f_{\text{max}} \)

<table>
<thead>
<tr>
<th>Operating Speed (km/hr)</th>
<th>( f_{\text{max}} ) Cars</th>
<th>( f_{\text{max}} ) Trucks</th>
</tr>
</thead>
<tbody>
<tr>
<td>40</td>
<td>0.30</td>
<td>-</td>
</tr>
<tr>
<td>50</td>
<td>0.30</td>
<td>0.21</td>
</tr>
<tr>
<td>60</td>
<td>0.24</td>
<td>0.17</td>
</tr>
<tr>
<td>70</td>
<td>0.19</td>
<td>0.14</td>
</tr>
<tr>
<td>80</td>
<td>0.16</td>
<td>0.13</td>
</tr>
<tr>
<td>90</td>
<td>0.13</td>
<td>0.11</td>
</tr>
<tr>
<td>100</td>
<td>0.12</td>
<td>0.12</td>
</tr>
<tr>
<td>110</td>
<td>0.12</td>
<td>0.12</td>
</tr>
<tr>
<td>120</td>
<td>0.11</td>
<td>0.11</td>
</tr>
<tr>
<td>130</td>
<td>0.11</td>
<td>-</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Width of Carriageway</th>
<th>Maximum Difference in Kerb Line Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 m</td>
<td>130 mm</td>
</tr>
<tr>
<td>8 m</td>
<td>150 mm</td>
</tr>
<tr>
<td>9 m</td>
<td>160 mm</td>
</tr>
<tr>
<td>11 m</td>
<td>175 mm</td>
</tr>
<tr>
<td>11.5 m</td>
<td>175 mm</td>
</tr>
<tr>
<td>12.5 m</td>
<td>200 mm</td>
</tr>
<tr>
<td>13 m</td>
<td>200 mm</td>
</tr>
</tbody>
</table>

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

### 3.5.8. 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.

#### 3.5.9. Structure PLANS

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

#### 3.5.10. 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.

#### 3.5.11. Intersection Approaches

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

#### 3.5.12. Intersection Spacing

Intersection spacing must be in accordance with the District Plan Rule 20.3.9.1

#### 3.5.13. Corner Splay

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

#### 3.5.14. Rural/rural Residential Intersections

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

Chevron boards to TNZ Manual of Traffic signs and Markings (MOTSAM) must be installed at the head of all intersections in rural areas.
3.5.15. 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.

3.5.16. 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).

3.5.17. 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

<table>
<thead>
<tr>
<th></th>
<th>Local - Residential</th>
<th>Local - Other</th>
<th>Collector</th>
<th>Minor Arterial</th>
<th>Major Arterial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local Residential Road-</td>
<td>4-6m*</td>
<td>4-6m*</td>
<td>4-6m*</td>
<td>10.5m</td>
<td>10.5m</td>
</tr>
<tr>
<td>Local Industrial/Commercial</td>
<td>13.5m</td>
<td>13.5m</td>
<td>13.5m</td>
<td>13.5m</td>
<td>13.5m</td>
</tr>
<tr>
<td>Collector</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>10.5m</td>
<td>10.5m</td>
</tr>
<tr>
<td>Minor Arterial</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major Arterial</td>
<td></td>
<td></td>
<td></td>
<td>Specific Design</td>
<td></td>
</tr>
</tbody>
</table>

*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.

3.5.18. 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. Refer to Section 3.10 for construction specifications.
3.19. 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.

3.20. Cul-de-Sac Heads

Cul-de-Sac heads must have minimum 10m radius turning area in residential areas. In commercial / 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.

Where there are greater than 10 allotments serviced off the Cul-de-Sac head, the Cul-de-Sac must be constructed in accordance with Standard Drawing 3.6.1.

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.

3.21. 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.
3.6. STRUCTURAL DESIGN AND TESTING OF PAVEMENTS

3.6.1. 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.

3.6.2. Pavement Loading

3.6.2.1. 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.

3.6.2.2. 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

<table>
<thead>
<tr>
<th>Street Classification</th>
<th>EDA/Lane</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arterial</td>
<td>$3.8 \times 10^6$</td>
</tr>
<tr>
<td>Principal</td>
<td>$3.0 \times 10^6$</td>
</tr>
<tr>
<td>Collector</td>
<td>$3.8 \times 10^5$</td>
</tr>
<tr>
<td>Local</td>
<td>$1.0 \times 10^5$</td>
</tr>
<tr>
<td>Rural Residential</td>
<td>$5.0 \times 10^4$</td>
</tr>
<tr>
<td>Rural</td>
<td>$3.65 \times 10^4$</td>
</tr>
<tr>
<td>Industrial</td>
<td>Specific design required</td>
</tr>
</tbody>
</table>
The design pavement loading must be stated as a note on the engineering drawings where the details of the pavement cross section are shown.

### 3.6.3. 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:

\[
\text{Design CBR} = \text{tenth percentile value of test CBR values} = C - 1.28 S
\]

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.

### 3.6.4. 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 urban 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 for (a) above and must normally be constructed 50mm outside the street reserve boundary.

### 3.6.5. 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 basecourse must be TNZ M/4 AP40.

### 3.6.6. 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 & 4G as applicable.

### 3.6.7. 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.
3.7. PAVEMENT CONSTRUCTION AND TESTING

3.7.1. Subgrade Construction and Acceptance

Subgrades must be constructed to the requirements of Part 2- Land Suitability and Earthworks of these Standards and drained in accordance with Clause 3.6.4

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 metalling or stabilisation. Refer clause 1.20.2 of these standards.

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 Part 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 deteriorate 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.

3.7.2. 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 stabilization stabilisation operations and the following factors controlled to ensure uniformity and acceptability of the treated layer.

(i) Uniformity of the material to be stabilized 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.

3.7.3. 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 basecourse 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 ravelling 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.
# Part 3 – Roading and Street Design

## Table 3.11 Maximum Benkelman Beam Deflection Standards

<table>
<thead>
<tr>
<th>Road Type</th>
<th>Maximum Allowable Deflection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arterial</td>
<td>1.00 mm</td>
</tr>
<tr>
<td>Principal</td>
<td>1.00 mm</td>
</tr>
<tr>
<td>Collector</td>
<td>1.20 mm</td>
</tr>
<tr>
<td>Local</td>
<td>1.60 mm</td>
</tr>
<tr>
<td>Residential ROW (up to 6 lots)</td>
<td>2.00 mm</td>
</tr>
<tr>
<td>Rural Residential</td>
<td>2.00 mm</td>
</tr>
<tr>
<td>Rural</td>
<td>2.00 mm</td>
</tr>
<tr>
<td>Industrial/Commercial</td>
<td>1.20 mm</td>
</tr>
</tbody>
</table>

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.

### 3.7.4. Surfacing

The surfacing of the metal course must take place within two working days after Council approves the basecourse. 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:

#### 3.7.4.1. STRUCTURAL ASPHALTIC CONCRETE PAVEMENTS

<table>
<thead>
<tr>
<th>Industrial and Commercial Developments</th>
<th>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 be in compliance with TNZ Specification M/10. Alternatively emulsion can be used providing the AC layer is applied within 24 hours.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>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.</td>
</tr>
</tbody>
</table>

(i) Thin Surfaced Pavements
| Urban 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 be in compliance 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 be in compliance 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 Residential | Application of a grade 3 and grade 5 two coat seal.

(a) Structural Asphaltic Concrete Pavements

*Industrial and Commercial 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 be in compliance with TNZ Specification M/10. Alternatively emulsion can be used providing the AC layer is applied with 24 hours.

(b) Thin Surfaced Pavements

*Urban Residential*

Application of a grade 3 or 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 be in compliance 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 be in compliance 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 Residential*
Application of a grade 2 and grade 4 two coat seal.

### 3.7.5. Sealing

Asphaltic bitumens 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.

### 3.7.6. Asphaltic Concrete

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

### 3.8. CONSTRUCTION OF KERB AND CHANNEL

#### 3.8.1. General

Kerb and channel must be provided on both sides of all proposed carriageways in both urban areas and may be provided in rural residential 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. The cement content of the kerb mix must be between 260-280kgs per cubic metre.

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 10metre length.

The minimum gradient of all kerb and channel, mountable kerb and dished channel must be 1 in 300. 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 urban 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

### 3.8.2. 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.

### 3.8.3. Testing

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

### 3.8.4. Sumps

Street sumps must be provided as outlined in Part 6 Stormwater Drainage of the standards

### 3.8.5. 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.

### 3.8.6. 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.

3.8.7. Curing

All concrete must be cured in accordance with NZS 3109.

3.8.8. Swales

Swales should be used wherever appropriate in Rural/Rural Residential 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. Typical details that may be used in swale design are shown in NZS4404:2010, figures 3.6(a) to 3.6(c).

3.9. FOOTPATHS

3.9.1. General

A footpath must be provided on both sides of all proposed carriageways in all urban and industrial areas and must generally follow the gradient of the adjacent kerb. A footpath must also be provided on one side in business and industrial accesses to rear lots.

3.9.2. Construction

All footpaths must be in accordance with the widths specified in Table 3.1, measured from kerb face where set adjacent to the kerb. Footpaths must be constructed with a crossfall 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 Residential 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 not 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.
Footpath 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).

3.9.3. 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 spacing’s. Refer Standard Drawing 3.12 and 3.13.

3.9.4. 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 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.

3.10. CROSSINGS

3.10.1. Mobility (Pram) Crossings

Mobility crossings must be provided in the kerb line at all urban intersection 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 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.

3.10.2. Vehicle Crossings

(a) Concrete crossings must be constructed between the kerb line and the boundary to all urban and rural residential allotments,. 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>
<thead>
<tr>
<th>Table 3.12 Vehicle crossing Construction Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle Crossing Type</td>
</tr>
<tr>
<td>Residential</td>
</tr>
</tbody>
</table>

Manawatu District Council
Draft for consultation
(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 a new development 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.

