# Tasman District Council

# Engineering Standards and Policies 2008

**Do it once – Do it right!**

**Kia ki te mea Tuatahi – Kia Oranga!**

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## FOREWORD

This 2008 edition of the Tasman District Council "Engineering Standards and Policies" is the result of an extensive review process aimed at encapsulating changes affecting Council's infrastructure.

The primary purpose of the Engineering Standards is to ensure that Council's assets achieve acceptable levels of service and that they are modern, cost-effective and durable.

The previous standards were approved by Council in January 2004. As technology and advancements in the way we do our business improve, so is the need for review.

Some of the technical changes affecting Council's infrastructure include:

- An assessment framework for alternative designs.
- New products and installation techniques.
- Global warming and potential sea level rise assessment.
- Formal training requirements for personnel working on Council's future assets.
- Clear guidance on accepted certificate of completed works and liability.
- Controls on erosion and sedimentation of ground that has been opened up.
- Standards of information submitted to Council.
- Consistency with the Tasman Resource Management Plan.

The 2008 review has resulted in a number of improvements. The document has been re-structured so that it is easier to follow. New design objectives have been written that clarify what Council is trying to achieve with the management of each asset. These objectives are tied in with Council's Activity Management Plans, and levels of service. The new structure sets out a more formal overview, document requirements, legal objectives, definitions, certification and designs followed by each of the infrastructural sections:

Each section is followed by the respective appendices and engineering plans which have been updated to reflect new advances in each infrastructure.

The Engineering Standards and Policies will require continuous review and amendment to reflect changes in engineering best practice and feedback from users.

Public enquiries regarding these Engineering Standards and Policies will be managed by the Engineering Department. Written comments on the standards should be sent to:

Development Engineer
Tasman District Council
Private Bag 4
RICHMOND 7050

Tasman District Council acknowledges the input of consultants, contractors, developers, surveyors, legal advisors, councillors and the general public to this edition of the Engineering Standards and Policies.

Peter Thomson
**Engineering Manager**
April 2008

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# 1 INTRODUCTION

The purpose of Council's Engineering Standards and Policies is to provide guidance and minimum standards for the design, construction and maintenance of all service infrastructure assets.

Design and construction in accordance with the standards ensures that all assets are managed effectively and efficiently.

The standards contained in this document serve as a basis for technical compliance for the subdivision and development of land, where these activities are subject to the Resource Management Act 1991 (RMA), and for the construction of assets under capital works contracts for Council. They also provide additional guidance to ensure the long-term cost effectiveness and efficiency of service provision to the Community.

## 1.1 Document Control

### 1.1.1 General

The Engineering Standards and Policies are a controlled document and amendment or re-issue is the responsibility of the Engineering Services Department of Tasman District Council delegated to the Engineering Manager.

### 1.1.2 Amendments

Amendments/reviews are carried out three-yearly. However, an earlier individual amendment may be made if an important alteration to a standard or technology arises.

Significant amendments will be reviewed and approved by Council's Engineering Services Committee.

### 1.1.3 Document Release

Each copy of the Engineering Standards and Policies will be available to existing copy holders and a register of these is held by the Engineering Manager.

### 1.1.4 Review Procedures

When the Engineering Standards and Policies are reviewed on a three-yearly cycle and once the draft document is approved by the Engineering Services Committee, the document will be submitted to interest groups for comment and feedback followed by a public consultation period. A panel comprising Councillors and Council staff will review and hear submissions on suggested amendments.

The review panel will confirm or otherwise amendments and/or submissions and subsequently approve the document for publication.

## 1.2 Legal Context

The provisions in these standards must be read within the context of the Tasman Resource Management Plan (TRMP), which is the primary guiding document for all land development and infrastructure works in the Tasman District. Compliance with it can ensure the sustainable management of all resources in accordance with the Resource Management Act 1991.

The standards are also aimed at providing a standard of service that will ensure the health, safety and wellbeing of people and communities living in the Tasman District in terms of the Local Government Act 2002. The Local Government Act requires that the Council determine and prioritise those projects and services that can ensure this. The Act also requires that Council deliver those projects and services in the most cost-effective way. The standards also ensure compliance with the following statutes:

- *Building Act 2004*
- *Land Transfer Act 1952*
- *Unit Titles Act 1972*
- *Property Law Act 1952*
- *Local Government Official Information and Meetings Act 1987 (LGOIMA)*

These statutes provide Council with the powers and functions to request, provide and supply information pertaining to the land. In addition to these, any developer must also be aware of and comply with the following statutes where applicable:

- *Electricity Act 1992*
- *Health and Safety in Employment Act 1992*
- *Land Transport Management Act 2003*
- *Plumbers, Fitters and Drainlayers Act 2006*
- *Telecommunications Act 2001*
- *Transit New Zealand Act 1989*
- *Water Supplies Protection Regulations 1961*

## 1.3 Objectives

The objectives of the Tasman District Council Engineering Standards and Policies are:

a) The standard of service ensures the health, safety and wellbeing of people and communities;

b) Community identified outcomes have been achieved in accordance with the Long Term Council Community Plan (LTCCP);

c) The management of natural and physical resources, in accordance with the Resource Management Act 1991(RMA), is sustainable;

d) Technical guidance about the design and construction of services necessary to meet the objectives and policies of the Tasman Resource Management Plan (TRMP) has been provided;

e) Other network utility providers have worked together with Council to deliver telecommunication, electrical and road network infrastructure works effectively and efficiently;

f) Long-term life-cycle costs associated with all service infrastructure assets are effective and efficient;

g) Good urban design and low impact design principles through land subdivision and development have been encouraged where they are appropriate and practicable;

h) Innovation in the use of alternative methods for achieving design objectives has been encouraged, provided that minimum standards for safety and efficiency of infrastructure provision can be met in a cost-effective way for the Community and Council.

## 1.4 Applicability

The standards outlined in this document will apply to:

a) All infrastructure assets that are to be vested in Council;

b) All infrastructure assets constructed under contract for Council:

c) Any development that may have an impact on Council's infrastructure assets;

d) Development that requires a building consent or resource consent.

This covers:

- subdivision development;
- any building or construction works;
- the design, construction and/or installation of any infrastructure assets;
- land activities that require modification of waterways and/or land disturbance; and
- any repair or maintenance works that may affect existing infrastructure.

## 1.5 Overview

The Tasman District Council's Engineering Standards and Policies have been organised into two key parts for ease of reference.

Part 1 (Sections 1 to 3) contains standards that relate to the administration of Council's asset infrastructure. This includes:

a) Section 1 – Definitions and interpretations of words.

b) Section 2 – Process and information requirements particularly information about the key steps in the process and decision points where Council approval may be required.

c) Section 3 – Legal which covers liability and responsibility issues, training and qualifications, and the location of services including land and asset ownership structures.

Part 2 (Sections 4 to 12) contains the engineering standards, relating to the design, material specifications and construction and installation of all and any part of the infrastructure that will fall under Council's control. The sections covered are:

a) Section 4 - Trenching and Reinstatement Works – standards for all trenching and excavation work on underground services.

b) Section 5 – Earthworks - standards for land disturbance activities involving the preparation of sites for development.

c) Section 6 – Roading Network – standards for the design and construction of roads and the management of road reserve.

d) Section 7 - Stormwater and Drainage - standards for the design and construction of stormwater system. An "alternative assessment" framework enables alternative designs such as low impact design to be considered.

e) Section 8 – Wastewater - standards are for the design and construction of wastewater collection and disposal systems.

f) Section 9 - Water supply - standards for the design and construction of water supply systems.

g) Section 10 - Electrical utilities – standards for electricity and road/streetlighting. This section is based on the requirements of network line operators.

h) Section 11 Telecommunications utilities – standards for telecommunications which are based on the requirements of line operators.

i) Section 12 – Reserves - standards for parks, reserves, walkways and any public open space areas, in the context of land development.

j) Section 13 – Contact details.

## 1.6 Definitions and Interpretations

**Annual Exceedance Probability (AEP)** – means the probability of exceedance in any 12-month period.

**CBD** – Central Business District (eg, in Richmond the block between and including Gladstone Road, McGlashen Avenue, Talbot Street, Oxford Street and Salisbury Road).

**Council** – shall mean the Tasman District Council or its officers.

**Cycleway** – means so much of any road as is laid out or constructed by authority of the territorial authority primarily for cyclists; and may include the edging, kerbing and channelling thereof.

**Designer** – shall mean the person responsible for producing and/or submitting the Engineering Drawings for approval and may be a Chartered Professional Engineer, Registered Professional Surveyor or authorised person experienced in the production, design and submission of plans.

**Developer** – means an individual or organisation having the financial responsibility for the development project and includes the owner.

**Developer's Professional Advisor (DPA)** – means the person, appointed by the developer being a Registered Professional Survey or a Chartered Professional Engineer, who shall be responsible for:

a) The investigation, design and obtaining of approvals for the works;
b) Contract administration and oversight of the works;
c) Certification upon completion of the works;
d) Sole point of communication with Council.

**DI** – Ductile iron pipes – generally socket jointed with Tyton elastometric seal rings.

**DN** – Nominal pipe bore diameter in millimetres. For polyethylene pipes, this relates to the pipes outside diameter. For other pipes this relates to the internal diameter.

**DP (Design Pressure)** – the maximum operating pressure that the designer expects to act on the pipeline in service.

**Drainage** – means wastewater drainage or stormwater drainage, and "drain" has a corresponding meaning.

**Easement In Gross -** An easement in gross is an easement that, unlike a normal easement, does not attach to any dominant tenement; examples are the right of public utilities, such as power, gas, phone, water and sewerage, to use part of the land

**Earthworks** – means any alteration to the contours, including the excavation and backfilling or recompaction of existing natural ground and the stripping of vegetation and topsoil.

**Electrical Reticulation** – means all "Electric Lines" that are owned by the "Line Owner" and form part of the Line Owner's Electrical Reticulation System or "Network".

**Engineering Manager** – shall mean the Engineering Manager of the Council.

**Exclusive fittings** – means those fittings used or intended to be used for the purpose of supplying electricity exclusively to that property.

**Footpath** – means so much of any road as is laid out or constructed by authority of the territorial authority primarily for pedestrians; and may include the edging, kerbing and channelling thereof.

**Geotechnical Engineer** – means a Chartered Professional Engineer (CPEng) or an engineering geologist with recognised qualifications and experience in geotechnical engineering and experience related to the development.

**Ground** – is used to describe the material in the vicinity of the surface of the earth whether soil or rock.

**GRP** – means glass reinforced plastic pipes, eg Hobas. This type of pipe is generally only used for major transfer or transmission mains since pipe diameters of less than DN 300mm are rare.

**Household Unit or Dwelling Unit** – means any building or group of buildings, or part thereof used, or intended to be used principally for residential purposes and occupied or intended to be occupied by not more than one household.

**HCV** – means a Heavy Commercial Vehicle.

**Independent Qualified Person** (IQP) – means a specialist approved by the territorial authority and having the appropriate skills and qualification to carry out specific procedures.

**Installation** – shall include excavation, the laying or thrusting of the pipe, ducting or cabling service, backfilling and reinstatement of surface.

**Land Drainage System** – refers to the flow of surface and ground water but concentrates mainly on peak surface discharges and their regulation under urban conditions.

**Landowner** – shall mean the consent holder or persons responsible for, or authorised persons subdividing or developing the land.

**LGA** – means the Local Government Act 2002.

**LGOIMA** – means the Local Government Official Information and Meetings Act 1987.

**LHCE's –** means Lamp Hole Cleaning Eyes

**Line Owner** – means a person or company that owns electrical reticulation (works) that are used or intended to be used for the conveyance of electricity.

**LINZ** – means Land Information New Zealand.

**Low Flow Path** – refers to the path taken by run-off resulting from ground water discharge and light rainfall. The low flow path should be kept to the minimum size consistent with ease of maintenance and may be considered to be 2% to 5% of the primary design flow.

**Low impact design (LID)** – relates to a stormwater design method that may be used to achieve multiple stormwater management requirements efficiently and effectively. The approach promotes the use of stormwater management methods and solutions which protect, incorporate or mimic natural drainage processes of a given site or catchment.

**LTCCP** – means Long Term Council Community Plan.

**Maximum Design Pressure (MDP)** – The maximum instantaneous pressure that may be created within a pipeline, including for pressure surge effects.

**Means of Compliance** – means a method by which the requirements of the standard may be complied with. It implies that there may be other methods which may meet the requirement subject to specific consideration or approval.

**MHWS** – means Mean High Water Springs

**Network Connection Point** – means the position where a service connects to a Line Owner's network.

**Network Utility Operator** - has the same meaning given to it by section 166 of the Resource Management Act 1991.

**Nominal Pressure Rating (PN)** – The pressure marked on the pipe or component and the maximum pressure that it can operate at throughout its design life.

**Operating Pressure** – means the internal pressure which occurs at a particular time and that on average will likely be experienced at a particular point in a water reticulation system on a typical day. For a gravity system, the operating pressure will depend on the water level of the reservoir, the ground level at the point on the pipeline under consideration, and the head loss due to demand in the system.

**Operator** – shall mean the party or parties either as approved by the Council or as approved as a network operator under the Telecommunications Act 2001 or as approved under any other service supply Act to carry out excavation, backfilling or reinstatement works within the road reserve under the control of the Tasman District Council.

**Owner** – the owner of the land that has the power to make decisions about the land and the power to sell the land. Includes the Crown, the Public Trustee, and any person, local authority, board, or other body or authority however designated, constituted or appointed.

**PE** – Polyethylene, generally pipes for water supply networks, for example PE 80B or PE 100. PE 80C is not recommended for long-term water reticulation networks.

**PN8 –** means quality and thickness of wall of pipe (the higher the number the higher the strength and quality).

**Point of Supply** – means the point at which the supply authority responsibility ends.

**Primary Design Flow** – is the estimated run-off selected to provide a reasonable degree of protection to the surrounding land and buildings. In most cases this flow will be piped or contained within relatively narrow confines under public control by reserve or easement.

**Private Road** – means any roadway, place or arcade laid out within a district on private land by the owner thereof intended for the use of the public generally.

**Private Way** – means any way or passage whatsoever over private land within a district, the right to use which is confined or intended to be confined to certain persons

or classes of persons, and which is not open or intended to be open to the use of the public generally and includes any shared access or right of way.

**PVC** – (Polyvinyl Chloride) – material from which the pipe or fitting is produced; has a similar meaning for uPVC, mPVC, PVC-O. Note – no glue jointing is permitted.

**RMA** – means the Resource Management Act 1991.

**Road** – has the same meaning given to it by section 315 of the Local Government Act 1974.

**Road Reserve** – means the whole parcel/s of land designated as road reserve.

**ROW** – means Right-of-Way.

**Runoff Cover –** means extension of insurance cover if a company ceases trading.

**Rural area** – means an area designated as Rural 1 or Rural 2 on the Tasman Resource Management Plan planning maps. (Note – Rural 3 is deemed to be rural-residential land).

**Secondary Flow Path** – refers to the path taken by run-off in excess of the primary design flow.

**Service or Service Main** – is the term for the cable (fitting), owned by the owner of premises and connecting premises to the electrical reticulation at an agreed network connection point.

**STP** – means System Test Pressure.

**Street** – has the same meaning as "road" as defined by section 315 of the Local Government Act 1974.

**Stormwater** – is rain water that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, channels or pipes into a defined surface water channel, open watercourse or a constructed infiltration facility.

**Surface Water** – means all naturally occurring water, other than sub-surface water, which results from rainfall on the site or water flowing onto the site, including that flowing from a drain, stream, river or sea.

**Survey Plan** – means a survey plan in terms of section 2 of the Resource Management Act 1991.

**Swale** – means a constructed watercourse shaped or graded in earth materials and stabilised with site-suitable vegetation, for the safe conveyance and water quality improvement of storm run-off.

**System Test Pressure (STP)** – The hydrostatic pressure to be applied to a newly laid pipeline (measured at the lowest point) to ensure its integrity and water tightness.

**Territorial Authority** (TA) – means a territorial authority defined in the Local Government Act 2002.

**TMP** – means Traffic Management Plan.

**TRMP** – means the Tasman Resource Management Plan.

**Urban drainage area** – means a drainage area as designated by Council.

**Wastewater** – is water that has been used and contains unwanted dissolved and/or suspended substances from communities, including homes, businesses and industries.

**Water Supply Authority** (WSA) – is the operational unit of the TA responsible for the supply of water, including its authorised agents.

**Works** – can be any type of construction or infrastructure and includes earthworks. Works can also be in the form of "money" as defined by the RMA.

# 2 PROCESS AND INFORMATION REQUIREMENTS

## 2.1 Introduction

This section sets out the information that Council requires in order to authorise construction of and vest new infrastructure assets within the Tasman District. This information typically comprises:

- Design drawings and details
- Supporting calculations
- Producer statements and certificates
- Specifications, and
- As-built information.

Prior to approval to commence work, Council requires the submission of fully detailed Engineering Drawings covering the design of all new roads, rights-of-way, access lots and service utilities. These drawings and associated information will be reviewed against these standards by Council.

Appendix 2-1 sets out the scope of these Engineering Standards in the context of an urban development and consenting process.

## 2.2 Requirements of the Designer

Council requires all design, construction and construction supervision of infrastructural assets and subdivisional works to be performed by suitably qualified and experienced individuals. Council standards, as set out in this document, are intended to reflect the minimum standard required by Council, and should not be seen as a replacement for professional engineering design.

The responsibility for site-specific design relies solely on the Designer of the work and this may include investigation of unusual site conditions and exceptional circumstances. In particular the Designer shall consider all risks to lifeline systems (significant infrastructure) in the event of a major earthquake, flood, tsunami. slope failure and climate change.

At the Engineering Drawing approval stage the Designer is required to complete and submit a Designer's Certificate and Check Sheet with the Engineering Drawings (see Appendix 2-2 and Appendix 2-3 of this section) together with the Designer's details on the plan title block.

At the Engineering Drawing as-built stage the Designer is required to certify that the work has been completed in accordance with sound engineering practice and as shown in the as-built information supplied.

## 2.3 Review and Approval Process

### 2.3.1 Preliminary Discussion

Council encourages Designers and the Developer's Professional Advisor (DPA) to meet with Council in the early stages of design to discuss any proposed works and how these will meet Council's standards and integrate with existing services and infrastructure.

In the case of larger subdivision development where Council's future infrastructure is involved, Council may require preliminary Engineering Drawings prior to the approval of subdivision consent (see Section 92 of the Resource Management Act (RMA) and Sections 19.2.1 and 19.2.2 of the Tasman Resource Management Plan (TRMP).

### 2.3.2 Review and Approval of Engineering Design Drawings and Supporting Information

Engineering Drawings and supporting information must be submitted to and approved by Council prior to the commencement of physical works, and prior to the pre-construction meeting. The requirements of the Engineering Drawings and supporting information are described in section 2.4.

Council will review the Engineering Drawings and supporting information and advise the applicant in writing of either:

a) approval of the Engineering Drawings, and supporting information; or
b) a request to modify the works or provide further information.

Approval of the Engineering Drawings and supporting information will consist of an Approval Letter and a single copy of each of the Drawings and supporting information, endorsed with the signature of the Engineering Manager or his/her approved representative.

### 2.3.3 Construction by Stages

Where the landowner proposes to proceed with construction of a subdivision in more than one stage, the Engineering Drawings shall cover the whole scheme in the first instance.

In the case of major staged subdivisions where Council's infrastructure is involved, Council, at its sole discretion, may relax this requirement to the extent that preliminary service layout drawings for the total project may be submitted for initial approval. Fully detailed drawings required for each particular stage shall subsequently be submitted for final approval.

Engineering Drawings for each stage shall comply with the Engineering Standards and Policies at the time of the subdivision consent approval; however should an extension of time for the consent be granted, compliance with the current engineering standard at the time of extension may be required.

### 2.3.4 Neighbours' Consent

Where any construction work is required on another property, the owners' consent shall be endorsed on the original drawing in opaque black ink that will permit satisfactory reproduction. Note that biro may not reproduce satisfactorily.

### 2.3.5 Notification of Contracts and Phases of Work

At least five (5) days prior to the commencement of work the consent holder or their agent shall advise the Engineering Manager in writing of the following information:

- the name(s), addresses and contact telephone numbers of contractor(s) to whom it is proposed to award the work,
- the nature of the work to be awarded in each case,
- the date that work will commence, and
- evidence of contract(s) awarded.

### 2.3.6 Pre-construction Meeting

The Developer shall arrange a formal pre-construction meeting (agenda and minutes taken) at Council's offices with the DPA, contractor's site representative, the Engineering Manager or representative and the Manager Environmental Compliance or representative. This meeting shall occur prior to the commencement of any work and after approval of the Engineering Drawings and will include discussion of the programme of works, the inspections required by Council or their agents and any other relevant matters.

Specifically, matters to be discussed at this meeting will include:

- Type/size of work contemplated and methodology;
- Soil types, ground, environmental and weather conditions;
- Locality of site;
- Consent conditions;
- Hold points and inspections required by Council (Engineering Services and Environment & Planning);
- Traffic effects, road opening notice and effects to neighbours;
- Risk to adjacent services;
- Health and Safety;
- Relevant experience/training of the Contractor(s);
- Relevant experience of the Designer(s) and the DPA and level of construction supervision.

The Designer/DPA shall bring to the pre-construction meeting:

- A construction programme;
- A set of A1 size Engineering Drawings (approved). A2/A3 drawings may be permitted depending on clarity of the drawing;
- The construction specification;
- An outline of the proposed construction supervision approach;
- Any relevant information on how risks, environmental compliance and consent compliance are going to be managed; and
- The design producer statement(s)

An agenda will be prepared and minutes distributed after the meeting by the Council.

There are four levels of monitoring carried out by Council. The appropriate level will be based on the list in Section 2.3.6 above and determined at the sole discretion of Council. Council reserves the right to review the level of monitoring at any stage of the construction activity.

| | |
|---|---|
| Level 1 | One visit per two weeks and at hold points |
| Level 2 | One visit per week and at hold points |
| Level 3 | Two visits per week and at hold points |
| Level 4 | Random visits and at hold points |

### 2.3.7 Monitoring by Council Subdivision Monitor

Work shall not commence on the engineering construction of the subdivision or development unless:

a) The Council has granted an appropriate resource consent; and

b) There are no outstanding appeals or rights of appeal to the Environment Court; and

c) The Engineering Manager has approved in writing the Engineering Drawings, specifications and calculations for the specific work that is required; and

d) The Engineering Manager has approved the Traffic Management Plan (TMP) (if required);

e) All other necessary consents or permits (eg road opening notice) have been obtained;

f) Separate land disturbance consents that come under the control of the Environment & Planning Department, and if required have been obtained from this department; and

g) The pre-construction meeting has been held.

The Engineering Manager may grant staged approval to allow earthworks to commence prior to approval of other works at his/her sole discretion.

The consent holder should be aware that in some cases, the Environment Court has ruled that works must not proceed without the Court's consent in cases where an appeal is lodged against consent conditions and has not been heard, or a right of appeal to the Court still exists, such as in the case of an objection lodged with the Council and still unheard.

### 2.3.8 Documentation to be Held

Throughout the construction period, the contractor's site representative shall have the following material on site at all times:

a) signed copies of the approved Engineering Drawings and the initial letter from Council setting out hold points, the inspection regime and engineering administration matters;

b) a verified Health and Safety Plan and the letter of verification;

c) copies of the resource consent;

d) copies of any Tasman District Council consents or permits necessary for the works;

e) signed copies of all consents to enter land for construction for works on land not owned by the Developer; and

f) plans and details of sedimentation and erosion control measures to be implemented.

### 2.3.9 Variations

No variations from the approved Engineering Drawings shall be made without the proposed amendments being first submitted to, and approved by, the Engineering Manager or his approved representative.

The Designer shall identify and fully document the nature and position of the amendments.

In the case of emergencies where immediate action is required to safeguard safety and health, property and infrastructure assets, such action shall be taken. At the earliest opportunity after the event, the Council shall be notified for approval.

### 2.3.10 Council Inspections and Construction Hold Points

The DPA shall notify the Engineering Manager, or representative at least five (5) working days (or as mutually agreed) before any of the following phases of the work are reached (and such other phases as have been determined) to enable inspection to be carried out by the Engineering Manager or representative.

a) Earthworks starting, (for checking of erosion and sediment control measures).

b) Street Works
   i. subgrade preparation and subsoil drains;
   ii. basecourse prior to sealing;
   iii. footpath and kerbside prior to sealing or concreting.

   Stormwater and Wastewater
   i. inspection of laying first pipes of pipeline in sub-division while there is work in progress;
   ii. inspections at a series of hold points determined by the Engineering Manager or representative to suit the particular situation and level of monitoring (refer Section 2.3.7).

c) Water Supply
   i. Inspection of each line prior to backfill and trench reinstatement, including pressure testing;
   ii. chlorination; and

iii. connection by Council required.

d) Final
After completion of all works including sweeping of roads and channels, clearing all drains, manholes and sumps, checking all valve and hydrant operations, planting riparian areas and appropriate inspections, eg CCTV, gauging or any other testing as required by Council as appropriate.

**Note**:

1. It is the responsibility of the DPA being a Chartered Professional Engineer or Registered Professional Surveyor for the supervision of and to certify the works at various stages in accordance with Section 2.3.10.

2. Council reserves the right to determine the inspection/monitoring regime on each project and the testing method of services/infrastructure which is appropriate.

### 2.3.11 Completion Certificate and Supply of As-built Drawings

On completion of the construction of a subdivision or development the DPA being a Chartered Professional Engineer or Registered Professional Surveyor, shall submit to Council a Completion Certificate that the work has been constructed in accordance with:

- these Engineering Standards and Policies;
- the approved Engineering Drawings and specifications;
- any approved amendments; and
- manufacturer's instructions.

The "certifier" may be required to provide sufficient evidence at the written request of Council to demonstrate to Council's satisfaction that they have experience and competence in the work they are certifying, that they have sufficient professional indemnity insurance and run-off cover, and they have sufficient documented observation and testing records to adequately certify the works.

The Work Completion Certificate shall be accompanied by as-built drawings, showing all works as actually constructed and drawn to the standards specified by Council.

The Certificate shall be in the form as shown in Appendix 2-4 and must be received by the Council before it decides whether to issue a certificate under Section 224(c) of the Resource Management Act.

### 2.3.12 Approval of Engineering As-Built Drawings

When the as-built Engineering Drawings have been approved and signed by the Engineering Manager, the DPA shall submit them along with electronic copies of the drawings and electronic coordinate files.

The DPA is responsible for collecting and documenting information set out in the as-built plans. Disclaimers or endorsement negating responsibility will render the plans unacceptable and the 224 Certificate will be withheld. Further, if underground asset locations are found to be inaccurate on excavation or otherwise, the Developer may be liable for rectifying the situation.

### 2.3.13 Maintenance Certificate (Council-Vested Assets)

On expiry of the twenty four (24) month maintenance period, the DPA shall issue a maintenance certificate confirming that all outstanding maintenance has been completed.

The performance bond for maintenance will not be released by Council until the work covered by the maintenance certificate is verified by Council.

### 2.3.14 Licence-to-Occupy

Where private services are proposed to be located within road reserve at the approval of Council or Council-owned land, the applicant is required to enter into a Licence-to-Occupy (LTO) agreement. This agreement is entered into by the applicant (a generic draft document is available on request).

The agreement will include, but not be limited to:

- a yearly licence fee;
- bond amount;
- public liability insurance; and
- an administration fee and actual costs incurred by Council in completing the agreement.

The applicant should arrange this document to be compiled by Council at an early stage and prior to a 224 certificate.

## 2.4 General Drawing Standards and Details Supporting Information Requirements

This section sets out Council's requirements for the preparation and submission of engineering design and as-built drawings and supporting design details and information.

Engineering design and as-built drawings are required by Council in all instances where an asset is constructed that will become a Council asset or attached to a Council asset.

Each and every plan must be signed by the Designer of the work. The Designer's signature is taken as evidence that the plans have been checked against and comply with Council's current Engineering Standards and Policies. Unsigned plans will not be accepted.

Approval of engineering design drawings and as-built plans together with specifications and supporting calculations where requested by Council, is required prior to approval of the survey plan of the subdivision pursuant to Section 223 of the Resource Management Act. This is to show that practical pipeline alignments and legal easements are consistent with each other. For large subdivisions, full Engineering Drawings may be required by Council prior to subdivision consent being granted.

Table 2-1 sets out Council's requirements for any proposed works at the Engineering Plan approval and as-built stages.

## Table 2-1 Council's Requirements

| | Design Engineering Plan submission | Section 223 and 224 As-built Engineering Plan submission |
|---|---|---|
| Engineering Drawings and As-builts<br>- hard copies<br>- electronic copies | <br>2 copies<br>If requested | <br>Required<br>If requested |
| Electronic coordinate and attribute information | | 1 copy required |
| Specifications (electronic or hard copies) | 2 copies | Changes only |
| Supporting calculations (electronic or hard copies) | Required | Changes only |
| Producer statements | Design<br>Design Review | Construction<br>Construction Review |

### 2.4.1 General Format Requirements

a) The symbols and arrangements shown on TDC Drawings 200 and 201 shall be used.

b) The standard approval signature block (TDC Drawing 200) shall be placed on the bottom right hand side of all plans, with the resource consent number where applicable.

c) A site location, in the form of a locality plan, including major street names and site identification shall be shown.

d) Where more than five sheets are involved a title sheet shall be included showing sheet numbers, individual sheet titles and site location plan.

e) Existing property boundary lines that abut the work and a north point shall be shown as a reference.

### 2.4.2 Hard Copy Format Requirements

Hard copies of Engineering Drawings are retained by Council as a permanent record of the proposed and as-built assets. The following is required to facilitate scanning of drawings and to ensure that a durable record of the works remains:

a) Two sets of Engineering Drawings shall be submitted on standard A1- or A2- (or A3- with the approval of the Engineering Manager) sized sheets of high quality paper (80 gsm or greater).

b) Final sheets submitted to Council for signing must not be folded or creased.

c) All draughting shall be in opaque black ink (not pencil).

d) All lettering shall be ISOCP, Arial or similar approved font style.

e) Minimum line thickness shall be 0.25mm.

f) A minimum letter height of 2.5mm for A1 and 2.0mm for A2 and A3 (including the actual height of lower case text) is required for all data specified by these Engineering Standards and Policies, in accordance with the relevant section of AS/NZS1100.101.

### 2.4.3 Electronic Drawing Format Requirements

At the submission of hard copies plans Council may, at its discretion, require the submission of supporting electronic drawing files. These files would typically include image files of the submitted drawing sheets (as TIF or JPG files).

### 2.4.4 Electronic Coordinate and Attribute Data Requirements

The supply to Council of electronic coordinate and attribute data is essential for the maintenance of Council's asset management system. The correct supply of this data for all new or modified assets is compulsory. This electronic data shall be submitted at the same time as the hard copy plans. Plans will not be processed until electronic data is supplied. Electronic data should be in the form specified by the template available from Council.

The data supplied must be a complete and accurate representation of the same information shown on the physical Engineering As-built Drawings and submitted in accordance with Section 2.7.

A separate tabulation of all the point coordinates and levels specified in these standards shall be shown on the drawing set as a cross-referenced table. This table will be used to assist in the distribution of the data in hard copy format.

Spot heights and boundary coordinate information are not required in this table.

### 2.4.5 Coordinate and Elevation Standards

Easting and Northing coordinates shall be accurate to two decimal places and in terms of the following (in preference):

- Local Circuit GD2000
- Local Circuit NZGD49

The local circuit origin shall be stated on all plans.

The origin of levels and height shall be recorded, for example "Origin of levels BP11 SO12345 = 4.26 AMSL".

A number of years ago heights were in terms of Mean Sea Level. However sea level rise over the last few years may have altered this level by a difference of up to 75mm. Nelson vertical datum, 1955 or in Golden Bay, Tarakohe vertical datum, 1982 shall continued to be used and are accurate to two decimal places. Known benchmarks and survey levels are recorded by Council and are available during office hours.