### 3.11. 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.

### 3.12. 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.

### 3.13. 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

<table>
<thead>
<tr>
<th>User Class</th>
<th>A</th>
<th>B</th>
<th>C1</th>
<th>C2</th>
<th>C3</th>
<th>Aisle Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2.1</td>
<td>4.2</td>
<td>4.4</td>
<td>4.1</td>
<td>4.5</td>
<td>3.1</td>
</tr>
<tr>
<td>2</td>
<td>2.3</td>
<td>4.6</td>
<td>4.4</td>
<td>4.1</td>
<td>4.7</td>
<td>3.0</td>
</tr>
<tr>
<td>3</td>
<td>2.5</td>
<td>5.0</td>
<td>4.4</td>
<td>4.1</td>
<td>4.9</td>
<td>2.9</td>
</tr>
<tr>
<td>4</td>
<td>3.6</td>
<td>6.4</td>
<td>4.4</td>
<td>4.1</td>
<td>5.5</td>
<td>2.9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>User Class</th>
<th>A</th>
<th>B</th>
<th>C1</th>
<th>C2</th>
<th>C3</th>
<th>Aisle Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2.4</td>
<td>3.4</td>
<td>5.2</td>
<td>4.8</td>
<td>5.5</td>
<td>3.9</td>
</tr>
<tr>
<td>2</td>
<td>2.5</td>
<td>3.5</td>
<td>5.2</td>
<td>4.8</td>
<td>5.6</td>
<td>3.7</td>
</tr>
<tr>
<td>3</td>
<td>2.6</td>
<td>3.7</td>
<td>5.2</td>
<td>4.8</td>
<td>5.7</td>
<td>3.5</td>
</tr>
<tr>
<td>4</td>
<td>3.6</td>
<td>5.1</td>
<td>5.2</td>
<td>4.8</td>
<td>6.1</td>
<td>3.3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>User Class</th>
<th>A</th>
<th>B</th>
<th>C1</th>
<th>C2</th>
<th>C3</th>
<th>Aisle Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2.4</td>
<td>2.8</td>
<td>5.7</td>
<td>5.1</td>
<td>5.9</td>
<td>4.9</td>
</tr>
<tr>
<td>2</td>
<td>2.5</td>
<td>2.9</td>
<td>5.7</td>
<td>5.1</td>
<td>6.0</td>
<td>4.6</td>
</tr>
<tr>
<td>3</td>
<td>2.6</td>
<td>3.0</td>
<td>5.7</td>
<td>5.1</td>
<td>6.0</td>
<td>4.3</td>
</tr>
<tr>
<td>4</td>
<td>3.6</td>
<td>4.2</td>
<td>5.7</td>
<td>5.1</td>
<td>6.3</td>
<td>4.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>User Class</th>
<th>A</th>
<th>B</th>
<th>L1</th>
<th>L2</th>
<th>L3</th>
<th>Aisle Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2, 3</td>
<td>2.1</td>
<td>2.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>3.6</td>
<td>3.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>User Class</th>
<th>A</th>
<th>B</th>
<th>L1</th>
<th>L2</th>
<th>L3</th>
<th>Aisle Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>6.3</td>
<td>6.6</td>
<td>5.4</td>
<td></td>
<td></td>
<td>3.0</td>
</tr>
<tr>
<td>All</td>
<td>6.1</td>
<td>6.4</td>
<td>5.4</td>
<td></td>
<td></td>
<td>3.3</td>
</tr>
<tr>
<td>All</td>
<td>5.9</td>
<td>6.2</td>
<td>5.4</td>
<td></td>
<td></td>
<td>3.6</td>
</tr>
</tbody>
</table>
Part 3 – Roading and Street Design

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 wheelstops 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 90(DEGREES) with two-way aisles, aisle width should not be less than 5.5meters.

For Parallel parking bays with two-way aisles, aisles widths must be at least 3 metres wider than for one way aisles.

Car park area must include provision for pedestrian movement. This will be assessed on case by case basis.

3.14. 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.

### 3.15. 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:

(vii) be conspicuous - Have good sight lines for passive surveillance from vehicular traffic, neighbouring properties and other road users. Fences adjacent to accessways should be less than 1.2m.

(viii) provide a direct route

(ix) 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. Refer Standard Drawing 3.25.

Minimum pavement width for access ways 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.

### 3.16. CYCLE FACILITIES

Cycle facilities must be selected according to Figure 4-1: Guide to Choice of Facility Type for Cyclists in Urban Areas from NZ Supplement to Austroads Part 14: 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. The typical width for cycle lanes must be provided in accordance with Table 3.1.

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°) 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**

<table>
<thead>
<tr>
<th>Parking Angle</th>
<th>0°</th>
<th>45°</th>
<th>60°</th>
<th>90°</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Spacing</td>
<td>1.0</td>
<td>2.0</td>
<td>2.5</td>
<td>3.0</td>
</tr>
</tbody>
</table>

A single removable bollard placed centrally must be erected at all intersections with public footpaths and streets. Refer Standard Drawing 3.25.

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 (85th 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.

### 3.17. BUS BAYS

Where the Council identifies a requirement for Bus Bay(s) these must be constructed by the Developer in accordance with Standard Drawing 3.26 at location(s) to be determined by the Utilities Manager. The construction of these areas must be to a minimum design EDA of $2 \times 10^6$. Design plans and documentation are to be
forwarded to Council as part of the engineering approval process. The construction of buy bays must be paid for by Council.

3.18. RURAL/RURAL RESIDENTIAL

3.18.1. General


3.18.2. Culverts

All culverts must be designed for the catchment area it serves in accordance with Part 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 the certified slope ends similar to NZTA specifications if drain is less than 1000 mm in depth. Drains deeper than 1000 mm must be subject to specific design.

3.18.3. Intersections

Refer Standard Drawing 3.3.

3.18.3.1. 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-ways.

Where the road or accessway is adjacent to a cutting or embankment

3.18.4. Rural Road Drainage

Roadside 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 RCRPJ pipe at the culvert headwall. Refer Standard Drawing 3.7. Also refer Clause 6.4 and 6.5.
3.18.5. 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 3.3.

Lighting must not exceed an output greater than 16,000 lm and must be mounted at a height not less than 7 metres. Refer AS/NZS 1158.

3.18.6. 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.

3.19. ACCESS TO REAR LOTS

3.19.1. General

All accessways to rear lots except those rear lots mentioned in Clause 3.19.2 and 3.19.3 must be constructed and serviced for the full length of the access.

3.19.2. In areas previously subdivided for residential purposes.

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. Where no accessway exists refer to Clause 3.19.1.

Laying of services is required as for new allotments.

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.

3.19.3. In all Rural/ Rural Residential Subdivisions:

(i) Construction of the access way 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 letter and milk boxes 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. The visibility between passing opportunities from bay to bay is required.

Vehicle crossings must be provided between the boundary and the carriageway. Refer Clause 3.10.1.

**3.19.4. 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. Refer Standard Drawing 3.27 (For examples of shared accessway refer to Standard Drawing 3.27.1).

Turning area must be as per clause 3.14 Hardstand Areas.

(ii) For 4-6 lots

Form, metal and surface carriageway with a minimum width of 5.0 m for the full length of access. 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 3.28.

(iii) For 7 lots and over

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

**3.19.5. 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 3.24.

(ii) For 5 Lots and Over

Specific design is required to the approval of the Utilities Manager.
### 3.19.6. Rural/ Rural Residential

(i) **For 1 Lot**

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 metalled width must be a minimum of 3.5m. A minimum 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 3.29.

(ii) **For 2-4 Lots**

The minimum width of accessway reserve is 8.0m. 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 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 3.29.

(iii) **For 5 Lots and over**

Design and construction requirements to be in accordance with Table 3.1- Street Classification and Street Width.

The above minimum standards for residential, business, industrial, rural residential and rural are to apply for the total length of the access.

### 3.19.6.1. 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.

### 3.20. ACCESS STANDARDS (DISTRICT PLAN R20.3.9.1)

(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
class of 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 Roading Utilities Manager, of Council, 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.

(b) Access on to Arterial and Principal Roads

Any access to a site or an activity on an Arterial Road or a Principal Road (as defined
in Appendix 20A 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 access
must be as recorded in Table 3.14 (illustrated in Figure 3.2), and measured in
accordance with Figure 3.3.

(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
3.3.

Table 3.14 Minimum Distance for Permitted Access on Arterial and Principal
Roads
### NOTES TO PLAN USERS:

(i) Where the posted speed limit differs on the two roads, the standards for the higher speed limit must apply.

(ii) Any part of a road which forms part of the State Highway network is also subject to the requirements of that road controlling authority New Zealand Transport Agency.
(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, being:
(iv) The minimum sight distances at intersections and accesses must be recorded as in Table 3.15, measured in accordance with Figure 3.3.

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

<table>
<thead>
<tr>
<th>Posted Speed (km/h)</th>
<th>Minimum Sight Distance at: (metres)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Access Crossings</td>
</tr>
<tr>
<td>100</td>
<td>250</td>
</tr>
<tr>
<td>80</td>
<td>170</td>
</tr>
<tr>
<td>70</td>
<td>115</td>
</tr>
<tr>
<td>60</td>
<td>85</td>
</tr>
<tr>
<td>50</td>
<td>65</td>
</tr>
</tbody>
</table>

(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) There must be no vehicle access across a Pedestrian Street (as identified in Appendix 20A of the District Plan);

(ii) Where the site or activity is located in a 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.

(iii) 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.

NOTE TO PLAN USERS:

(iv) Where the site or activity is located in an Industrial/Business Zone: (what is this?)

(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.

(v) Where the site or activity is not covered by standards (i), (ii), (iii) or (iv) 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 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.

NOTE FOR PLAN USERS:

For the purposes of interpreting this Rule, vehicle crossing widths are measured at the property boundary.
Figure 3.3  Sight Distance Measurement Diagram

Note:
Sight distances shall be measured to and from a height of 1.15 metres above the existing road surface and the proposed surface level of the side road or access.
3.21. **BRIDGES AND CULVERTS**

All appropriate building and resource consents must be obtained.

Design is to be in accordance with the NZTA? Bridge Manual.

3.22. **TRAFFIC CONTROL AND CALMING DEVICES**

All proposed traffic control and calming devices with and adjacent to the proposed development including, for example, intersection controls, roadmarking, 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.

3.23. **RETAINING WALLS**

All appropriate building and resource consents must be obtained.

3.24. **STREETSCAPING (RESIDENTIAL)**

3.24.1. **General**

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

(i) Topsoiling

(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. Due to potential damage of the trees and during development of the subdivision, the Developer will be required
to pay a contribution per tree for the supply, planting and establishment of each tree to Council. Council will undertake establishment of trees on completion of the building development.

The Developer will also be required to contribute towards gardens and/or street furniture identified as part of the proposed development.

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.

**3.24.2. Grassed Berms**

**3.24.2.1. 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 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.

**3.24.2.2. Grassing**

Berms must be sown with a bird repellent coated grass seed mixture conforming to the following proportions: chewings fescue 50% and brown 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 must mow the grass berms at least twice prior to final inspection.
3.24.3. 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 800mm.

Topsoiling and grass requirements are to be similar to grassed berms.

Median strips less than 800mm in width are to be concreted.

3.24.4. Gardens

Gardens at ground level must be excavated to a depth of 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 Utilities Manager prior to planting. Planting must fall within the following guidelines:

- All species chosen must be perennial in nature.
- 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 planted must comply with Council Tree Policy Guidelines. (I don’t think we have one of these!)
- 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.

3.24.5. Raised Gardens

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 in layers in the proportions indicated in Standard Drawing 3.31. 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.

Topsoil and mulching requirements must be in accordance with 3.23.5.

3.24.6. Street Trees

3.24.6.1. General

All tree planting must be carried out in accordance with Council’s Tree Policy and Guidelines for the Manawatu District Council and with the approval of the Utilities Manager.

3.24.6.2. Tree Planting

Street trees are only to be planted between the kerb and footpath. Design plans are to be submitted for engineering approval as part of the consent process. All trees should be planted as shown on Standard Drawing 3.31.1.

3.24.7. Street Furniture

3.24.7.1. 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.

3.24.7.2. Bollards

Bollards must be supplied and installed in accordance with Standard Drawing 3.34. The Developer must submit the bollard layout plan as part of the engineering approval process.

3.24.7.3. Street Nameplates

The Developer must provide street nameplates. Product details and installation must be in accordance with Council’s Policy for Roading Signage. All street signs and nameplates must be installed by MDC’s signs contractors.

3.25. STREET LIGHTING

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

(i) AS/NZS 1158 Lighting for Roads and Public Spaces- Part 0: Introduction

(ii) AS/NZS 1158 Lighting for Roads and Public Spaces- Part:1.1:Vehicular Traffic (Category V) lighting-Performance and Design Requirements
Street Lighting must form part of the engineering approval process.

The following streetlight columns/luminaries must only be used in any development:

(i) CSP Pacific Columns and Betacom Luminaires Units
(ii) Schreder Columns and Luminaire Units
(iii) Kendelier Column/Luminaire Units
(iv) Windsor Heritage Column/Luminaire Units

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.

The following fusing/earthing system must only be used in any development:

SL3 Street Lighting Cut Outs 25A, 240V AC

### 3.25.1 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.

### 3.25.2 Lamp Specifics:

Only the highest efficacy tubular clear High Pressure Sodium lamps are allowed.

Only the highest efficacy new generation metal halide lamps are allowed.

Only the highest efficacy LED luminaires are allowed.

### 3.25.3 Luminaire Specifics:

Only IP65+ ingress protection ratings are allowed.
All street light columns must be backfilled with approved granular backfill as per the street light column’s 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.

3.25.4. Earthing:

All steel street light columns must have a separate driven earth.

The Developer must provide and install street nameplates. Product details and installation must be in accordance with Manawatu District Councils Policy for Roading Signage.

1.1.1 Gardens

Gardens at ground level must be excavated to a depth of 450mm and backfilled with good quality topsoil free from 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 more than 100mm below the top of the concrete surround.

Planting plans must be submitted and approved by the Utilities Manager prior to planting. The following criteria must be adhered to and must fall within the following guidelines:

(a) All species chosen must be perennial in nature.

(b)

(c) All trees planted must possess a single trunk and must not exceed 5.0 metres in height at maturity. All trees must be planted no less than 40 metres from any intersection.

(d) The total garden surface area must be covered in clean bark nuggets 30mm to 50mm in diameter to a depth of 90mm. The finished level of the bark nuggets must be 10mm below the top of the concrete surround. Prior to the placement of the bark nuggets, approved weed control matting must be placed over the total garden surface area. Minimum 200mm overlap must be provided at the joins of the weed mat. The weed mat must extend up the sides of the concrete surround and be placed as close as possible to the base of the plantings.

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 topsoil and free draining material in layers in the proportions indicated in Standard Drawing 3.31. All gardens located within grass areas must be surrounded by a 100mm wide concrete mowing strip.

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.
1.1.2 Street Trees

1.1.2.1 GENERAL

All tree planting must be carried out in accordance with Council’s Tree Policy and Guidelines for the Manawatu District Council.

The trees are to be perennial with a maximum height at maturity of 5 metres. Design plans are to be submitted for engineering approval as part of the consent process. All trees should be planted as shown on Standard Drawing 3.31.1.

1.1.3 Street Furniture

1.1.3.1 GENERAL

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

Street furniture design is to be submitted for engineering approval as part of the consent process.

Bollards must be supplied and installed in accordance with Standard Drawing 3.34. The Developer must submit the bollard layout plan as part of the engineering approval process.
4. PART 4  WASTEWATER DRAINAGE

4.1. INTRODUCTION

This section sets out standards and design criteria for wastewater drainage in land development. It does not cover the 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.
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 80 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 Manawatu 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.

4.5. 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.

4.5.1. 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.

4.5.2. 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 commercial and industrial developments range from 30,000 to 100,000 litres/hectare/day.

4.6. HYDRAULIC DESIGN

4.6.1. 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

4.6.2. 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
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.

4.6.3. 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.

4.6.4. 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

<table>
<thead>
<tr>
<th>Gradient</th>
<th>150 mm nominal bore</th>
<th>190 mm nominal bore</th>
<th>225 mm nominal bore</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 in 100</td>
<td>320</td>
<td>600</td>
<td>970</td>
</tr>
<tr>
<td>1 in 120</td>
<td>300</td>
<td>540</td>
<td>890</td>
</tr>
<tr>
<td>1 in 150</td>
<td>280</td>
<td>500</td>
<td>800</td>
</tr>
<tr>
<td>1 in 200</td>
<td>450</td>
<td>710</td>
<td></td>
</tr>
<tr>
<td>1 in 260</td>
<td></td>
<td>600</td>
<td></td>
</tr>
</tbody>
</table>

4.6.5. 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.

4.7. STRUCTURAL DESIGN
4.7.1. 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.

4.7.2. 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 3.0, 5.1, 5.1.1 and 5.1.2. Bedding and trench details must be shown on the Engineering Plan.

Maximum and minimum permitted trench widths are shown on Standard Drawing No. 5.1, 5.1.1 and 5.1.2.

4.7.3. Cover

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

Table 4.3 Minimum Cover

<table>
<thead>
<tr>
<th>Location</th>
<th>Minimum Cover (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roads, berms, accesses and parking areas</td>
<td>900*</td>
</tr>
<tr>
<td>All other areas</td>
<td>750</td>
</tr>
</tbody>
</table>

*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 required. As shown in Standard Drawing 5.2.

4.8. PIPEWORK
Rubber ring 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 (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. INFLTRATION CONTROL**

**4.9.1. 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. Refer Clause 4.10.3.

**4.9.2. 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 Utility Asset Utilities Manager.

**4.9.3. 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.

**4.10. PIPE LAYING AND TESTING**

**4.10.1. Pipeline Location**

Wastewater pipelines must be sited in accordance with the standard position allocated by the Council. Refer Standard Drawing 1.2.

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**

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

**NOTE** – 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 watermain are parallel. The wastewater pipe should always be located below the watermain to minimise the possibility of backflow contamination in the event of a main break.

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.

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 over 300mm 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.

Public wastewater drainage pipes are to be laid in Council controlled land. Where this is unavoidable, pipelines must be sited so as not to reduce the building area available on the lot (that is, within the front, side or rear yard areas). Easements must be minimum 3 metre width and will be required for all wastewater reticulation pipelines and for all lateral connections serving other than the affected lot. 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.
4.10.2. 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. 5.1, 5.1.1 and 5.1.2.

Connections to the existing wastewater drainage system must be carried out by an approved person under the supervision of the appropriate Council staff. See Clause 1.9.1.

4.10.3. 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.

4.10.4. Pipe Testing

4.10.4.1. 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 during 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.

4.10.4.2. Air Testing

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

4.10.4.3. Water Testing

Where required, water testing will be in accordance with:

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

4.10.4.4. Closed Circuit Television (CCTV) Inspection
All pipelines proposed to become public drains are to be CCTV surveyed after all other works have been completed. Refer clause 1.29. 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.

4.11. MANHOLES

4.11.1. Location

Manholes 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 not more than 100m on straight lengths.

4.11.2. Construction

Manholes must be constructed 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 5.3. 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 5.3. 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**

<table>
<thead>
<tr>
<th>Change of Direction</th>
<th>Additional Fall</th>
</tr>
</thead>
<tbody>
<tr>
<td>5° - 15°</td>
<td>25 mm</td>
</tr>
<tr>
<td>15° - 60°</td>
<td>50 mm</td>
</tr>
<tr>
<td>60° - 90°</td>
<td>75 mm</td>
</tr>
</tbody>
</table>
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.

4.11.3. Testing

Water testing must be required on all manholes. The test must be over 24 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.

4.12. LATERAL CONNECTIONS

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

4.12.1. Lateral

(a) Be served by a minimum 110mm OD 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 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 white 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.

4.12.2. 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;
Part 4 – Wastewater Drainage

(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 five residential lots, with a maximum potential of 35 persons, may be serviced by a single lateral of 110mm OD. This lateral must be laid in an access 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 110mm OD 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.

4.12.3. Inspection

The Utility Asset Utilities Manager reserves the right to require any connections to be opened for checking purposes at the time of Final Inspection. All laterals required in a development must be completed before the Final Inspection.

4.13. PUMP STATIONS

4.13.1. 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 MDC, see clause 4.12.3.

(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).

4.13.2. Public Pumping Stations

4.13.2.1. 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 Utility Asset Utilities Manager so as to retain compatibility with existing infrastructure.

4.13.2.2. 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.

4.13.2.3. 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.

4.13.2.4. 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.

4.13.2.5. 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 not concreted must be grassed.

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

4.13.2.7. 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

4.13.3. 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.

4.14. 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 Manawatu-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. PART 5 WATER SUPPLY

5.1. INTRODUCTION

Part 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:

- Water Supply Protection Regulations
- The Code of Practice for Fire Fighting Water Supplies
- The current Manawatu District Council Water Supply Development Plan
- The Manawatu District Council Design Criteria for Water Supply
- Manawatu District Council Water Supply by-law 2015 and any amendments
- Manawatu District Council Water Supply Mains Disinfection Code of Practice
- NZS 4404:2010 Land Development and Subdivision Engineering.

5.2. MANAWATU DISTRICT COUNCIL GENERAL REQUIREMENTS

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 new connections. Refer clause 1.9.1 and 1.9.2 of the standards. A list of the approved waterworks contractors is available from the Council. 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 Utilities 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. Refer clause 1.9.1 and 1.9.2.

5.2.1. or in a Nodal Area Business and Industrial

5.3. MANAWATU 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.
## Part 5 - Water Supply

<table>
<thead>
<tr>
<th>Standard</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS1628</td>
<td>Water Supply – Metallic Gate, Globe and Non-Return Valves</td>
</tr>
<tr>
<td>AS 1831</td>
<td>Ductile Cast Iron</td>
</tr>
<tr>
<td>AS 3571/AS 3572</td>
<td>Glass Filament Reinforced Thermosetting Plastics (GRP) Pipes – Polyester Based – Water Supply, Sewerage and Drainage Applications</td>
</tr>
<tr>
<td>AS/NZS 1477</td>
<td>PVC Pipes and Fittings for Pressure Applications</td>
</tr>
<tr>
<td>AS/NZS 2280</td>
<td>Ductile Iron Pipe and Fittings</td>
</tr>
<tr>
<td>AS/NZS 2566</td>
<td>Buried Flexible Pipelines – Structural Design and Installation</td>
</tr>
<tr>
<td>AS 2638</td>
<td>Sluice Valves for Waterworks Purposes</td>
</tr>
<tr>
<td>AS/NZS 4087</td>
<td>Metallic Flanges for Waterworks Purposes</td>
</tr>
<tr>
<td>AS/NZS 4129</td>
<td>Fittings for Polyethylene (PE) Pipes for Pressure Applications</td>
</tr>
<tr>
<td>AS/NZS 4130</td>
<td>Polyethylene (PE) Pipes for Pressure Applications</td>
</tr>
<tr>
<td>AS/NZS 4131</td>
<td>Polyethylene (PE) Compounds for Pressure Pipes and Fittings</td>
</tr>
<tr>
<td>AS/NZS 4158</td>
<td>Thermal-bonded Polymeric Coatings on Valves and Fittings for Water Industry Purposes</td>
</tr>
<tr>
<td>AS 4441</td>
<td>Blue series 2, Polyvinylchloride Oriented (PVC-O) pipe for Pressure Applications</td>
</tr>
<tr>
<td>NZS 4442</td>
<td>Welded Steel Pipes and Fittings for Water, Sewage and Medium Pressure Gas Applications</td>
</tr>
<tr>
<td>AS/NZS 4765</td>
<td>Modified PVC (PVC-M) Pipes for Pressure Applications</td>
</tr>
<tr>
<td>AS/NZS ISO9001</td>
<td>Quality Management Systems - Requirements</td>
</tr>
<tr>
<td>BS 381 C</td>
<td>Specification for Colours for Identification, Coding and Special Purposes</td>
</tr>
<tr>
<td>SNZ PAS 4509</td>
<td>Code of Practice for Firefighting Water Supplies</td>
</tr>
<tr>
<td>NZS 4404</td>
<td>Land Development and Subdivision Infrastructure</td>
</tr>
<tr>
<td>NZS 4442</td>
<td>Welded Steel Pipes and Fittings for Water, Sewage and Medium Pressure Gas</td>
</tr>
<tr>
<td>NZS 4501</td>
<td>Code of Practice for the Location Marking of Fire Hydrants</td>
</tr>
<tr>
<td>NZS 7643</td>
<td>Code of Practice for the Installation of unplasticised PVC Pipe Systems</td>
</tr>
<tr>
<td>NZS/AS 2033</td>
<td>Installation of Polyethylene Pipe Systems</td>
</tr>
</tbody>
</table>
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 & 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

**5.4. DESIGN REQUIREMENTS**

The reticulation design must conform to the current Code of Practice for Fire Fighting Water Supplies as promulgated by the NZ Fire Service.