### 2.4.6 Orientation of Plans and Sections

a) Plans should generally be orientated with either north or west to the top of the sheet. North point shall always be shown.

b) In the case where a layout plan and longitudinal section appear on one sheet, the layout plan is to be orientated to suit the longitudinal section.

c) Plans and longitudinal sections shall generally have the lowest distance on the left hand side of the sheet. In drainage longitudinal sections, the lowest end of the drain shall be at the lower distance and the plan should be orientated correspondingly.

d) Cross-sections of a street shall commence at the bottom left hand corner of the sheet and proceed upwards where this is possible.

### 2.4.7 Scales

## Table 2-2 Scales to be used for all Engineering Drawings

| | | |
|---|---|---|
| 1 | Consent applications | At recognised scales |
| 2 | Location plan | Not less than 1 in 20,000<br>Not larger than 1 in 5,000 |
| 3 | Site contours | 1:1000 or 1:500 or 1:250 or 1:200 |
| 4 | Road/Streetworks plan | 1:500 or 1:250 or 1:200 |
| 5 | Longitudinal sections of channels<br>- Horizontal<br>- Vertical | <br>1:500 or 1:250 or 1:200<br>1:50 or 1:25 or 1:20 |
| 6 | Cross Sections<br>- Horizontal<br>- Vertical | <br>1:50<br>1:50 or 1:20 |
| 7 | Sewer, stormwater and water plans<br>- Longitudinal section<br>- Horizontal<br>- Vertical | <br>1:500 or 1:250 or 1:200<br>1:500 or 1:250 or 1:200<br>1:100 or 1:50 |
| 8 | Details | 1:20 or 1:10 or 1:5 |
| 9 | Other services (eg streetlights)<br>- Plans<br>- Cross section | <br>1:500 or 1:250 or 1:200<br>1:50 |

**Note:** Longitudinal and cross sections should be drawn at appropriate exaggerated vertical to horizontal scale ratio.

### 2.4.8 Special Scales

Special scales (other than the above) may be approved by the Engineering Manager for rural areas and special cases, but only on prior application.

## 2.5 Engineering Design Details Required

The following plans and drawings of each street are required showing:

- proposed and existing survey lots and Land Transfer (LT) numbers (if known);
- street numbers;
- names of new streets; and
- the location of services, including the necessary manholes, fittings and similar features (on separate plans for each service).

New services shall be located as shown on TDC Drawing 200, generally along with bench marks and survey mark levels.

The Designer shall make every endeavour to locate existing power and telecommunication services. Where proposed pipes cross under or over existing or proposed services, these services shall be shown on the plan and section with reduced levels.

Plans shall show the location of services in existing streets which abut the subdivisions.

A TMP is required by Council for any work on or immediately adjacent to a public road. Council requires demonstration that the consent holder and agents are in compliance with requirements of the Health and Safety in Employment Act 1992.

### 2.5.1 Earthworks Design Drawings

Earthworks drawings shall be provided and show:

- original and finished contours;
- proposed earthworks (cut and fill);
- erosion and sedimentation control;
- geotechnical engineers input; and
- property boundaries, kerb lines and street names.

A contour plan of the site at an appropriate interval in terms of LINZ datum shall be provided for all subdivisions and developments of 0.25 hectares or greater. In rural areas, these levels may be interpolated from existing contour plans produced by LINZ or equivalent.

Erosion and sediment control may be shown schematically at the Engineering Drawing approval stage, but must be shown in detail prior to commencement of work on site and approved by either the Engineering Manager or the Environment & Planning Manager.

### 2.5.2 Road/Street Works Design Drawings

A road/street works plan shall be provided and show:

- property boundaries;
- kerbs and channels;
- road/street names;
- footpaths;
- longitudinal and cross sections of the existing ground;
- proposed road/street levels with batters;
- existing and proposed survey bench marks;
- road marking; and
- signs (where relevant).

Left-hand and right-hand top of kerb shall be shown separately unless they are identical, in which case this shall be stated.

The levels of the proposed services shall also be shown on sections. Longitudinal sections shall extend 40.0m beyond the extent of the works.

### 2.5.3 Wastewater Design Drawings

Wastewater services drawings shall be provided and show:

- wastewater pipes and manholes (in plan and long-section);
- pipe size, length and gradient in long section;
- pump stations;

- stormwater pipes and manholes (for proximity purposes, with a thick line for wastewater and thin line for stormwater); and
- property boundaries, kerb lines and road/street names.

Wastewater discharge calculations complying with Council's Engineering Standards and Policies shall be submitted.

### 2.5.4 Stormwater Design Drawings

Stormwater services drawings will be provided and show:

- property boundaries;
- stormwater pipes, channels, manholes and structures (in plan and long-section), pipe size, length and gradient in long section;
- secondary flow paths and proposed easements;
- wastewater pipes and manholes (for proximity purposes, with a thick line for stormwater and thin line for wastewater); and
- property boundaries, kerb lines and road/street names.

Drainage drawings submitted for checking shall be accompanied by:

- catchment plans showing all the catchment areas to be served; and
- stormwater discharge calculations for each and every proposed pipe and channel.

### 2.5.5 Water Supply Design Drawings

Water supply services drawings shall be provided and show:

- Water main and fittings;
- pump stations, and
- property boundaries, kerb lines and road/street names.

### 2.5.6 Streetlighting and Power Utilities Design Drawings

Streetlighting and power utilities drawings shall be provided and show:

- Power cables and substations;
- street lighting; and
- property boundaries, kerb lines and road/street names.

Power plans may be submitted separately to Council as these are designed by specialists.

## 2.6 Engineering As-built Details Required

As-built drawings shall be provided and approved before the 223 certificate pursuant to the RMA is issued. For Council's physical works contracts, as-built drawings are required prior to the issue of the Practical Completion certificate or within an agreed timeframe with the Engineering Manager's approval.

### 2.6.1 Separate Plans to be Submitted for Each Infrastructural Asset

All non-standard structures (eg pump stations, reservoirs, bridges) shall be shown as an outline and all lids and surface openings shall be shown and separately located. The position of all pipe connections to a structure shall also be located with coordinates and invert.

### 2.6.2 Earthworks As-built Drawings

Where bulk earthworks have been carried out, sufficient additional levels, coordinates and break lines to regenerate contours on earthworks plans at 1.0m intervals shall be provided. The contours are to be shown on an appropriate as-built plan.

Ground level in terms of the LINZ datum shall be shown on an appropriate plan at all boundary pegs for all subdivisions regardless of size.

### 2.6.3 Road/Street Works As-built Drawings

In **addition** to the road/street works design drawing requirements, as-built plans shall show:

a) All kerbing (including traffic islands/traffic calming), channels where separate from kerb, or edge of seal or formed carriageway in the absence of kerbing. Points shall be located at top of kerb, centre of channel or edge of seal and in terms of coordinates and level at changes of type, direction or grade. All curves are to be located using the tangent points and at least one central point on each curve.

b) The location and width of footpaths. Locations in terms of coordinates are preferred but are acceptable in terms of offset from boundaries or kerb.

c) Road signs in terms of sign type and coordinates.

d) Road markings in terms of symbol type and coordinates. Coordinates shall be positioned at ends and changes of type and/or direction. All curves are to be positioned using the tangent points and at least one central point on each curve. Offsets from the front face of kerb and channel will be acceptable. Road marking symbols need only be positioned to their centres.

e) Bridge abutments, piers, carriageway, kerbing and footpaths in terms of outline coordinates and level, as per above specifications.

f) New or altered benchmarks and survey standards in terms of coordinates and level in terms of LINZ datum. The points shall be clearly defined as either a bench mark or survey standard and shall be levelled/coordinated back to known benchmarks or reference points. The work must be undertaken in accordance with LINZ requirements.

g) Any road/street works removed or relocated shall be noted on the plans to the same level of detail as new assets.

Note: Further road construction information, Road Assessment and Maintenance Management System (RAMM) data, as required on the standard form (Section 6 6.8.4Appendix 6-1).

### 2.6.4 Wastewater As-built Drawings

In **addition** to the wastewater design drawing requirements, as-built plans shall show:

a) Material, class and size (diameter, or height and width) and date installed for all assets.

b) Manholes, chambers, storage tanks, and pump station wet wells in terms of coordinates, lid level, invert level and size and dimensions to lot boundaries.

c) Lamp Hole Cleaning Eyes (LHCEs) and valves in terms of coordinates and lid level size and dimensions to lot boundaries.

d) Pump stations, non-standard manholes, underground chambers, storage tanks, intake structures and outlet structures in terms of outline and pipe connection coordinates. Invert levels on all chambers, storage tanks, wet wells, intakes and outlet points.

e) Coordinates and inverts on all pipe connections to non standard structures (eg pump stations, outfalls, intakes).

f) Upstream and downstream invert levels on each length of pipeline. At drop manholes the invert is required for both the upper and the lower level entry point.

g) Any change in direction, grade or type not located by the above information is to be defined in terms of coordinates and invert level.

h) The blank end of pipe laterals or connection point to existing house drains. These shall be in terms of as coordinates and reduced level, depth to the blank end from the final ground level and distance from two readily defined permanent points (usually boundary pegs).

i) Junction of laterals to mains in terms of coordinates or running distances along mains between surface features.

Details of any pump, automated valve, or motor components and electrical control equipment shall be incorporated into four sets of operations and maintenance instruction manuals enclosed in a hard-copy A4 bound folder. The folder shall include as-built plans of the pump station including electrical wiring, operational schematic diagrams, valves, flow meters and the like.

### 2.6.5 Stormwater As-built Drawings

In **addition** to the stormwater design drawing requirements, as-built plans shall show:

a) Material, class and size (diameter, or height and width) and date installed for all assets.

b) Manholes, chambers, storage tanks, and pump station wet wells in terms of coordinates, lid level, invert level and size and dimensions to lot boundaries.

c) LHCEs and valves in terms of coordinates lid level, size and dimensions to lot boundaries.

d) Pump stations, non standard manholes, underground chambers, storage tanks, intake structures and outlet structures in terms of outline and pipe connection coordinates. Invert levels on all chambers, storage tanks, wet wells and intake and outlet points.

e) Coordinates and inverts on all pipe connections to non standard structures (eg pump stations, outfalls, intakes).

f) Upstream and downstream invert levels of each length of pipeline (at node points). At drop manholes the invert is required for both the upper and the lower level entry point.

g) Any change in direction, grade or type not located by the above information is to be defined in terms of coordinates and invert level.

h) The blank end of pipe laterals or connection point to existing house drains in terms of depth to the blank end from the final ground level and measurements from two readily defined permanent points, usually boundary pegs, and as coordinates and reduced level.

i) Junction of laterals to mains in terms of coordinates or running distances along mains between surface features.

j) Subsoil drains in terms of coordinates and invert level at all changes in direction and grade.

k) Watercourses, streams, rivers, secondary flow paths and easements are to be defined by coordinates and levels at the centre line of water course and the top and bottom of both banks.

l) Detention dam structures (inlet, outlet, spillway, dam crest) are to be specifically surveyed in terms of coordinates and level. Reservoir areas are to be defined by 0.2m contour data to maximum operating level.

Details of any pump, automated valve, or motor components and electrical control equipment shall be incorporated into four sets of operations and maintenance instruction manuals enclosed in a hard copy A4 bound folder. The folder shall include as-built plans of the pump station including electrical wiring, operational schematic diagrams, valves, flow meters together with all other relevant components of the pump station. The plans shall be in a form that can be electronically scanned.

An operation and maintenance manual is required for all detention dam structures. This manual shall include key design parameters (such as reservoir catchment areas, inflows and reservoir and spillway operation) and ongoing maintenance and dam safety inspection requirements.

Operation and maintenance information may be required for non-standard stormwater components (such as water treatment devices, ponds, wetlands or swales). This information would include any special maintenance or servicing requirements.

### 2.6.6 Water Supply As-built Drawings

In **addition** to the water supply design drawing requirements, as-built plans shall show:

a) Material, class, type and size (diameter, or height and width) and date installed for all assets.

b) Valves and hydrants in terms of coordinates and lid level size and dimensions to lot boundaries.

c) Meter boxes in terms of coordinates and lid level and by distance to two adjoining boundary pegs. In addition the meter number and meter reading information is required – refer Appendix 2-7.

d) Manholes in terms of coordinates, lid level size, invert level and dimensions to lot boundaries.

e) Water mains and rider mains, in terms of coordinates at any change in horizontal direction or material or type or diameter. Curves are to be located either using the tangent points and at least one central point on each curve or points at regular intervals.

f) Pump stations, storage tanks, reservoirs, chambers and non-standard manholes in terms of outline, pipe connection and lid coordinates, lid level and pipe connection tank/wet well inverts as well as floor and overflow levels.

g) Any horizontal change in direction or type not covered by the above information is to be defined in terms of coordinates. Curves are to be located using the tangent points and at least one central point on each curve. Offsets from the front face of kerb and channel maybe acceptable.

h) Junctions of laterals to mains in terms of coordinates or running distances along mains between surface features.

Details of any reservoir, pump, motor components, automated valve or electrical control equipment shall be incorporated in four sets of operation and maintenance instruction manuals enclosed in a hard-copy A4 bound folder. The folder shall include as-builts, plans of the pump station including electrical wiring and operational schematic diagrams. The plans shall be in a form that can be scanned.

### 2.6.7 Telecommunication and Power Utilities

Electrical, telephone and other reticulation drawings shall be supplied to the relevant network line operator(s). Council may require evidence from the relevant network line operators that the as-built plans have been received and are fit-for-purpose.

### 2.6.8 Road/Streetlights

Council will require an as-built plan of all road/streetlights installed and completion of the data collection form (Appendix 2-5). This may be provided as part of the telecommunication and power utilities as-builts and shall include:

a) Location in terms of coordinates.
b) Light type, dimensions, wattage and date installed.

### 2.6.9 Redundant Assets

In addition to new assets, as-built information shall show all existing assets that have been made redundant. The assets shall be marked as either “abandoned” or “removed”. Where an existing pipe or asset has been made partially redundant the coordinates and invert of the disconnection point are required.

### 2.6.10 Existing Assets

The location and level of all existing drainage and water services encountered during construction shall be verified and recorded on as-built plans.

As a minimum, at least one asset feature (such as a manhole lid and invert, valve or hydrant lid) adjacent to each new service shall be surveyed and recorded on the as-built plans.

## 2.7 Electronic As-Built Asset Data

Submission of electronic as-built asset data is required for all works. The electronic data shall be an exact electronic representation of the coordinates, levels and attribute data shown on the physical drawings.

Electronic data must be submitted as a Microsoft Excel spreadsheet, with separate spreadsheets for features – See Appendix 2-6.

The following are the data format requirements:

- Each asset record shall have a unique identifier, and this identifier must exactly match that shown on the hard copy plan supplied.

- Each asset point (coordinated location) shall appear on a separate line.

- Each asset record shall include asset attributes such as:
  - asset type;
  - asset location (Northing, and Easting);
  - asset levels (lid level and/or invert level);
  - asset dimensions;
  - asset material;
  - date installed; and
  - any comments (if applicable).

Full details of attributes requirements for each asset type are specified in Appendix 2-6. Templates can be made available on request to the Engineering Manager.

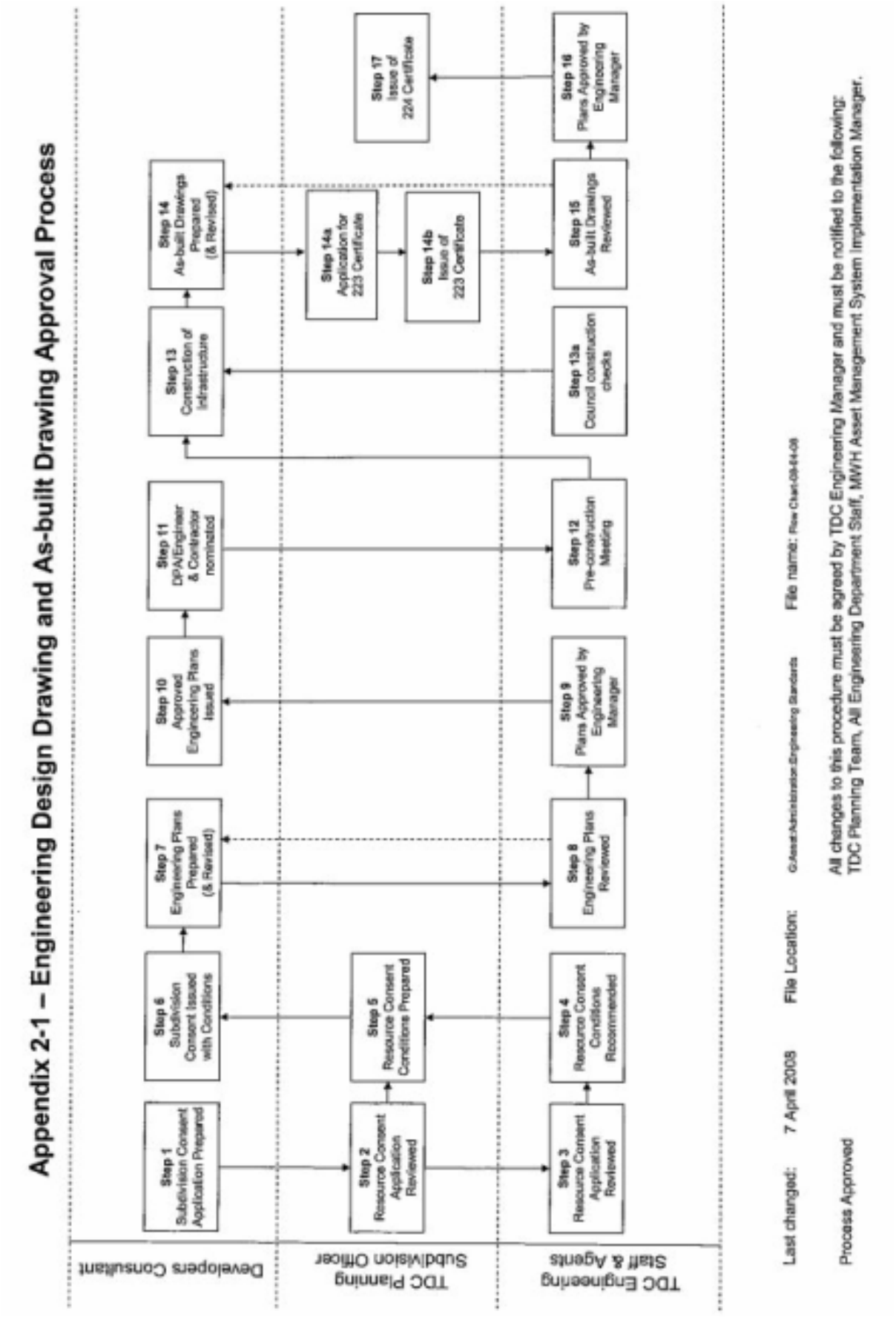
## 2.8 Disclaimer

As-built plans held by Council are to the best of Council's knowledge and information received from DPA's. Council takes no responsibility for inaccurate information or unknown infrastructure found on site.

All contractors, consultants, surveyors, designers and owners have a duty to investigate further and pothole if necessary to verify the position of services.

Council will not be liable for any damages or loss whatsoever suffered from the use of information held by them.

# Appendix 2-1 Engineering Design Drawing and As-built Drawing Approval Process



## Appendix 2-2 Design Certificate – Land Development/Subdivision Work

ISSUED BY: _____
*(Approved certifier)*

TO: _____
*(Developer/Owner)*

TO BE SUPPLIED TO: _____
*(Territorial authority)*

IN RESPECT OF: _____
*(Description of land development/subdivision work)*

AT: _____
*(Address)*

_____ has been engaged by _____
*(Consultant/Designer)* *(Developer/Owner)*

to provide _____ services in respect of the land development and/or subdivision work described above.

I _____ have the qualifications and experience relevant to this project as set out herein and have designed the subject works and confirm that the design is to current good engineering practice, and that it satisfies all relevant resource consent conditions, all relevant Tasman District Council requirements and applicable codes and standards. I/My practice holds professional indemnity insurance in the sum of $ _____ and run-off cover.

_____ Date _____
*(Signature of approved certifier)*

_____ Member
*(Professional Qualifications)*

_____
*(Address)*

RPSurv ☐ CPEng ☐

*Practice field*

Civil ☐ Mechanical ☐
Structural ☐ Electrical ☐
Geotechnical ☐ Industrial ☐
Environmental ☐

**Outstanding Works**

_____

_____

_____

_____

## Appendix 2-3 Designer's Check Sheet

TDC Consent No: _____ Date: _____

| | | |
|---|---|---|
| Site Address: | | |
| Site Legal Description: | | |
| Designer: | Name | |
| | Address | |
| Qualification: | Phone No: | |
| | Fax No: | |
| Engineer/Surveyor Contact: | | |
| Landowner: | Name: | |
| | Address: | |
| | Phone No: | |

Place a tick in a box if information is provided, otherwise write NA for not applicable

Reason for Submission: Subdivision ☐ ROW ☐

Development ☐ Other ☐

Design Certificate provided ☐

Drawing Sheet size and number of sheets A1 ☐ A2 ☐

Draughting to AS 1100.101 and TDC Standards Section 2.4.

Levels to LINZ Datum ☐ Locality Diagram ☐

Contour Plan ☐ Spot Levels ☐

Overall Site Plan ☐

Plans and Sections Road/street works ☐ Power ☐

Drainage ☐ Telephone ☐

Water ☐ Earthworks ☐

Sewerage Catchment Plans and Discharge Calculations ☐

Stormwater Catchment Plans and Draughting Calculations ☐

Road/Streetworks Pavement Design ☐

Specific Design – specify aspect: ☐

Owner's Consent for Work in Private Property ☐

## Appendix 2-4 Certification upon completion of Subdivisional Work

**ISSUED BY:** _____
*(Approved certifier)*

**TO:** _____
*(Developer/ Owner)*

**TO BE SUPPLIED TO:** _____
*(Territorial Authority)*

**IN RESPECT OF:** _____
*(Description of land development/subdivision work)*

**AT:** _____

_____
*(Address)*

_____ has been engaged by _____
*(Consultant/Designer)* *(Developer/Owner))*

to provide construction observation, review and certification services in respect of the above subdivisional work which is described in the specification and shown on the drawings numbered

TDC _____ approved by _____
*(Territorial Authority)*

I have sighted the _____ consent and conditions of consent to the
*(Territorial Authority)*
subdivisional works and the approved specification and drawings.

"I believe on reasonable grounds that the works other than those outstanding works listed below, are complete and have been constructed in accordance with:

(a) The approved engineering drawings and specifications and any approved amendments;
(b) The Council's Engineering Standards; and
(c) Manufacturer's Instructions."

_____ Date _____
*(Signature of approved certifier)*

_____ Member
*(Professional Qualifications)*

_____
*(Address)*

RPSurv ☐ CPEng ☐
Practice field
Civil ☐ Mechanical ☐
Structural ☐ Electrical ☐
Geotechnical ☐ Industrial ☐
Environmental ☐

**Outstanding Works**

_____

_____

_____

## Appendix 2-5 Streetlight Data Collection Form

| **STREET LIGHT No** | STRL | **INSPECTION DATE** | |
|---|---|---|---|
| Street Name | | House number | |
| Comments / notes | | | |
| **LANTERN DATA AND CONTROL GEAR** | | | |
| Light ownership / responsibility | *Private / TDC carpark / TDC Community Services / TDC road reserve / TDC service lane / Transit NZ* | | |
| Lantern make | | Lantern model | |
| Lamp type | | Lamp wattage | |
| Mounting height | | Number of lamps in lantern | |
| Lantern tilt angle | | Date lantern installed | |
| Number of lanterns on pole | | Control type | *Photocell / Relay Other* |
| **POLE DATA** | | | |
| Column ownership | *Network Tasman / Private / TDC / Telecom / Transit NZ* | | |
| Column type | *Concrete / Fibreglass / Not applicable /Steel / Timber / Other* | | |
| Column make | | Column model | |
| Column mounting | *Flange bolted / Ground planted / Shear base / Wall / Other* | | |
| Column colour | *Black / Galvanised / Rangoon Green / Zebra striped / Other* | | |
| Outreach shape | *Curved / Elliptical / Mitred / Not applicable / Post top lantern / Other* | | |
| Outreach material | *Steel / Other* | | |
| Outreach length | | | |
| Distance from kerb / boundary / seal edge | *kerb / boundary / seal edge* | | |
| "x" / Northing | | "y" / Easting | |
| **LIGHTING CONTROL** | | | |
| Origin of power supply | *Overhead line / service box* | | |
| Isolation point | *Transformer / Service box* | | |
| Transformer / Service box number | | | |

| **Office Use Only** | Signature | Date |
|---|---|---|
| Checked by Contractor | | |
| Verified by | | |

## Appendix 2-6 As-Built Data Structure

The following data structure shall be adopted by parties supplying electronic “as built” data to Tasman District Council, ie, as separate layers.

| Level/Layer | Description |
|---|---|
| 1 | New water pipeline |
| 2 | New water surface feature |
| 3 | New wastewater pipeline |
| 4 | New wastewater surface feature |
| 5 | New stormwater pipeline |
| 6 | New stormwater surface feature |
| 7 | New stormwater drain |
| 8 | New kerb |
| 9 | New lamp pole (streetlight – includes pole and light) |
| 10 | New boundaries |
| 11 | New road markings |
| 12 | |
| 13 | |
| 14 | |
| 15 | Existing water pipeline |
| 16 | Existing water surface feature |
| 17 | Existing wastewater pipeline |
| 18 | Existing wastewater surface feature |
| 19 | Existing stormwater pipeline |
| 20 | Existing stormwater surface feature |
| 21 | Existing stormwater drain |
| 22 | Existing kerb |
| 23 | Existing lamp pole (streetlight) |
| 24 | Existing boundaries |
| 25 | Existing road markings |
| 26 | |
| 27 | |
| 28 | Abandoned assets |
| 29 | |
| 30 | |

## Appendix 2-7 Water Meter Location

**Tasman District Council**

To: Water Meter Officer

Subdivision/Meter Location: ……

**Resource Consent No (if applicable)** …….

The following table defines information required by the Tasman District Council for all new water meters.

In the Meter Type Column, please indicate whether the meter is an Invensys/Sensus 620m or Kent (MSM Qn 1.5 class C) water meter. Indicate either S or K.

In the Meter Reading Column show the reading to the nearest whole cubic meter only (BLACK NUMBERS on the meter).

In the Location Column, indicate whether the measurement is from the right or left boundary when facing the lot from the road (R or L). Show one measurement to the meter from either the right or left boundary (measured along the front boundary) and one measurement to the meter from the front boundary (measured perpendicular to the front boundary).

| Lot No | DP No | Road/ Street No | Road/ Street Name | Meter Type S/K | Meter No | Meter Reading ($m^3$) | Reading Date | Location (Distance from) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | R/L | Side Bdy (m) | Front Bdy (m) |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

(Use additional page if required)

| | |
|---|---|
| Name: | |
| Signature: | Date: |
| Address: | |
| | |

## Section 2 Drawings

Drawing 200 – Draughting Symbols & Scales
Drawing 201 – Draughting Standards & Symbols

Note: The drawings are **not** included in this document. They are available in PDF format or hard copy from the Engineering Secretary (03 543 8524) or email engineeringstandards@tdc.govt.nz

# 3 LEGAL RESPONSIBILITY ASSOCIATED WITH COUNCIL ASSETS

## 3.1 Introduction

The purpose of this section is to clearly define responsibilities and obligations of any party involved in the design, construction and maintenance of a Council-owned asset, or asset to be vested in Council. In particular it addresses:

(a) Matters concerning training and qualifications of any operator involved in the, construction and maintenance of a Council-owned asset (section 3.2);

(b) Liability and responsibility for the quality of a Council-owned asset (section 3.3)

(c) Legal and physical protection of an asset in terms of its location, ownership, access and responsibility, whether it is Council-owned or located on Council-owned land (section 3.4).

(d) Standards controlling building work in proximity to or over an underground asset (section 3.5)

## 3.2 Training and Qualifications

This section sets out minimum requirements for contractors in the construction of assets that will be vested in Council.

### 3.2.1 Qualifications and Experience

To ensure the highest standard of quality of construction works carried out on any asset vested or to be vested in the Tasman District Council, contractors must comply with the following standards:

A contractor or the on-site supervisor of the contractor must hold a minimum relevant qualification and training for the proposed design or works in accordance with the Training Requirements Schedule, Table 3-1.

Contractors must be suitably experienced in the field of work to be undertaken. Council will request a schedule of qualifications in support of this in advance of any work being undertaken.

Contractors who intend to work on Council's live systems will only be permitted to do so if they are authorised by Council or have submitted the appropriate application and gained approval.

Table 3-1 below sets out works usually carried out in the construction of assets. Council officers will assess the work involved once engineering plans have been received.

Council will then advise the DPA the expected qualifications that a contractor will require to complete the works.