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. However the minimum pipe size must be 150mm diameter.

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 (DN) internal diameter. OD is overall diameter. The reticulation must have a design life of at least 80 years.

**5.5. LAYOUT**
Part 5 - Water Supply

5.5.1 GENERAL

Water supply pipelines must be located in accordance with Standard Drawing 1.2. 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 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 450 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.

5.5.2 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.

5.5.3 "THROUGH" MAINS FOR CUL-DE-SACS

(a) 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 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.

5.5.4 "DEAD END" MAINS

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

5.5.5 SETTING OUT

(a) Principal and rider mains must be laid after the placement of kerb and channel. 450 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 land transfer pegs or temporary boundary marks placed by the registered surveyor responsible for the final land transfer 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 land transfer 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 100 mm of that used for pipes installed by open excavation.

5.5.6 VALVES

(a) Sluice valves with similar nominal diameter to the main must be provided at all junctions where water mains connect, so that there is one less valve than the number of branches. 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 350 m.

(b) Valving arrangements must be such that less than the following number of dwelling units will be affected by shut offs.

Table 5.1 Shut-off areas

(c) MDCA all valves are to be located behind the kerb and channel. Sluice valves at intersections must be located opposite kerb tangent points.

5.5.7 HYDRANTS

Fire hydrants must be provided on all water mains 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).

Hydrant spacing must be in accordance with the Code of Practice for Fire Fighting Water Supplies.

Where a residential private way is more than 65 m 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.
**5.5.8 SWAB INLETS**

Swab inlets must be provided on all principle watermains of DN100 or greater. The swab inlet must consist of a flanged Tee and risers of the same diameter as the principle main and must be brought up to within 150mm of the finished berm surface. The riser must be sealed with a blank cap drilled to AS/NZ4087 Table D. The swab inlets are to be located adjacent to the sluice valve at each end of the principle main. Swab inlets must be located within a standard valve box lid and surface box.

**5.5.9 PRINCIPAL MAINS**

The minimum size must not be less than 150mm NB for residential areas and 150mm NB for commercial and industrial areas.

The pipe sizes must be standardised as 150, 200, 250, 300, 375, 450, 525 and 575mm nominal diameter only.

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

- MPVC AS/NZ4765 (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).

**5.5.10 RIDER MAINS**

Rider mains must be 50mm nominal internal diameter and laid on the opposite side of the street to the principal main 450mm behind the face of the kerb. Refer Standard Drawing 5.1 and 5.2.

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 takeoff 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.

**5.5.11 SERVICE CONNECTIONS**

5.5.11.1 Service Pipe

Domestic service connection pipes must be blue or predominantly 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.
Part 5 - Water Supply

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

5.6. 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 Commercial 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.

5.6.1. 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 100mm 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.

5.7. 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 250 kPa and 800 kPa (25 m to 80 m).

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 water mains 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 should be designed for these pressures and include appropriate backflow prevention.

5.8. 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.

5.9. MATERIALS

5.9.1. Working Pressures

All pipes, fittings and other materials used in the construction of water mains and service pipes must be suitable for a minimum sustained working pressure of 1200 kPa (PN12). All materials used must be of the qualities and kinds specified and approved by the Utilities Manager.

Fittings such as tees, hydrant tees, crosses, tapers, hydrant risers, blank caps, plugs and bends of various degrees must be made of ductile iron and cast iron and must be nylon coated in accordance with AS/NZS4158, unless otherwise approved by the Utilities Manager.

5.9.2. Pipe

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 pipe must be coloured blue.

Pressure ratings must comply with Clause 5.6.1 i.e., 1200 kPa (PN12).

5.9.3. mPVC Pipe

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

5.10.1. 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 molybdenum based anticalling lubricant must be used.

5.10.2. “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.

5.11. SLUICE VALVES

Must comply with AS/NZS2638. They must be standard waterworks pattern, double flanged or double spigot with non-rising spindle. All sluice valves must be anti-clockwise 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 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.

5.11.1. Gate and Manifold Valves

All valves used in 50-mm rider mains must 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).

5.11.2. 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.

5.11.3. 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 5.4 and 5.5). 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 fire fighting supplies and NZS/BS 750.

Valve and Hydrant Markers

Refer Standard Drawing 5.4 and 5.5

5.12. CONSTRUCTION

<table>
<thead>
<tr>
<th>Item</th>
<th>Cover</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mains under carriageways</td>
<td>1000mm – 1500mm</td>
</tr>
<tr>
<td>Mains under berms and footpaths</td>
<td>750mm – 1000mm</td>
</tr>
<tr>
<td>Rider mains under carriageway and berms</td>
<td>750mm – 1000mm</td>
</tr>
<tr>
<td>Hydrant spindles</td>
<td>75mm – 225mm</td>
</tr>
</tbody>
</table>
**5.12.1. General**

The Utilities Manager may require the use of materials other than those listed above under certain circumstances and all materials used must meet with his approval.

**5.13. PIPE LAYING AND TESTING**

**5.13.1. Pipes**

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

**5.13.2. Trenches**

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

<table>
<thead>
<tr>
<th>Nominal Pipe Diameter</th>
<th>Trench Widths</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 mm - 100 mm</td>
<td>D + 300 mm</td>
</tr>
<tr>
<td>150 mm - 200 mm</td>
<td>D + 300 mm</td>
</tr>
<tr>
<td>250 mm - 300 mm</td>
<td>D + 300 mm</td>
</tr>
</tbody>
</table>

**5.13.3. Cover**

Cover over pipelines must conform with Table 5.3. Cover must be measured from the finished ground surface level of the development.

<table>
<thead>
<tr>
<th>Nominal Pipe Diameter</th>
<th>Cover Required over Pipelines</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5.13.4. Laying

Bedding and trench details for all pipelines must 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 17.5kPa 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

<table>
<thead>
<tr>
<th>Sieve Size, mm</th>
<th>Mass of samples passing, percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>19.0</td>
<td>100</td>
</tr>
<tr>
<td>2.36</td>
<td>50 to 100</td>
</tr>
<tr>
<td>0.6</td>
<td>20 to 90</td>
</tr>
<tr>
<td>0.3</td>
<td>10 to 60</td>
</tr>
</tbody>
</table>
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.

### 5.13.5. 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.

### 5.13.6. 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. Refer Table 5.4 for cover details.

### 5.13.7. 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.

### 5.13.8. Valve and Hydrant Markers

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

### 5.14. MANAWATU DISTRICT FLOW TESTING OF PIPES

The completed water supply reticulation must be flow tested by the Developer 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.

#### 5.14.1. 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**
Part 5 - Water Supply

(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) Testing must be carried out in accordance with NZS 7643 and in lengths/sections agreed by the Utilities Manager;

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

(c) The pressure must be raised at a steady rate without shock loading;

(d) 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;

(e) 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.

5.14.2. Disinfection and testing

Disinfection and testing must comply with the Manawatu 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.
### 5.15. CONNECTIONS

#### 5.15.1. 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 100mm 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.

#### 5.15.2. 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 Manawatu District Council Water Supply By-Law 1996 and its amendments.

#### 5.15.3. 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 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 access must be serviced from the street.
5.15.4. 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 in accordance with Clause 5.9.2.1.

For 2 – 6 Lots

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 7 or more Lots

Service lines that serve more than six lots must be ‘through’ lines.

Table 5.4 Service Connections

<table>
<thead>
<tr>
<th>Nominal Internal Diameter of Service Pipe (mm)</th>
<th>Maximum Number of Single Dwelling Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>1</td>
</tr>
<tr>
<td>25</td>
<td>3</td>
</tr>
<tr>
<td>32</td>
<td>4</td>
</tr>
<tr>
<td>40</td>
<td>6</td>
</tr>
</tbody>
</table>

5.15.5. 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.

5.15.6. Metered Services


5.16. 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 Manawatu 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 Manawatu 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.


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. Refer Clause 1.11.2

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 80 years.
Where open watercourses 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 of the 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
- Biofiltration 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.

6.2. 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.
6.3. 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).

6.4. 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

6.5. MANAWATU DISTRICT OPEN WATERCOURSES

Natural watercourses where there is no requirement for piping must be retained and must be located in public or designated reserves.

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.
6.6. 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 Gradients

<table>
<thead>
<tr>
<th>Nominal Pipe Diameter</th>
<th>Minimum Allowable Gradient</th>
</tr>
</thead>
<tbody>
<tr>
<td>150 mm</td>
<td>1 in 150</td>
</tr>
<tr>
<td>225 mm</td>
<td>1 in 260</td>
</tr>
<tr>
<td>300 mm</td>
<td>1 in 390</td>
</tr>
<tr>
<td>375 mm</td>
<td>1 in 525</td>
</tr>
<tr>
<td>450 mm</td>
<td>1 in 650</td>
</tr>
<tr>
<td>525 mm</td>
<td>1 in 800</td>
</tr>
<tr>
<td>600 mm</td>
<td>1 in 900</td>
</tr>
</tbody>
</table>

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 drowned, 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 Engineer.

6.7. STRUCTURAL DESIGN

6.7.1. 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.

### 6.7.2. Bedding

Refer Clause 4.6.2

Maximum and minimum permitted trench widths are as follows:

<table>
<thead>
<tr>
<th>Pipe Type</th>
<th>Minimum Width</th>
<th>Maximum Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete</td>
<td>Dia + 400mm</td>
<td>Dia + 600mm</td>
</tr>
<tr>
<td>uPVC</td>
<td>Dia + 200mm</td>
<td>Dia + 400mm</td>
</tr>
</tbody>
</table>

### 6.7.3. Cover

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

<table>
<thead>
<tr>
<th>Location</th>
<th>Minimum Cover (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roads, berms, accesses and parking areas</td>
<td>750*</td>
</tr>
<tr>
<td>All other areas</td>
<td>600</td>
</tr>
</tbody>
</table>

* During construction, pipework may require ramped metal protection.

The manufacturer’s 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.

### 6.8. 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.

6.9. PIPE LAYING AND TESTING

6.9.1. 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.

Public stormwater drainage pipes are to be laid in Council controlled land. Where this is unavoidable, pipelines must be sited so as not to reduce the building area available on the lot (that is, within the front, side or rear yard areas). Easements must be minimum 3 metre width and will be required for all wastewater reticulation pipelines and for all lateral connections serving other than the affected lot. 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.

6.9.2. 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.

Connections to the existing stormwater drainage system must be carried out by an approved person under the supervision of the appropriate Council staff. Refer Clause 1.9.1.

All pipes must have an approved flexible sealed joint.

6.9.3. 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 4.9.4.
6.10. MANHOLES

6.10.1. 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.

6.10.2. Construction

Manholes must be constructed in accordance with the details shown on Standard Drawing 6.1 and 6.2. 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 5.3.

Pipelines of diameter 300mm or less must be provided with additional fall at manholes as following:
6.10.3. Specials

Manholes on pipelines of 1200mm 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 6.2.

6.10.4. 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.

6.10.5. 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.

6.11. SUMPS

6.11.1. Construction

Sumps must be constructed in accordance with Standard Drawing 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.

6.11.2. 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.

<table>
<thead>
<tr>
<th>Change of Direction</th>
<th>Additional Fall</th>
</tr>
</thead>
<tbody>
<tr>
<td>5° - 15°</td>
<td>25 mm</td>
</tr>
<tr>
<td>15° - 75°</td>
<td>50 mm</td>
</tr>
<tr>
<td>75° - 90°</td>
<td>75 mm</td>
</tr>
</tbody>
</table>
Part 6 – Stormwater Drainage

(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 cross fall 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-desac bulbs) The sumps must be interconnected with a 200mm minimum diameter pipe. Only one outlet must be provided for.

6.11.3. 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 6.3. Refer Clause 3.6.4.

6.11.4. Connection

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

6.12. CULVERTS

Culvert design must comply with the Manawatu 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 6.6 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.

6.13. 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 inlet 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 Manawatu River 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.

### 6.14. 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:

<table>
<thead>
<tr>
<th>No.</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i)</td>
<td>Each front residential lot must have a 110mm OD 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.</td>
</tr>
<tr>
<td>(ii)</td>
<td>Corner residential lots must be provided with two such stormwater connections, one to each frontage.</td>
</tr>
<tr>
<td>(iii)</td>
<td>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.</td>
</tr>
<tr>
<td>(iv)</td>
<td>Single rear residential lots must be serviced by a 110mm OD lateral.</td>
</tr>
<tr>
<td>(v)</td>
<td>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 110mm OD. Where the size is determined to be 160mm OD or more this must be connected directly to the stormwater system and terminate in a manhole. See Standard Drawing 4.3 Inspection chambers are required at the junction. See Standard Drawing 4.5. Where no stormwater system is available a suitable design detail must be submitted for engineering approval.</td>
</tr>
<tr>
<td>(vi)</td>
<td>Lateral connections to sumps are only permitted if no other option is available.</td>
</tr>
<tr>
<td>(vii)</td>
<td>An approved plug, or cap of appropriate material must be installed on the last pipe of the lateral connection and securely fastened.</td>
</tr>
<tr>
<td>(viii)</td>
<td>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.</td>
</tr>
</tbody>
</table>
(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, raingardens, 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 calculation 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. Refer to Standard Drawing 6.7.

(k) 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 an appropriate stormwater treatment devices (to be determined in conjunction with Council Engineers).

6.14.1. Inspection

The Utilities Manager may require any lateral connections to be opened for inspection. All laterals must be constructed prior to Final Inspection. Refer Clause 1.29.

6.15. 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 a s224c certificate. Prior to the issue of the s224c 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.

6.16. 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. Refer Clause 2.4.6.

6.17. DRAINAGE OF RURAL ROADS

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

6.18. HEADWALLS

Refer Standard Drawing 4.5
## 7. DRAWING LIST

<table>
<thead>
<tr>
<th>Drawing No.</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General</strong></td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>Standard Symbols and G.I.S. Codes</td>
</tr>
<tr>
<td>1.2</td>
<td>Standard Location of Services in Road Reserve</td>
</tr>
<tr>
<td>1.3</td>
<td>Trench Cross Section for Existing Roads and Footpaths</td>
</tr>
<tr>
<td><strong>Roading</strong></td>
<td></td>
</tr>
<tr>
<td>3.1</td>
<td>Mobility Crossing and Corner Splay Details</td>
</tr>
<tr>
<td>3.2</td>
<td>Intersection Detail</td>
</tr>
<tr>
<td>3.3</td>
<td>Rural/Rural Residential Road Intersection (VPD 0-500)</td>
</tr>
<tr>
<td>3.4</td>
<td>Rural Road/Accessway Entrance – Edge Protection - Drain Depth &gt;1000mm</td>
</tr>
<tr>
<td>3.4.1</td>
<td>Rural Road/Accessway Entrance – Edge Protection for Drain Depth &lt;1000mm</td>
</tr>
<tr>
<td>3.5</td>
<td>Dish Channel and Subgrade Drainage</td>
</tr>
<tr>
<td>3.6</td>
<td>Minimum Cul-de-sac Head Design</td>
</tr>
<tr>
<td>3.6.1</td>
<td>Cul de Sac Detail Servicing more than 10 Allotments</td>
</tr>
<tr>
<td>3.7</td>
<td>Rural Road (VPD 0-500) Typical Details</td>
</tr>
<tr>
<td>3.8</td>
<td>Rural Road Open Drain Typical Details</td>
</tr>
<tr>
<td>3.9</td>
<td>Rural Road (VPD 0-500). Typical Cross Section</td>
</tr>
<tr>
<td>3.9.1</td>
<td>Urban/Rural Residential/Rural Road. Typical Cross Section</td>
</tr>
<tr>
<td>3.10</td>
<td>Standard 150mm Kerb and Channel Details</td>
</tr>
<tr>
<td>3.10.1</td>
<td>Kerbs for Traffic Islands, Roundabouts and Raised Medians</td>
</tr>
<tr>
<td>3.11</td>
<td>Stormwater to Kerb</td>
</tr>
</tbody>
</table>
## Part 7 – Drawing List

<table>
<thead>
<tr>
<th>Drawing No.</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.12</td>
<td>Footpath Details</td>
</tr>
<tr>
<td>3.13</td>
<td>Maximum Breakover Angles for Vehicular Access to Property</td>
</tr>
<tr>
<td>3.14</td>
<td>Dish Vehicle Crossing (Full Width Hotmix Footpath)</td>
</tr>
<tr>
<td>3.15</td>
<td>Dish Vehicle Crossing (Concrete Footpath)</td>
</tr>
<tr>
<td>3.16</td>
<td>Dish Vehicle Crossing – Channel Detail</td>
</tr>
<tr>
<td>3.17</td>
<td>Dish Vehicle Crossing – Cross Sections</td>
</tr>
<tr>
<td>3.18</td>
<td>Plate Vehicle Crossing</td>
</tr>
<tr>
<td>3.19</td>
<td>Plate Vehicle Crossing – Channel Detail</td>
</tr>
<tr>
<td>3.20</td>
<td>Paved Vehicle Crossing (for existing paved areas only)</td>
</tr>
<tr>
<td>3.21</td>
<td>Repair of Vehicle Crossing – General Position</td>
</tr>
<tr>
<td>3.22</td>
<td>Rural Vehicle Crossing – One Lot</td>
</tr>
<tr>
<td>3.23</td>
<td>Rural Vehicle Crossing – 2 - 4 Lots</td>
</tr>
<tr>
<td>3.24</td>
<td>Business and Industrial Service Lane, and Access to Rear Lot – Typical Cross Section</td>
</tr>
<tr>
<td>3.25</td>
<td>Pedestrian/Cycleway Accessway – Barrier and Crossing</td>
</tr>
<tr>
<td>3.25.1</td>
<td>Pedestrian/Cycleway Accessway – Cross Section Details</td>
</tr>
<tr>
<td>3.26</td>
<td>Bus Bay Design</td>
</tr>
<tr>
<td>3.27</td>
<td>Residential Access to Rear Lots – One to Three Lots</td>
</tr>
<tr>
<td>3.27.1</td>
<td>Shared access of Two to Three lots</td>
</tr>
<tr>
<td>3.28</td>
<td>Residential Access to Rear Lots – Four to Six Lots</td>
</tr>
<tr>
<td>3.29</td>
<td>Rural - Access to Rear Lots</td>
</tr>
<tr>
<td>3.30</td>
<td>Steel Lighting Columns for Streets</td>
</tr>
<tr>
<td>Part 7 – Drawing List</td>
<td>Page 126</td>
</tr>
<tr>
<td>-----------------------</td>
<td>---------</td>
</tr>
<tr>
<td>3.31</td>
<td>Raised Gardens</td>
</tr>
<tr>
<td>3.31.1</td>
<td>Street Tree Plan</td>
</tr>
<tr>
<td>3.32</td>
<td>Stormwater &amp; Sewer Access Chamber Lid Securing Details</td>
</tr>
<tr>
<td>3.33</td>
<td>Asphalitic Concrete Resurfacing – Cul de Sac Bowls</td>
</tr>
<tr>
<td>3.34</td>
<td>Screw Mounted Bollard</td>
</tr>
<tr>
<td><strong>Wastewater</strong></td>
<td></td>
</tr>
<tr>
<td>4.1</td>
<td>Pipe Trenching Details – Wastewater and Stormwater</td>
</tr>
<tr>
<td>4.2</td>
<td>Anti-scour Blocks for Steep Pipelines</td>
</tr>
<tr>
<td>4.3</td>
<td>Manhole - Wastewater and Stormwater</td>
</tr>
<tr>
<td>4.4</td>
<td>Drop Manhole – Wastewater</td>
</tr>
<tr>
<td>4.4.1</td>
<td>Internal Drop Manhole - Wastewater</td>
</tr>
<tr>
<td>4.5</td>
<td>Typical Inspection Chamber for 100mm Pipe</td>
</tr>
<tr>
<td>4.6</td>
<td>Wastewater Pump Station – Level Monitoring</td>
</tr>
<tr>
<td><strong>Water Supply</strong></td>
<td></td>
</tr>
<tr>
<td>5.1</td>
<td>Layout of Valves and Hydrants</td>
</tr>
<tr>
<td>5.2</td>
<td>Layout of Watermains in Cul de Sac</td>
</tr>
<tr>
<td>5.3</td>
<td>50mm Rider Main or Right of Way Service Connection</td>
</tr>
<tr>
<td>5.4</td>
<td>Sluice Valve and Marker Installation</td>
</tr>
<tr>
<td>Section</td>
<td>Description</td>
</tr>
<tr>
<td>---------</td>
<td>-------------</td>
</tr>
<tr>
<td>5.5</td>
<td>Hydrant and Hydrant Marker Installation</td>
</tr>
<tr>
<td>5.6</td>
<td>Watermain – Pipelaying Details</td>
</tr>
<tr>
<td>5.6.1</td>
<td>Watermain – Thrust Block Details</td>
</tr>
<tr>
<td>5.7</td>
<td>Details of Box to Cover Air Valves (50mm dia.)</td>
</tr>
<tr>
<td>5.8</td>
<td>20mm ID Water Service Connection and Toby</td>
</tr>
<tr>
<td>5.9</td>
<td>25mm, 32mm &amp; 40mm Service Connection and Valve</td>
</tr>
</tbody>
</table>

**Stormwater**

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.1</td>
<td>Manhole for Large Dia. Pipes – 750mm to 1050mm</td>
</tr>
<tr>
<td>6.2</td>
<td>Manhole for Large Dia. Pipes – 1050mm Dia. Plus</td>
</tr>
<tr>
<td>6.3</td>
<td>Street Sump Details</td>
</tr>
<tr>
<td>6.3.1</td>
<td>Sump Details (Yard Sump/Small Sump)</td>
</tr>
<tr>
<td>6.4</td>
<td>Standard Grate Details</td>
</tr>
<tr>
<td>6.5</td>
<td>Vehicle Crossing (Heavy Duty and Standard) Well-up Sump</td>
</tr>
<tr>
<td>6.6</td>
<td>Standard Headwall Detail</td>
</tr>
<tr>
<td>6.7</td>
<td>Standard Soak Pit Detail (Residential)</td>
</tr>
</tbody>
</table>
PART 8 APPENDICES

Appendix 1  Developer checklist for Development Concept Plan

Appendix 2  Developer checklist for Engineering Drawings, Specifications and Reports

Appendix 3  Tonkin Taylor Report – Development of Land which is, or is likely to be, Subject to Erosion or Slippage. August 2005.