**Table 3-1 Qualifications**

| Work or issues involved in the construction works | Qualification and time to complete required course |
|---|---|
| Health and Safety, Civil Plant Operation, Civil Construction Works, Road Construction, Road Maintenance, Traffic Control, Pavement Surfacing, Driving Endorsements, Driving Licences, Horticulture, Pest Management, Agrichemical Application, Water Generic, Concrete Construction, Production and Technology. | Civil Construction General Skills (GS) Level 2<br>12-15 months |
| Road Opening - Traffic Control, Opening the Surface, Backfilling and Compaction, Allows for work to be conducted for the following Services - Water Services, Electricity Supply and Gas Distribution. | Road Opening Trenching (ROT) - Level 2<br>12-15 months (due to expire 2010) |
| Coordinate Road Opening Operations, Notify Public of Operations Liaise with relevant parties, STMS, Supervise personnel, ensure legal standards are met, correct procedures methods and materials are used | Road Opening Site Coordinator (ROS) - Level 3<br>12-15 months |
| Concrete Work, Concrete Kerb and Channel - Place, finish, cure, surface dressing, vehicle crossings, prepare, construct and reinstate site. Interlocking Pavers, Culverts and Drainage - set out and maintain, install, repair road drainage, subsoil, road drainage and piped stormwater, retaining structures, roadside amenities, road safety barriers, road construction, road maintenance and traffic signage - prepare, install, maintain and service structures alongside a road or road reserve. | Civil Construction Works (CCW) - Level 3<br>15-18 months |
| Earth Works - Health and Safety, foundation and sub-grades.<br>Road Construction - design, construct and maintenance,<br>Road Maintenance - Maintain road surfaces and maintenance of roadside amenities.<br>Culverts Drainage - Install pipes, culverts and drainage systems, maintenance of road drainage systems, cleaning, repairing open drainage, subsoil drainage, road drainage or piped stormwater, operating a range of civil plant and equipment. | Civil Plant Operations (CPO) - Level 3<br>15-18 months |
| Locate and identify procedures, documentation, and equipment for various jointing procedures; prepare for and perform various jointing; and complete reporting and documentation. | Electrofusion jointing of polyethylene pipe<br>Butt welding of polyethylene pipe<br>Electrofusion jointing |
| Installing infrastructure pipes, fittings and associated structures in the road and elsewhere. Includes sanitary and stormwater, pipes, ducting for potable water, trenching and depth, health and safety, confined space, slinging, lifting and placing, locate and identify. Services, level and grade, open roads, excavate, backfill and compact, prepare surface reinstatement, | Infrastructure Pipe Laying (IPC) - Level 3<br>15-18 months |

| Work or issues involved in the construction works | Qualification and time to complete required course |
|---|---|
| install associated structures and carry out testing. | |
| Basic knowledge of roadmarking materials, plant and processes; approved handler requirements for HSNO, driver response to spillage, leakage or loss of load; class 1 and dangerous goods licence; health, safety and environmental requirements. | Roadmarking Assistant (RMA) - Level 2 and Level 3<br>12-15 months |
| First aid; hazardous substances requirements; driver response to spillage, leakage or loss of load; roadmarking specifications. Industry calculations; maintain quality records; locate, set out, and manage simple roadmarking sites. | Roadmarking Operator with strands (RMO) Level 3<br>12-15 months |
| Knowledge of materials, processes and specifications for complex roadmarking work. Manage health, safety, and environmental requirements; apply sustainable environmental management practices; utilise roadmarking maps and plans for plant operation. | Roadmarking Skilled Operator (RMSO) - Level 3 and Level 4<br>15-18 months |
| General knowledge of agrichemicals and demonstrate knowledge of safety, environmental, NZS8409, and local body accountability requirements relating to agrichemicals and their application, conduct first aid, safely transport and apply agrichemicals. | Agrichemical Application (Agr Chem) - Level 3<br>12-15 months |
| General skills of civil plant operation and management, knowledge horizontal directional drilling, civil works and services, traffic control, safety, prepare and restore site, assist with HDD driller or tracker. | Horizontal Directional Drilling (HDD) - Level 2<br>12-15 months |
| Control of horizontal directional drilling site operations, knowledge of HDD, safety, locate and identify services, read and interpret plans, traffic control, prepare and restore HDD sites, knowledge of HDD driller and/or tracker, civil plant operation and management. | Horizontal Directional Drilling Site Controller (HDDSC) - Level 3<br>15-18 months |
| Drainlaying tools and equipment, excavate and trench, install and maintain drainlaying systems and structures within the boundary of the section (house or commercial buildings). | National Certificate in Drainlaying (NCD)<br>12 months |
| Work 'inside the boundary' drainage / water / pipe work (not public systems). | Registered Drainlaying with Plumbers, Gasfitters and Drainlayers Board (PGDB) |
| Specialise in Water or Wastewater Reticulation, trenching and trenchless pipe installation, lay PVC pipes, enter, work in and exit a confined space, knowledge of civil plant operation, health and safety.<br>Water Service - Clean, disinfect and restore mains/reservoirs or reticulation mains, materials and fittings.Wastewater Pipe Maintenance - Unblocking, collection systems and sewer systems and materials. | Water Reticulation Service Person (WR) - Level 3<br>15-18 months |
| Supervise maintenance and operations in water reticulation, including plant, equipment and vehicles. Supply and storage of materials, as built plans, communicate with sub-contractors and public, implement permits and maintain records, locate reticulation services, health and Safety.<br>Water - Cleaning, disinfect, pressure zones and | Water Reticulation Supervisor (WR Sup) - Level 4<br>15-18 months |

| Work or issues involved in the construction works | Qualification and time to complete required course |
|---|---|
| backflow prevention, quality monitoring and prevention.<br>Wastewater - Sewer management, wastewater composition, corrosion in sewers and odour control, flows and flow measurement. | |
| Level 2 - Handwork skills for asphalt or chipseal surfacing, bitumen safety traffic control, operate small civil plant equipment.<br>Level 3 - class 2 licence, health and safety incl fire safety, operating larger bitumen plant on surfacing sites, licences / endorsements, optional strand in health and safety supervision.<br>Level 4 – Health and safety including fire, burns, emergency response, knowledge of bitumen, heating, blending, mixing and transferring bituminous liquids, gangbar spraying, handbar spraying.<br>Level 4 paving machine – Health and safety including fire, burns, emergency response, paving and compaction for asphalt. | Roading - Bitumen Surfacing Levels 2, 3 and 4<br>12-18 months |
| Health and safety including fire, burns, emergency response, hazard ID, risk prevention, working with public, contract documents (supervision) supervising staff, asphalt of chipseal speciality, optional strand in level 2 and 3 roads. | Bitumen Surfacing Foreperson (Level 4) and Supervision (Level 5) (asphalt or chipseal)<br>18 months |
| Deals with all issues relating to operating construction equipment in any place the public has access to, includes bridges, culverts, beaches, riverbeds, reserve land, wharves and road shoulders. | Drivers Required to Operate Machinery Endorsement W, T & R |
| General traffic control. | TNZ Traffic Controller Certificate |
| Traffic signs and detours. | TNZ STMS Certificate |
| For electrofusion jointing, only personnel trained and holding a current certificate of competency in the system to be used will be permitted by Council to carry out the work. | PE Pipe Electrofusion Butt Welding |

Note: Some courses may not be available at the time of writing but will be during the life of this document.

## 3.3 Liability

### 3.3.1 Information

The following sets out matters of liability and responsibility for any works involving an asset that is vested in or is to be vested in Tasman District Council ownership.

a) The Developer is responsible for complying with all statutes, standards, regulations, bylaws, requirements and obligations. The Developer is also responsible for giving all notices, obtaining all necessary consents and providing for the protection of other property from damage resulting from the development works.

b) Plans held by Council are the best to their knowledge. Council takes no responsibility for inaccurate information or unknown infrastructure found on site.

c) Council will not be liable for any damages or loss whatsoever suffered from the use of information held by Council.

d) All contractors/consultants must undertake other (such that there is a duty) field investigations that are necessary for surveyors/designers/owners etc to investigate fully/pothole to verify designs and correct positions of services etc.

e) The consent holders, their employees, contractors and agents are responsible for physically locating the position of pipes and other utilities and infrastructure owned by the Council before commencing works.

### 3.3.2 Indemnity

a) All Designers or DPA's must have current professional indemnity insurance with run-off cover of at least two years.

b) Any contractor undertaking excavation and reinstatement works within the road reserve shall hold public liability insurance for an amount not less than two million dollars ($2,000,000) for any claim or series of claims arising out of the same occurrence.

c) Compliance with any instruction of Council, or any person acting on its behalf, in performing what is considered to be necessary actions in terms of these standards shall not absolve the contractor from any legal liability that he would otherwise have had in regard to claims for damage or failure of work for the client.

d) The Council shall not be held liable for a loss of income due to construction works or loss of services while Council's contractors or agents work on programmed works.

e) The contractor shall be held responsible for any infrastructure maintenance work required as a result of the excavation and reinstatement operations for a minimum twenty-four (24) months and a maximum of six years (for low impact stormwater designs) after notification to Council that the final surfacing material has been applied. Note: These or any other time frames shall be specified in the consent conditions or set out in the contract.

f) Any such maintenance work required by Council or agreed as a condition of resource consent shall be undertaken by the contractor at the contractor's cost within seven (7) days of being notified by Council to undertake repair works.

g) If on the grounds of safety there is a need for more immediate action, this remedial work shall be completed within forty eight (48) hours or such other time as may be directed by Council.

h) Should this not be complied with, Council reserves the right to arrange or undertake such maintenance work which will be at the cost of the contractor.

i) In the case of wastewater pumping stations, the Developer shall retain responsibility for addressing defects arising from poor workmanship or faulty materials during the required maintenance period.

j) In the event that such a defect arises the Developer shall be advised and, provided that the remedial work is not classified as urgent, given the opportunity to address the defect. Where urgent work is required to maintain service or where work on a 'live' system is required it shall be carried out by Council's contractor at the Developer's cost.

### 3.3.3 Performance Bonds

The Developer shall provide a performance bond (for work where Council's future infrastructure is involved) for unknown construction defects in cash or from a bondsman such as a registered bank (as defined in section 2 of the Reserve Bank of New Zealand Act 1989) or insurance company or other approved company, and meet the following conditions:

a) The bond shall apply to all subdivision or development construction works involving more than three additional lots or three new residential sites or where roads or services are to be vested in the Council.

b) The bond for maintenance shall be for the sum of $1,100 per lot or residential site from a minimum of $3,300 to a maximum of $25,000.

c) The term of the performance bond for defects liability shall be for a minimum period of twenty four (24) months and a maximum of six (6) years (see 3.3.3 above) from the satisfactory completion of the works (for contracts), or the issue of a 224 certificate as required under the RMA.

d) The performance bond for defects shall cover maintenance attributable to defects and the remedy of all defects arising from defective workmanship or materials. This shall cover the services and roading construction works that are to be vested in the Council and other civil and structural engineering construction works to serve the subdivision or development and including electrical supply and telecommunication cable systems.

e) The Developer/consent holder shall be liable for the remedy of all asset defects arising before the end of the period of maintenance, together with Tasman District Council costs in administering the bond. Damage by third parties as part of their individual building consents will be a separate issue.

The performance bond for maintenance shall not be required to cover general earthworks but shall be required to cover earthworks considered to be part of the civil engineering construction.

### 3.3.4 Delegations

The Council has the authority to enforce the provisions of the Engineering Standards and Policies and may delegate such authority to any officer of Council or its nominated consultant.

### 3.3.5 Engineering Manager's Discretion

The Engineering Manager's decision on the interpretation of any aspect of the Engineering Standards and Policies is final.

On application to the Engineering Manager for an alternative design, full supporting information shall be provided. This shall include all advantages and disadvantages of the proposal.

Council's interests will concentrate on the long-term public benefits to the ratepayer and limited maintenance costs for the future, rather than a short-term benefit for private individuals or Developers.

## 3.4 Ownership and location of services

This section deals with the location of services, and ownership responsibilities associated with all and any part of the service on privately-owned land, or privately-owned services on Council-owned land

### 3.4.1 Services on Public Land

Stormwater, water supply and wastewater reticulation shall be located in accordance with the following general requirements:

a) The preferred location of services to be vested in Council is on Council-owned land;

b) All services shall be aligned in accordance with the requirements of each section of this document.

c) All services shall be easily accessible for maintenance and repair works, so as to minimise disruption during excavation.

d) Diagonal crossing of other services, including kerb lines and boundaries or fence lines, at acute angles less than 45 degrees shall be avoided wherever possible.

e) A minimum of 200mm vertical separation distance to all other underground services is required.

f) Must meet the specific conditions of Table 3-2.

## Table 3-2 Location of services

| Service | Drawing or Standard Reference | Requirements |
|---|---|---|
| Stormwater | Stormwater infrastructure shall be located and aligned together with demarcation lines of responsibilities in accordance with TDC Drawing 700.<br><br>Both primary and secondary stormwater systems shall be physically and legally protected.<br><br>Direct connection of a stormwater pipe into the wastewater system is not permitted under any circumstances.<br><br>Secondary flow paths shall be identified in all instances and located (in preference) in:<br><br>• roads/reserves<br>• public land, or<br>• private land (protected by suitable easements, and on a limited basis). | Design of overland flow paths through private property will generally not be permitted in new developments.<br><br>Where a flow path is approved through private property it shall be clear of building sites and protected by an easement in favour of Council or private landowner and/or a consent notice which prohibits ground reshaping and the erection of barriers or any features that may compromise the functioning of the secondary flow path system.<br><br>Ponding and overland flow on roads is permitted in 2% and 1% AEP events, but shall allow the passage of light vehicles and 4WD vehicles respectively. |
| Water supply | See TDC Drawings 609 and 610. | See TDC Drawing 911 for private connections to properties and meter and lateral location requirements for water services. |
| Wastewater | Wastewater pipework shall be aligned in the centre of the road carriageway.<br><br>The extent of the Council's responsibility for public wastewater is defined on TDC Drawing 400.<br><br>Sewer mains shall be aligned within public areas such as roads wherever possible.<br><br>Sewers in roads shall be aligned parallel to kerb lines within the carriageway to ensure that they do not clash with other services or occupy the full carriageway width.<br><br>Adequate clearance from other services and kerb lines shall be maintained to allow for: excavation on existing services; the future relaying of the drains; the provision of additional future services. | To be classified as a public wastewater sewer a line must have been inspected, approved, and designated as such by Council. (Council responsibility does not extend to private pumping systems and rising mains which remain the responsibility of the users they serve)<br><br>Minimising the possibility of surface water infiltration of the wastewater system by ensuring that surface openings are not located in flood routes.<br>Wastewater manholes shall not be located with the manhole cover closer than 2.0m from the channel or edge of seal (in the carriageway) or at low points in the finished ground surface, ie, secondary flow path or ponding areas.<br><br>In curved roads, sewers shall generally follow the road alignment in straight lines between manholes on such alignment that they do not occupy the full carriageway width. |

| Service | Drawing or Standard Reference | Requirements |
|---|---|---|
| | This responsibility terminates at the property boundary, or, in the case of public sewers on private property, at the last manhole or mini manhole provided for a service connection. | |

### 3.4.2 Services on Private Land

The preferred location of services is on public land.

However, this cannot be achieved in all circumstances, due to the location of existing infrastructure networks, land ownership and the topography of the landscape. The following matters guide the placement of services on private land:

(a) Where services are to be located on private land, consideration shall be given to:

i. Preserving access to the pipelines for maintenance purposes;
ii. Preserving the route for relaying services in the future; and
iii. Avoiding likely positions for buildings, garages, carports and retaining walls.

(b) The preferred alignments of piped reticulation on private property shall be:

i. Within rights-of-way (ROWs) or driveways;
ii. Outside probable building envelopes;
iii. Clear of fence lines and kerb lines;
iv. Clear of large trees or heavily vegetated areas;
v. Adjacent to boundaries;
vi. Parallel to boundaries.

(c) Where a service is located on private land access for repairs and maintenance shall be maintained, and the following conditions met:

- An easement shall be required in favour of the Council, where as part of a subdivision or development proposal, pipes greater than or equal to 300mm diameter will be located in private property. The minimum width of easement shall be 3.0m plus the pipe diameter (ie, 1.5m either side of the pipe).

- The standard wording required on engineering plans in the “notes” section, shall be: “Memorandum of Easement in Gross shall be provided in favour of Tasman District Council to convey stormwater and/or wastewater in a pipe and to provide unrestricted access along the line of the pipe for maintenance and renewal work and to protect secondary flow paths”.

- Similar easements may be required over private common drains in favour of the lots served.

- Pipelines deeper than 2.5m may require easement widths greater than 3.0m plus pipe diameter to allow for wider than normal trench widths needed to access the pipe in the future.

(d) Where any construction work is required on another property, the owners consent shall be endorsed on the original drawing in opaque black ink (not biro) that will permit satisfactory scanning reproduction.

### 3.4.3 Drainage of Right-of-Way (ROW) Driveways

The Designer shall design a stormwater control method such that the primary stormwater flows are prevented from discharging:

a) Across the footpath (existing or proposed) where the ROW falls towards the road/street.

b) Across private property where the ROW falls away from the road/street, or at any low point within the ROW.

### 3.4.4 Licence-to-Occupy

The preference is for all service infrastructure assets to be both owned by (vested in) Council and located on public land. However, in some circumstances part of the infrastructure necessary to serve a private development may be located on public land with the approval of Council. Refer to section 2.3.14 for details.

### 3.4.5 Private Wastewater/Stormwater Pumping Stations

Council will not accept the discharge of sewage from small private pumping stations unless prior approval has been obtained from Council and complies with the specific design criteria as follows:

a) Properly designed wet well pumping stations with macerator pumps servicing industrial/commercial sites which employ permanent staff capable of ensuring that adequate maintenance is carried out.

b) Adequate emergency procedures and storage shall be established which precludes the possibility of uncontrolled overflow for whatever reason, eg power failure, pump failure.

c) Self-contained miniature pumping systems may be approved providing the pump is only to serve a secondary amenity on a lot where the primary service shall be a gravity sewerage system.

d) Separate power supply and meter board.

e) Any rising main from a private pump station remains the responsibility of the users and shall be located entirely on private property, ie, discharge to gravity

lateral at the boundary. This may require an appropriate odour control system to be installed at that point.

Where a private wastewater pumping station is located on public land, a licence-to-occupy agreement shall be obtained in accordance with Section 2.3.14.

## 3.5 Structures Alongside or Over Services

### 3.5.1 General

Building close to or over services is not permitted unless approved by the Engineering Manager. Where approval is given, the engineering requirements for building over or alongside services are as follows:

Building Alongside Services:

a) Structures must be located no closer than 1.0m measured horizontally from the outside wall of any public water main, or common private or public wastewater sewer or stormwater drain, 300mm diameter or less.

b) Structures must be located no closer than 1.5m measured horizontally from the outside wall of any public watermain or common private or public wastewater sewer or stormwater drain greater than 300mm diameter.

c) Structures which are balconies, may overhang the line of the pipe or drain, provided the balcony is cantilevered and its height above ground level is not less than 2.4m at the location of the pipe or drain.

d) Structures which are located within 3.0m measured horizontally from the outside wall of the pipe or drain must have the base of the foundations deeper than a line drawn at 30 degrees from the horizontal from the invert (bottom) of the pipe or drain.

e) Structures must allow for secondary overland flow paths around the building and not affecting adjoining properties.

f) Structures may be located over common private or public wastewater sewer or stormwater drains, if they comply with Table 3-3 below (acceptable techniques for building over sewers or drains).

Building Over Services:

a) Structures to be built in compliance with Table 3-3.

b) Structures must allow for secondary overland flow paths around the building and not affecting adjoining properties.

**Table 3-3 Acceptable techniques for building over public sewer and stormwater services**

| **Technique A**<br>**Applicable in zones:** | **Technique B**<br>**Applicable in zones:** |
|---|---|
| **Industrial, commercial**<br>i. There are no changes in direction or junctions in the portion built over;<br>ii. The drain is proven to be in good condition by internal inspection or a water test;<br>iii. The floor is constructed with lift out sections, and all foundations are designed to allow the entire drain to be readily exposed for maintenance and replacement work; and<br>iv. The design and use of the structure is such that a 12-tonne excavator and truck could readily gain access along the line of the drain for maintenance and replacement work. | **Industrial, commercial and residential**<br>i. Only secondary structures and not dwellings are built over drains;<br>ii. The diameter of the drain is 150mm or less;<br>iii. The length of drain built over is no more than 6.0m;<br>iv. There are no changes in direction or junctions in the portion built over;<br>v. The length of drain built over is re-laid using a continuous length of pipe without joints, sleeved inside a 225mm diameter class 4(z) concrete pipe;<br>vi. There is practical access and the foundations are designed to allow the drain to be readily exposed at both ends of the sleeve for maintenance and replacement work; and<br>vii. There is a minimum 6.0m clear length at one end of the sleeve to allow replacement of the pipe. |

# 4 TRENCHING AND REINSTATEMENT WORKS

## 4.1 Introduction

The purpose of this section is to clearly outline Council's requirements for excavation, backfilling and reinstatement works within the road reserve and public property.

It is important to ensure that all excavation works are completed to a high standard with minimal disruption to the surrounding environment.

### 4.1.1 Objectives

Council must ensure that all trenching and excavation works meet the following objectives:

a) The health and safety of the public, particularly the local community, has been ensured;

b) The level of the service is as good as or better than the existing standard of service following the new excavation works;

c) All practicable steps have been taken to minimise the level of disruption;

d) Council has been informed of excavation works and all steps have been taken to follow standards and conditions of notification;

e) Any affected or potentially affected persons have been notified in advance of the proposed disruption;

f) Remediation and reinstatement works have been completed to the same or higher standard than prior to the initiation of works.

### 4.1.2 Key References

| Document | Reference | Comment |
|---|---|---|
| TDC Engineering Standards & Policies 2008 | Liability for maintenance in the road reserve lies with the Road Controlling Authority. | Council's maintenance contractor carries out the work. |
| Transit New Zealand | Working on the Road – A Handbook for Temporary Traffic Control and Safety at Roadwork Sites | Means of compliance for traffic control measures |
| New Zealand Standards | Compaction standards | |

## 4.2 Preparation for Excavation Works

### 4.2.1 Plans

All excavation and trenching works shall meet the following requirements

a) Plans of the proposed work shall be submitted to the Council with the road opening notice, in accordance with Section 4.2.2 of this document.

b) The positioning of pipes/conduits will, wherever possible, be in accordance with TDC Drawings 608 and 609.

c) Variation from these alignments shall be by written agreement from the Council, following discussions with other affected service authorities.

### 4.2.2 Notification

A road opening notice shall be lodged at the Council and shall meet the following requirements:

a) Notice is required for each separate job or section of a continuing job which involves excavation or the lifting of the surface within a road reserve in the Tasman District.

b) A minimum of ten (10) days notice is to be given for planned excavations.

c) The operator shall advise other affected service authorities of proposed construction works. Confirmation that other affected service authorities have been advised of planned works shall be indicated on the road opening notice.

If the road involved is a state highway, the notice shall require confirmation that Transit New Zealand has been notified and if any special conditions imposed by that body have been received.

### 4.2.3 Issue of Permit

a) Providing that all required information has been supplied with the road opening notice, the Council shall issue a permit and advise known existing Council services in the locality and any specific conditions related to the proposal.

b) No works may commence in advance of the permit being issued. Permits are valid for six (6) months from the date of issue.

c) A charge for each permit issued will be made in accordance with the rates that may be set by the Council from time-to-time.

### 4.2.4 Disruption to Public

To minimise disruption to the public, the requirements as set out in Table 4-1 will be complied with:

**Table 4-1 Requirements to Minimise Disruption to Public**

| Matter | Standard | Comment |
|---|---|---|
| Notice | 24-hours notice to property owners. | The operator shall advise all affected parties, and provide a contact for further information and/or complaints. |
| Normal work hours | Between 0700 – 1800 hours, Monday to Saturday | |
| Work hours on arterial roads | Between 0900 – 1600 hours | Other hours may be specified by Council. |
| Work hours CBD | On a case-by-case basis | Hours to be specified by Council and will depend on time of year and adjacent shop and residential/apartment locations. |
| Noise | NZS6803P | |

### 4.2.5 Temporary Traffic Control, Public Safety

The following standards and regulations apply to the temporary control of traffic where a road is affected by excavation works disrupting normal traffic flows:

a) All relevant matters in Transit New Zealand's current Code of Practice for Temporary Traffic Management;

b) Obligations under the Health and Safety in Employment Act 1992.

c) The operator shall be responsible for the supply, erection and maintenance of all necessary barricades, lights, warning notices, traffic control signs etc.

d) Should the contractor wish to use any alternative methods of traffic control, the prior consultation with and approval of the Council shall be required.

e) The carriageway shall be fully open to the traffic during hours of darkness and not more than half the carriageway shall be closed at any one time, except with the express permission in writing of the Council.

f) Additional traffic control measure may be required at the request of Council, or the NZ Police (Traffic Safety).

Failure by the contractor to provide adequate safety measures may result in a work suspension notice being issued by the Council, until such time as adequate control is provided.

### 4.2.6 Closure of Roads

The following standards apply to the closure of roads:

a) No road may be closed to any traffic without the specific written approval of Council.

b) The closure of any road requires public notification. This notification will be carried out by the Council, at the operator's expense

c) Where any closure is required for less than twelve (12) hours within any twenty- four (24) hour period, Council requires a minimum of forty-eight (48) hours notice to approve and advertise any closure.

d) Where any closure is required for more than twelve (12) hours within any twenty- four (24) hour period, Council requires a minimum of forty-two (42) days to approve and advertise any closure.

e) Approval for road closure will only be given where all other options are unsatisfactory.

f) Where work is to take place within 50.0m of traffic signals, the operator shall consult with Council.

g) Special conditions when working near traffic signals may be imposed by Council to protect the detector loops and the operation of the signals.

## 4.3 Excavation

### 4.3.1 General

The follow general standards apply to excavation works:

a) Where excavation is required through any cement concrete, asphaltic concrete or chip seal surface, the edges of the excavation or trench shall be cut with a power saw prior to the excavation of the trench, ie urban roads. Excavation in rural roads shall be agreed with Council prior to works commencing.

b) The cut is to extend through the full thickness of the surface layer in a clean straight vertical line. The cut shall be 150mm beyond (50mm in footpaths) and parallel to the edge of the trench or to a line outside any pavement damage, whichever is greater.

c) Within footpaths all saw cuts shall be parallel to or at right angles to the centre line of the footpath.

d) Only wet cutting shall be permitted in the CBD, in the vicinity of suburban shopping centres or where directed by Council, to minimise the problems cause by dust.

e) All excavated material unsuitable for backfilling, together with sufficient material to compensate for the services being installed will be removed from the site immediately as excavation proceeds.

f) Areas adjacent to the excavation will not be undercut. If slumping of material from the sides of the excavation causes depressed areas adjacent to the excavation or if the edges of the pavement are lifted during excavation, additional saw cutting outside of the original line of the excavation and outside the area of damage shall be required before reinstatement is permitted.

g) Trench widths will be kept to the minimum necessary to lay the service and correctly compact the backfill (through use of trench shields).

### 4.3.2 Thrusting/Mole Tunnelling

The following standards apply to thrusting or mole tunnelling:

a) Unless impractical or unsafe, thrusting/mole tunnelling will be required:
   - under all roads;
   - under concrete carriageways; and
   - under vehicle crossings.

b) Specific approval is required for “open” trenching on any roads.

c) Water jetting will not be permitted.

### 4.3.3 Open Trenches

The following conditions apply to the use of open trenches:

a) The maximum permitted length of open trench at any one time shall be 100m unless approval for a greater length has been authorised by Council.

b) The operator will not exceed any length that is not capable of being backfilled and opened to traffic in the same day, nor shall it interfere with two-way traffic flow.

c) Open trenches will not be permitted overnight without the prior authority of Council.

d) All open trenches will be maintained in a dewatered condition and water logged material removed to the satisfaction of Council.

e) Water from any excavation will be disposed of so as not to cause any damage, nuisance or contamination/sediment discharge;

f) A discharge consent may be required for (e) above.

### 4.3.4 Backfilling

Backfilling works shall be consistent with the following:

a) Undertaken in accordance with TDC Drawing 400 using suitable excavated material or imported fill material.

b) Basecourse used in the pavement section of the backfill shall be to Transit New Zealand (TNZ) M/4 (Nelson) or TDC Drawings 400 to 402 standard.

c) The material used for bedding underneath and around the service or service duct shall be as required by the service authority. In no case shall it be less than 100mm above the top of the service, unless specific coverage is required by a reticulation pipe laying specification.

## 4.4 Reinstatement and Repair

### 4.4.1 General

a) As work proceeds the operator shall progressively carry out all restoration and tidying up work. If regular tidying up and restoration is not done, Council may require and instruct the operator concerned to carry out this work immediately.

b) Arrangements shall be made to dampen down work areas and excavated material as may be required from time-to-time, to eliminate any dust nuisance.

c) On completion of the work, the operator shall remove all plant, materials and other things that may have been brought upon the site in aid of the works, and generally clear away all rubbish and leave the site in a similar or better condition to that which existed before the work commenced.

d) Any trees or branches cut down or tree stumps uprooted during the work shall be removed. Branches that require removal should be cut by saw and not broken by machinery.

e) The operator shall, at their own expense, clean out all sumps and repair or reinstate all road surfaces, fencing, walls, floors, lawns, gardens, paths, inclusive of transplanting trees, shrubs etc and make good all damage which may have been caused through this operation to at least as good as the “as found condition” in connection with the work.

f) Where existing services are damaged as a result of the construction work, the operator shall immediately advise the owner of the damaged services (public or private).

g) The cost of repair or reinstatement of any disturbances or damage shall be borne by the operator. The standard of repair shall be to the same or better than that prior to the excavation works.

h) The repair and reinstatement shall include damage to:
- water pipes;
- wastewater sewer or stormwater drains, and any other underground services or structures;
- existing kerb and channel;
- road markings;
- survey marks within the vicinity of their work; and
- trees, shrubs or ornamental gardens within the road reserve.

### 4.4.2 Surface Reinstatement

The following standards apply to the reinstatement of surfaces following any excavation works:

a) For works within the CBD or arterial roads, surface reinstatement shall be completed within twenty-four (24) hours of the trench being opened or such

other period as directed by the Council, ie, rain/adverse weather conditions.

b) Surface reinstatement outside the areas listed in a) shall be completed within five (5) days of the trench being opened or such other period as directed by the Council.

c) Failure to complete reinstatement within the specified period may result in Council arranged reinstatement at the operator's expense.

d) All excavations will be backfilled as detailed on TDC Drawings 400, 401 and 402 to the underside of the proposed wearing surface, or to the finished level if permanent reinstatement is not being undertaken immediately. This temporary over-filling will be removed when permanent reinstatement is carried out.

e) If permanent reinstatement cannot be undertaken immediately in the CBD (footpaths and carriageway), the carriageways of roads/streets with large traffic flows, footpaths outside shops, or where Council so specifies, the contractor shall arrange for a 10mm thick layer of fine plant mix to be applied to the trench immediately backfilling is completed in order to minimise nuisance and danger to the public.

f) This is to be regarded as a temporary seal only and shall be removed before the permanent resurfacing of the trench is carried out. The operator shall maintain this surface, even and free draining, until the final restoration is complete. The cost of all temporary resurfacing and subsequent removal shall be borne by the operator.

g) If plant mix is not available, a temporary seal of sprayed emulsion and Grade 6 chip may be substituted with the approval of Council.

h) In addition to the above conditions, the standards in Table 4-2 shall also be met in relation to the particular surface being reinstated.

**Table 4-2 Surface Reinstatement Requirements**

| | **Standard or Reference** | **Clarification and Additional Requirements** |
|---|---|---|
| **Within carriageways** | Consistency with TDC Drawing 400;<br><br>Finished wearing surface flush with or no more than 5mm above the existing surface;<br><br>Unsealed surfaces, backfilling shall be as for chip sealed carriageways with 50mm of top course being placed as the final reinstatement<br><br>Appropriate "polymer modified bandage" 100mm x 1.5mm thick, shall be laid over the finished saw cut/joint.<br><br>(For State Highways refer to Transit New Zealand). | All parts of the surface damaged during or as a result of the work shall be reinstated to maintain the cross-fall slope.<br><br>Finished levels shall be compatible with the existing pavement.<br><br>Surface boxes, eg water hydrant boxes, manholes etc shall be installed in their final location during trench compaction and their finished level shall be within 5mm to 10mm above the reinstated pavement surface. |
| **Within footpaths** | TDC Drawings 616 and 617.<br>Finished surface matching the adjacent existing surface and finishing flush with | In asphaltic concrete and chip-sealed footpaths, the depth of basecourse at vehicle crossings shall match the depth of |

| | Standard or Reference | Clarification and Additional Requirements |
|---|---|---|
| **and vehicle crossings** | or no more than 5mm above the existing surface;<br>Reinstatement of damaged footpaths shall be across the full width of the footpath as shown on TDC Drawing 403;<br><br>Concrete footpaths shall match the existing with a minimum thickness of 100mm and the concrete shall attain a minimum compressive strength of 28 MPa after 28 days;<br><br>Construction joints shall be formed at 6.0m centres and the line and level of the finished surface shall match the crossfall and level of the adjacent undamaged surface;<br><br>Crossings affected by the work shall be reinstated as per TEC Drawings 616 and 617. | the existing basecourse, or a minimum depth of 200mm for commercial crossings, 300mm for industrial crossings and 150mm for residential crossings – whichever is the greater.<br><br>Vehicle crossings which are affected by the work shall be reinstated to the same material and texture as per the adjoining footpath, while industrial crossings are to match existing with a minimum standard as for commercial crossings.<br><br>Surface boxes etc shall be finished to either the berm level or footpath level. |
| **Interlocking pavement block surfaces** | The work shall be completed to give a true surface in accordance with NZS3116. | Blocks removed during excavation, or new blocks of identical shape, thickness and colour shall be replaced on a sub-grade similar to that in adjoining undisturbed areas. |
| **Within Grassed Berms, Shoulders and Lawns** | TDC Drawing 401.<br><br>Berms are the responsibility of adjacent owners to maintain.<br><br>The final 100mm shall consist of topsoil which shall be raked level with surrounding areas and shall be free of all stones.<br><br>The reinstated area shall be sown with the following grass seed mixture at a rate of 1kg to 40 square metres and raked into the soil:<br>• 1.0kg chewing fescue<br>• 4.5kg dwarf rye grass<br>• 0.5kg browntop<br><br>Turfs may be cut from the berm 75mm in thickness and 50mm wider than the trench and stacked for re-use.<br><br>Surface boxes etc shall be finished to the berm level. | A dressing of superphosphate shall be applied at the rate of 30grams per square metre. Alternative fertiliser and application rates may be used subject to prior consultation and agreement with the Engineering Manger. After two months, a dressing of Sulphate of Ammonia applied at a rate of 30g per square metre shall be applied.<br><br>Full reinstatement shall be achieved within 48 hours with screened topsoil being raked into all cut joints, with all turfs being adequately watered immediately following completion of reinstatement. |
| **Alternatives to grass berms** | Various surface dressings may be used with the Engineering Manager's approval subject to mitigation of risks. | Risk to Council<br>- acceptability to local residents;<br>- services below ground;<br>- permeability of cover;<br>- safety of pedestrians – tripping;<br>- debris dispersal;<br>- vandalism;<br>- no cost to Council for reinstatement; |

| | Standard or Reference | Clarification and Additional Requirements |
|---|---|---|
| | | and<br>- locality to traffic volumes and pedestrian volumes and use. |

### 4.4.3 Inspections

The operator shall notify Council immediately upon the completion of final reinstatement so that an inspection may be made of the completed surface reinstatement works.