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
STANDARD DRAUGHTING SYMBOLS

SYMBOLS:
- ○ Proposed Manhole
- ◊ Existing Manhole
- □ Existing Valve
- ▶ Existing Fire Hydrant
- □ Existing Water Toby
- □ Existing Sump
- ▼ Existing Survey Marks
- ○ Existing Street Lights

LINE TYPES:

- Proposed Water
- S Proposed Wastewater
- SW Proposed Stormwater
- Existing Water
- Existing Wastewater
- Existing Stormwater
- LV Existing Power (Low Voltage)
- HV Existing Power (High Voltage)
- V Existing Power Ducts
- Existing Street Light Wiring
- T Existing Telecommunication Providers
- GAS Existing Gas

Scales: Not to scale

Plan No. 1.1

Sheet of Sheets
GENERAL LOCATION OF SERVICES IN ROAD RESERVE

TYPICAL CROSS SECTION

NOTE
Principal watermains are required on both sides of street on all arterial, industrial and dual carrigeway roads.

Scales: Not to scale
100mm wide Emulsion Band or Rubber Crack Sealer/PMB Bandage along line saw cut joints of new asphalt concrete surfacing.

Min. 300mm thick pavement:
- AP65 - 200mm thick
- M4/AP40 - 100mm thick

All compaction on trench backfilling in the carriageways, footpaths and vehicle crossings must achieve 7 blows per 50mm with Scala Penetrometer or a Clegg Impact value >40
- 100mm layer of NZTA:M/4 AP40 basecourse, Clegg Impact Value > 40 at top of basecourse layer

<table>
<thead>
<tr>
<th>Service</th>
<th>Road Pavement</th>
<th>Berm</th>
<th>Vehicle Access</th>
<th>Parking Areas</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wastewater</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Mains</td>
<td>900</td>
<td>750</td>
<td>900</td>
<td>900</td>
<td>750</td>
</tr>
<tr>
<td>- Service</td>
<td>900</td>
<td>750</td>
<td>900</td>
<td>900</td>
<td>750</td>
</tr>
<tr>
<td>Water Supply</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Mains</td>
<td>900</td>
<td>750</td>
<td>900</td>
<td>900</td>
<td>750</td>
</tr>
<tr>
<td>- Service</td>
<td>900</td>
<td>750</td>
<td>900</td>
<td>900</td>
<td>750</td>
</tr>
<tr>
<td>Stormwater</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Mains</td>
<td>900</td>
<td>750</td>
<td>900</td>
<td>900</td>
<td>750</td>
</tr>
<tr>
<td>- Service</td>
<td>900</td>
<td>750</td>
<td>900</td>
<td>900</td>
<td>750</td>
</tr>
<tr>
<td>Other Utilities</td>
<td>900</td>
<td>750</td>
<td>900</td>
<td>900</td>
<td>750</td>
</tr>
</tbody>
</table>

Notes:
- See Plan No. 5.1 and 5.1.1 for details on L and L

TRENCH REINSTATEMENT FOR EXISTING ROADS

Scales: Not to scale
**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.

---

**MOBILITY CROSSING & CORNER SPLAY DETAILS**

**LAYOUT OF MOBILITY CROSSING & CORNER SPLAY**

- **Mobility crossing to be "rolled up" into berm each side.**
  - 1 in 8 grade max.

- **Kerb to be graded down for 300mm or 600mm where there is no grass berm.**

---

**Note:**
- 100mm thick 20 MPa concrete on 100mm thick compacted NZTA:M4 AP40

---

**Plan No.**

3.1

**Sheet of Sheets**

---

**Mobility crossing at tangent points and at pedestrian/cycleway accessways.**

---

**Radius = 10.5m**

to kerb face

---

**Boundary**

**Inner berm**

**Concrete footpath**

**Grass berm**

**Kerb & Channel**

---

**9.0m Splay at primary road intersections**

**6.0m Splay at secondary road intersections**

---

**Legend:**
- **Boundary**
- **Inner berm**
- **Concrete footpath**
- **Grass berm**
- **Kerb & Channel**

---

**Footnotes:**
- 10mm step
- 1 in 8 Max.
- 1 in 8 Max.
- 1 in 20
- 1 in 20
- 1 in 8 Max.
Existing water channel to be diverted to be diverted through new culvert where possible

Seal to property boundary

Establish new gate position 15.0m (min) from road seal edge

Vehicle Crossing

Position of road culvert, Min. size 300mmØ ID. If installation of this size of culvert is not possible, please notify Council.

R6.0m

45° Splay

2.5m

1 in 10 taper to 2.5m width

20m

1 in 10 taper to 2.5m width

1 in 10 Taper to 2.5m Width

Legal Boundary

Edge of Seal

Extent of Seal Widening and Access Seal Area

Note:
The vehicle crossing pavement surface shall be constructed similar to the surface to the adjoining carriageway

STANDARD RURAL ACCESSWAY
Existing water channel to be diverted to be diverted through new culvert where possible

Seal to property boundary
45 ° Splay
Establish new gate position
15.0m (min) from road seal edge

Access Drive 3.0m Min

Position of road culvert, Min. size
300mmØ ID. If installation of this size of culvert is not possible, please notify Council.

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.

Water Channel

Legal Boundary

Edge of Seal

1 in 10 taper to 2.5m width

R6.0m

1 in 10 taper to 2.5m width

Centre of Crossing

2.5

20m

1 in 10 taper to 2.5m width

STANDARD RURAL RESIDENTIAL VEHICLE CROSSING - FREQUENT USED BY HEAVY VEHICLES
Position of road culvert, Min. size 300mmØ ID. If installation of this size of culvert is not possible, please notify Council.

Note:
The vehicle crossing's surface shall be constructed similar to the existing adjoining road's surface.

STANDARD RURAL VEHICLE CROSSING
Legal Boundary

6.0m radius both sides

Extent of seal from existing seal to legal boundary

Where a culvert is required, it shall be 300mmØ ID diameter, Reinforced Concrete, Rubber Ring Jointed (RCRRJ), and appropriately levelled and aligned.

Appropriate retaining or side batter to ensure integrity of pavement surface & traffic safety (e.g. reinforced concrete headwalls or concrete filled bags).

Notes:
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.
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.
The existing ground is to be excavated down to solid bearing and backfilled with a minimum of 300mm of metal placed and compacted.

Where the existing carriageway is sealed or paved, the vehicle crossing is to be sealed with a two coat seal coat, Grade 4 and 6 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.

Where the road environment dictates (such as steep gradients, etc.), specific design is required. Please consult with the Council's Roading Manager.

The locations of all new vehicle crossings must be approved by Council to ensure that site distances stipulated in the District Plan are met.

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 in Employment Act 1992. 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.

Contact Telecommunications, Power and Gas companies and the District Council for the locations of services prior to commencing any works.
Note:
All sumps to be located on upstream side of a mobility crossing.

KEY
Direction of flow

New Kerb & Channel
New Kerb & Channel
New Kerb & Channel
New Sumps

Low Spot

New Mobility Crossings

Existing Footpath

Existing Kerb & Channel

New Sump

New Sump

Sawcut seal

Existing Street

New Pram Crossings

NOTE: This detail applies where footpath, kerb and channel is to be removed from the existing street.

INTERSECTION DETAIL
EXISTING ROAD

Note: Existing Pavement to be Upgraded to Similar Standard to New Road Unless it is Already to the Required Standards.

JUNCTION WITH SECONDARY ROADS

Note: Existing Pavement to be Upgraded to Similar Standard to New Road Unless it is Already to the Required Standards.

JUNCTION WITH PRIMARY ROADS

RURAL/RURAL RESIDENTIAL ROAD INTERSECTION (VPD 0-500)
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

3. 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.

4. 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.

5. Concrete filled bags culvert headwalls may be used with the approval of Council's Roading Manager.
NOTES:
1. Refer also to standard Drawing No. 3.2.2 & 3.2.3
2. Timber posts to be treated to H5 specification.
3. Timber rails to be H3 treated.

RURAL ROAD/ACCESSWAY ENTRANCE-EDGE PROTECTION DRAIN DEPTH >1.0m
DISHED CHANNEL

20 MPa Concrete

Basecourse
Subgrade

Approved Drainage Material
110mmØ flexible PVC perforated pipe with filter cloth. Connect to sump outlets

SUBGRADE DRAINAGE DETAIL AT KERB

DISH CHANNEL AND SUBGRADE DRAINAGE
Note:
Industrial Cul de Sac min. radius 15m.
Islands are not permitted

Note:
Carriageway width vary

Footpath and boundary need not be concentric with kerb.
All radii shown are minimum radii.

MINIMUM CUL-DE-SAC HEAD DESIGN
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

Scales: Not to scale
Plan No. 3.7
Sheet of Sheets
Where the gradient of the open drain is steeper than 1 in 15 or where soil type has the potential to erode use "Enkamat W" or similar.

NOTE:
"Enkamat W" or similar to be installed to manufacturers instructions.

RURAL ROAD OPEN DRAIN TYPICAL DETAILS
SIDE SLOPE DETAIL

TYPICAL CROSS SECTION

NOTES:

(i) Pavement depth to be designed

(ii) Adopt which ever provides the greater depth:
    a) 400mm below the seal edge or
    b) 150mm below the pavement subbase and subgrade interface

(iii) For batter slopes steeper than 1.5:1 engineering design will be required.

DESIRED SERVICE LOCATION (for both sides)

RURAL ROAD (VPD 0-500) TYPICAL CROSS SECTION
STANDARD MOUNTABLE KERB

20 MPa Concrete

KERB FOR TRAFFIC ISLAND, ROUNDABOUTS & RAISED MEDIANS
DETAIL OF STANDARD KERB & CHANNEL

CHAMFER

DETAIL OF ALTERNATIVE KERB & CHANNEL

20 MPa Concrete

STANDARD 150mm KERB & CHANNEL DETAILS
PVC Novadrain 110 Kerb Outlet or similar

KERB OUTLET

110mmØ PVC pipe complying to NZS/AS 1260 with an SN value not less than than 10

Concrete of Asphalt Footpath

Boundary

4% Crossfall

2% Crossfall

110mmØ Kerb Outlet or similar

Kerb outlet at invert of channel

200mm trench width

Sawcuts

Plaster kerb with 3 Sand : 1 Cement mixed with either 40% Araplex : 60% Water or Febfix

75mm thick Turf or topsoil, sow with coated Grass Seed

100mm thick 20 MPa Concrete footpath

30mm thick Mix 5 or 10 Asphalt Footpath with Emulsion Tack Coat.