## Section 4 Drawings

Drawing 400 – Trench reinstatement in carriageway

Drawing 401 – Trench reinstatement in footpath

Drawing 402 – Trench reinstatement in carriageway (friction course)

Drawing 402 – Footpath reinstatement concrete or asphaltic concrete

Note: The drawings are **not** included in this document. They are available in PDF format or hard copy from the Engineering Secretary (03 543 8524) or email engineeringstandards@tdc.govt.nz

# 5 EARTHWORKS

## 5.1 Introduction

This section provides standards for the management of earthworks, excavation, soil disturbance and sedimentation.

The purpose of the earthworks standards is to provide guidance to any operator involved in vegetation removal, excavation, recontouring of land and the preparation of sites for 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. A lack of adequate rehabilitation of worked landscapes can create an eye-sore.

### 5.1.1 Objectives

Council is responsible for ensuring that all earthworks being undertaken during the construction and installation phases of service infrastructure development meet the following general objectives:

a) The extent and scale of disruption has been minimised;

b) Significant re-contouring and large-scale earth movement has been minimised;

c) All practicable measures have been undertaken to minimise soil loss, erosion and sedimentation from exposed surfaces;

d) Finished landscapes, sites for future building development, and surfaces that will become part of the road network, meet geotechnical approval;

e) Finished landscapes have been rehabilitated to a standard that is the same as or better than the standard of finish prior to the earthworks activity;

f) The earthworks activity is consistent with all permitted activity standards and conditions, or has obtained resource consent, in terms of the TRMP.

g) All permitted activity standards, subdivision consents standards and/or conditions of any applicable resource consent have been met.

### 5.1.2 Key References

The standards and external references set out in Table 5-1 must also be taken into account in the design and management of any earthworks activity.

**Table 5-1 Standards and External References**

| Matter | Standard or reference | Comment |
|---|---|---|
| Tasman Resource Management Plan | Section 18.6 Land Disturbance | A resource consent will be required where significant earthworks is proposed and/or where permitted activity standards and conditions cannot be met. |
| Subdivision | RMA Sections 104 and 106 | Conditions may be imposed through the subdivisions consent process.<br>Any applicable conditions must be met prior to the Engineering Manager's approval.<br>Subdivision may not be granted if land is not suitable for development as a result of instability, subsidence, inundation and/or erosion. |
| Engineering Plan and Subdivision Consent Approvals | RMA Section 223 and 224 | Prior to Section 223 approval, Council needs to be satisfied that potential house sites can exist and can be serviced.<br>Prior to Section 224 approval Council must be satisfied that house sites do exist. |
| Consent notice requirements | RMA Section 221 | Any conditions may be registered against the property and outlined in consent notices to be recorded on the individual titles pursuant to section 221. |
| New Zealand Standards | NZS4404, 4402, 4431 | General earthworks standards and guidance for the preparation of a future building site or road sub-grade. |
| Other technical publications | TP10, TP90, TP124<br>TNZ F/1 | Stormwater and sedimentation control technical guidance from the Auckland Regional Council. |

## 5.2 Earthworks

### 5.2.1 General

The following general principles shall apply to all earthworks in the Tasman District:

a) All earthworks activities comply with permitted activity standards and conditions of Section 18.6 of the TRMP.

b) Information to show compliance with permitted activity standards, or that compliance can be achieved, may be required at the request of Council.

c) Where permitted activity standards and conditions cannot be achieved, a land disturbance resource consent must be obtained in accordance with Section 18.6 of the TRMP. The applicant may be required to provide information to show compliance with all conditions of consent;

d) All earthworks and land disturbance shall be consistent with the principles of earthworks in section 5.2.2 below

e) Management of sedimentation and control of erosion shall be undertaken in accordance with section 5.3 below;

f) Where a large earth fill is required, the following information shall be submitted:

   i. plans showing contours or levels of the existing site, existing water courses, drainage features and any water table information;
   ii. a plan showing proposed final contour levels, sections boundaries, the extent of cut and fill;
   iii. a plan showing batter slopes, surface and subsoil drainage and/or culverting; and
   iv. specifications on compaction methods and degrees of compaction required, also giving moisture/density test results of the soil to be encountered;

g) Stormwater and drainage management must be undertaken in accordance with section 7 of the Engineering Standards and Policies;

### 5.2.2 Principles

All earthworks and land disturbance activities in the Tasman District, regardless of the scale and size of the activity, compliance with permitted activity standards and conditions, or resource consent conditions, must be consistent with the following principles:

a) Minimise disturbance – 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;

b) 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.

c) Topsoil stripping - All topsoil shall 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;

d) Unsuitable material - All unsuitable material uncovered during stripping or earthworks shall be excavated. Unsuitable material is generally described as any material having a California Bearing Ratio (Scala or equivalent) (CBR) inferred value of three or less;

e) Compaction - all fill areas must be re-worked and compacted in accordance with the appropriate design relevant to soil conditions and geology.

f) Protect steep slopes – Steep slopes shall be protected in accordance with Table 5-2 and all fills must be compacted to reduce erosion and sedimentation.

**Table 5-2 Slope Protection**

| Slope | Intended Stabilisation | Standard |
|---|---|---|
| Less than 1-in-25 (4%) | Not later than six months from the date of disturbance. | Revegetate or otherwise protect from erosion as soon as practicable.<br><br>If permanent rehabilitation/stabilisation is delayed then temporary measures such as mulching will be required. |
| 1-in-25 (4%) and 1-in-5 (20%) | Within 14 days. | Temporary contour drains (TDC Drawing 500) will be required draining to temporary diversion earth bunds (TDC Drawing 500), until the land is stabilised. |
| Between 1-in-25 (4%) and 1-in-5 (20%) | Where measures taken for the land to be stabilised within 14 days. | Temporary contour drains are required, draining to a sedimentation pond (TDC Drawing 501), until the land is stabilised. |
| Greater than 1-in-5 (20%) | Have measures taken for the land to be stabilised within 14 days. | Temporary benched slopes (TDC Drawing 500) will be required, draining to temporary earth bunds, until the land is stabilised. |
| Greater than 1-in-5 (20%) | No measures taken for the land to be stabilised within 14 days. | Divert clean water runoff from above steep slopes, away from worked areas and keep separate from sediment prone water.<br><br>Compact all fills to reduce erosion and sedimentation. |

g) 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;

h) Protect watercourses - Vegetation clearance and soil disturbance is not permitted within 10m of the banks of any river or within 200m of the coastal marine area without resource consent as per Section 18.6 of the TRMP. The realignment of a natural watercourse is not permitted without resource consent;

i) 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.

### 5.2.3 Subsoil Drainage

a) Subsoil drainage will generally be required for significant areas of fill. Similar requirements in conjunction with more extensive sub-soil drains may be necessary on flatter ground in wet areas.

b) Sub-soil drains are discouraged under proposed building envelopes as they may be damaged in piling/excavations for the future dwelling.

c) Subsoil drainage will not be a general requirement for a permeable retaining wall except in the following circumstances:

   i. Where semi-watertight materials (such as tongue and groove boards) are used;
   ii. Where walls have a back-sloping, below-ground footing where water may be trapped;
   iii. Where seepage from a retaining wall may cause a nuisance to an adjoining property owner;

iv. Where seepage from a retaining wall in close proximity to a building site may be a nuisance or unsightly; or
v. Where a retaining wall is being built in an area of suspect stability and the removal of surface or groundwater would be an advantage.

d) Sub-soil drains shall be shown on all as-built drawings, with depths to finished ground levels.

## 5.3 Methods for Erosion Control

### 5.3.1 General

To meet permitted activity standards and conditions of Sections 18.6 and 36.2 of the TRMP erosion and downstream sedimentation must be managed, regardless of the size and scale of the development and associated earthworks.

The methods set out in this section provide some technical guidance as to how erosion can be avoided, and the temporary effects of sedimentation during construction can be managed.

Site characteristics, the type of development, the extent of land cover change, the character and intensity of development downstream of the site and the scale of earthworks, will among other things, influence the need for erosion and sedimentation management.

The following methods may be used to manage erosion and sedimentation effects, and should be used as a guide to developers seeking to meet the provisions of Section 18.6 of the TRMP.

### 5.3.2 Erosion Control

The preferred method of erosion and sedimentation control is prevention. Prevention, through erosion control, will avoid problems associated with soil and sediment loss. Table 5-3 sets out key methods that can be implemented to help control erosion.

**Table 5-3 Erosion Control Methods**

| Management Method | Standard and/or reference | Comment |
|---|---|---|
| **Diversion channel or bund** | Channel will contain a $Q_{20}$ return period peak flood flow from the catchment, plus 300mm freeboard.<br><br>Where channel velocity is greater than 1.0m/s stabilisation measures such as geotextile, rock check dams or pipe drop structure will be required to prevent channel erosion.<br><br>See TDC Drawings 500 to 502. | Diversion channels and bunds are to be used to divert clean or sediment laden runoff.<br>Channels are to be of a trapezoidal cross-sectional shape.<br><br>Avoid abrupt changes in grade / direction, or design structure to allow for sediment deposition or super-elevation.<br><br>Incorporate erosion proof outfall, such as a level weir to prevent scour and reduce outfall velocities.<br><br>Where there are critical downstream structures, secondary flow path measures |

| Management Method | Standard and/or reference | Comment |
|---|---|---|
| | | may need to be considered. |
| **Contour drain or benched slopes** | Contour drains should be used where the slope of disturbed land or exposed soil is between 1-in-25 (4%) and 1-in-5 (20%).<br>The drains gradient should not exceed 1-in-50 (2%). The land slope:contour spacing requirements are as follows:<br>4 to 10% 50m<br>10 to 15% 40m<br>15 to 20% 30m<br><br>Benched slopes should be used where the slope of disturbed land or exposed soil is greater than 1-in-5 (20%).<br><br>The spacing of the benched slopes should be:<br>20 to 32% 20m<br>33 to 50% 15m<br>Greater than 50% 10m<br><br>The benched slope with a maximum reverse angle of 1-in-6.6 (15%), a minimum depth of 300mm and a width suitable to allow access for maintenance (minimum 3.0m).<br><br>The benched slope gradient should not exceed 1-in-50 (2%).<br><br>Benched slopes are to be a maximum 250m long.<br><br>Refer to TDC Drawing 500. | Contour drains and benched slopes are to be used to prevent overland flow velocity build up on long continuous, and steep slopes.<br><br>Install additional drainage where natural seepage is present which may affect slope stability or create excessive runoff.<br><br>Consider risk of erosion, sedimentation, slippage, settlement, subsidence and rotation of the slope on downstream land.<br><br>Consider design of diversion channel draining the benched slopes. |
| **Stabilised construction entrance** | A stabilised construction entrance is required on all site entrances onto a public road or right-of-way.<br><br>A stabilised entrance leading on to the carriageway from the construction area will be 10.0m x 4.0m wide where the vehicle will travel the length over a 75-100mm sized washed aggregate which will help dislodge soil particles from the wheels etc. | A stabilised construction entrance is required to prevent site access points becoming sediment sources.<br><br>Where it is found or anticipated that a stabilised construction entrance will not prevent sediment being transported onto the road additional measures will be required such as the installation of a wheel wash facility. |
| **Pipe flume drop structures** | The structure shall meeting the following standards:<br><br>Calculations showing that the structure will contain a $Q_{20}$ return period peak flood flow from the catchment. | A pipe drop structure is required to convey runoff down an un-stabilised slope to prevent erosion of that slope.<br><br>Pipe flume drop structures can be used as diversion channels where run of velocities are high. |

| Management Method | Standard and/or reference | Comment |
|---|---|---|
| | Materials, inlets and joints should be watertight.<br><br>Secure the pipe drop structure to the slope at least every 4m.<br>Careful consideration of the inlet and outlet is required to ensure no erosion occurs.<br><br>The structure is placed on suitably compacted or undisturbed material.<br><br>The structure is constructed in accordance with TDC Drawing 502. | |

### 5.3.3 Stabilisation

In addition to the above stormwater flow management structure, earth stabilisation techniques should also be used. The following guidelines should be used in the stabilisation of soils and exposed surfaces:

a) Stabilisation measures include seeding, mulching, hydroseeding, turfing and the installation of geosynthetic erosion control systems. Mulching "with sheep-foot roller compaction" is the most effective instant protection.

b) Seeding may be used to stabilise disturbed ground or exposed soils where the gradient is less than 1-in-4 (25%) and where the seed is applied between 1st March and 30th April and between 1st September and 31st November.

c) For slopes greater than 1-in-4 (25%) mulching must be used in conjunction with seeding.

d) Install the seed bed free of large clods, rocks and other unsuitable material and apply a minimum of 100mm topsoil. Fertiliser may be applied where necessary.

e) Seeded disturbed land is considered stabilised two (2) months after sowing and after visible grass growth has appeared.

f) Mulching can be used at any time of the year, where the instant stabilisation of exposed soils is required. Mulching may be used in conjunction with seeding and sheep foot roller compaction on steeper slopes.

g) Mulch should contain un-rotted small grain straw, an adhesive and fertilizer applied at a minimum rate of 4,000kg per hectare spread uniformly to a minimum depth of 60mm.

h) In some circumstances, ground conditions and the season should be taken into consideration when assessing the method that the mulch will be anchored to the ground.

i) Alternative mulch materials such as wood fibre, wood chip, hay, hydromulch may be acceptable, where appropriate, subject to approval.

j) Hydroseeding should be used to establish vegetation quickly for critical areas such as steep non-soil slopes and sediment retention pond batters. The proposed limits of application and specification should be specified by the supplier for approval.

k) Hydroseeded disturbed land is considered stabilised two (2) months after application and when visible grass growth has appeared.

l) Grass turf may be used where immediate cover is required (ie, runoff diversion channels and beside watercourses). Turf reinforced with geosynthetic matting should be considered for areas of high erosion potential.

m) Turf is to be installed in accordance with the supplier's recommendations.

n) Geosynthetic erosion control systems provide artificial protection of channels and slopes and include matting, geotextiles and erosion matting. There are several types of systems suitable for different circumstances.

o) For all techniques the following design factors should be considered:

i. Site preparation – Install all necessary erosion and sediment control structures prior to stabilisation;
ii. Irrigation – Address water supply measures for seed germination and plant growth. Control irrigation to prevent erosion;
iii. Protection – Protect re-vegetated areas from traffic and other ground disturbing activities; and
iv. Maintenance – Reseed where erosion or germination is unsuccessful (within the timeframes previously mentioned), otherwise consider mulching.

### 5.3.4 Sedimentation control

There are many methods available for managing sediment loss. Those set out in Table 5-4 may be used to help prevent excessive sediment loss.

**Table 5-4 Sedimentation Control Methods**

| Method | Standard and/or Reference | Comment |
|---|---|---|
| **Sediment retention pond** | The pond should be designed so that larger runoff events will receive partial treatment, while smaller events will receive a high level of treatment.<br><br>Refer to TDC Drawings 500 to 505.<br><br>Refer to Appendix 5-1. | A sediment retention pond is a temporary structure designed to treat sediment laden runoff by dewatering the pond at a rate that allows suspended sediments to settle out.<br><br>The pond shall be cleaned out once 50% of the design volume has been filled with sediment. |
| **Silt fence** | They should be used on low gradient sites, or for confined areas where the | Silt fences should be used to detain sheet flow runoff so that |

<table>
<tr><th>Method</th><th>Standard and/or Reference</th><th>Comment</th></tr>
<tr><td></td><td>contributing catchment is small (less than 0.5ha.).<br><br>Maximum slope length, spacing of upslope returns and gradients or silt fences is as follows:<br><br>
<table>
<tr><th>Slope</th><th>Upslope Return Length (m) Maximum</th><th>Spacing of Returns (m)</th></tr>
<tr><td>Flatter than 2%</td><td>Unlimited</td><td>N/A</td></tr>
<tr><td>2-10%</td><td>40</td><td>60</td></tr>
<tr><td>10-20%</td><td>30</td><td>50</td></tr>
<tr><td>20-33%</td><td>20</td><td>40</td></tr>
<tr><td>33-50%</td><td>15</td><td>30</td></tr>
<tr><td>>50%</td><td>6</td><td>20</td></tr>
</table>
<br>Refer to TDC Drawing 506.<br><br>Excavate a trench a minimum 100mm wide and 200mm deep along the line of the proposed fence. Install the support post and fence fabric and backfill the trench with compacted soil.<br><br>Where water may pond behind the fence provide extra post support.<br><br>The fence fabric should have minimum tension strength of 0.345pa, minimum tensile modulus of 0.140pa and apparent opening size of 100µm.<br><br>Fence supporting posts should be a minimum 50mm square of tanalised timber or steel waratahs, a minimum 2m apart.<br><br>The top of the fence fabric should be reinforced with 2.5mm galvanised wire, tensioned and tied.</td><td>sedimentation can occur through settlement.<br><br>Silt fences should not be used as velocity checks in channels or watercourses or to intercept concentrated flows.<br><br>Silt fences should remain in place until the catchment has been stabilised.<br>Repair fences where bulges occur or when sediment accumulation reaches 50% of the fabric height.<br><br>Geotextiles will require specific design due to soil types and application to be used.</td></tr>
<tr><td>Stormwater sump protection</td><td>Stormwater sump protection shall be used only as a secondary control device to filter sediment laden runoff before it enters the existing stormwater reticulation system from small catchments less than 0.5ha.</td><td>Additional measures are required such as filter cloth, sump lining bags, diversion bunds, contour drains, benched slopes and silt fences to minimise the volume of sediment laden water reaching the stormwater inlet. On-site vehicle washes may also be required.<br><br>A silt fence can be erected around the inlet or coarse geotextile fabric wrapped around the sump grate (and within the sump) with a layer of appropriately weighted material over to act as a primary filter and hold the fabric in place. Back entry sumps</td></tr>
</table>

| Method | Standard and/or Reference | Comment |
|---|---|---|
| | | require additional fabric protection secured in place.<br><br>Sandbag check dams should be placed up the gutter to act as sediment traps, ensuring these are lower than the kerb to prevent berm runoff. |
| **Earth bund** | Earth bund outlets need to be designed as for a sediment retention pond decant system or by using a perforated pipe.<br><br>The perforated pipe outlet should be 150mm lower than the stabilised spillway which in turn should be 250mm below the top of the earth bund. The outlet should be watertight along the bed of, and through, the bund.<br><br>The impoundment area of the bund is to be level, and have a minimum volume (measured to the top of the novacoil pipe) of $1m^3$ for every $100m^2$ of contributing catchment. | Earth bunds are used to intercept and detain sediment laden runoff for disturbed land or exposed soils that are to be stabilised within 14 days. They are to be kept in place until stabilisation is complete. |

## Appendix 5-1 Sediment Retention Pond

A sediment retention pond should be designed in accordance with the following requirements and figures:

a) for any activity where the disturbed land slopes less than 1-in-10 (10%) and less than 200m in length the pond shall be designed with a minimum volume of 1% of the contributing catchment, ie, 100m$^3$ for each hectare of contributing catchment;

b) for any activity where the disturbed land slopes greater than 1-in-10 (10%) and/or 200m in length the pond shall be designed with a minimum volume of 2% of the contributing catchment, ie, 200m$^3$ for each hectare of contributing catchment;

c) for any activity where the disturbed land slopes greater than 1-in-2.50 (40%) and 200m in length the pond shall be designed with a minimum volume of 3% of the contributing catchment, ie, 300m$^3$ for each hectare of contributing catchment;

d) the slope angle is determined by that slope immediately above the pond or by the average slope angle over the contributing catchment, whichever is greater;

e) ensure base of pond is level, between 1.0m and 2.0m deep and between three to five times longer than wide. The distance between the pond inlet and decant structure should be as great as possible;

f) the decant system should be carefully designed to ensure approximately 30% dead storage at the bottom of the pond to dissipate energy flows;

g) decants work only through the remaining 70% live storage volume. For catchments up to 1.5ha, 1 decant should work through the whole live storage height. For catchments 1.5ha to 3ha, 2 decants required, one through the whole live storage, the second through the top half only. For catchments 3ha to 4.5ha, 3 decants required one through the whole live storage, the second through upper two-thirds and the third through upper third of live storage;

h) a decant should be provided for each 1.5ha catchment with 6 rows of 10mm diameter holes at 60mm spacing (200 holes) along the 2.0m long decant arm. For catchments less than a multiple of 1.5ha, the appropriate number of holes should be sealed off (ie, for 1ha catchment drill 133 holes in decant), one 10mm diameter hole per 75m$^2$ of contributing catchment;

i) each decant should be weighted to keep it submerged just below the pond surface through all stages of the decant cycle to prevent blockage from debris;

j) the discharge pipe should be installed with anti-seep collars;

k) the pond inlet should utilise a level weir to maximise the pond capacity. The level weir should be the same width as the pond floor. The inlet slope, below the level weir should be protected from erosion with geotextile and at a slope

no greater than 1-in-3 (33%);

l) the inlet level weir/spreader should be set 100-200mm above the invert of the emergency outlet spillway;

m) incorporate a 1.0m deep by 2.0m wide forebay in front of the level weir;

n) silt fences should be installed below the pond prior to construction to prevent downstream sedimentation until the pond batters are stabilised;

o) stabilise the pond batters and any other disturbed areas immediately after construction;

p) for catchments between 1.5ha and 3ha, a 150mm diameter primary spillway pipe is required. For catchments greater than 3ha, a concrete manhole riser and pipe outlet is required, sized for a $Q_{20}$ return period peak flood flow from the catchment;

q) an emergency spillway must be installed on all sediment retention ponds, designed for a $Q_{50}$ return period peak flood flow from the catchment. The spillway requires adequate stabilisation to accommodate a $Q_{50}$ flow and should be a minimum 6.0m wide or the width of the pond floor, whichever is the greater. The spillway should have 300mm freeboard above the height of the primary spillway and 300mm below the pond banks;

r) fence sediment ponds as necessary in accordance with site safety management plan;

s) sediment ponds are to be cleaned out when the volume of sediment accumulated reaches 20%. The 20% level should be clearly marked on the decant riser;

t) identify sediment disposal locations where there is no risk of erosion;

u) chemical treatment of the pond, promoting flocculation to increase the rate of sediment settlement may be considered, subject to Council approval, (1) in circumstances where the pond volume cannot be achieved, (2) where there are high levels of downstream sensitivity, (3) high proportion of clays in the disturbed land.

Refer to TDC Drawings 500 to 506.

## Section 5 Drawings

Drawing 500 – Contour drains, bunds and benches

Drawing 501 – Diversion channel and sediment retention pond

Drawing 502 – Pipe/Flume drop structures

Drawing 503 – Flume drop structure - details

Drawing 504 – Decant detail for various catchments

Drawing 505 – Decant detail for various catchments

Drawing 505 – Silt retention fences

Note: The drawings are **not** included in this document. They are available in PDF format or hard copy from the Engineering Secretary (03 543 8524) or email engineeringstandards@tdc.govt.nz

# 6 ROAD NETWORK

## 6.1 Introduction

The purpose of this section is to provide design guidance for the construction of the road/street network.

Appropriate design standards for roads are important to ensure that Council's assets are constructed to an appropriate standard. These standards allow for cost-effective and long- term benefits that consider environmental effects and reduce the financial impact on Council's infrastructure.

Poor road network design can be costly for Council and ratepayers, and can affect the safety and wellbeing of people and communities.

Note: The words, street and road have the same meaning in terms of this document.

### 6.1.1 Objectives

Council is responsible for all road assets under its control. Council must therefore ensure that they are designed, constructed and maintained to meet the following general objectives:

a) The road provides a safe and efficient corridor for all road users in accordance with current and projected traffic volumes;

b) The road has a high level of street amenity, in keeping with the character of development within the surrounding environment;

c) The road corridor provides safe access options for pedestrians, cyclists and other legal road users;

d) The road corridor accommodates a range of infrastructural services, enabling easy access for maintenance and upgrade works within the corridor with a minimum of disruption;

e) Off-street parking has been provided to meet the needs of the local environment;

f) Stormwater has been managed effectively so as to avoid flood risk/inundation potential and water quality contamination;

g) The road carriageway surface is durable and safe;

h) Access to the road corridor by network utility operators and the road controlling authority is ensured, for road maintenance and access to services within the road reserve.

i) The road corridor is managed efficiently by network utility operators and the road controlling authority.

j) The road network is cost-effective to construct and maintain over the lifecycle of the road asset;

k) The road network meets the needs and expectations of the community in terms of the LTCCP.

l) The road meets all requirements of the TRMP, including compliance with any relevant conditions of resource consents

Private access-ways and private roads are not directly a Council responsibility, but their safe and efficient functioning and ongoing maintenance can have an effect on Council's road network. Council must also ensure that its network does not adversely affect the safety and efficiency of the state highway network, under Transit NZ as the road controlling authority.

These general objectives guide Council in developing standards that deliver an effective and efficient level of land transportation management.

### 6.1.2 Key references

Table 6-1 summarises all of the external national standards that are relevant to the design and construction of the road network in the Tasman District.

**Table 6-1 New Zealand Road Design Standards**

| Matter | Standard and/or Reference | Comment |
|---|---|---|
| Principal Design Guide | Austroads – Including NZ Supplements | Use primarily for rural roads, intersections, paving and sight distance criteria. |
| | NZS:4404 | Urban and rural road design principles. |
| Principal pavement standards | Transit New Zealand specifications | |

Where an Act or Standard is referenced this shall be the current version including any associated amendments.

## 6.2 Road Design Solutions

### 6.2.1 General

The following design matters must be addressed in the road design and layout:

a) The road network must be well connected to ensure efficiency and legibility, reduce congestion at key intersection points and can provide security of access under emergency conditions (See TDC Drawing 602);

b) Roading layouts shall be planned to maximise convenient access to all users (traffic, cyclists, walkers etc;

c) Road design alignments shall not be designed in isolation but will require an overall appraisal of the surrounding area, even if adjoining areas are zoned differently;

d) New roads being added to the network must be guided by what is optimal for the area as a whole, rather than allowing individual developments to be created with minimal roading;

e) Cross intersections shall be avoided unless designed with sound traffic engineering principles and approved by the Engineering Manager;

f) New roads shall be extended to the boundaries of the owner's land where the road will require to be ultimately extended into the adjoining land. A temporary turnaround shall be constructed if it is part of a staged development by the same owner;

g) The road design and layout must be approved as part of a subdivision and/or road area land-use consents, and be consistent with any resource consent conditions that may apply in accordance with the TRMP;

h) The proposed road meets the standards set out in 6.8.4Appendix 6-2.

i) The proposed road is consistent with any "indicative road" layout shown on the planning maps of the TRMP;

j) The road design, spacing, layouts, and cross sections must be consistent with TDC Drawings 600 to 605.

k) Final roading layouts will require the approval the Engineering Manager which will be carried out through the vetting of subdivision consent plans at the time of consent approval.

l) In redeveloping the existing network there may be constraints such as limited road reserve width and existing development that mean that Council's standard designs cannot always be achieved.

m) Where a road is developed in stages a temporary turning area shall be provided at the end of the construction and outside the road-to-vest areas.

n) The pavement shall be formed to the same standard as the road and permanently surfaced to provide a minimum 16m diameter turning area for residential areas or such other turning design such as "hammer head".

o) Where a road abuts an adjoining property and is not part of the consent, the road shall be formed up to the boundary and vested with Council without isolation strips. The turning requirement may be modified to provide some form of turning facility.

p) Provision shall be made to control stormwater, including the construction of open channels to intercept surface runoff and direct it to an approved stormwater system. If a lot is created with two road frontages, then both roads shall be constructed and vested in Council in the one stage. (This allows full development of the corner section and traffic off the lesser road, or to the requirements of the future landowner).

q) Stormwater from roads must be managed as part of the overall road design and development proposal:

i. All stormwater from the carriageway and footpaths shall be collected and managed so as to avoid inundation and water contamination effects;
ii. Compliance with the requirements of the TRMP including the need for a discharge consent;
iii. Compliance with section 7 of the Engineering Standards, which details the accepted design standards for all methods of stormwater control.

r) Road/Street Pattern Philosophy – The Council is aiming at a pattern of roads/streets that form a network rather than a series of "trees". This is to eventually give road users a choice of route for every journey so as to avoid undue concentration of traffic and also to provide more security of access under emergency conditions. In particular, development of new areas will be guided by what is optimal for the area as a whole rather than allowing individual developments to be created with minimal roading. Application of this policy may give due regard to topography and road/street layout and indicative roads.

### 6.2.2 Geometrical Design of Carriageways

The geometric design of all roads is set out in the following Table 6-2.

**Table 6-2 Geometric Design of Carriageway**

| Design consideration | Standard/Reference | Notes |
|---|---|---|
| **Design** | Intersections at Grade (Guide to Traffic Engineering Practice) Austroads 2005 Part 5; See TDC Drawing 612 to 614.<br><br>Rural Road Design (Guide to the Geometric Design of Rural Roads), Austroads 2003 and current amendments.<br><br>Both of these documents are to be read in conjunction with the New Zealand supplements issued from time-to-time to amend any criteria to suit New Zealand conditions and practices. | With regard to the use of the Rural Road Design manual, some modifications and extrapolations may be necessary to suit urban situations. This guide has been included as it is the current design document for horizontal and vertical curvature, super elevation and curve widening.<br><br>Safety considerations are paramount and designers shall endeavour to eliminate or protect road users from all potential hazards within the safety clear zone appropriate to the road.<br><br>To maintain driver safety at road intersections it is important to ensure that the crown of the intersecting road does not extend out into the carriageway of the through road. |

| Design consideration | Standard/Reference | Notes |
|---|---|---|
| **Gradients** | See 6.8.4Appendix 6-1.<br><br>Grades shall be as long as possible and vertical curves provided at all changes of grade. | Minimum/maximum gradients shall apply to the inside of any curves.<br><br>Minimum gradient on a kerb shall be 0.40%, 1-in-250. Centreline gradients are not acceptable even in cases where the channel gradients may be nearly identical. |
| **Crossfall on Carriageway** | Normal crossfall of 1–in-33 (3%) in both directions from the crown shall be developed on all standard carriageways.<br><br>Where the kerb levels differ for design purposes, crossfalls varying from 1–in-50 to 1-in-25 (2% to 4%) from the crown may be permitted, coupled with a lateral shift in crown position of up to one quarter of the effective road width. | Where a uniform cross-fall is developed from kerb to kerb, this shall not be flatter than 1–in-50 (2%).<br><br>Unsealed roads (if approved through resource consent) shall have crossfall of 4% to 6% from the centreline crown. |
| **Super-Elevation** | Super-elevation will not normally be required or permitted in 50 km/h zones or areas that in the opinion of the Engineering Manager likely to become 50 km/h zones.<br><br>The maximum super elevation shall not exceed 1-in-12 (8%) where uniform crossfall is developed. | Certain main routes may in the future have an increased speed limit. If this change is a possibility, Council may require super-elevation to be constructed to a speed value nominated at the time of the request.<br><br>On hillside development super-elevation may be employed where it suits boundary levels up to the allowable design maximum crossfall. |
| **Kerb lines** | See TDC Drawings 610 and 611.<br><br>Where kerbs are used in the road design they shall be at the same level on both sides of the road/street.<br><br>In special circumstances, the left and right hand kerb lines may be better graded individually.<br><br>The following maximum difference applies:<br><br>Width of Carriageway **-** Maximum Difference in kerb level:<br><br>7m - *120mm*<br>8m - *140mm*<br>13m – *200mm*<br>14m - *220mm*<br>16.5m - *250mm*<br><br>Kerbs in commercial zones where verandas are present shall be set 450mm out from the veranda. | In special circumstances, the left and right hand kerb lines may be better graded individually in conjunction with centre line levels, footpath levels and boundary levels.<br><br>Under such circumstances, at a given cross section, the left and right hand kerbs may differ.<br><br>This allows for a shift in the crown to approximately the quarter point, while maintaining a 3% crossfall. |

| Design consideration | Standard/Reference | Notes |
|---|---|---|
| **Curves (and Turning Heads)** | See TDC Drawing No. 606.<br><br>Road Types 1, 2, 3, 9, 10 and 11 shall have transition horizontal curves designed to match or exceed the design speed. Vertical curves shall be designed to exceed the design speed by 10km/hr.<br><br>Road types 4, 5, 6, 7, 8, 12, 13, 14 and 15 may be designed with fully circular horizontal curves with a minimum radius of 40m on the centreline.<br><br>Horizontal curves with radii of 150-350m and Design Speed Values of 70km/hr and above must incorporate a safety recovery width of 1.5m as additional seal on the outside of the curve.<br><br>The minimum radius of the turning circle of a cul-de-sac shall be 8 metres in residential areas, 12.5 metres in commercial and 15 metres in industrial areas. | Reduced radii may be considered for any road type on approval of the Engineering Manager; however additional mitigation measures may be required. These may include widening on the inside of curves and/or vesting of additional road reserve to maintain sight lines for the design speed.<br><br>In areas where the roads could have a higher design speed in the future Council may require geometric elements to be provided to the higher speed.<br><br>At intersections, the kerb line shall have a minimum radius of 6 metres, except at major intersections, when the Engineering Manager may require a larger radius.<br><br>Alternative turning heads (hammerhead or fish tail) in residential cul-de-sacs/access places may be permitted subject to a minimum two-axle truck completing a three-point turn and to the approval of the Engineering Manager. |
| **Slope of Berms** | See TDC Drawings 607-609, 615, 616 and 620. | Where it becomes necessary to have a berm steeper than 1-in-12, it shall be necessary to produce design gradients for individual property access to show that these may be satisfactorily negotiated for a 90 percentile vehicle. |
| **Batters** | See TDC Drawing 607.<br><br>Batter slopes and location from Boundaries shall conform to TDC Drawings 607 and 608 and shall begin/terminate at the berm edges as shown in TDC drawings.<br><br>The requirements of Appendix 6-2 must also be met. | Batter slopes shall be suitably planted or hydroseeded to enhance stability on the completion of construction.<br><br>The road reserve shall terminate at the bottom of the batter when below the road and top of the batter above the road. |
| **Walls** | Where conditions indicate reinforced earth walls, retaining walls, and crib walls, benching or similar may be required. | A producer statement for design and construction for any such structure shall be submitted and a building consent obtained, together with safety fencing where drops exceed 1.0m. |
| **Roadside barriers** | The road designer shall be responsible for the identification and assessment of potential hazards resulting from the geometric design and/or location of the road.<br><br>For pedestrian handrails refer to Drawing No's 617 and 618. | Roadside Safety Barriers generally in accordance with TNZ M/23 may be used to mitigate the hazards. Specific design approval shall be required from the Engineering Manager. |

### 6.2.3 Threshold Treatment and Traffic Calming

Designers are encouraged to incorporate "Traffic Calming" measures in the roading design. The following standards apply:

a) These may include but are not limited to, threshold treatment raised pavement, changes in surface textures, kerb extensions and landscaped medians. See TDC Drawings 621 and 622 and associated delineation.

b) These measures may only be incorporated in local residential roads (type 4, 5, 6, 7, 8, 12, 13, 14 and 15, (Appendix 6-2) and following discussion with and approval by the Engineering Manager.

### 6.2.4 Pedestrian Ways

Pedestrian and cyclist access ways are encouraged. The following specifications apply:

a) Pedestrian/Cycle ways linking roads or parks etc may be required through a subdivision or to link to an existing or proposed subdivision.

b) For design requirements refer to Section 12. TDC Drawings 623 and 624 show cycle barriers to be constructed where access is restricted.

c) These access ways may also be used for secondary stormwater flow paths and approved services. Conversely secondary stormwater flow paths when located at the bottom of a cul-de-sac (not approved design), shall incorporate the above accessways or services shall be oversized together with additional sumps.

### 6.2.5 Bridge Design

Bridge/culvert design shall be in accordance with the Transit NZ Bridge Design Manual. Designs shall also include roadside barriers, batter slope protection, clearances, and foundation assessments.

## 6.3 Pavement Formation

### 6.3.1 General

The standard of formation must be consistent with the following conditions:

a) The carriageway pavement shall be designed to a 25-year design period.

b) The width of the carriageway shall be in accordance with Appendix 6-2.

c) Where the work needed to provide the formation width extends outside the road reserve width, the legal road boundary shall be adjusted (vested) to accommodate any retaining structure or batter slope necessary to support the road or adjacent property and for provision of maintenance.

d) Where any land to be subdivided/developed, fronts any of the above that is not constructed to the current engineering standards, Council will require as a condition of consent that these roads be upgraded at the full cost of the subdivider/developer. This may also require the installation of services or works.

e) When subdivisions/development fronts or uses an existing substandard road, Council will usually only request full upgrade of half the road on the Consent holders frontage unless a mitigating effect is required on the other side or adjacent to the subdivision ie, only one footpath required and the ideal location being on the opposite side to the development or lot.

### 6.3.2 Material Specifications

The developer shall comply with national specifications in accordance with Table 6-3.

**Table 6-3 Carriageway Surface Specifications**

| Construction | Standard |
|---|---|
| Earthworks | TNZ Specification F/1 |
| Geotextiles | TNZ Specification F/7 |
| Subsoil Drains | TNZ Specification F/2 |
| Pipe Culverts | TNZ Specification F/3 |
| Basecourse Aggregates | TDC Specification (TDC Drawings 603 to 605), TNZ M4 |
| Basecourse Construction | TNZ Specification B/2 |
| Sealing Binder | TNZ Specification M/1and M/13 |
| Binder Application | TNZ Specification P/3 |
| Sealing Chip | TNZ Specification M/6 |
| Asphaltic Concrete | TNZ Specification M/10 |
| Paving | TNZ Specification P/9 |

**Table 6-4 Surfacing Methods**

| Matter | Standard and/or Reference | Comment |
|---|---|---|
| **General** | Residential streets, grade 3/5 chip wearing surface of a two-coat seal operation (2 Bitumen and 2 Chip coats) shall be constructed on the approved basecourse, or 25mm compacted asphaltic concrete mix 10 to cover an emulsion Grade 5 chip seal constructed on the approved basecourse<br><br>For industrial streets a wearing surface of 40mm depth of mix 15 asphaltic concrete on an emulsion Grade 5 chip seal shall be constructed on the approved basecourse<br><br>For all roundabouts and the turning heads in residential/industrial/ commercial cul-de-sacs, the surface | Alternative surfacing may be allowed to specific limited areas with the approval of the Engineering Manager.<br><br>The basecourse surface finish shall be such that when swept it presents a tightly compacted, non-glazed, clean stone mosaic surface that will not ravel as a result of sweeping. The standard of sweeping shall be sufficient to remove all loose aggregate, dirt, dust, silt and other deleterious matter.<br><br>A two coat chip sealed surface shall always be extended into unsealed side roads, crossings and ROW's. For unsealed roads, the distance is 50m. For ROWs the distance is 5.0m onto |

| Matter | Standard and/or Reference | Comment |
|---|---|---|
| | shall be 50mm depth of mix 15 asphaltic concrete on an emulsion Grade 5 chip seal. | the site and for crossings back to the property boundary.<br><br>Other surface treatments may be required depending on traffic, road hierarchy or site configurations such as gradients. |
| **Seal Design** | The submitted designs shall include details of:<br>• Bitumen/Emulsion to be used<br>• Additives to be used<br>• Application rates<br>• Construction method<br>• Chip size, ALD, AGD, source and PSV value. | The seal design shall generally be the responsibility of the Designer.<br><br>The Designer shall submit his seal design for approval by the Engineering Manager, seven (7) days prior to any sealing commencing. |
| **Sealing Binder** | The materials used shall meet the requirements of the relevant clauses of the following TNZ specifications.<br>• M/1: Specification for Asphaltic Bitumens<br>• M/13: Specification for Adhesion Agents | Sealing binder shall be either 180/200 penetration grade bitumen or emulsion of a suitable type from an approved supplier. |
| **Sealing Chip** | Sealing chip shall meet the requirements of the relevant clauses of TNZ M6 specification.<br><br>The initial seal coat will usually be a Grade 3 first coat immediately followed by a Grade 5 seal coat. | |
| **Application of Sealing Binder** | Application of sealing binder and chip shall be in accordance with TNZ P/3.<br><br>Where a two-coat seal is specified this shall be applied as a two-coat seal operation (2 Bitumen and 2 chip coats).<br><br>The bitumen sprayer used for the work shall hold a current E/2 certificate of compliance. | Spraying operations shall be carried out so that private property and street furniture are not affected by over spray. In kerb situations the seal shall overlap the channel by 20mm. |
| **Acceptance Criteria** | The two-coat seal shall provide a fully interlocked surface after rolling. Chip loss, bleeding or flushing shall not exceed 5% in any one metre by one metre square of the total sealed area during the maintenance period. | |
| **Asphaltic Concrete** | Asphaltic concrete paving (hotmix) shall comply with TNZ Specification M/10 Table 5-1 Mix 10 and shall be a minimum compacted thickness of 25mm. The binder shall be 80/100 penetration bitumen. The construction of the paving shall be carried out in accordance with TNZ P/9. | Industrial streets shall be M/10 Table 5-1 mix 15 with a compacted thickness of 40mm. The Designer shall submit the mix design for approval of the Engineering Manager seven (7) days prior to construction. |
| **Weed Protection** | Immediately prior to any form of surfacing, a strip one metre wide adjacent to each channel shall be applied with an approved weed killer | |

| Matter | Standard and/or Reference | Comment |
|---|---|---|
| | at the manufacturer's recommended rate of application. | |

### 6.3.3 Structural Design of Pavement

The pavement shall be designed in general accordance with recognised techniques which include, but are not limited to those listed below.

a) Soaked CBR Method (CBR design curves are given on TDC Drawing 612 or Austroads pavement design, NZ supplement applies to pavement design).

b) Scala/Dynamic Cone Penetrometer (Design curves are given on TDC Drawing 613).

c) Design method based on Benkleman beam deflections (Design curves are given on TDC Drawing 614).

d) The Designer shall state the method used and shall supply information to support the design method.

e) The following information shall be provided at the same time that Engineering Drawings are submitted for approval:

   i. All test information obtained to provide a basis for pavement design.
   ii. Copy of design calculations used to determine pavement thickness.
   iii. Design life and %HCV and ESA's.

f) The minimum pavement depth shall be 200mm in streets, roads and commercial/industrial rights of way and 150mm for residential rights-of-way and crossings (subject to sound sub-base strength).

g) The top 150mm of pavement shall be M4 AP40 basecourse. A specific design is required for each individual road. Also applies to rights-of-way. Refer TDC Drawings 600 and 601.

h) The Designer may choose to use stabilising agents on the construction courses to reduce the depths required. The Designer shall supply supporting information and test results to prove the type and quantity of stabilising agent is compatible with the type of material and projected use of the road.

   This design option shall only be permitted after consultation with and approval by the Engineering Manager.

i) The use of geotextiles/geogrids as a structural element of the pavement design shall only be permitted after consultation with and approval by the Engineering Manager.

### 6.3.4 Strength Acceptance Criteria

The Designer shall nominate a method of testing to be used to demonstrate that the construction is within the design criteria. The following conditions apply:

a) Final testing shall be carried out prior to the surfacing of the pavement. Table 6-5 sets out the deflection standards for each road category.

b) If no method is nominated or approved by the Engineering Manager, then the method of testing for compliance with the pavement design standard shall be the carrying out of Benkleman Beam tests as set out in TNZ test procedure (weighbridge dockets for the current day weighing test will be required).

c) The maximum allowable deflections shall comply with Table 6-5. Both Benkleman Beam test and Nuclear Densometer will be required for type 1-4, 9-11 and 22.

**Table 6-5 Road Deflection Standards**

| Description | Road Type* | Maximum Deflection |
|---|---|---|
| Arterial | 1 & 9 | 0.8mm |
| Distributor | 2 & 10 | 1.0mm |
| Collector or Industrial/Commercial | 3, 11, 21 & 22 | 1.3mm |
| Access Road | 4, 12 & 13 | 1.5mm |
| Access Place | 5, 6, 7, 8, 14 & 15 | 1.8mm |
| Private Access | 16, 17, 18, 19, 20 | 2.0mm |

*For road classification details see Appendix 6-2.

a) No more than 5% of the tests shall exceed the maximum as set out in Table 6-5.

b) No single result shall exceed the maximum allowable by more than 50%.

c) Any area of excessive deflection shall not exceed 5.0 square metres.

d) Impact tester/ "Clegg" hammer readings can be used on private ROW's (Road Types 16-20) where the minimum reading after four blows is 35.

e) Where any areas of the carriageway fail the acceptance testing, the Designer shall nominate this proposed remedial action for approval by the Engineering Manager.

f) A further set of tests shall be carried out to show that the affected area is up to the required standard.

g) Once sub-base and basecourse have been laid, the road shall not be used as a haul road and allowed to be contaminated.

In addition to the above testing requirements, the finished road profile shall also meet the following conditions:

a) The finished shape of the road shall be such that when a straight edge is laid parallel to the centre line of the road or a camber board laid perpendicular to the centre line, the surface shall not vary from the straight edge or camber board by more than 10mm in any three metre length.

b) Prior to sealing (within the sealing seasons), the surface of the road shall be clean, reasonably dry and free of ice, frost or loose material, tightly compacted and shall present a clean stone mosaic appearance.

c) All concrete surfaces, channels, sump surrounds, service boxes, manholes etc shall be completed to their final height to fit the finished (sealed) road profile.

d) All service boxes and manhole lids shall be finished to within 5-to-10mm above the finished (sealed) road profile. No sealing shall be carried out until inspected and approved by the Engineering Manager's representative.

## 6.4 Accepted Construction Methods

### 6.4.1 Placement of Filling

The following standards (Table 6-6) apply to the placement of filling in preparation of the road surface.

**Table 6-6 Road Construction Standards**

| Construction Matter | Method of Construction and/or Standard | Comment |
|---|---|---|
| **General** | Compliance with NZS4431.<br><br>The fill material shall be spread and compacted in uniform homogeneous layers parallel to the road and consistent with TNZ F1 in road reserves. | See Section 7.4.2 for minimum ground levels. |
| **Compaction Against Existing Slopes** | In areas of enclosed filling, where the original ground has a slope steeper than 1-in-2.75 ($20^{o}$), the original ground surface shall be properly benched before any material is placed against it. | The benches shall be of sufficient width to accommodate compaction and spreading equipment, and shall be arranged so as to be adequately drained during the placement of filling material. |
| **Depth of Layer** | The depth of the layer shall be related to the type and model of compaction plant proposed to be used and the type and size of material.<br><br>When no information is supplied, compliance with TNZ F1 is required. Elsewhere, the layers shall be spread and compacted to a loose depth not exceeding 200mm. | The Designer shall nominate the proposed layer depths and plant, and may be required to supply supporting documentation showing that the proposed compaction method is compatible with the material being used. |
| **Moisture Content** | The material shall at all times be placed in compliance with TNZ F1. | Moisture content shall be close to the optimum moisture content for the material under consideration. |
| **Standard of Compaction** | The maximum dry density shall be obtained by New Zealand standard compaction at optimum moisture content as detailed in NZS4402 for the appropriate soils. | Within the carriageway the criteria for Section 6.3.3, structural design of pavement shall take precedence over standards of compaction given in this clause. |

| Construction Matter | Method of Construction and/or Standard | Comment |
|---|---|---|
| | Minimum % of Maximum Dry Density<br>Heavy Clay Silt, Sandy Clay and Gravel – 95%<br>Sands – 100% | |
| **Routine Testing** | Routine testing shall be carried out on earthworks at the rate of one test every one metre depth of filling spaced at 30.0m grid points over the area concerned.<br><br>The results of these tests shall be supplied to Council within seven days. | All tests prior to and during construction including sampling shall be carried out by a certified IANZ soil laboratory. Council may carry out further tests at any stage if it considers them necessary. |
| **Stability of Embankments** | Where in the opinion of the Engineering Manager the stability of any embankment as planned is in doubt, a stability analysis of the slope may be required. | If work is carried out by the developer which indicates instability, remedial measures shall be undertaken at the developer's expense. |

Where the area of fill does not exceed 100.0m$^2$ and the depth does not exceed 600mm maximum, the above requirement concerning testing will not be enforced

### 6.4.2 Subgrade Checking

The following conditions apply to subgrade checking:

a) Where the extent of cut or fill for the project is too great to make subgrade testing feasible at the design stage, it may be done on completion of earthworks when sub-grade levels have been exposed.

b) Even in cases where subgrade has been tested as part of the design its condition shall be reviewed on exposure during construction and pavement thicknesses adjusted accordingly.

c) The results of such testing and/or review along with consequent adjustments to pavement layer thicknesses shall be advised to Council before placing of pavement layers commences.

### 6.4.3 Subgrade Drainage

Table 6-7 shall apply to subgrade drainage:

**Table 6-7 Subgrade Drainage**

| Matter | Method of Construction and/or Standard | Comment |
|---|---|---|
| **General** | Drainage shall be a 100mm diameter or equivalent proprietary sub-soil drainage system complying with TNZ F/5 or TNZF/2 where appropriate.<br><br>The pipe shall be surrounded by drainage aggregate complying | The construction of the subsoil drain shall be to TNZ F/6. |

| Matter | Method of Construction and/or Standard | Comment |
|---|---|---|
| | with TNZ F/6 which will be wrapped in an appropriate geotextile complying with TNZ F/7. | |
| **Sub-soil Drains in Cuts (on hillside subdivisions)** | When the road or right-of-way is in cut, a sub-soil drain as per TDC Drawing 620 shall be placed at the toe of the batter. | Connect drain into the back of the nearest sump downstream. |
| **Wet Spots in Subgrade** | Any permanent wet spot in the subgrade or any area undercut below adjacent subsoil drains shall be connected to the nearest piped stormwater system by another sub-soil drain. | Where the drain is located under the carriageway, traffic loading shall be taken into consideration for the type of pipe which must comply with TNZ F/2. |
| **Subgrade Drainage Systems** | In general, to satisfy the condition that particles do not enter the pipe and no scour occurs in the "filter", the following ratios must be complied with: (Alternatively a suitable geotextile lining the sub-soil trench may be used)<br><br>i) 85% size of filter material / Size of opening in pipe<br><br>ii) 15% size of filter material / 85% size of protected soil<br><br>iii) 15% size of filter material / 15% size of protected soil<br><br>It shall be necessary in most cases to manufacture a suitable filter material to comply with the above requirements. | In some cases it may be necessary, due to the nature of the country, to lay an extensive sub-soil drainage system. In such a case, the material covering the pipes shall be graded upwards so that particles cannot enter the pipes |

## 6.5 Kerb and Channel

### 6.5.1 General

The following standards apply to the design and construction of the road kerb, and channel where these are used in the road design:

a) All concrete shall be produced in accordance with NZS3104 and supplied by a certified graded plant. Concrete shall be constructed in accordance with the strengths specified and to the manufacturers' specification

b) Mountable kerbs shall only be used in flat terrain and with the prior consent of the Engineering Manager. Where mountable kerbs are provided, the corresponding footpath shall be reinforced to the standard required for a standard access crossing.

c) Design and construction standards in accordance with Table 6-8.

**Table 6-8 Kerb and Channel Construction Standard**

| Matter | Standard and/or Reference | Comments |
|---|---|---|
| **Excavation and Basecourse** | A minimum depth of 50mm of compacted basecourse shall be placed under the kerb and channel.<br><br>Compaction shall be to a minimum of 98% of maximum dry density.<br><br>All concrete shall achieve a minimum specified crushing strength of 25MPa at 28 days standard cured. | If unsuitable soil conditions are encountered at the base of kerb and channel, the site shall be trenched out below this depth and backfilled with gravel or other approved fill material in layers of a thickness that is compatible with the type of compaction equipment and material being used. |
| **Formwork** | Slip forming of the kerb and channel is generally preferred. The standard of work produced by an individual machine must be approved by the Engineering Manager, prior to any construction.<br><br>The profile shall conform to TDC Drawings 610 and 611. | Formwork for kerb and channel shall be approved dressed timber, steel or aluminium alloy sections adequately oiled or otherwise treated to allow ease of striking without staining of the stripped concrete surface. All formwork shall be accurately placed to the lines and levels of the works and shall be such as to give the finished kerbs smooth lines, free of kinks and angles. |
| **Accuracy and Standard of Workmanship** | Kerbs and channels shall be finished so that on straight sections there is nowhere a deviation of more than 5mm within the length of a 3.0m straight edge; nor anywhere a deviation of more than 5mm from the line and level. | Kerbing and channelling is to be finished with a steel float and any concrete work showing honeycombing or scale in the face is to be removed and replaced with fresh concrete. |
| **Curves** | Council may direct that horizontal curves of less than 6m radius shall be constructed using special *in situ* formwork. | Use of regular forms to produce kinks or a tangent effect shall not be accepted.<br><br>Changes of grade shall be made with a smooth vertical and horizontal curve. |
| **Benchmarks/Survey Marks** | A standard TDC benchmark plaque/survey mark shall be installed on the top of the kerb. A minimum of one plaque shall be installed in each new street, at maximum intervals of 300m.<br><br>Where a plaque is installed to meet the requirement of LINZ this shall be used as the benchmark and the TDC plaque omitted. | The proposed locations shall be shown on the engineering plans. A reduced level and coordinates shall be established on each new benchmark and shown on the "as built" plans to two decimal places. The origin for the levels shall be from previously established benchmarks, and shall be stated on the drawings. The coordinates shall be established to Fourth Order survey standard accuracy.<br><br>Where a subdivision is staged, and the above requirements are met it may not be necessary to install a benchmark in each stage.<br><br>TDC benchmark plaques/survey marks will be supplied by Council at no cost to the developer. |
| **Kerb Entries** | Kerb entries may only be installed | It shall be recessed back into the kerb by |

| Matter | Standard and/or Reference | Comments |
|---|---|---|
| | with the Engineering Manager's approval and shall be a 125mm x 75mm rectangular box section of galvanised steel with a wall thickness of 4mm. | 10mm and extend from the kerb to the property boundary in one continuous length. |
| **Kerb Cut-outs** | At intervals and sized as directed by the Engineering Manager. | Kerb cut-outs are used to dispose of stormwater to vegetated swales and will only be approved by the Engineering Manager in certain situations and soil types. |

## 6.6 Footpaths, Crossings and Berms

### 6.6.1 Footpaths

The following general specifications apply to all footpaths:

a) The number, location and width of footpaths are shown in Appendix 6-2.

b) Generally footpaths on hillsides will be placed on the outside (fill) edge of the carriageway.

c) The surface may be concrete, asphaltic concrete, chip seal (in rural/residential areas) or block paving where specifically approved by the Engineering Manager. In areas where tree roots are to be protected, alternatives to allow the soil to breathe can be submitted for approval.

d) The preferred location for footpaths shall be away from the kerb and channel, with a grass berm between.

e) The footpath shall meet the material specifications in Table 6-9.

**Table 6-9 Footpath Material Specifications**

| Matter | Standard and/or Reference | Comment |
|---|---|---|
| **Concrete** | Concrete shall achieve a minimum specified crushing strength of 28 MPa at 28 days standard cure. A U5 Shallow Textured Broom finish in accordance with NZS3114 is required.<br><br>Footpaths and entranceways (residential, commercial and industrial) shall be to the dimensions and depths shown on TDC Drawings 615 and 616. | Industrial entrance slabs shall be designed to take the same traffic loadings as the carriageway.<br><br>Construction joints are required at 6.0m intervals, and on both sides of entrance slabs. |
| **Asphaltic Concrete Footpaths** | The path shall be paved with 20mm compacted depth of asphaltic concrete mix 10. All areas to be paved must be spray tack-coated prior to paving. | Joints in the asphalt surfacing shall be either saw cut or formed to produce a neat straight line at right angles to the edge of the footpath and a flush smooth finish to the surface of the footpath. Joints shall have a tack coat applied to the vertical face. |

| Matter | Standard and/or Reference | Comment |
|---|---|---|
| | Refer to TDC Drawings 615 and 616 for dimensions and details.<br>At residential entrances, the basecourse depth shall be increased to a minimum depth of 150mm and the asphaltic concrete to a minimum compacted depth of 30mm. | Commercial and industrial entrances shall be designed to take the same traffic loadings as the carriageway. |
| **Chip Seal Footpaths – Rural/Residential Areas** | The path shall be a 2-coat (grade 4 and 6 chip) seal, with ground-treated (H4) timber batten 75mm x 25mm minimum and be firmly pegged along the edges of the footpath with the top of the batten at finished level. The underlying basecourse shall be a minimum of 150mm of compacted basecourse. The basecourse shall be weed sprayed (slow release granules) prior to sealing. | Chip seal footpaths may be permitted in rural/residential areas where cluster housing is envisaged and located remote from the edge of the carriageway. |

a) The surface of the finished footpath shall be such that when a straight edge is placed across the footpath, no area deviates from the straight edge by more than 5mm or by more than 5mm from a 3.0m straight edge when placed along the footpath.

b) The edge of the footpath shall not deviate by more than 5mm from the line and levels shown on the approved Engineering Drawings.

c) Where adjacent to a kerb, the surface of the footpath shall be flush with or no more than 5mm above the top of the kerb.

d) In situations where there is more than a one metre high drop within one metre of the back of a footpath, a handrail complying with TDC Drawing 617 shall be constructed at the back of the footpath or top of the bank.

e) If the Designer wishes to erect a fence or handrail of an alternative design, then full details shall be submitted to the Engineering Manager for approval. Compliance with the building code and occupational health and safety requirements will also need to be met.

f) A nominal thickness of compacted basecourse under the footpath shall be 150mm.

### 6.6.2 Crossings

Vehicle access and footpath crossing shall be provided in accordance with the following standards and conditions:

a) Any new access crossing will require Council approval as to its location on the road reserve it adjoins.

(Note – One crossing per urban property; Rural areas as per TRMP, section 16.2.2).

b) For location, surface treatment, sight distance and minimum distance of a vehicle crossing from an intersection, see TRMP section 16.2.

c) All entranceways shall be sealed or concreted from the kerb and channel, back of footpath or edge of carriageway to the property boundary or beyond as specified in TRMP Figure 16.2A.

d) Where the footpath is adjacent to the kerb and crossings are within 4.0m of each other, the vehicle crossing shall be continuous to a maximum of 8.0m.

e) Crossings shall be provided in accordance with the land use and development of the applicable Zone, and in accordance with Table 6-10.

### Table 6-10 Crossings Standards

| Zone | Standard and/or Reference | Comment |
|---|---|---|
| **Residential** | For standard kerb and channel, one vehicle crossing shall be provided (TDC Drawings 615, 616 and 619) of 4.0m in width at the boundary of all lots in residential areas. Where approved by Council, wider crossings may be provided up to a maximum of 6.0m.<br>For proposed vehicle crossings where the footpath is offset from the kerb a ramped section shall be formed between the back of the kerb and channel and the edge of footpath. See TDC Drawing 616 | Vehicle crossings in mountable kerb and channel will be permitted for rights-of-way where the ground profile of the lot falls, generally, towards the right-of-way and the upstream catchment is small.<br>Continuous crossings shall be used round the ends of cul-de-sacs, provided the footpath for the corresponding length is located immediately behind the kerb and is constructed to take the same traffic loadings as the carriageway and suitable provision is made for the disposal of stormwater. |
| **Rural** | A minimum 375mm diameter RCRRJ Culvert shall be installed under the entranceway or road crossing but increased sizing will depend on the catchment served. | |
| **Commercial and Rural Residential** | One crossing of 5.0m in width on any one allotment. (TDC Drawings 615 and 616). Where approved by Council, wider crossings may be provided up to a maximum of 7.0m.<br>In the case of adjacent property owners wishing to have a mutual crossing at their shared boundary, the maximum permitted total length is 8.0m. | A minimum 375mm diameter RCRRJ culvert shall be installed under the entranceway but increased sizing will depend on the catchment served. |
| **Industrial** | One crossing of 6.0m in width on any frontage. Where approved by Council, wider crossings may be provided up to a maximum of 8.0m.<br>In the case of adjacent property owners wishing to have a mutual crossing at their shared boundary, the maximum permitted total length is 8.0m.<br>A wider crossing may be permitted at the discretion of the Engineering Manager. | Industrial crossings shall be designed to carry the same vehicle loading as the carriageway having regard to the foundation conditions of the site. The footpath crossings associated with them shall also be designed to carry the same loading as the carriageway.<br>Where large HCV's will be using a vehicle entrance on a regular basis, a crossing width of 10.0m may be permitted on application to the Engineering Manager. |

a) Pram crossings shall be provided (TDC Drawing 611) of 1.0m width at road intersections, entrances to pedestrian ways and elsewhere as requested by the

Engineering Manager. (See Appendix 6-2, 1.5m for when tactile pavers are used).

b) Tactile pavers shall be installed in the footpath at the location of all pram crossings (and elsewhere as required by Council) in types 1, 2 and 3 roads. Tactile pavers shall be type B warning indicator pattern and made of concrete coloured “red”.

c) There shall be 12 pavers laid 4 across and 3 deep. They shall be installed adjacent to the kerb face and shown on the design engineering plans.

d) The tactile paver pattern (raised dots) shall be aligned with the direction of pedestrian flow towards the pram crossing on the opposite side of the road.

e) The footpath surface shall be flush with the edges of the pavers.

### 6.6.3 Berms and Landscaping

Berms shall be provided alongside the sealed carriageway surface, in accordance with the following standards:

a) A service berm shall be provided for road types 1-8. Refer Appendix 6-2 and TDC Drawings 608-610.

b) Where possible a landscape berm shall be provided for road types 1-7. Refer Appendix 6-2 and TDC Drawings 608 to 610. The subgrade shall be capable of allowing root penetration and sustaining growth.

c) For alternative berm surfacing see Appendix 6-2.

The landscaped berm area shall comply with the following standards:

a) This final topsoil surface shall be sown with approved seed mixtures. Special soils shall be treated to Council approval.

b) Topsoil to a firm minimum thickness of 100mm shall be spread on the berms so that a smoothly contoured surface is produced, free of ponding areas. Prior to the sowing of the grass seed, superphosphate shall be spread and mixed with the topsoil at a rate of 30g per square metre.

c) After fertilising, the berms shall be sown with grass seed that conforms to the following mix proportions:

- 1.0 kg chewing fescue
- 4.5 kg dwarf rye grass
- 0.5 kg browntop

d) The mixture shall be sown at a rate of 1kg to 40 square metres area.

e) After two months a dressing of Sulphate of Ammonia applied at a rate of 30g per square metre shall be applied.

f) Berms shall be maintained by the consent holder until new owners take over maintenance.