PROPERTY STORMWATER DISCHARGE TO KERB

Scales: Not to scale

Plan No.

3.11

Sheet of Sheets
CONCRETE FOOTPATH DETAILS

DETAIL OF CONCRETE FOOTPATH
(Excluding Vehicle Crossings)

All footpaths must be constructed on a layer of 100mm-minimum compacted NZTA M/4 basecourse on sound foundation (95% Standard Compaction).

20 MPa concrete
Ready Mix Concrete Only

SECTION OF LOW LEVEL FOOTPATH
(Excluding Vehicle Crossings)
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
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.
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
H.R.C. 665 mesh reinforcement, overlap all reinforcement 150mm centres.

Carriageway

Sawcut

NZTA Mix 10 AC

45° Chamfer

300

20

75

x

Undercut to road pavement sub-base depth.

Compacted metal to achieve sound foundation.

Note:
All steel to have 50mm min. cover

SECTION 'A'-'A'

NB:
Residential 20MPa, X=150mm thick certified concrete only.
Commercial 25MPa, X=200mm thick certified concrete only.
Industrial 30MPa, X=300mm thick certified concrete only.

DISH VEHICLE CROSSING - CHANNEL DETAIL
STANDARD CONCRETE VEHICLE CROSSING

Concrete ramp reinforced with HRC 665 mesh, 50mm from bottom of crossing.

Section of footpath, crossfall not to exceed 2%

1.5m Min. Footpath

20mm step with 45° chamfer.
See Std Dwg No. 3.16

600
Berm

Boundary Line

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 Dwg 3.13 for breakover angles.

20mm step with 45° chamfer.
See Std Dwg No. 3.16

600

Crossing sub-base to be compacted metal to achieve a sound foundation.

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 CROSSING - CROSS SECTIONS
PLATE VEHICLE CROSSING

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.

Crossings greater than 3.0m may require separate resource consent.

This Section of the crossing is for pedestrians and shall match the crossfall of the adjacent footpath and not exceed 2%. If maintaining the required crossfall through the pedestrian section of the vehicle crossing is unattainable, specific design will be required that includes the adjacent footpath being ramped up/down to tie-in at no greater than 1:12(8%). This design will require the approval of the Council’s Roading Manager.
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, 200mm thick certified concrete only.
HEAVY DUTY CONCRETE RESIDENTIAL VEHICLE CROSSING (2 OR MORE PROPERTIES)

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 (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.
SECTION A-A

Repaired section 1.0m Min

Existing Crossing
665 mesh reinforcement.

Tied

AP100 River run

Varies

Existing Kerb & Channel

Trench width
500mm Min

12mmØ deformed starter rods, 250mm long, at 400 crs., 150mm exposed - 100mm drilled and epoxied to existing. (Ramset or Similar)

Service Pipe

Repaired Section 800mm Min

Boundary line

Existing crossing

Note:
1. Residential 15MPa, 150mm thick certified concrete only.
2. Commercial 30MPa, 200mm thick certified concrete only.
3. Industrial 30MPa, 200mm thick certified concrete only.

REPAIR OF VEHICLE CROSSING - GENERAL POSITION
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.
3.0m BUS BAY

14m for one bus + 12m each extra bus

20m RAD

10m RAD

Bus Stop Sign

Parking when permitted.

3.5m BUS BAY

8m for one bus

+12m each extra bus

20m RAD

10m RAD

Parking when permitted.
5.0m min. 5-7 Lots
3.5m min. 2-4 Lots
3.0m min. 1 Lot

Basecourse 100mm thick NZTA M4
2 Coat Chipseal Grade 3 / 5
Kerb and Channel if required

3.5m min. 2-4 Lots
2 Coat Chipseal Grade 3 / 5

Concrete Nib if required

20mm
1 in 30 Crossfall

Subbase AP65 Aggregate - 200mm Min. thickness to be specifically designed
River run Backfill

Concrete Nib if required

Min. 150mm River run metal AP100 compacted to achieve 95% Standard Compaction

CONCRETE ALTERNATIVE

Note:
Concrete ROW’s may be drained to the centre.

Note
1. Pavement formation depths to be designed.
2. Surfacing - 2 coat chipseal, sizes 3 & 5 or 30mm of Mix 10 asphaltic concrete
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 ACCESS TO REAR LOTS - 1 TO 6 LOTS
Notes:

1. For batter slopes steeper than 1.5:1, Engineering design report will be required.
2. Drainage details as for rural road requirements. Refer to Drawing No. 3.4 and 3.7

* The minimum width of 8.0m must be increased to include cut and fill batters and roadside drainage

RURAL ACCESS TO REAR LOTS

Scales: Not to scale
Plan No. 3.29
Sheet of 1
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 RDC.
- For decorative installation proposed luminaires and poles to be approved by RDC.

Structural Notes:
- Minimum allowable 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 sued, no additional attachments can be placed on pole without Spunlite's approval.
- 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 Pole and Luminaire details for new Category P3 and P4 Residential Lighting see:

TYPICAL STEEL LIGHTING COLUMNS FOR STREETS
SECTION

FOR USE WITH PIPES OF 1050mmØ & OVER INTERNAL DIA. WHERE NO JUNCTION IS REQUIRED.

NOTE:
Bends may be installed adjacent to a manhole using splay cut epoxy jointed specials.

PLAN

Heavy Duty Cast Iron cover and frame flush with surface

Step irons at 300mm centers
Seal bolt holes with epoxy mortar

Epoxy 1050mmØ riser to centre of pipe.

Up to 30° per joint
Epoxy joint

Note:
The jointing of the off-take riser to pipe & bend special work must be carried out by the Pipe Manufacturer.

MANHOLE FOR LARGE DIAMETER CONCRETE PIPES - 1050mm DIA. PLUS
Precast Sump Base
Hynds SUMPPB-LHCC
or approved equivalent.

225mm Ø Stormwater pipe min.

Precast Sump Top with Frame & Grate. Hynds SUMPTFG-WDC or approved equivalent.

225mm Ø Stormwater pipe min.

Precast Sump Base
Hynds SUMPPB-LHCC or approved equivalent.

Precast Sump Top with Frame & Grate. Hynds SUMPTFG-WDC or approved equivalent.

225mm Ø Stormwater pipe min.

Precast Sump Base
Hynds SUMPPB-LHCC or approved equivalent.

Precast Sump Top with Frame & Grate. Hynds SUMPTFG-WDC or approved equivalent.

225mm Ø Stormwater pipe min.

Precast Sump Base
Hynds SUMPPB-LHCC or approved equivalent.

Precast Sump Top with Frame & Grate. Hynds SUMPTFG-WDC or approved equivalent.

225mm Ø Stormwater pipe min.

Precast Sump Base
Hynds SUMPPB-LHCC or approved equivalent.

Precast Sump Top with Frame & Grate. Hynds SUMPTFG-WDC or approved equivalent.

225mm Ø Stormwater pipe min.

Precast Sump Base
Hynds SUMPPB-LHCC or approved equivalent.

Precast Sump Top with Frame & Grate. Hynds SUMPTFG-WDC or approved equivalent.

225mm Ø Stormwater pipe min.

Precast Sump Base
Hynds SUMPPB-LHCC or approved equivalent.

Precast Sump Top with Frame & Grate. Hynds SUMPTFG-WDC or approved equivalent.

225mm Ø Stormwater pipe min.

Precast Sump Base
Hynds SUMPPB-LHCC or approved equivalent.

Precast Sump Top with Frame & Grate. Hynds SUMPTFG-WDC or approved equivalent.

225mm Ø Stormwater pipe min.
YARD SUMP

450 X 450 Cast Iron Cover

Min. 225mm Ø Stormwater pipe

FOOTPATH/SMALL SUMP

300 X 300 Cast Iron Cover

Min. 150mm Ø Stormwater pipe

Note:
Nominal grate size shown.
To conform with manufacturer's dimensions.
STANDARD SUMP GRATE DETAILS

Note
Where grates are replaced on frames with no centre supports the grate should have deeper sections, i.e., greater than 45mm to distribute loading.

PLAN VIEW OF FRAME

Minimum supports required

Scales: Not to scale
Plan No.

4.3

Sheet of Sheets
DN100mmØ SN10 PVC-U pipe complying to AS/NZS 1260: PVC-U pipes and fittings for drain waste and vent applications.

"WEBFORGE"
Well-up sump grate

Grate

Vehicle Crossing.

DN100mmØ SN10 PVC-U pipe complying to AS/NZS 1260: PVC-U pipes and fittings for drain waste and vent applications.

VEHICLE CROSSING (HEAVY DUTY & STANDARD) WELL-UP - SUMP

Scales: Not to scale
Plan No.
4.4
Sheet of Sheets
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**
**Embedment Zones Dimensions for Flexible Pipelines**

<table>
<thead>
<tr>
<th>Nominal Diameter (mm)</th>
<th>Bedding Zone, $l_b$ (mm)</th>
<th>Horizontal Distance between spring line and trench line, $l_h$ (mm)</th>
<th>Overlay Zone, $l_o$ (mm)</th>
<th>Trench width, $E$ (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>75</td>
<td>100</td>
<td>100</td>
<td>310</td>
</tr>
<tr>
<td>150-225</td>
<td>100</td>
<td>150</td>
<td>150</td>
<td>460-550</td>
</tr>
<tr>
<td>300-375</td>
<td>100</td>
<td>200</td>
<td>150</td>
<td>715-800</td>
</tr>
<tr>
<td>475-525</td>
<td>150</td>
<td>300</td>
<td>150</td>
<td>1100-1230</td>
</tr>
</tbody>
</table>

Carriageways & Parking Areas
Road pavement basecourse and subbase aggregate. See Plan No. 3.0 for details.

Berms & Other Non-Traffic Areas
See Plan No. 3.0 for details.

Min. - 300mm thick pavement

AP100 River Run

Min. - 100mm thick Topsoil - Sow Grass

Aluminum Detector Tape - Water Pipes only

Ordinary Fill - Material containing not more than 20% by mass of stones, particle size 75-150mm Ø.

* Embedment Zone Material
See Plan No. 5.1.2

**PVC Pipes**

**Flexible Pipe Trenching Details - Water, Wastewater & Stormwater**
### AS/NZS 3725 TABLE 6 and AS/NZS 2566.2 TABLE G2

#### GRADING LIMITS FOR ACCEPTABLE EMBEDMENT MATERIALS

<table>
<thead>
<tr>
<th>Sieve Size (mm)</th>
<th>Mass of Sample Passing (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>100</td>
</tr>
<tr>
<td>2.36</td>
<td>50-100</td>
</tr>
<tr>
<td>0.6</td>
<td>20-90</td>
</tr>
<tr>
<td>0.3</td>
<td>10-60</td>
</tr>
<tr>
<td>0.15</td>
<td>0-25</td>
</tr>
<tr>
<td>0.075</td>
<td>0-10</td>
</tr>
</tbody>
</table>

---

**GRADING LIMITS FOR EMBEDMENT ZONE MATERIALS**
**Rigid Pipe Trenching Details - Wastewater & Stormwater**

**Embedment Zones Dimensions for Rigid Pipelines**

<table>
<thead>
<tr>
<th>Nominal Diameter (mm)</th>
<th>Bedding Zone, $x$ (mm)</th>
<th>Haunch Zone, $y$ (mm)</th>
<th>Overlay Zone, $z_a$ (mm)</th>
<th>Trench Width, $B$ (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤1200</td>
<td>100</td>
<td>$\frac{D}{3}$</td>
<td>300</td>
<td>880-1975</td>
</tr>
<tr>
<td>1350-1800</td>
<td>150</td>
<td>$\frac{D}{3}$</td>
<td>300</td>
<td>2135-2810</td>
</tr>
</tbody>
</table>
Bedding material with cement added to give a strength of not less than 7 MPa.