Landscape planting shall meet the following standards:

a) Opportunities for road/street landscaping shall be taken where possible to improve the visual amenity of the district. Landscaping shall be designed to meet the following objectives:

   i. Functional (provide a sense of separation between the road and the footpath);
   ii. Aesthetic (frame views);
   iii. Emphasise landscape features;
   iv. Soften hard surfaces;
   v. Enhance aesthetic values; and
   vi. Road contaminant filtration.

b) Trees and garden plantings shall be located as to not compromise the integrity and efficient operation of infrastructure services and reduce sight distance at access crossings and intersections.

c) The minimum planting size of a landscape tree is 1.5m high with a maximum mature trunk diameter of 100mm unless the local conditions require alternatives.

d) Species are to be selected in accordance with Council's planting policy and register of suitable species. All plants used shall be health vigorous and free of any defects that may be detrimental to plant growth and development. Council requires the use of locally sourced native species where appropriate.

e) Street trees are to be provided on service free berms or paved areas within the inner CBD area, as appropriate.

f) Trees shall be planted using an approved root barrier system.

g) Street trees planted within pavement areas of the CBD shall be provided in accordance with Council's Reserve Policy document.

h) Trees in infiltration swales and detention areas shall require specific requirements as to root structure and ability to absorb water and growth in varied climatic conditions.

## 6.7 Signs and Road/Streetlighting

### 6.7.1 Signage

The following standards apply to road/street signage:

a) When submitting the subdivision plan, the Developer shall where a new road/street is to vest with Council, provide a list of at least three suggested road/street names, with alternatives, including any supporting information and

background for the preferred choices. (Note – Council will not allow the same names as others used within our district or in Nelson city).

b) Road/street names and numbers shall be shown on engineering plans and as-built plans.

c) This shall apply to walkways and common accessways which shall incorporate the word “Way” on the sign.

d) The Designer shall adhere to the true definitions of road/street descriptions, ie, avenue, drive, crescent etc.

e) The Designer will be advised of the name(s) that have been approved by Council in terms of its policy and shall be required to pay the prescribed fee. This fee shall cover the administration, supply and erection of a standard road/street name plate, as undertaken by Council’s contractor.

f) In a rural road environment, the rural addressing number will also be included on the sign.

g) Road signs shall be blue with lower case white reflective lettering and arrow at the direction end. The sign height will be a minimum of 2.5m from the ground level.

h) If the Designer wishes to incorporate special signs, these shall be in addition to the standard name plate, and be subject to specific approval by Council and LTO agreement.

i) Supply and erection of any special sign and private signs approved by Council on road reserve will be the responsibility of the Designer. Council has no responsibility to maintain special signs and structures, other than the standard sign. If these special signs and structures, if located on road reserve, fall into disrepair, they may be removed. See also note 16 of Appendix 6-2.

j) All new roading within a subdivision shall incorporate road marking, signage, road signs and delineation to Manual of Traffic Signs and Markings (MOTSAM) Standards (Transit New Zealand/Land Transport New Zealand document).

### 6.7.2 Street Lighting

Pedestrian street lighting shall be provided for traffic and personal safety reasons. Section 10.3 of these standards sets out Council’s requirements for the provision of street lighting

## 6.8 Alternative Assessment Framework (where appropriate)

This section provides guidance to applicants and Council when considering any road network design that does not meet one or more of the conventional standards set out in Appendix 6-2 of this document.

For every road network design proposal, Council reserves the right to require additional control measures to ensure that the design objectives and requirements of Section 6.1.2.

### 6.8.1 General Information

A general outline of the proposed road design must be provided, addressing the following matters, where relevant:

a) Describe the activities associated with the design and construction of the new road (eg, subdivision);

b) Outline the zone, expected development density affecting the proposed road network, and road speed environment;

c) Provide a copy of all relevant resource consents. This must include a copy of any discharge and/or land use consent conditions where they relate to the site and the requirement to provide a road network;

d) Provide a site map showing the site, the road network, topographic features and TRMP Zone/Area requirements that apply to the site and the adjoining road network;

e) Describe the proposed road design and construction method in general terms and/or the design philosophy underpinning the overall design, referencing best practise methods that have been used (eg, low impact design subdivision and development philosophies);

f) Submit all road plans and construction details in accordance with standard specifications and the criteria in Section 2 to the Engineering Manager for approval.

### 6.8.2 Design Criteria

The applicant must provide Council with information to show that the design of the proposed road network is capable of achieving the objectives of Section 6.1.2.

For the purpose of this document, a capable road network is one that will avoid traffic congestion, traffic safety risks, danger to pedestrians, cyclists and other road users, stormwater inundation or water quality contamination and access to other infrastructure services, and meets the following criteria:

a) The proposed road is in an urban area and is an access road, or an access place, with a speed environment of 30km/hr;

b) The proposed road is in a rural area and is an access road with a speed environment of 70km/hr and/or 50km/hr or access place with a speed environment of 30km/hr;

c) The proposed road or road network provides an overall environment for access roads and access places that places a priority for a living environment.

d) The road is located within Land Disturbance Area 1 of the TRMP or has shown that it can meet the requirements for earthworks and land disturbance in Land Disturbance Area 2;

e) Where applicable to the particular road design, design geometrics comply with Austroads Rural Road Design, and NZS4404, and include vertical and horizontal road curvature, super-elevation for the rural environment, road gradient, carriageway cross fall, kerb lines, turning curves, berm slopes, and batters,

f) The total carriageway surface is at least 5.5m wide as shown in Appendix 6-2.

g) The total road reserve area is at least 12.0m wide or as shown in Appendix 6-2;

h) In an urban area, parking has been provided to a standard of five vehicles per 100.0m of road length within the road reserve, that is free of the carriageway, obstruction or impediment of any traffic flows, including intersections and crossings, or as otherwise approved by the Engineering Manager;

i) All underground services are provided for within the road reserve, unobstructed for maintenance and upgrade works;

j) Directly adjoining the carriageway there is at least 1.4m of roadside berm, free of services, level with or within 150mm above or below the carriageway surface at the centreline.

k) Pedestrian access not less that 1.4m wide has been provided on at least one side of the road and shall be formed and constructed using a permanent surface and remote from the carriageway kerb and channel;

l) All pedestrian crossings shall be able to accommodate prams, trolleys or mobility scooters, in accordance with Section 6.6.2.

m) The layout of the roads and the intersections shall comply with the minimum intersection spacing for access roads and access places as detailed on TDC Drawing 602.

n) Earthworks and subgrade preparation shall be in accordance with Section 5 or NZS4431 as applicable

o) The carriageway pavement has been designed to meet a minimum 25-year design period;

p) The carriageway surface shall comply with the standards for access roads and access places as detailed in Appendix 6-2.

q) A stormwater discharge consent has been obtained in accordance with the Tasman Resource Management Plan, and all relevant standards in Section 7 of the Engineering Standards have been met;

r) The road design is consistent with all applicable subdivision, land-use and/or stormwater discharge consent conditions.

s) A landscape and planting plan shall be submitted with the road layout plans and shall be designed in accordance with the principles as detailed in Section 6.6.3.

### 6.8.3 Design Specifications

The applicant must provide information to Council outlining detailed specifications of the proposed design. The following information must be submitted to Council where applicable:

a) Plans have been submitted to Council in accordance with Section 2 of this document;

b) The specifications of all materials used in the design and construction of the road network has been submitted to Council;

c) The method of construction for any proposed road or network has been provided, including construction techniques and maintenance requirements.

Note: Council reserves the right to request additional information to satisfy itself that the proposed road design and construction can meet the objectives of Section 6.1.1.

### 6.8.4 Maintenance and Management

Information about what, when and how a proposed road network will be maintained to ensure its ongoing effectiveness in achieving stormwater management functions, must be submitted to Council at the time of application. This must include estimated costs of ongoing maintenance and address the following matters where they are applicable:

a) A description of ongoing maintenance procedures required to ensure that the road network is maintained to avoid safety risks and nuisance concerns;

b) Specification of any resource consent conditions, and description of how they will be achieved;

c) Clearly defined ownership and management responsibilities for every part of the road network;

d) Information to show efficient integration with existing network;

e) Detailed maintenance requirements and costs for the life of the network;

f) The replacement value of any part of the network.

## Appendix 6-1 RAMM (Road Assessment and Maintenance Management) Data Contract/Work Details

| | | | |
|---|---|---|---|
| Road Name | | | |
| Brief description of work (ie, Subdivision, Reconstruction, Kerb and Channel etc) | | | |
| Start Name | | Start Displacement | |
| End Name | | End Displacement | |
| Carriageway Width | | Carriageway Length | |
| Completion Date | | | |

### Pavement Construction Details

| | | | |
|---|---|---|---|
| Subgrade Material | | Subgrade CBR | |
| | Material | Depth | Source |
| Sub-base | | | |
| Basecourse | | | |
| Pavement Construction Completion Date | | | |

### Surfacing Details

### Chip Seal

| | | | |
|---|---|---|---|
| Type of Chip Seal | | Source of Chip | |
| Size of Chip (1st) | | Size of Chip (2nd) | |
| | Quantity (pph) | Type | |
| Cutter | | | |
| Adhesion Agent | | | |
| Additives | | | |
| Flux | | | |
| Binder Type | | | |
| Binder Residual Application Rate | | | |
| Sealing Date | | Sealing Contractor | |

### Asphaltic Concrete

| | | | |
|---|---|---|---|
| Type of Asphalt | | Depth of Asphalt | |
| Size of Aggregate | | Source of Aggregate | |
| Binder Type | | | |
| Binder Percentage | | | |
| Asphalting Date | | Asphaltic Contractor | |

### Contractor Details

| | |
|---|---|
| Contractor Name | |
| Contractor Address | |
| Consultant | |

## Appendix 6-2 Road Design Standards and Private Access

| Type | Speed Environ-ment | Hierarchy | Volume Veh/day houses | Lane Widths | Cycle lane widths | Parking Widths/ Shoulder | Total Carriage-way Width | Footpaths & Width | Berms | | Res width Min | Max Grade | Street-lighting min | Stormwater Control | Pedestrian/ pram Cross | Traffic Calming | Intersection Control/give /stop | Min Carriageway Surface | Min clear zone from Carriageway |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Services | Landscape | | | | | | | | | |
| **Residential/Commercial/Industrial Road Design** | | | | | | | | | | | | | | | | | | | |
| 1 Residential | 60k/hr and above | Arterial | >10,000 Veh/day | 2 x 3.5 + 2.5 Flush med | 2 x 1.5 | 2 x 2.0 | 16.5 | 2 x 2.0 away from kerb | 2 x 1.5 | 2 x 1.5 | 26.5 | 1 in 20 | 12.5m poles Luminaire 150w son T, V3 | K/C both sides | 1.5m wide +Tactiles | No | All | Asphaltic Concrete Friction course or similar | 3 |
| 2 Residential | 60k/hr and above | Distributor | 1,000 to 10,000 Veh/day | 2 x 3.5 | 2 x 1.5 | 2 x 2.0 | 14 | 2 x 2.0 away from kerb | 2 x 1.5 | 2 x 1.5 | 24 | 1 in 8 | 12.5m poles Luminaire 150w son T, V3 | K/C both sides | 1.5m wide +Tactiles | No | All | Asphaltic Concrete | 3 |
| 3 Residential | 50 k/hr | Collector | 500 to 1,000 Veh/day | 2 x 3.0 | 2 x 1.5 | 2 x 2.0 | 13 | 2 x 1.4 away from kerb | 2 x 1.5 | 2 x 1.5 adj to kerb | 21.8 | 1 in 8 | 10.5m poles luminaire 110w son-T,V4 | K/C both sides | 1.5m wide +Tactiles | No | All | 2-coat chip, turning heads asphalt | 2 |
| Commercial/Industrial | | | | | | | | Com/Ind 2 x 3.0 | N/A | N/A | 19 | | | | | | | Asphaltic concrete | |
| 4 Residential | 30 k/hr | Access Road | 30 to 50 house lots | 2 x 3.0 | N/A | 1 X 2.0 | 8 | 2 x 1.4 away from kerb | 2 x 1.5 | 2 x 1.5 adjacent to kerb | 16.8 | 1 in 7 | 8.5m poles luminarie 70w son T, P3 | K/C both sides | 1.0m wide | Yes | All | 2 coat chip turning heads Asphalt | 2 |
| 5 Residential | 25k/hr | Access Place | < 30 house lots | 2 x 2.5 | N/A | 1 x 2.0 | 7 | 1 x 1.4 away from kerb | 2 x 1.0 | 1 x 1.0 | 11.4 | 1 in 7 | 8.5m poles luminarie 70w son T, P3 | K/C both sides | 1.0m wide | Yes | At TDC discretion | 2 coat chip turning heads Asphalt | 2 |
| 6 Residential Richmond Sth (Var 49&50) | 25 k/hr | Access Place | 2<50 house lots | 2 x 2.5 | N/A- | 1 x 2.0 | 7 | 1 x 1.4 away from kerb | 2 x 1.5 | 2 x 1.5 | 18.0 | 1 in 7 | 5.0m poles luminaire 70 w son T, P3 | Mountable kerb + 3.6m swales | 1.0m wide | Yes | All | Asphaltic concrete | 2 |
| 7 Residential Richmond Sth (Var 49&50) | 25 k/hr | Lane (see Note 24) | <26 house lots | 2 x 2.5 | N/A | N/A | 5.0 | 1 x 1.4 away from kerb | 2 x 1.0 | 2 x 1.0 | 12 | 1 in 6 | 5.0m poles luminaire 70 w son T, P3 | Mountable kerb + 1.6m swales | 1.0m wide | Yes | All | Asphaltic concrete | 2 |
| 8 Residential steep hillsides>20 deg | 25k/hr | Access Place | < 30 house lots | 2 x 2.5 | N/A | 1 x 2.0 | 7 | 1 x 1.4 adj K & C, downhill side | 1 x 1.0 | N/A | 9.4 plus batters | 1 in 7 | 8.5m poles luminarie 70w son T, P3 | K/C both sides | 1.0m wide | Yes | At TDC discretion | 2 coat chip turning heads Asphalt | 2 |
| **Rural Road Design** | | | | | | | | | | | | | | | | | | | |
| 9 Rural | 100k/hr | Arterial | 1500 Veh/day and above | 2 x 3.5 | 2 x 1.5 sealed | 2 x 1.5 metal shoulders | 13 | N/A | 2 x side drains and batters | N/A | 20 | 1 in 8 | Flag light at intersections Flangible Base | water table and side drains | N/A | No | All | 2 coat chip seal | 3 |
| 10 Rural | 100 k/hr | Distributor road | 750 to 1500 Veh/day | 2 x 3.25 | N/A | 2 x 1.0 metal shoulders | 8.5 | N/A | 2 x side drains and batters | N/A | 20 | 1 in 8 | Flag light at intersections Flangible base | water table side drains | N/A | No | All | 2 coat chip seal | 3 |
| 11 Rural Rural character | 70k/hr | Collector Road | 500 V/d or >60 house lots | 2 x 3.0 | N/A | 2x600mm metal shoulders | 7.2 | 1 x 1.4 | 2 x side drains and batters | N/A | 20 | 1 in 8 | Flag light at intersections Flangible Base | Water table side drains | N/A | Yes | All | 2 coat chip seal | 2 |
| 12 Rural/residential Residential character | 70k/hr | Access Road | Below 500 V/d or +>60 house lots | 2 x 3.0 | N/A | 2x600mm metal shoulders | 7.2 | 1 x 1.4 | 2xgrassed swales & batters | N/A | 20 | 1 in 7 | Flag light at intersections Flangible Base | Water table side drains | N/A | Yes | All | 2 coat chip seal | 2 |
| 13 Rural/residential Residential character | 50k/hr | Access road | 20 to 60 house lots | 2 x 3.0 | N/A | 2 x 600 Grassed | 7.2 | 1 x 1.4 | 2xgrassed swales & batters | N/A | 18 | 1 in 7 | P3 | subsoils under grassed swale/K& C | N/A | Yes | All | 2 coat chip seal | 2 |
| 14 Rural/residential Residential character | 30k/hr | Access Place | 7 to 19 house lots | 2 x 2.5 | N/A | 2 x 600 Grassed | 6.2 | 1 x 1.4 | 2 x grassed swales and batters | N/A | 18 | 1 in 7 | P3 | subsoils under grassed swale/K& C | N/A | Yes | All | 2 coat chip seal | 2 |
| 15 Rural, Forestry, Farming (Non Residential) | 30 to 70k/hr | Access Place | 7 to 19 lots | 2 x 3.0 | N/A | 2 x 600mm metal shoulders | 7.2 | N/A | 2 x side drains and batters | N/A | 16 | 1 in 7 | P3 | Water table side drains | N/A | No | All | Compacted Base/running course, | 2 |

**Private ROW/ACCESS Design**

| Type | Speed Environ-ment | Hierarchy | Volume Veh/day house | Lane Widths | Cycle lane widths | Parking Widths/ Shoulder | Total Carriage-way Width | Footpaths & Width | Berms | | Res width Min | Max Grade | Street-lighting min | Stormwater Control | Pedestrian/ pram Cross | Traffic Calming | Intersection Control/give /stop | Min Carriageway Surface | Min clear zone from Carriageway |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16<br>Private ROW<br>Residential | Residential<br>10k/hr | ROW<br>urban | 5-6 users | 5 | N/A | N/A | 5 | N/A | N/A | N/A | 6 | 1 in 6 | N/A | K/C or approved | N/A | No | N/A | 2 coat chip seal | N/A |
| 17<br>Private ROW<br>Residential | Residential<br>10 k/hr | ROW<br>urban | 2-4 users | 3.5 | N/A | N/A | 3.5 | N/A | N/A | N/A | 4 | 1 in 5 | N/A | K/C or approved | N/A | No | N/A | 2 coat chip seal<br>1 in 4.5-5 - concrete | N/A |
| 18<br>Private sole user residential | Residential<br>10 k/hr | Urban<br>Access leg | 1 user | 3 | N/A | N/A | 3 | N/A | N/A | N/A | 3.5 | 1in 4 Concrete<br>> 1 in 5 unsealed | N/A | Not to effect adjoining owner | N/A | No | N/A | 1 in 4 to 5 Concrete > 1in 5 Compacted Basecourse | N/A |
| 19<br>Private ROW Rural & Rural/Residential | Rural<br>10k/hr | ROW rural | 2-6 users | 4.5 | N/A | 2 x 500mm metal shoulders | 5.5 | N/A | 2 x 1.0m side drains | N/A | 7.5 | 1 in 5<br>> 1 in 6 unsealed | N/A | side drains to approved outfall | N/A | No | N/A | 1 in 5-6 sealed.<br>>1 in 6 Compacted Base/Running course | N/A |
| 20<br>Private sole user Rural | Rural<br>10k/hr | Rural<br>Access leg | 1 user | 3.5 | N/A | N/A | 3.5 | N/A | 2 x1.0m side drains | N/A | 5.5 | 1in 4 Concrete<br>> 1 in 5 unsealed | N/A | Not to effect adjoining owner | N/A | No | N/A | Compacted Base/Running course | N/A |
| 21<br>Industrial private | Private | ROW<br>industrial | <50HCV &<1000vpd and/or up to 10,000m2 | 2 x 3.0 | N/A | 1 x 2.5 | 8.5 | 1 x 1.4 | 0.6 | N/A | 10.5 | 1 in 8 | N/A | K/C or approved | 1.5m | No | N/A | 2 coat chip seal | N/A |
| 22<br>Central business<br>Commercial<br>Tourist services | Private | Access<br>lane | 1-6 users | 4.5 | N/A | N/A | 4.5 | N/A | 1 x 1.5 | N/A | 6.0 | 1 in 8 | N/A | K/C or approved | N/A | No | N/A | 2 coat chip seal | N/A |

Notes; One household unit equates to approx 10 VPD in urban/rural-residential zones
See list of notes relevant to the appropriate road type, Appendix 6.2 notes

## Appendix 6.2 *continued* – Road Design Standards and Private Access (Notes)

| | |
|---|---|
| **Note 1** | Additional road reserve width shall be provided to:<br>Accommodate any retaining structure or slope necessary to support the road or adjacent property;<br>Achieve a complying horizontal alignment; and<br>Accommodate any turning area required by Note 5. |
| **Note 2** | For each side of the road where kerb and channel is provided, a 2.0m parking lane shall be required instead of a 0.5m unsealed shoulder. The berm may also be reduced to 1.0m. |
| **Note 3** | In residential areas the number of potential household units shall be based on the relevant minimum allotment size as in the Residential Zone Rules, or the actual number of household units proposed, whichever is the greatest.<br>"Veh/day" means vehicles per day |
| **Note 4** | Passing bays shall be provided on accesses in all zones. Passing bays may be incorporated in vehicle accesses to a site, eg, the vehicle entrance to a garage in commercial and industrial areas specific passing will be required to accommodate B trains. (Passing bay intervals and maximum lengths shall be as set out in Table 16.2A of the TRMP). |
| **Note 5** | An area shall be formed at the end of the cul-de-sacs shown in TDC Drawing 607 to allow turning. |
| **Note 6** | Steep hillside means where a road is formed on ground that has an average slope of greater than 20 degrees at right angles to the road. |
| **Note 7** | "Rural" means land zoned rural or rural-residential.<br>"Comm" means the commercial zone and CBD.<br>"Indust" means an industrial zone. |
| **Note 8** | All dimensions are in metres |
| **Note 9** | The width required for landscaping is a continuous strip adjacent to the footpath and free of other services. |
| **Note 10** | When determining the number of households served by a future road, an assessment shall be made on the re-subdivision of lots down to the minimum size lots for that zoning and the number of households totalled accordingly. |
| **Note 11** | All private access shall have a permanent surface for a minimum distance into the property from the legal boundary of the road and out to the sealed carriageway. (See TRMP Figure 16.2A for seal distance). |
| **Note 12** | The layout for services and landscaping shall be in accordance with the diagrams included in the TDC Engineering Standards and Policies. |
| **Note 13** | Where a road or access serves land in more than one zone, the requirements for footpaths and berms on each side of the road or access shall be the maximum required for any of the adjoining zones. |
| **Note 14** | Street lighting poles shall comply with TDC street lighting policy. Only approved decorative alternative poles can be used. Cul-de-sac lighting pole heights and spacing can be varied but must comply with standards.<br>All lighting shall comply with NZS6701 and AS/NZ 1158 or other TDC-approved alternatives.<br>Pole spacing shall be 45.0m to 50.0m, except for arterial or principal, which |

| | |
|---|---|
| | require specific design. (See section 10.3.3) for specific design for rural/residential roads). |
| **Note 15** | Any street within the Richmond CBD area bordered by and including Gladstone Road, McGlashen Avenue, Talbot Street, Salisbury Road and Oxford Street, shall be surfaced in asphaltic concrete.<br><br>Any street within the Motueka CBD area including parts of High Street, Greenwood Street, Pah Street, Wallace Street and Tudor Street shall be surfaced in asphaltic concrete.<br><br>Any street within the Takaka CBD area including parts of Commercial Street shall be surfaced in asphaltic concrete. |
| **Note 16** | Developers may apply for consent from Council to construct a "gateway entrance" to the subdivision. Council accepts no responsibility for maintenance of assets and reserves the right to remove those assets if they deteriorate due to lack of maintenance. Residents of a street can maintain the "gateway entrance" as a private asset (LTO required) on road reserve. Any lighting shall be at the expense of the residents as well as any landscaping and water usage/metering thereof. |
| **Note 17** | Road hierarchy is determined by the function the road serves in the network. The traffic volume is used as an indicative guide. |
| **Note 18** | Cycleways on collector roads may be omitted on reconstruction of existing roads at Council discretion. All other roads shall meet the requirements of the Regional Land Transport Strategy and Regional Cycling and Walking Strategy. |
| **Note 19** | On private ROW, the minimum radius on horizontal curves shall be 30.0m and also comply with safe sight stopping distances. |
| **Note 20** | Footpaths on rural and rural/residential roads shall be located a minimum distance of 1.0m away from the outside edge of the shoulder and formed with a minimum 2-coat chip seal with edge supports. |
| **Note 21** | For rural/residential character roads, the shoulders may be replaced with concrete edge restraint. The road reserve adjacent to the edge restraint will usually be a gentle grassed (see TDC Drawing 620) and well compacted/geogrid drainage swale no steeper than 1-in-20 longitudinally. |
| **Note 22** | Private ROWs with rural/residential character roads shall be sealed and in landscape sensitive areas, shall be limited to the lengths as set out in 16.2A of the TRMP. |
| **Note 23** | The minimum road reserve width as shown in Appendix 6-2 may be required to be enlarged to accommodate swales or vegetated gardens where low impact designs or streetscaping are proposed, ie, see type 6 road. |
| **Note 24** | Road type 7 "lane" has been placed in the hierarchy in lieu of a private right-of-way. Therefore properties that have access via "lane" shall also have their main frontage to an alternative legal road." |

## Section 6 Drawings

Drawing 600 – Typical cross section urban carriageway

Drawing 601 – Typical cross sections rural carriageway

Drawing 602 – Minimum intersection spacing for collectors, access places, access roads, urban and rural

Drawing 603 – 20mm 4 Basecourse Aggregate

Drawing 604 – 40mm M4 Crushed basecourse aggregate

Drawing 605 – 65mm sub-basecourse aggregate

Drawing 606 – Cul-de-sac turning circles

Drawing 607 – Typical cross sections roadside batters Types 9-12 (Appendix 6-2)

Drawing 608 – Typical cross sections (berms) Type 1 & 2 roads & Type 3 commercial

Drawing 609 – Typical cross sections (berms) Type 3 to 8 roads

Drawing 610 – Standard details kerb and channel profiles

Drawing 611 – Standard details kerb and channel crossings

Drawing 612 – Design graph for flexible pavements CBR method

Drawing 613 – Design graph for flexible pavements scala dynamic cone penetrometer

Drawing 614 – Design graph for flexible pavements Benkleman beam deflections

Drawing 615 – Standard details 1.4m wide concrete footpath offset from kerb

Drawing 616 – Standard details (type 8 road) 1.4m wide asphalt concrete footpath beside kerb

Drawing 617 – Handrails

Drawing 618 – Handrails alternative

Drawing 619 – Access Breakover angles where no proposed footpath

Drawing 620 – Typical drainage details for roadside batters

Drawing 621 – Carriageway thresholds (concrete blocks or clay bricks)

Drawing 622 – Road hump details

Drawing 623 – Removable cycle bollard

Drawing 624 – Standard cycle bollard

Drawing 625 – Cycle rest-awhile/leaner

Note: The drawings are **not** included in this document. They are available in PDF format or hard copy from the Engineering Secretary (03 543 8524) or email engineeringstandards@tdc.govt.nz

# 7 STORMWATER AND DRAINAGE

## 7.1 Introduction

The purpose of Council's stormwater engineering standards is to provide design guidance and minimum standards for the design and construction of stormwater management infrastructure.

Construction in accordance with the standards is intended to ensure that stormwater runoff is managed effectively and efficiently.

Effective stormwater management is important, because without it, inundation, property damage and nuisance ponding can occur. The quality of water and aquatic environments like streams and estuaries can be degraded.

### 7.1.1 Objectives

Council is responsible for all stormwater infrastructure assets under its control. Council must therefore ensure that they are designed, constructed and maintained to meet the following general objectives:

a) Stormwater generated by a 2% Annual Exceedance Probability (AEP) (1:50 year) storm event shall be accommodated within the secondary stormwater management system in a way that does not cause damage to or nuisance effects on people and property;

b) Stormwater generated by more frequent, but significant rainfall events (normally 5% AEP (1:20 year)) shall be accommodated within the primary stormwater management system in a way that does not cause damage to or nuisance effects on people and property;

c) Stormwater infrastructure is constructed in a manner that results in a robust, durable network, and which is able to be efficiently maintained;

d) Stormwater is managed and disposed of in a way that avoids, remedies or mitigates adverse effects on water quality, and the aquatic environments that affect the habitats of flora and fauna;

e) Stormwater infrastructure is designed and constructed in a way that maintains or enhances the amenity values of the locality;

f) The stormwater infrastructure network is cost-effective and efficient in delivering the required level of service over the entire life-cycle of the network;

g) The management of stormwater meets the needs and expectations of the community in terms of the LTCCP;

h) All stormwater is managed in compliance with resource consent(s) for the discharge of water onto land or into water, or the discharge can be accommodated within an existing consented system, in accordance with the TRMP.

### 7.1.2 Design Methods

There are a variety of ways that the above may be achieved. Accepted design methods are generally guided by the New Zealand Standard for Land Development and Subdivision Engineering (NZS4404) and by the accepted design standards set out in the following sections below.

However, in the Tasman District additional or alternative solutions (such as those detailed in Section 7.6) may also be accepted, provided that they complement the existing infrastructure network and are appropriate to the site conditions. Additional guidance may be obtained from the appropriate department.

### 7.1.3 Key References

Table 7-1 sets out other sections of this document and external standards that are relevant to the management of stormwater.

These apply and must be taken into account in the design and construction of any stormwater management asset in the Tasman District.

**Table 7-1 Minimum standards for stormwater design, materials and construction**

| Number | Title |
|---|---|
| AS/NZS1260 | uPVC Pipes and fittings for drain waste and vent applications |
| AS/NZS2032 | Installation of PVC pipe systems |
| AS/NZS2566 | Buried flexible pipelines – Structural design |
| AS/NZS4058 | Pre-cast concrete pipes (pressure and non-pressure) |
| NZS3109 | Concrete construction |
| NZS3121 | Specification for water and aggregate for concrete |
| AS/NZS3725 | Loads on buried concrete pipes |
| NZS4442 | Welded steel pipes and fittings for water, sewage, and medium pressure gas |
| NZS7643 | Code of practice for the installation of unplasticised PVC pipe systems |
| | Building Act |
| | New Zealand Pipe Inspection Manual 3rd edition |

## 7.2 Design Requirements

### 7.2.1 General

The design of every stormwater management system must be consistent with the following standards and conditions:

a) The stormwater discharge must be consistent with Chapter 36.4 of the TRMP, concerning discharges to land or water. Permitted activity standards and conditions must be met, or discharge consent obtained.

b) Stormwater flows from all impervious surfaces, especially roads, must be accommodated within the stormwater systems

c) The stormwater management system must be designed to accommodate both primary and secondary stormwater flows to a standard determined by the design parameters set out in Table 7-2.

d) Both primary and secondary flow paths within the stormwater system must be physically defined and legally protected from development that may obstruct the stormwater flows.

e) The quality of the water discharged from the stormwater system must not contribute to a degradation of water quality within the receiving environment.

f) A flood risk assessment must be undertaken, taking into account historical information and appropriate field tests. The assessment shall address the proximity and nature of any river, stream or watercourse and associated flood plain(s).

g) The capacity of culverts and watercourses upstream and downstream of the site must be determined, and the implications of flooding caused by debris or slip induced blockages, under capacity and/or overland flows must be considered and appropriately designed for.

h) Secondary flow paths which are strategically important to stormwater infrastructure shall be subject to specific design, which will take account of the safety of the public and operation of the flow path without undue nuisance. Factors which will dictate the secondary flow design are:

   i. The capacity of primary stormwater systems (both existing and proposed)
   ii. The capacity of downstream surface water system(s), and the risk of blockage at any downstream intake(s).
   iii. The necessity for a secondary intake structure and the relative flow distribution between primary and secondary intakes for a range of blockage scenarios.
   iv. The protection of land from erosion or land instability.
   v. The nature of the roading system and ability to drain once the storm has passed.

i) Downstream owners are required to accept stormwater which naturally falls and migrates from the upstream catchment.

j) The short- and long-term maintenance requirements (if any) of all proposed stormwater systems shall be identified by the Designer. This information shall be provided at the time designs are submitted to Council.

### 7.2.2 Design Standard

The determination of these design standards has been guided by the required long-term level of service for the stormwater network, taking into account possible changes in rainfall patterns in the future.

It is considered possible that changes in rainfall intensity and frequency will, for example, "degrade" the current (2008) 20-year design standard to a 10-year standard in 2100, and thus a 20-year standard has been adopted for conventional pipe networks.