Dotted line indicates gradients steeper than 30%.

Block for 20% - 30% grades.

Note:
Spacing of anti-scour blocks is subject to Engineer's design.

ANti-SCOUR BLOCKS FOR STEEP PIPELINES
Stormwater and wastewater details as shown, apply to both upstream and downstream sides of the manhole.

- **STORMWATER DETAIL**
  - Continuous sand coated PVC pipe where in contact with concrete.
  - Single Flexible joints
  - Pour 20MPa concrete corbel up to flexible joint.

- **WASTEWATER DETAIL**
  - Channels to be constructed using half rounds uPVC or ceramic.
  - Double Flexible joints
  - Note: Stormwater MH’s may have mass conc. base 150mm min. below bottom of pipe.

- **MANHOLE - WASTEWATER & STORMWATER**

- **JOINT DETAIL**
  - Approved Rubber/Bitumen Sealing Strip.

- **RISER-LID DETAIL**
  - (Full height riser)
  - Approved sealing strip.

- **RISER-LID DETAIL**
  - (Riser shortened)
  - Dry pack mortar

- **Details**
  - 10 MPa site concrete (Min 75mm thickness).
  - Haunching 1 in 3 minimum width 190mm
  - Seal with epoxy mortar or flexible sealant.
  - Standard precast 1050Ø manhole section with fitted base.
  - See joint detail
  - Stepped at 300mm crs. Seal bolt holes with epoxy mortar
  - Topsoil or Hotmix
  - Concrete Haunching
  - Heavy Duty Cast Iron cover & frame flush with surface
  - Heavy Duty Lid
  - Note: Stormwater MH’s bottom of pipe.
  - Continuous sand coated PVC pipe with concrete.
  - Minimum width 190mm

- **Plan**
  - Manhole section with fitted base.
  - Scales: Not to scale
  - Plan No. 5.3
  - Sheet of Sheets
Pour 17.5 MPa concrete corbel up to flexible joint.

PVC Dropper pipe to be installed as close as possible to MH riser.

Seal with epoxy mortar or flexible sealant. 10mm Dia. x 40mm long stainless steel anchor connector.

10 MPa blinding concrete. Min. thickness 75mm.

Double Flexible Joint

Plain Junction

Provide screw cap

20mm x 0.8mm stainless steel strap at 1.5m max. spacings. Seal with epoxy mortar or flexible sealant.

Pour 17.5 MPa concrete corbel upto flexible joint.

Standard precast manhole with fitted base.

PE coated hot dipped galvanised 'non slip' stepped rungs at 300mm crs. Seal bolt holes with epoxy mortar.

Approved rubber/bitumen sealing strip

Approved sealing strip

Dry Pack Mortar

Topsoil or Hotmix

Concrete Haunching

Heavy Duty Lid

Heavy Duty Cast Iron cover & Frame

Flush with surface

See Joint Detail

100mm Ø or 150mm Ø Sewer

INTERNAL DROP MANHOLE - WASTEWATER
750 Max. Detail
RISER-LID (Full height riser)
Sealing Strip. Bitumen Rubber/Approved
Approved sealing strip.

750 Max. Detail
RISER-LID (Riser shortened)
Double Flexible joints
Provide screw cap
Seal with Epoxy mortar or flexible sealant.

750 approx.
Double Flexible joints
10 Min.

20MPa Concrete surround to drop structure. Pour to undisturbed ground.
Bond to Manhole by scabbling or with epoxy bonding agent.

1:3 Haunching
10 MPa site concrete (Min 75mm thickness).

Pour 20MPa concrete corbel up to flexible joint.
Detailed for Concrete & PVC-U pipelines from manhole.

Bond to Manhole by scabbling or with epoxy bonding agent.

100 Min.

Seal with Epoxy mortar or flexible sealant.

1:3 Haunching
20MPa Concrete

Seal bolt holes with epoxy mortar

Detail for drop structure.

20MPa Concrete surround to drop structure. Pour to undisturbed ground.

Approved Rubber/Bitumen Sealing Strip.

EXTERNAL DROP MANHOLE - WASTEWATER
For lid see Plan No. 5.3 & 5.4

Epoxy Mortar Riser

Corbel to extend 150mm each side of pipe

Pipe must be completely bonded to concrete base. An acceptable method for PVC-U pipes is either a manhole connector or a glued coating of sand to the outside of the pipe

Double Flexible joint at corbel to be provided within 500mm of the inspection chamber

Where this pipe stub has a downstream facing socket, it shall be encased as shown opposite

Single Flexible Joint to be provided within 500mm of the Inspection Chamber

Cut flush with wall of chamber

TYPICAL INSPECTION CHAMBER FOR 100mm Ø PIPE
Manhole Riser

Incoming Sewer

High Level Alarm

Pump 2 Start

Both Pumps Stop

Guide Rail

Lifting Chain

100mm Ø Rising main

Discharge

Non Return Valve

Isolating Valve

Four Hours Storage Required at 2 x DWF above High Level Alarm

2 Pumps of type removable from chamber by raising from discharge bend.

750mm Opening Heavy Duty

Isolating Valve

Discharge Bend

Pump 1 Starting Range to give no more than 10 starts per hour

Both Pumps Stop

Pump 2 Start

High Level Alarm

TYPICAL WASTEWATER PUMP STATION-LEVEL MONITORING
MANHOLE FOR LARGE DIA. PIPES - 750 to 1050mm

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.

Heavy Duty Cast Iron cover & frame flush with surface
Topsoil or Hotmix
Concrete fillet
Precast manhole cover
Precast manhole liners
1200, 1500 or 1800 internal diameter

Concrete fillet
Manhole liners embedded on mass concrete base 25mm above barrel of pipe. Alternatively precast base may be used. Haunching common to both

Flexible joint

Plan No. 5.7
Sheet of Sheets

Scales: Not to scale
50mm Rider Mains
Fed one end, max. 6 dwelling units
max. length 90m
Fed both ends, max. 20 dwelling units
max. length 200m.

25mm. or 32mm. Service to rear lots can be taken off rider main. Refer Engineering Standards for land development for set criteria.

Valve Spacing - Not exceeding 350m
Fire Hydrant Spacing
Not exceeding 135m Residential Streets
Not exceeding 90m Business and Industrial Street
SI = Swab Inlet

LAYOUT OF VALVES AND FIRE HYDRANTS
Principal main is to be connected with principal main in adjacent street.

63mm OD Rider Main to be connected to Principal main at both ends.

Walkway/cycleway or easement.

Principal Main

63mm OD Ø Rider Main

Gate Valve

63mm OD Ø Rider Main
to be connected to Principal main at both ends.
PLAN

DN50mm RIDER MAIN OR R.O.W. SERVICE CONNECTION

Scales: Not to scale

Plan No. 6.3

Sheet of Sheets
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
HYDRANT INSTALLATION

- Cast iron surface box
- Precast concrete surface box surround.
- Spindle cap.
- Precast concrete under blocks 520 x 675 x 110 (270 x 410 opening)
- Approved concrete base plate.

HYDRANT MARKER INSTALLATION

- “Scotchlite” strip on face at end of Cul-de-sac.
- Timber marker post painted yellow (Colour No. 356, B.S. 381 C).
- Ground level
- 6mm bolt

NOTE:
Hydrant must also be marked on road with yellow triangle and blue coloured R.P.M.

HYDRANT AND MARKER INSTALLATION
STANDARD THRUST BLOCKS
FOR 100mm Ø WATERMAIN
STANDARD WATER MAINS LAYING DETAILS

<table>
<thead>
<tr>
<th>ITEM</th>
<th>COVER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mains under carriageways</td>
<td>900mm (Min.)</td>
</tr>
<tr>
<td>Mains under berms and footpaths</td>
<td>750mm (Min.)</td>
</tr>
<tr>
<td>Rider mains under carriageways and berms</td>
<td>750mm (Min.)</td>
</tr>
<tr>
<td>Hydrant spindle</td>
<td>75mm (Min.) and 225mm (Max.)</td>
</tr>
<tr>
<td>Valve spindle</td>
<td>75mm (Min.) and 400mm (Max.)</td>
</tr>
<tr>
<td>Service pipes under carriageways</td>
<td>900mm (Min.)</td>
</tr>
<tr>
<td>Service pipes under berms and footpath</td>
<td>750mm (Min.)</td>
</tr>
<tr>
<td>Service pipes at road boundary</td>
<td>300mm (Max.)</td>
</tr>
</tbody>
</table>

WATER MAIN - PIPE LAYING DETAILS
Outlet of Air Valve must be min. 300mm above Ground Level.

35mm gap

4 x M12 Stainless Steel bolts with tubular spacers.

50mm gap

4 x M10 threaded studs welded to flanged top of box.

1.6mm thick Stainless Steel coloured Dark Green plus Reflector Strip.

400

150

50

55

35mm gap

Outlet of Air Valve must be min. 300mm above Ground Level.

4 x M12 Stainless Steel bolts with tubular spacers.

50mm gap

4 x M10 threaded studs welded to flanged top of box.

1.6mm thick Stainless Steel coloured Dark Green plus Reflector Strip.

AIR VALVES BOX BLOCK DETAILS
300mm Max.
235mm Min.
if no base in
meter box

250mm

Lower/Raise existing service to
meet min./max depth requirements

'ACUFLO' CM 2000 manifold centrally
located in meter box

PE adaptor

Gunmetal
Tapping
Band

Approved Self
Tapping Ferrule

MDPE80 Metric (Blue) pipe

Service Pipe

Supply Pipe

235mm Min. if
meter box is
installed with base

355mm Max.

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)

Meter Box with blue lid
marked "WATER" installed
on polyethylene base plate
**METER, RPZ AND CAGE STANDARD CONFIGURATION**

**FRONT VIEW**
- 25mm Ø Galvanised Steel Tube
- 335 Mesh Galvanised
- 2 Off 50x5mm Flat Plate
- Galvanised Gate Hinges

**PLAN VIEW**
- 25mm Ø Galvanised Steel Tube
- 335 Mesh
- 2 Off 50x5mm Flat Plate
- Embed Legs into Concrete Pad

**ELEVATION**
- Service
- Property Fence
- Water Main
- Edge Of Seal
- Point of Supply
- Strainer
- Distance Equals 4 x Meter Inlet Diameter
- 300mm Min. Clearance
- Approved Meter
- Approved Stainless Steel RPZ
- DN100 or Larger / Nylon Coated Steel Less Than DN100 / 316 Stainless Tube
- Approved Shut Off Valve
- 100mm thick Concrete Pad
- 665 Mesh, 45mm Top Cover

Fittings shown are indicative only.