### 7.2.3 Calculation of Runoff

The determination of the necessary capacity for the purpose of design should be based on the following design parameters:

a) Calculation of runoff for stormwater network design shall be determined using an appropriate, recognised, design methodology. In the first instance the determination of design flows lies with the Designer of the proposed network, however Council reserves the right to require adoption of Council calculations at the Engineering Manager's discretion.

b) For piped reticulation networks, calculation of runoff using the Rational Method will generally be accepted. Alternative runoff methodologies may be approved by the Engineering Manager on application. In all cases all underlying assumptions used in the calculation must be stated.

c) The Rational Method formula is:

$$Q = CIA \times 2.78$$

Where

Q = runoff in litres per second
C = runoff coefficient (See Table 7-2 below)
I = rainfall intensity in millimetres per hour
A = area of catchment in hectares

d) Fixed runoff models (such as the Rational Method) will not generally be accepted for detention dam design or inundation assessment.

e) In larger network design, or where the proposed works integrate into an existing stormwater network, the determination of design flows may be most efficiently determined using a hydrological or hydraulic model.

f) When the design process includes the use of a hydrological or hydraulic model, all underlying assumptions (such as runoff coefficients, time of concentration and catchment areas) must be clearly stated so that a manual check of

calculations is possible. Council reserves the right to request a copy of the model for review.

The general requirements for the design of stormwater networks in Tasman District are shown in Table 7-2.

**Table 7-2 Tasman District Stormwater System Capacity Requirements**

| Stormwater System Type | Primary System Capacity | Overall System Capacity |
|---|---|---|
| Conventional pipe system design | 5% AEP ($Q_{20}$, 20 return period) | 2% AEP ($Q_{50}$ ,50 return period) |
| Low impact design | 5% AEP ($Q_{20}$, 20 return period) and to the Engineering Managers approval | 2% AEP ($Q_{50}$ ,50 return period) |
| Minor streams* | 2% AEP ($Q_{50}$ ,50 return period) | |
| Major streams and rivers* | 1% AEP ($Q_{100}$ ,100 return period) | |
| *A minor stream is one where it has a width, top of bank to top of bank, of less than 3.0m. For clarification, the bank-to-bank width for streams is generally at mean annual flood flow ($Q_{2.3}$). This area may include areas of vegetation which go under water at various storm events (consistent with Esplanade provisions of the RMA). | | |

The minimum freeboard from the hydraulic grade line to the finished ground level (ie, sump or manhole lid level) shall be 400mm. This information shall be included on the as-built drawings.

### 7.2.4 Rainfall Intensity

a) For urban stormwater design the Tasman District Urban Design Rainfall (Table 7-3) shall be used.

b) In remaining areas the determination of design rainfall intensity for each site may be determined on a case-by-case by the Designer as an alternative to Table 7-3. Historical rainfall records and software such as HIRDS 2.0 are appropriate for this purpose.

**Table 7-3 Tasman District Urban Design Rainfall Intensity (mm/hr)**

| | | Duration (minutes) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Annual Exceedance Period (AEP)** | **Return Period (years)** | **10** | **20** | **30** | **60** | **120** | **360 (6 hr)** | **720 (12 hr)** | **1440 (24 hr)** |
| 20% | 5 | 72 | 57 | 46 | 32 | 23 | 12 | 8 | 5 |
| 10% | 10 | 90 | 69 | 54 | 38 | 27 | 14 | 9 | 5 |
| 5% | 20 | 108 | 81 | 60 | 43 | 31 | 16 | 10 | 6 |
| 2% | 50 | 132 | 93 | 70 | 49 | 37 | 19 | 12 | 7 |
| 1% | 100 | 146 | 102 | 76 | 54 | 40 | 21 | 13 | 8 |

See TDC Drawing 712 for the 10 to 120-minute duration events.

### 7.2.5 Runoff Coefficient

The following standards apply to the calculation of run-off:

a) Determination of catchment run-off is the key basis for stormwater network design, and must be assessed carefully for each site. Designers are referred to Verification Method E1/VM1 of the Building Code for guidance on the determination of run-off coefficients. These coefficients are reproduced in the Table 7-4.

b) In all cases the assumptions used (and the basis of these assumptions) in the calculation of run-off shall be clearly stated. Specifically, the calculation of impervious area and runoff coefficients shall be based on site specific data and account for the ultimate development of the site.

**Table 7-4 Recommended Runoff Coefficients for Design**

| Natural surface types | C | Developed surface types | C |
|---|---|---|---|
| Bare impermeable clay with no interception channels or run-off control. | 0.70 | Fully roofed and/or sealed developments. | 0.90 |
| | | Steel and non-absorbent roof surfaces | 0.90 |
| Bare uncultivated soil of medium soakage. | 0.60 | Asphalt and concrete paved surfaces | 0.85 |
| Heavy clay soil types: | | Near flat and slightly absorbent | |
| – pasture and grass cover | 0.40 | roof surfaces. | 0.80 |
| – bush and scrub cover | 0.35 | Stone, brick and pre-cast concrete | |
| – cultivated | 0.30 | paving panels | |
| Medium soakage soil types: | | – with sealed joints | 0.80 |
| – pasture and scrub cover | 0.30 | – with open joints | 0.60 |
| – bush and scrub cover | 0.25 | Unsealed roads | 0.50 |
| – cultivated | 0.20 | Unsealed yards and similar surfaces | 0.35 |
| High soakage gravel, sandy and volcanic soil types: | | **Slope correction factor** | |
| – pasture and scrub cover | 0.20 | Slope | Adjustment factor |
| – bush and scrub cover | 0.15 | 5-10% | subtracting 0.05 |
| – cultivated | 0.10 | 10-20% | no adjustment |
| Parks, playgrounds and reserves: | | 20% or steeper | adding 0.05 |
| – mainly grassed | 0.30 | | |
| – predominantly bush | 0.25 | | |

### 7.2.6 Time of Concentration

a) It is essential that the critical rainfall duration is determined for the design of each portion of the stormwater network. In large or flat catchments the critical rainfall intensity is likely to vary for different sections of the network and should be determined using the time of concentration at the particular point being considered.

b) The time of concentration shall be calculated in the determination of critical rainfall duration for a given network, and the assessment of this shall include the calculation of time of entry (including surface flow) and the time of pipe or channel flow (refer TDC Drawing 713).

c) Calculation of the time of concentration may be made explicitly, through the use of manual calculations, or via a hydrological / hydraulic model.

d) Designers are referred to Section 2.3 of Verification Method E1/VM1 of the Building Code for guidance in the calculation of the time of concentration.

e) Where the stormwater system includes detention facilities, Designers must consider the dynamic effects of attenuation through the facility to work out the critical duration this will cause and the greatest flooding during design storm events. Design of the area downstream of the detention facility will also be critical to mitigate erosion and downstream flooding.

## 7.3 Hydraulics

### 7.3.1 Pipelines (Gravity and Pressure)

Friction losses should be calculated in accordance with Pipe Manufacturers Hydraulic Design Charts. Appropriate allowances should be made for velocity head, inlet and outlet losses, and losses due to changes of direction and obstacles.

As a guide, the following table gives typical energy loss coefficients (k) (excluding changes in hydraulic grade line due to changes in velocity head which should also be allowed for).

| Energy loss $h_e = K v^2/2g$ (h in metres, v in m/s) | |
|---|---|
| Type | k |
| Sharp pipe entry (from reservoir) | 0.5 |
| 90° manhole (depending on radius) | 0.5 to 1.0 |
| Velocity head loss at outlet | 1.0 |

For short culverts, refer Ministry of Works and Development Culvert Manual CDP/706A.

### 7.3.2 Sumps – Collection of Water from Side-Channels

Head loss at sumps will depend partly on direction, depth and velocity of flow, and it should be ensured that side-channel water does not bypass sumps when velocities are high.

### 7.3.3 Sump Positions

Head loss through sump gratings in low sag positions should be calculated as follows, an allowance having been made for partial blockage:

| | Head loss per sump (m) | Max. flow ($m^3/s$) | Head up at sump (m) |
|---|---|---|---|
| Single flat channel grating, ie standard TDC sump | 33 $Q^2$ * | 0.060 | 0.12 |
| Single grating with back entry, ie standard TDC sump with back entry | 20 $Q^2$ * | 0.075 | 0.11 |

* Where Q is flow in m3/s

### 7.3.4 Open Channels

Mannings formula $Q = \frac{AR^{2/3} s^{1/2}}{n}$ is usually satisfactory,

| | | |
|---|---|---|
| Q | = | flow m³ / s |
| R | = | hydraulic radius (m) |
| S | = | slope of surface |
| A | = | water section area, m² |

Typical Mannings n values are:

| | |
|---|---|
| Concrete | 0.011 to 0.017 |
| Channels – with weeds | 0.025 to 0.04 |
| Frame and slab | 0.035 |

Extra freeboard should be allowed in steep channels where roll waves can occur.

## 7.4 Kerb and channels – maximum flows

Piping should be extended far enough up road catchments to limit the stormwater flow in standard flat channels as follows:

| | Gradient | |
|---|---|---|
| | 1-in-300 (min. grade) | Or maximum flow depending on grade |
| Residential, up to 200 persons/ha | 55 ℓ/s | 953 $\sqrt{}$ gradient |
| Residential, over 200 persons/ha | 45 ℓ/s | 780 $\sqrt{}$ gradient |
| Commercial | 35 ℓ/s | 606 $\sqrt{}$ gradient |
| Industrial | 55 ℓ/s | 953 $\sqrt{}$ gradient |

This gradient calculation will reduce the amount of water carried in side channels as the pedestrian population increases, ie less disruption to pedestrians walking over water channels during heavy rain events. TDC may also wish to reduce side channel peak flows on through roads for traffic reasons.

### 7.4.1 Sea Outfall Design Level Criteria

It is imperative that properties (assets) and, in some instances, land be protected from inundation especially from the sea and potential climate change characteristics.

In the mid 1950s Harbour Boards and LINZ worked together to have a consistent level which was that mean sea level equated to a 0.00 datum. TDC subsequently accepted this datum 0.00 for all levels around the region. Due to sea level rise over the last few years the mean sea level may have risen above the 0.00 datum. Therefore any design should be based on the mean sea level in the relevant area.

To give some guidance to Designers the following assumptions are made to set minimum levels in terms of inundation from the sea:

a) Any discharge to the Coastal Marine Area will require resource consent under the TRMP.

b) Designers will need to satisfy Council that all adverse known environmental effects are acknowledge when designing for the life of the asset.

c) Global warming is expected to raise sea levels by 180 to 590mm by the year 2100. Therefore 500mm has been accepted until further evidence has come to hand. (The Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report "Climate Change 2007").

d) Significant areas of catchments in the district are low lying and may present a problem when attempting to dispose of stormwater adequately. In these locations Designers shall consider the backwater effects of tidal water levels as well as the free-draining capacity of hydraulic systems.

e) For the purpose of pipe and open channel design the hydraulic grade line at the sea outfall shall start at 100mm below the MHWS mark in each coastal marine area.

### 7.4.2 Minimum Ground Levels (Tidal Flooding)

a) Specific design will be required in most cases. Table 7-5 sets out the rationale for required increases above MHWS for finished ground levels for subdivision and developments adjacent to the coast.

**Table 7-5 Basis of Minimum Finished Ground Levels above MHWS (Mean High Water Springs)**

| Tidal Component | Level Above MHWS |
|---|---|
| Maximum possible high tide<br>(Astronomical Spring Tide or Highest astronomical tide) | 0.60 |
| Global Warming Sea Level Rise Allowance<br>(IPCC Fourth Assessment Report 2007 - NIWA) | 0.50 |
| Storm/Tidal Surge | 0.70 |
| River Flow Influence / Wave run up | 0.30 |
| Safety Margin | 0.20 |
| New minimum levels in the coastal environment above MHWS | **2.30** |
| Basis of information – "Little Kaiteriteri sea level recorder", NIWA, July 2001<br>LINZ hydrographical charts have confirmed that the Highest Astronomical tide (HAT) is 0.60m above MHWS. | |

b) MHWS, in terms of TDC datum, will need to be determined by survey at each locality and the ground level raised by a minimum of 2.30m above that level. Note that Tasman District Council figures will differ from Nelson City Council due to tidal variations around the coastline.

c) There are tidal variations around the district. Table 7-6 is provided as a guide for finished ground levels in the specific locations in Tasman District, and specific design will be required to be submitted with the consent application.

**Table 7-6 General Guide for Finished Ground Levels for the two bays in Tasman District in relation to MSL**

| Area | Difference between MSL and MHWS | Minimum Ground Level in Relation to MSL |
|---|---|---|
| **Tasman Bay** | | |
| Richmond | 1.88 | 4.18 |
| Mapua | 1.70 | 4.00 |
| Motueka | 1.50 | 3.80 |
| **Golden Bay** | | |
| Tarakohe | 1.90 | 4.20 |
| Motupipi Inlet | 2.20 | 4.50 |
| Collingwood | 2.10 | 4.40 |
| Note: Some data is approximate and will require specific design to ascertain the correct MSL and its relationship to TDC datum. | | |

d) To obtain subsequent floor levels refer to the Building Act.

e) The minimum ground level requirement will be reviewed at the time of every TRMP review or at relevant resource consent application.

### 7.4.3 Minimum Ground Levels (Residential Areas Below Road)

a) In areas of level topography, roads vested with Council shall be used as secondary flow paths, ie 1-in-20 or flatter.

b) The site shall be contoured as necessary to ensure that:

i. Where practicable, the minimum finished level is greater than the crown level of the road/street to which the piped stormwater from the allotment is drained.
ii. Stormwater shall not flow from the road reserve into the site (either as backflow via stormwater connections or as surface run-off).
iii. No fill shall be placed which interferes with the natural run-off from neighbouring land. Where filling of the site obstructs the natural run-off from an adjoining property then provision shall be made for the drainage of that property.
iv. There is continuous fall towards the road/street that the site is draining to. Provision shall be made for potential development and filling of any intermediate sites.

### 7.4.4 Minimum Ground Levels (Adjoining Rivers and Streams)

a) Where a site adjoins a river or major stream (wider than 3.0m at the top of bank) the minimum building platform will be controlled by water levels for a 2% AEP (a 50-year return period) event and a 500mm minimum freeboard for the design life of the building.

b) Where building platforms are raised above adjoining ground levels, a safe access shall be provided to the building platform. This access shall not significantly impede overland flow or locally raise flood risk.

c) To obtain subsequent floor levels refer to the Building Act.

d) For permanent structures the Designer must allow for changes in rainfall patterns, either through a higher design standard or an increased freeboard.

e) Council's Environmental Monitoring officers who can interpret 50-year flooding levels should be consulted with respect to flood hazard areas for major streams/rivers in the Tasman District. No development will be permitted in the above areas until adverse effects have been mitigated.

## 7.5 Accepted Methods

This section outlines accepted design solutions for stormwater management and drainage in the Tasman District, based on conventional stormwater design.

### 7.5.1 General

There are a number of methods available for the management of stormwater. Where a piped system is to be used Section 7.6.1 sets out the key piped system design standards and conditions that must be met in order for the system to meet Council's expectations

The following guidelines set out the other available methods of stormwater management and disposal that are generally considered to be acceptable provided that all standards and conditions associated with their design and installation are met.

### 7.5.2 Soakbeds and Soakage Trench Design

In new subdivisions a pipe system is the preferred solution; however Council may permit a combination of soakage and reticulation on approved soil classifications and with specific design.

a) Approval of soakage for stormwater is at Council's discretion. Grounds for refusal of soakage may include:

   i. potential groundwater contamination;
   ii. high groundwater levels;
   iii. slope stability concerns;
   iv. compatibility with the built environment and Council's existing assets; and
   v. lack of secondary flowpaths.

b) Specific design of soakage solutions is required, due to the variation of soil types and shallow groundwater levels throughout the district. Refer NZBC/E1 for site testing regime.

c) Soakage systems shall have a capacity adequate for a 5% AEP (20-year) event. This capacity shall be proven through field testing.

d) Continued maintenance is required for soakage systems, as silting up of the soakage media may occur over time. This maintenance must be specifically addressed by the Designer. A maintenance period of between 2-6 years plus a Bank Bond shall apply for any soakage asset vested in Council.

e) Particularly rigorous flood risk analysis and overland flow design will be required where soakage is chosen as a preferred disposal option. When assessing flood risk and overland flow, no allowance for soakage capacity shall be assumed.

f) The effectiveness of soakage may be maximised with the reuse, storage, or detention of stormwater on site through means such as tanks, rain gardens (areas of gardens planted in trees and shrubs that soak up water) and irrigation areas. In such instances a reduction of soakage capacity may be accepted in conjunction with other low-impact design solutions.

g) A typical soak pit / trench / rain garden concept is shown on TDC Drawing 725. This drawing is intended as a guide and specific proposals will require the Engineering Manager's approval.

h) Soakbeds and soakage trenches shall be kept clear of secondary over land flow paths with vehicle access for maintenance purposes.

i) Disposal of stormwater by soakage on a private right-of-way will require specific design. The right-of-way shall initially drain via a standard sump and then to a soak bed as shown on TDC Drawing 723. The ongoing maintenance of this soakage shall lie with the properties served by the right-of-way and Council will require this to be recorded on the title of each property.

### 7.5.3 Open Channel Design

These standards apply to open channel design;

a) For watercourses requiring pipes of greater than 900mm diameter, consideration should be given to providing the necessary waterway in the form of an appropriately-designed open channel.

b) In all cases the size, shape and grade of open channels and the diameter and grades of pipelines shall be to the approval of the Engineering Manager and may require resource consent under the TRMP.

c) Where natural watercourses or formed channels are to be incorporated in the stormwater drainage system, they shall be located within a drainage reserve of sufficient width to contain the full design flood flow with a minimum freeboard of 500mm and allow for super elevation on curves.

d) All channel works shall include protection against scour and erosion of the stream banks and stream bed. A low-flow channel shall be formed in the invert. See also TDC Drawing 724 for outfall details and drainage waterway design concepts.

e) Such reserves shall ideally have a maximum batter slope of 1 vertical to 5 horizontal. Maintenance access shall be provided for the full length of the channel by either a 6.0m wide berm on one side or a 4.0m berm on both sides.

f) Designed open channels must have a “natural” appearance, with existing flow regimes maintained, meanders reinstated, stream water temperatures maintained, native plants and fish used, invertebrate and bird habitat encouraged. A comprehensive design may be requested to fulfil these design criteria. Refer to TDC Drawing 724.

g) Natural open stream areas shall be cleared of all unsuitable plant growth and replanted to an appropriately approved landscape design. Material shall be position to allow trapped fish etc to re-enter streams.

Also note the Te Tau Ihu Mahi Tuna (Nelson/North Marlborough Eel Management Plan).

### 7.5.4 Piping of Watercourses

The piping of natural watercourses should be avoided. The piping of continually flowing watercourses with an equivalent pipe size over 900mm is not recommended due to cost, long-term maintenance liabilities and potential freshwater habitat effects. Ephemeral water courses should be retained as natural drainage features where practicable.

In some circumstances retention of open channels is not possible due to the ongoing maintenance requirements and access restrictions.

Where piping of watercourses is necessary, the following standards shall apply:

a) Resource consent will be required.

b) Should a watercourse be piped (such as in an intensively developed area), a subsoil drain shall be laid at the invert level of the pipe and connected to manholes, to ensure groundwater levels are not forced to rise. Where pipe routes differ from the original stream course, sufficient protection from seepage in the original stream bed shall be provided.

c) Secondary flow paths shall be provided. These shall be shown on the Engineering Drawings and protected by easements.

d) Where a continually flowing stream is replaced with a pipe of 600mm or greater, allowance shall be made for fish passage, and provision of an in-stream environment. As a minimum, pipes shall be increased one pipe size above that normally required and shall be embedded such that the invert is 50mm below the stream bed.

### 7.5.5 Temporary Intakes into Pipe Networks

In the case of a temporary intake to a piped network, the structure shall be adequate for the estimated time before the permanent extension. Permanent intakes and outlets shall be designed to cope with individual requirements including fish passage.

### 7.5.6 Cut-Off Channels

a) Approved cut-off channels may be required parallel and adjacent to the uphill boundaries of high level sections. When required, these shall be located within the upper boundary of the property to be protected and covered by suitable easements.

b) In this case a consent notice shall be placed on the section outlining that the property owner is responsible for maintaining the cut-off channel.

### 7.5.7 Culverts Under Fill

a) Culverts shall be of sufficient strength to support all designed super imposed loads in accordance with NZS/AS 3725 and culvert design manuals. Note – minimum 375mm diameter for rural access crossings.

b) Culverts shall have adequate wingwalls, headwalls, aprons, approved grills, traps and/or pits to prevent blockage, scouring and erosion.

c) Inlets shall be designed to ensure adequate intake capacity and provide headwalls no lower than maximum surcharge levels.

d) Sufficient erosion protection shall be provided in the event of flow over an embankment.

### 7.5.8 Sub-Soil Drains

a) Sub-soil drains draining residential land areas shall terminate at a sump (TDC Drawing 707). Sub-soil drains shall not discharge to the kerb and channel.

b) Sub-soil drains draining service trenches shall terminate at the closest stormwater manhole or sump.

c) Sub-soil drains are not to be considered as part of the surface water drainage system.

### 7.5.9 On-Site Retention of Stormwater

a) Water is a valuable resource and land owners are encouraged to retain and reuse stormwater collected on their site. This also reduces off-site adverse effects by restricting stormwater flows in Council's pipe systems until after a high intensity storm has passed.

b) Retention of stormwater can be achieved via holding tanks on site. The lower two-thirds of a tank can be used for stormwater reuse and the top one-third of the tank for detention and slow discharge to Council's reticulation system if available. TDC Drawing 725 gives a working example for stormwater retention design.

### 7.5.10 Detention Basins

Detention basins that are to be vested in Council must have the prior approval of the Engineering Manager. Detention basins may be needed for the control of stormwater flows should downstream stormwater systems be substandard. Because of long-term maintenance costs, large basins are preferred by Council over a series of smaller ones.

Council may consider smaller basins if they are incorporated into local purpose reserves and have other benefits for the public.

If detention basins are approved they should be designed to the following standard:

a) The 10-year, 20-year and (where required) 50-year return period peak flood flow from the developed catchment shall be no greater than would have occurred from the undeveloped catchment at the critical downstream location(s) in the network. This requirement may result in design for a number of duration rainfall events.

b) A design and construction certificate shall be provided for each structure by a suitably qualified Chartered Professional Engineer stating that the basin has been designed and constructed in accordance with the appropriate standards.

c) A 500mm freeboard shall be provided above the maximum design storage level to the spillway crest in most cases. Council reserves the right to vary the freeboard requirement on discussion with the Designer.

d) The spillway shall be capable of passing the 1% AEP ($Q_{100}$) event without risk of over-topping the dam structure or eroding the spillway.

e) In locations where the majority of the flow into the structure would be via overland flow the discharge into the downstream stormwater system shall be through a standard stormwater intake (TDC Drawing 702).

f) In dry detention basin locations where the majority of the flow into the structure would be via piped systems, the piped systems shall be extended through the basin with surcharging capabilities to allow:
   - Multi-use options for the basin area;
   - Peak flood flows to bubble up via a sump out of the pipe system into the storage basin;
   - Stored water to drain once the flood peak has passed;

g) For detentions dams within continually flowing catchments, swale drains and landscaped drains may be more appropriate.

h) In all cases a secondary intake shall be provided terminating 500mm below spillway crest level (or at an approved alternative level as per (e) above). An acceptable example is shown on TDC Drawings 701, 702 and 703

i) An all-weather access track shall be provided from a legal road reserve to the basin of the detention dam and intake structures. The track shall be no steeper than 1-in-7, have a physical width of not less than 3.0m and be provided with stormwater control.

j) Detention pond design shall mitigate any actual or potential adverse effects by addressing the following points:

- side slope stability and safety considerations;
- ease of maintenance, including mowing and silt cleanout;
- shape and contour for amenity value;
- the effectiveness of the outlet structure;
- secondary overflow options;
- dam or bank failure;
- silt traps;
- fish passage habitats and birdlife enhancements;
- pedestrian links to other reserves;
- safety fencing; and
- vegetation islands, shading.

k) Detention ponds shall vest as "utility reserves" and not form part of a reserve fund calculation trade-off, unless previously agreed with the Reserves Manager.

## 7.6 Piped System Specifications

### 7.6.1 Pipe Design

All systems shall be designed to accept flows from above a proposed development, and shall be of sufficient capacity to provide for maximum flows from possible future development (as indicated by zoning in the TRMP).

Pipe capacity matching that of the pre-developed state, will only be accepted if appropriate mitigation measures (such as detention structures or on-site detention) and approved by Council are constructed by the developer.

Any mitigation measures must be designed so that flows in the entire downstream network are attenuated for the appropriate design event(s). Refer to the detailed requirements for detention dams in this standard.

Table 7-7 sets out the minimum specifications for public stormwater pipe design.

**Table 7-7 Minimum Specification for Public Stormwater Pipes**

| | Concrete pipe | uPVC pipe |
|---|---|---|
| Permitted size | Minimum 225mm ID<br>Thereafter in 75mm increments | Minimum 225mm ID<br>Maximum 300mm ID |
| Minimum standard | NZS4058 | AS/NZS1260 |
| Material strength | Minimum Class 2<br>and in accordance with AS/NZS3725 | Minimum SN 8<br>Specific design to AS/NZS2566 method for depth >5.0m, or traffic wheel loads >96 kN |
| Cover depth | Refer Table 7-6 | Refer Table 7-6 |
| Joints | Rubber ring jointed | |

| | Concrete pipe | uPVC pipe |
|---|---|---|
| Pipe capacity | 5% AEP (1 in 20 year) | |
| Flow velocity | Minimum 0.75m/s*<br>Maximum 6.0m/s | |
| Pipe location (in preference) | Road reserve<br>Note TDC Drawing 700 | |
| Clearance from other services | Minimum 200mm vertical<br>Minimum 500mm horizontal<br>(lesser clearance on approval of the Engineering Manager) | |
| * Gravel or silt traps may be required to be installed in low velocity flow situations. | | |

### 7.6.2 Calculation of Pipe Capacity

Pipe sizes and grades shall be calculated using standard hydraulic formulae (Manning, Colebrook-White), or an approved hydraulic calculator or model.

Piped stormwater systems shall generally be designed to flow full or part full under gravity at design flows with pipes aligned soffit-to-soffit.

It will not be permitted to reduce the diameter of pipe even where changes in grade would produce the required capacity in a smaller diameter of the downstream pipe. This is due to the potential for debris/sticks which could enter the system to block at the reduced orifice.

A pipe roughness calculated using either the Mannings (n = 0.013) or Colebrook-White formulae ($k_s$ = 1.5mm – up to 450mm dia/ $k_s$ = 0.6mm – over 450mm dia) shall be adopted, to account for gravel and grit deposits and other *in-situ* variables (such as construction performance and pipeline deterioration with age).

Losses due to bends, manholes and sumps shall be incorporated into the design of pipe systems.

### 7.6.3 Calculation of Flow in Steep Pipelines

Where a pipe gradient exceeds 1-in-10 an allowance for the bulking of the flow due to air entrainment should be made. This allowance is made by increasing the area of the pipe for the additional volume of air in the flow. The air-to-water ratio may be calculated from the formula:

$$\frac{\text{Air}}{\text{Water}} = \frac{kV^2}{gR}$$

Where:

k = coefficient of entrainment (dimensionless)
  = 0.004 for smooth pipes
  = 0.008 for cast-*in-situ* concrete culverts
V = velocity (m/s)
R = hydraulic radius (m)
g = acceleration due to gravity (9.81 m/s)

### 7.6.4 Pressurised Pipelines

A pressurised stormwater system shall be subject to Council approval. Stormwater pumping is not generally permitted. Any stormwater pump station design must be

specifically approved by the Engineering Manager and generally be in accordance with Council's wastewater pump station design standards.

Where a non-pumped pressurised stormwater system is deemed to be necessary (for a 5% AEP design storm) the hydraulic grade line shall be plotted on the longitudinal section. Reduced levels and the hydraulic gradient shall be quoted for the entire length of the pipeline. In no cases shall the hydraulic grade line be above finished ground level.

### 7.6.5 Pipe Cover

Pipe systems shall be designed to ensure the minimum cover over the barrel in accordance with Table 7-8.

Generally deep pipelines exceeding 2.5m deep shall be avoided. Over-depth pipelines are difficult to access in the future for maintenance and renewal works.

**Table 7-8 Pipe Cover Standards**

| Location of Pipe | Minimum Cover Required | |
|---|---|---|
| | Concrete Pipe | PVC Pipe |
| Areas subject to highway traffic loading eg, within road carriageway. | 600mm | 750mm |
| Areas subject to light traffic loading outside road eg ROWs, driveways, car parks and berms. | 450mm | 600mm |
| Areas never subject to traffic loading. | 300mm | 450mm |
| Under continuous concrete encasement for full circumference (specific design required to mitigate expansion of pipe material). | 300mm | 300mm |

Reduced cover on pipes may be approved providing the appropriate class of pipe is specified and cover is according to the manufacturer's specification.

Minimum cover may also be reduced providing the pipe is concrete encased and subject to Council's approval. The minimum thickness of concrete encasement shall be 100mm and the minimum concrete strength shall be 20MPa. Capping of the pipe may be permitted subject to specific design and approval by the Engineering Manager.

Where pipes with inadequate cover require concrete encasement the extent and thickness of concrete and concrete strength shall be specified on the drawings.

These standards are specific to the installation of particular components of the stormwater system:

a) Backfilling, compaction and maintenance of the circular shape of the pipe is of paramount importance when laying thin walled pipes. The relevant specifications shall be adhered to. Pipelines constructed with thin walled pipe require close supervision during construction.

b) For minimum pipe cover requirements refer to Table 7-8. Minimum cover may be reduced providing the pipe is concrete encased and subject to Council's approval.

c) To avoid reflective cracking of pavements and differential settlement concrete encasement shall not be permitted to penetrate the basecourse or pavement construction.

d) No concrete protection shall be placed around the pipe until the line has been inspected and approved by the Engineering Manager.

e) PVC piping adjacent to concrete shall be protected with appropriate 6mm thick denso tape or equivalent 250 micron polythene.

### 7.6.6 Manholes

Table 7-9 sets out the minimum specifications for manholes, mini-manholes and lamp hole cleaning eyes.

**Table 7-9 Required Pipe Access Openings and Limiting Requirements**

| | **Manholes** | **Mini-manholes** | **Lamp Hole Cleaning Eyes** |
|---|---|---|---|
| Locations where pipe access openings must be provided: | Manholes to be provided at:<br>• Change in grade<br>• Change in direction<br>• Change in size<br>• Pipe junctions<br>• End of public pipe 100m centres | Mini Manholes to be provided at:<br>• Private connections, out of areas subject to traffic loading. | LHCE not to be used.<br><br>Change in grade at top of steep sections not in carriageways, footpaths or berms. |
| Maximum pipe size | 450mm (1050 mm dia)<br>750mm (1350 mm dia)<br>1075mm (1500 mm dia)<br>1200mm (1800 mm dia)* | 225mm ID | 225mm ID |
| Maximum depth | 2.5m | 0.9m for public pipe | 1.5m |
| Maximum deflection angle | 90° for pipe to 375mm<br>60° for pipe >375mm | 45° | - |
| Maximum distance between centres | 100m | 100m | 100m |
| Approved materials | Concrete | uPVC<br>Concrete | uPVC |
| TDC Drawing | 717 | 803 | 807 and 808 |
| * Factory-made “T” manholes will be permitted for pipes of 1350mm diameter and over, subject to the approval of Council. | | | |

Stormwater manholes shall be constructed of pre-cast cast *in-situ* concrete in accordance with TDC Drawings 716 and 802.

The diameter of any manhole installed shall meet the dimensional requirements set out in TDC Drawing 716.

Manholes shall be provided at minimum intervals of 100m, at changes of grade, direction or pipe size and at junctions and end points of public stormwater pipes.

A fall of no less than 50mm shall be provided through all manholes.

All pipe soffits shall be matched to the soffit of the outgoing pipes incorporating the 50mm fall noted above when working with different pipe diameters.

### 7.6.7 Manhole Construction

a) Manholes shall be constructed in accordance with TDC Drawings 717, 719 and 803.

b) All manholes shall be made water-tight by effective sealing of manhole section joints (with mastic sealant) and pipe entries with epoxy mortar.

c) Manholes must be designed to resist uplift especially in areas where high groundwater is experienced.

d) All concrete pipes entering or leaving a manhole shall have one flexible joint within 500mm of the manhole and a second flexible joint within 3.0m of the manhole.

e) All PVC pipes entering or leaving a manhole shall have one flexible joint within 200mm of the manhole and a second flexible joint within 1200mm of the manhole. "Starters" and "finishers" shall be used as appropriate.

f) A semicircular channel shall be formed with *in-situ* concrete through the manhole connecting the upstream and downstream pipes. The channel shall be finished with a smooth, regular half-circle invert with no abrupt changes in direction. Benching shall be steel float finished to give a regular smooth surface. The height of the concrete channel shall not be less than the diameter of the pipe on the downstream side of the manhole.

g) If manhole lids other than Humes or Hynds pre-cast concrete lids are to be used, then the appropriate certification must be submitted to Council showing that the lids will withstand loadings of 0.85 HN. Manholes shall have a minimum opening of 600mm in the concrete lid and picton ring.

h) Minor pipelines are generally connected to major pipelines through manholes. Direct connection of minor pipelines to major pipelines is acceptable provided it is either through a suitable junction (eg, a prefabricated and welded junction for large PVC diameter); or through a saddle, provided the diameter of the minor pipeline is not greater than half the diameter of the major pipeline.

i) A saddle junction shall be formed by cutting the collar end off a pipe of sufficient length below the collar to enter the pipe wall fully without intruding into the main pipe. The hole in the main pipe shall be as neat as possible and the "saddle" entry shall be neatly and securely epoxy mortared. Refer TDC Drawing 717.

### 7.6.8 Mini-manholes

Shallow concrete mini-manholes shall be in accordance with the requirements set out in TDC Drawing 803.

Prefabricated uPVC mini-manholes shall only be used on approval by Council.

Mini-manholes are not to be used in areas subject to vehicular traffic, except where formed in residential driveways or rights-of-ways open to light domestic vehicles. In this instance they shall be located out of usually trafficked areas.

### 7.6.9 Lamp Hole Cleaning Eyes (LHCE)

The use of lamp hole cleaning eyes shall be limited to changes in grade at top of steep banks where installation of a manhole or mini-manhole would not be practicably feasible.

### 7.6.10 Sumps

Sumps shall be to Tasman District Council standard (ie, 900mm x 450mm) and constructed in accordance with TDC Drawings 705 to 711 and in accordance with the requirements of Table 7-10.

**Table 7-10 Required Sump Locations and Limiting Requirements**

| | **Standard Back Entry Sumps** | **Standard Back Entry Sumps with toothed connectors** | **Duplicate Sumps** |
|---|---|---|---|
| Approved locations | At each tangent point of the channel on the upstream side of road intersections where the grade is less than 1:100.<br><br>At any low spot in a channel.<br><br>Serving any right-of-way.<br><br>Bubble sump in channel (TDC approved only). | At each tangent point of the channel on the upstream side of road intersections where the grade is greater than 1:100.<br><br>Where the area of the catchment warrants the provision of adequate stormwater entry. | Where the length of kerb and channel draining to a low point is excessive.<br><br>At a low point at the head of a cul-de-sac or street where secondary flow paths flow through private property. |
| Minimum lateral pipe size | 225mm ID | 225mm ID | 300mm ID |
| TDC Drawing | 705 – 711 | 705 – 711, 715, 716 | 705 – 711 |
| Maximum depth | 1300mm | | |
| Maximum distance between sumps* | Standard kerb: 100m<br>Mountable kerb: 60m<br>(Subject to specific design on a case-by-case basis) | | |
| Approved materials | Concrete | | |
| *Closer spacing of sumps may be required depending on the rate of runoff expected.<br>Sumps shall not be positioned at vehicle crossings or pram crossings. | | | |

Sumps draining private right-of-ways can be a minimum 150mm subject to suitable catchment design and a secondary flow path being directed to the road carriageway.

All sumps shall have a back-entry. Where a sump unavoidably coincides with a vehicle crossing (and back entry is not feasible) an additional standard (back entry) sump or a side entry shall be constructed on the upstream side of the crossing and the pipe extended into the sump.

The tolerance for the location, alignment and level of a sump shall be as follows:

a) Lateral alignment of the sump top shall be within a maximum of plus or minus 10mm of the design line of the kerb and channel.

b) The skew of the sump top in relation to the kerb and channel alignment shall be within 10mm of being parallel.

c) The sump shall be placed within 20mm of being vertical.

d) The maximum depth of a sump shall be 1300mm as per TDC Drawing 709.

e) The finished level of the sump shall ensure compliance with the tolerance requirements for kerb and channel finished level as per the roading network section.

The vertical alignment of kerb and channel shall be designed to ensure that no low point requiring a standard sump will coincide with any kerb and channel curve of less than 50m radius (except at the turning heads of cul-de-sacs).

Sumps which are located in tidal areas or in areas subject to flooding may require non-return systems as shown on TDC Drawing 721 to prevent backflow up the line. Other designs will be assessed on a case-by-case basis.

Sump connections may be made to the stormwater pipe by use of saddle connections as in the following sections, where this is physically possible.

### 7.6.11 Individual Site Connections

Connections to each site shall meet the following standards:

a) In all subdivisions a stormwater connection of a minimum 100mm diameter shall be provided to each property and terminate at least 1.0m inside the boundary of each lot. The pipe end shall be painted green to denote that it is a stormwater pipe.

b) A LHCE (inspection point) is required on all lateral connections, at a maximum depth to invert of 900m and located at the roadside of the property boundary. See TDC Drawing 807.

c) On generally flat land, sloping at 1-in-50 or less, each connection shall be capable of serving the entire building area of the section by gravity.

d) On land steeper than 1-in-50 every effort shall be made to serve the entire section. Where this proves to be impossible and the servicing of the site is limited the area on each lot capable of being serviced shall be shown on the Engineering Drawing.

e) Individual house/site/lot stormwater shall be disposed of by piping to one of the following approved outfalls in order of preference; a lesser option will only be considered if a more preferable option is not practical or economically feasible:

i. stormwater pipe;
ii. watercourse/swale;
iii. kerb entry;
iv. bubble-up sump (pressurised);
v. on-site reticulation soakage, subject to testing.

In some areas and special cases (ie, free-running gravels and sands), on application and subject to Building Code requirements soakage disposal may be an approved preferred option. Note these may be required to be over-designed to cater for the lack of a secondary flow path).

f) On-site requirements for stormwater management systems, such as special sumps and filters, are governed by the Building Act and its regulations.

### 7.6.12 Contaminated Stormwater

a) Bunded areas around fuel storage areas shall discharge to the stormwater via a suitably designed oil interceptor with an appropriate shut-off valve system to contain fuel spills.

b) Where it is considered that there is a high risk of yard run-off being contaminated with oil and silt then an oil and silt trap shall be required with a connection to the stormwater system via an appropriate shut-off valve system. This shall require specific design and approval. An appropriate mechanically or electronically operated wastewater diversion system may be required. Maximum permissible discharge rates to the wastewater network may be restricted by the Engineering Manager subject to network constraints. Stormwater shall not be allowed to directly discharge to the wastewater system.

c) Contaminated stormwater effluent that contains a combination of detergent and/or degreasing agents with oil and/or silt shall be treated as trade waste (refer section 8.2.3) and directed to the wastewater sewer after first passing through a silt and oil trap built to TDC Drawing 801 standard. This also requires “Trade Waste Discharge” consent.

## 7.7 Pipe System Construction

The following specifications must be met in the construction of any stormwater management system.

### 7.7.1 General Specification

The following specification shall apply to the preparation of pipe installation, including trenching works:

a) All drainage pipelines shall be constructed in accordance with the requirements of New Zealand and Australian standards as set out in Table 7-1, except as modified by the Tasman District Council Engineering Standards & Policies.

b) The maximum width of trench for side support to the pipe, measured at the level of the top of the pipe shall not exceed:

   i. For pipes up to 1200mm diameter – external diameter of the pipe plus 300mm;
   ii. For pipes over 1200mm diameter – external diameter of the pipe plus 500mm.

c) Excavation for manholes shall be only of sufficient size to leave adequate space for construction and for compaction of backfill and sealing of the manhole.

d) Excavations shall be kept free of water during construction.

e) In no circumstances shall stormwater or groundwater be allowed to drain into any existing sewer, and pipe ends shall be plugged to prevent such ingress.

f) Discharge of stormwater or groundwater to existing stormwater drains or the pipes already laid will be permitted providing adequate silt traps prevent debris and suspended matter from entering drains. Should deposits in existing stormwater drains, the pipes already laid, or on roads occur as a result of the operations of the landowner or the contractor, then such deposits shall be cleared forthwith at the landowner's or the contractor's expense.

g) Groundwater lowering may be permitted except where this practice may present a risk of subsidence.

h) The contractor or landowner shall cause as little damage or interference to property or persons as possible in disposing of water from the works, and shall be responsible for any damage or interference which may be caused. This shall include any damage to the structure of any road.

i) All materials and workmanship in mass or reinforced concrete shall be in conformity with NZS3109, and structural concrete shall have a minimum crushing strength of 20 MPa at 28 days.

j) Bedding metal shall consist of graded metal to the following sizes and as shown on TDC Drawings810 and 908:

   i. PVC – uniformly graded chip, all passing 9.5mm sieve and all retained on 4.75mm sieve.
   ii. Concrete Pipe – 18mm aggregate, with a minimum of 66% crushed, all passing an 18mm mesh and all retained on a 9mm mesh.

iii. Or to manufacturers' specifications.

k) Alternative bedding material will only be permitted on the approval of the Engineering Manager.

l) The bottom of the trench shall be carefully hand trimmed to the correct line, grade and level and a bedding of pea gravel or 18mm drainage metal shall be provided, to a minimum thickness of 100mm under the pipe.

m) At the position of any collar, a hole shall be formed in the bedding so that the pipe barrel rests evenly on the bedding along its length.

n) The pipes shall be brought to true alignment and level before covering the pipes with side support material to the approval of the Engineering Manager.

o) Should substandard foundations be present that cannot be excavated, or in-filled ground service support structures will be required as shown on TDC Drawing 720.

p) In general a laser shall be used by the contractor for fixing line and grade, setting pipes to line and level, and for jointing.

q) Sight boards and boning rods will only be approved on minor works, eg, infill subdivisions or on steep gradients.

r) The maximum deviation in level of pipe invert when laid shall be 5mm from design level.

s) The maximum horizontal deviation from a straight line shall be 10mm.

t) Pipes shall not be laid on bricks, blocks and wedges or other temporary or permanent supports except when concrete surround is to be placed.

u) Joints shall be flexible and water tight.

v) Pipes shall be kept clear of dirt or debris, and any pipes that contain such matter shall be required to be cleaned out.

w) Testing by way of CCTV inspection of pressuring lines or appropriate will be required prior to completion of the works.

### 7.7.2 Sump Construction

a) The tolerance for the location, alignment and level of a sump shall be as specified in Table 7-10.

b) Sumps which are located in tidal areas or in areas subject to flooding may require non-return systems as shown on TDC Drawing 721 to prevent backflow up the line.

### 7.7.3 Private Connections

a) As stormwater construction proceeds, each connection shall be marked by a 75mm x 25mm ground-treated marker stake suitably identified and partly painted green (red for wastewater, green for stormwater).

b) The end caps and inside of all new stormwater lateral connections must be painted with green acrylic paint to help with future identification. The actual work of pipe laying shall be done by a person approved by Council.

c) Kerb entry connections may only be installed using approved kerb entry adaptors (not PVC) and with the Engineering Manager's approval. Approved kerb entry adaptors shall be 100mm diameter galvanised steel for a continuous length to the lot boundary.

d) Where a manhole is not required at a pipe junction the connection shall be made by using a "y" junction or a proper "saddle" junction. See TDC Drawings 718 and 810.

## 7.8 Alternative Assessment Framework

### 7.8.1 Introduction

The alternative assessment framework has been developed to provide further guidance to applicants considering a design, management method or solution that does not meet one or more of the conventional standards.

In particular, the assessment framework has been developed to help applicants and Council when considering Low Impact Design (LID) approaches to stormwater management.

LID is a method that may be used to achieve multiple stormwater management requirements efficiently and effectively. The approach promotes the use of stormwater management methods and solutions which protect, incorporate or mimic natural drainage processes of a given site or catchment.

It is anticipated that the LID design approach will include:

a) Understanding existing and/or natural drainage patterns within the catchment;

b) Maintaining or enhancing natural drainage systems where possible;

c) Minimising impervious surface cover within developments;

d) Preventing, rather than mitigating, adverse effects by managing stormwater at source (on-site);

e) Using natural systems and processes, such as soil infiltration and vegetation, in the management of flow and quality treatment of stormwater.

f) Integrating stormwater design into the early stages of design and planning of development proposals;

g) Integrating stormwater management and disposal with other urban values, such as open-space retention, recreation and amenity values;

Council encourages the use of LID in the management of stormwater within every development. However, Council also recognises that LID approaches may not be suitable under all circumstances such as (but not limited to) the following:

a) Where the proposed development is located within an urban area that has a high percentage of impervious surface cover and, where the existing stormwater systems rely on piped infrastructure;

b) Where the development is located on land that has poor natural drainage and/or a high water table, especially during high rainfall periods;

c) Where the soil or naturally occurring ground surface has poor permeability, preventing infiltration;

d) Where local conditions (such as total land area available, surface slopes or access issues) limit the effective operation and ongoing maintenance of a proposed system.

### 7.8.2 Information Requirements

The following information must be submitted with engineering designs:

a) A general outline of the proposed stormwater management system, design philosophy and design standards, referencing best practise methods that are used.

b) A description of the activities occurring on the site that will have an effect on stormwater drainage. Include a description of the nature of the effects on water flows and potential for water contamination;

c) A projection of the reasonably expected future development density, including the estimated impervious surface cover, and the type of activities likely to occur within the catchment;

d) A copy of all relevant resource consents. This must include a copy of the discharge consent, it may include subdivision and land-use consents where they relate to the site and stormwater activity;

e) A catchment plan that clearly defines the site, the catchment boundaries and all existing drainage features such as drainage infrastructure and watercourses, within it; and,

f) A hydrological analysis of rainfall run-off and design flows and a hydraulic analysis of system capacity, performance and flood levels.

### 7.8.3 Design Parameters

The applicant must provide Council with information to show that the proposed stormwater system is capable of managing stormwater effectively and efficiently.

For the purpose of this document, a capable system is defined as one that avoids adverse effects such as nuisance inundation, flooding, road safety risk, water quality degradation and/or risk of property damage, within the following design parameters:

a) The system must be able to manage stormwater generated by a rainfall event in accordance with Section 7.1.1 and 7.2.3 and Table 7-2 of this document.

b) The system must be able to manage stormwater runoff from all surfaces within the catchment area, and must allow for all stormwater that flows from upstream land assuming development to TRMP zonings.

c) Must be designed to cope with failure through blockages, bank failure or reduction in performance without placing property at undue risk.

d) The calculation of run-off must be provided in accordance with section 7.2.4 of this document.

e) The system shall be designed such that if the pipe system fails, ie, blockage then an adequate recording system will cope with storm flows.

### 7.8.4 Site Suitability

The site must be suitable for the proposed design method or solution. The following matters may be relevant to the assessment of suitability. The applicant must provide information that addresses each of the following matters where they are relevant.

a) The proposed method of transfer or disposal is suitable for the slope or topography of the site.

b) Where on-site disposal is used for all or part of the proposed system, the ground permeability must be demonstrated to be suitable.

c) Where ground infiltration is to be used, show that there will be no adverse effects on any groundwater resource, nor adverse effects on the proposed system by groundwater.

d) Where ground infiltration is to be used, show that there will be no adverse effects on ground stability, and any infrastructure asset such as roads, pipe systems or the amenity of reserves. (A ground infiltration test shall be carried out during June, July or August).

e) The proposed stormwater management method must be able to be integrated with existing stormwater infrastructure, above and below the given stormwater management system within the catchment.

f) The point of discharge/receiving environment must be able to accommodate any additional flow and/or water quality changes, without adverse effects on the downstream stormwater system or properties.

### 7.8.5 Design Specifications

The applicant must provide information to Council outlining detailed specifications of the proposed design. The following information must be submitted to Council where applicable:

a) Plans must be submitted to Council in accordance with section 7.2 of this document;

b) The specifications of all materials used in the design and construction of the stormwater system shall be submitted to Council;

c) The method of construction for any proposed device or system shall be provided, including construction techniques; and,

d) References to Best Practise Design in the construction of Low Impact Design solutions, such as the Auckland Regional Council TP124, shall be provided.

### 7.8.6 Maintenance and Management

Information about what, when and how a proposed system will be maintained to ensure its ongoing effectiveness in achieving stormwater management functions, must be submitted to Council at the time of application.

This must include estimated costs of ongoing maintenance and address the following matters where they are applicable:

a) A comprehensive description of ongoing maintenance procedures required to ensure that the system operates effectively and efficiently;

b) Specification of accessibility to all points of the stormwater system;

c) An assessment of the durability of each device/system and/or materials used;

d) Specification of any resource consent conditions, and description of how they will be achieved;

e) Clearly defined ownership and management responsibilities for every part of the given system, including the resource consent holder(s);

f) Sufficient information to describe how the proposed device integrates into the existing infrastructure;

g) The replacement value of any system devices, including the method of replacement; and

h) Lifecycle costing of the given system.

## Section 7 Drawings

Drawing 700 – Definition of public & private stormwater assets

Drawing 701 – Typical stormwater intake structure details

Drawing 702 – Stormwater intake structures with debris traps

Drawing 703 – Secondary intake debris grill

Drawing 704 – Debris trap grill

Drawing 705 – Standard sump frame & grill

Drawing 706 – Standard back entry sump in standard kerb and channel

Drawing 707 – Yard sump (usually private)

Drawing 708 – Standard stump top mould for standard kerb and channel

Drawing 709 – Standard back entry sump for standard mountable kerb & channel

Drawing 710 – Standard sump top mould for standard mountable kerb

Drawing 711 – Berm sump

Drawing 712 – Rainfall intensity curves for Richmond

Drawing 713 – Times for surface flow

Drawing 714 – Standard intake section of toothed connector

Drawing 715 – Standard toothed connector

Drawing 716 – Standard stormwater manhole details

Drawing 717 – Direct connections to stormwater pipes

Drawing 718 – Hillside trench drainage details

Drawing 719 – Drainage shared trench clearances

Drawing 720 – Services support beam for fill sites

Drawing 721 – Standard sump with non-return chamber

Drawing 722 – Miscellaneous drainage details

Drawing 723 – Standard soak pit detail via sump

Drawing 724 – Outfall details & drainage waterway concepts

Drawing 725 – Low impact design concepts (specific design required)

Note: The drawings are **not** included in this document. They are available in PDF format or hard copy from the Engineering Secretary (03 543 8524) or email engineeringstandards@tdc.govt.nz

# 8 WASTEWATER

## 8.1 Introduction

The purpose of this section is to outline Council's requirements for the provision of wastewater reticulation.

It is important that wastewater disposal matters are adequately addressed within all developments, regardless of size and scale. The standards in this section provide a basis for the design and construction of a reticulated wastewater system, to dispose of wastewater in a Council-provided treatment facility.

### 8.1.1 Objectives

The following objectives must be met in the provision of any wastewater disposal reticulation:

a) The health and safety of people and communities is ensured;

b) The system is cost-effective and efficient in serving communities over the long-term;

c) The standard of materials is durable and robust to ensure a long design life and minimise the need for ongoing maintenance and repair;

d) The design and layout of the proposed system will minimise the potential for system failure or damage and avoid the risk of blockages, odours and overflows;

e) The location and alignment of all wastewater pipes will enable easy access for maintenance and repair works with a minimum of disruption to other services, and

f) Ownership and maintenance responsibilities of all and any privately-owned parts of the wastewater system are clearly defined;

### 8.1.2 Key References

Table 8-1 sets out the New Zealand, Australian and British Standards and publications that apply to the design and construction of wastewater systems except where modified by current Tasman District Council Engineering Standards and Policies.

**Table 8-1 Standards Related to the Design and Construction of Wastewater Services**

| Standards and Publications Related to the Design and Construction of Wastewater Services | |
|---|---|
| AS/NZS1260 | PVC-U Pipes and fittings for drain, waste and vent application |
| AS/NZS2032 | Installation of PVC pipe systems |
| AS/NZS2566.1 | Buried flexible pipelines – Structural design |
| AS/NZS4058 | Pre-cast concrete drainage pipes (pressure and non-pressure) |
| NZS3109 | Concrete construction |
| NZS3121 | Specification for water and aggregate for concrete |
| BS3412 | PE materials for moulding and extrusion |
| AS3572 | Glass filament reinforced plastics |
| AS/NZS3725 | Design for installation of buried concrete pipes |
| NZS4442 | Welded steel pipes and fittings for water, sewage, and medium pressure gas |
| NZS7643 | Code of practice for the installation of unplasticized PVC pipe systems |
| | Building Act 2004 |
| | New Zealand Pipe Inspection Manual 3rd edition |

## 8.2 Reticulation Design

### 8.2.1 General

The following general matters apply to the design of wastewater reticulation:

a) Wastewater disposal shall be provided to every allotment by means of a connection to a reticulated wastewater system wherever possible and within urban drainage areas.

b) All systems shall be designed to accommodate the flow from upstream of the subdivision or development and shall be of sufficient capacity to provide for maximum flow from possible future development.

c) The Designer shall minimise retention of wastewater in piped systems and potential for wastewater to become anaerobic and produce gases by:

   i making use of adequate grades for self cleansing and slime control;
   ii avoiding use of wastewater pumping stations where possible;
   iii ensuring adequate ventilation of stale wastewater; and
   iv avoiding any unnecessary turbulence at junctions and changes in grades, particularly where rising mains enter gravity system at drop junctions.

d) Increased use of an existing wastewater sewer may require upgrading of a downstream network to prevent overloading.

e) Under no circumstances shall a wastewater sewer be connected to a stormwater drain.

f) A main wastewater sewer shall be provided for the full length of each new road/street, unless approved otherwise by Council. Pipes shall be extended past the far boundary of the development by a distance equivalent to the depth to invert and be capped off.

g) Ventilation of pipelines/manholes may be required.

h) To be classified as a public wastewater sewer, a pipeline must have been inspected, approved, and designated as such by Council. Council responsibility does not extend to private pumping systems and rising mains, which remain the responsibility of the users they serve.

### 8.2.2 Private connections

a) In all new subdivisions, a 100mm diameter wastewater drain shall be provided at least 1.0m inside the boundary of every lot or body of each lot (ie, served by ROW) with an access point installed on the road side of the boundary or before it connects to the communal line. The maximum depth of the access point shall be 900mm. Wastewater laterals, pipes and end caps shall be painted red, (stormwater shall be painted green). See TDC Drawing 807 for the LHCE lateral inspection point at the boundary. Pipe ends staked – See Section 7.7.3(a).

b) In commercial and industrial subdivisions where there is a wastewater sewer in the road fronting the subdivision, the lateral service connections shall be 150mm diameter installed to the back of kerb or 1.0m beyond the edge of seal. Laterals may be omitted beyond this point until the specific requirements of the consumer are known. A mini-manhole will be required at building consent stage, either as shown on TDC Drawing 803 or an approved prefabricated design.

c) Pipes shall be deep enough to provide gravity service and be installed to the boundary of the adjacent property.

d) Each connection shall be adequate to serve the section and to have a self-cleansing velocity flowing full.

e) To minimise the potential for a wastewater overflow into private property, the minimum lid level of any gully trap for all new dwellings shall not be less than 150mm above the lid level of the manhole on the public wastewater sewer immediately upstream of the lateral connection. The only exception to this requirement would be on hillsides or sloping land where compliance is not practical.

f) In some locations a gravity connection to the wastewater sewer may not be possible and the discharge may have to be pumped to the wastewater system. This will require specific design and approval.

### 8.2.3 Trade waste

a) The discharge of trade waste into a wastewater sewer is subject to the current TDC Trade Waste Bylaw.

b) Contaminated stormwater effluent that contains a combination of detergent and/or degreasing agents with oil and/or silt shall be directed to the wastewater sewer after first passing through a silt and oil trap built to TDC Drawing 801 standard.

c) Any proposal to discharge contaminated stormwater to the wastewater network shall require a Trade Waste application and comply with the provisions set out in the TRMP.

d) Building consents are required for all works together with a monitoring programme.

e) For premises where food is prepared, a minimum of an under bench style oil trap shall be provided, subject to the design and annual maintenance check being submitted to Council.

f) To ensure stormwater does not enter the wastewater system any area being served by the silt and oil trap must be roofed and have a low bund around the perimeter with a minimum height of at least 50mm, see TDC Drawing 801.

## 8.3 Pipe Design

**Table 8-2 Minimum specification for public wastewater pipes**

| | **Concrete pipe** | **uPVC pipe** |
|---|---|---|
| Permitted size | Minimum 375mm ID<br>Thereafter in 75mm increments | Minimum 150mm ID |
| Minimum standard | NZS3107 | AS/NZS1260 |
| Material strength | Minimum Class 2<br>and in accordance with AS/NZS3725 | Minimum SN 8<br>Specific design to AS/NZS2566 method for depth >5.0m, or traffic wheel loads >96 kN |
| Cover depth | Refer Table 7-6 | Refer Table 7-6 |
| Joints | Rubber ring jointed | |
| Pipe capacity | As per Section 8.3.1 | |
| Flow velocity | A per Table 8-4 | |
| Pipe location (in preference) | Road reserve<br>Note TDC Drawing 700 | |
| Clearance from other services | Minimum 200mm vertical<br>Minimum 500mm horizontal | |

### 8.3.1 Calculation of Flow

The following matters should be taken into account in determining the capacity of the system:

a) The catchment area is defined as the total gravity catchment upstream of the point being considered.

b) Several trunk gravity sewers discharging into one pump station shall be considered as separate catchments.

c) Discharge rates from pump stations may be accumulated but their catchment areas shall not.

d) Industrial and commercial areas shall be treated as residential unless a greater rate of discharge is known.

### 8.3.2 Material Specifications

### 8.3.3 Pipe Material

The following specifications apply to all pipe work that makes up Council's wastewater reticulation:

a) Wastewater sewers shall generally be rubber ring jointed PVC pipes and fittings complying with AS/NZS1260 and laid in 6.0m lengths. Pipe stiffness shall be in accordance with Table 8-3.

b) PE (polyethylene) pipe complying with AS/NZS4130 may be used in specific circumstances (eg, for sleeving or relining existing wastewater sewers and in wastewater rising mains) with the approval of the Engineering Manager.

**Table 8-3 Pipe Stiffness Required for uPVC Pipe**

| uPVC Pipe | Public Wastewater Sewers | Private Wastewater Sewers |
|---|---|---|
| DN 100mm | SN 10 | SN 6 |
| DN 150mm | SN 8 | SN 4 |
| DN 175mm and larger | SN 4 | SN 4 |
| depths greater than 5.0m | Specific design to AS/NZS2566 design method | |
| wheel loads > 96 kN | Specific design to AS/NZS2566 design method | |

### 8.3.4 Pipe Size

The minimum permissible diameter for all new public wastewater sewers is 150mm except as detailed below.

a) When an infill subdivision development (hereinafter referred to as infill development) occurs in an area serviced by an existing 100mm diameter public wastewater sewer it need not be upgraded to 150mm provided that:

i. the existing sewer is not located longitudinally in the road reserve;
ii. the existing pipe material is uPVC;
iii. the existing sewer will service 5 or less residential units in total; and
iv. the installation complies with the current Engineering Standards and Policies.

b) Where a 100mm diameter public wastewater sewer will be upgraded to 150mm diameter an Engineering Drawing including the longitudinal section shall be provided.

c) Where infill development results in an existing 150mm uPVC private drain becoming public sewer, the existing pipe shall be:

i pressure tested to prove that it is sound, and
ii tested for roundness with an appropriate gauging tool, and
iii CCTV inspected to prove that it is sound;
iv other appropriate test; or
iv re-laid.

d) When vesting a private sewer as a public wastewater sewer, surface opening access points shall be provided in compliance with the Engineering Standards for new wastewater sewers.

e) The following classes shall apply:

i DN 100mm diameter shall be minimum stiffness class SN 10 for public sewers and SN 6 for private sewers.
ii DN 150mm diameter shall be minimum stiffness class SN 8 for public sewers and SN 4 for private sewers.
iii DN 175mm and larger shall be minimum stiffness class SN 4 for public and private sewers.
iv Specific design shall apply for depths greater than 5.0m, or traffic wheel loads greater than 96 kN, using AS/NZS2566 design method.

f) All wastewater sewers shall be designed to utilise velocity and flow characteristics to improve hydraulic performance and minimise settlement of solids and future maintenance costs.

g) Wastewater sewers shall generally be no deeper than 2.5m below finished ground levels. Where sewers are required at a depth greater than 2.5m, design calculations and manufacturers specifications shall be provided to show that the proposed pipeline will withstand the additional loading imposed by the depth of cover without deformation or damage.

h) In commercial and industrial subdivisions where there is a wastewater sewer in the road fronting the subdivision, the lateral service connections shall be 150mm diameter installed to the back of kerb or 1.0m beyond the edge of seal. Laterals may be omitted beyond this point until the specific requirements of the consumer are known. A mini-manhole will be required at building consent stage, as shown on TDC Drawing 803.

i) Domestic flows shall be calculated on the basis of the average dry weather flow of 210 litres per person per day. Peak wet weather flow shall be calculated as six times the average dry weather flow. Commercial and industrial areas will need specific design depending on the type of trade waste or likely discharge for that area.

j) The same roughness factor shall be adopted for all pipe materials to account for sewer slimes, grit deposits and other *in situ* variables such as construction performance and pipeline deterioration with age.

**Table 8-4 Minimum Velocity and Grade Requirements**

| Internal Diameter | Residential Units Served | Minimum Grade | Minimum Velocity Flowing Full |
|---|---|---|---|
| 150mm | 1–5 | 1.25% - 1-in-80 | 1.0m/s |
| 150mm | 6–10 | 1.00% - 1-in-100 | 0.9m/s |
| 150mm | 11–19 | 0.80% - 1-in-125 | 0.8m/s |
| 150mm | 20–150 | 0.67% - 1-in-150 | 0.75m/s |
| >150mm | Specific design | Specific design | 0.75m/s |

a) The above are indicative only and specific design will be required on submission of the design plans.

b) Where velocity limits cannot be complied with, additional works may be required in order to obtain satisfactory operation of the system.

c) The recommended minimum grade for a 100mm wastewater sewer is 1-in-60, which allows for improved hydraulics and minimises future maintenance cost on the line.

### 8.3.5 Manholes

These standards and conditions apply to the design and material specifications for manholes:

a) Manholes are to be located in the road carriageway, preferably at the centreline of the road but no closer than 2.0m to kerb and channel, to minimise inflow from stormwater flowing down the road/street. Manholes maybe permitted on the grass berm or footpath provided that the fall is towards the road kerb and channel.

b) Manholes will be required in the following locations:

- At maximum centres of 100m;
- At change of direction;
- At change of grade;
- At change of pipe diameter;
- At junctions of main drains;
- At the head of a main drain, and
- As required to keep within the road carriageway.

(c) Manholes shall conform to TDC Drawings 802 to 806 unless other detailed drawings are approved by Council. Consideration will be given to prefabricated manholes and pipes which will inhibit the infiltration of stormwater.

(d) Shallow mini-manholes shall be in accordance with the requirements set out on TDC Drawing 803 or a proprietary PVC or polypropylene moulded product approved by Council.

(e) The diameter of any manhole installed shall meet the dimensional requirements set out in TDC Drawing 716. These are:

- A fall of no less than 50mm shall be provided through all manholes.
- All pipes shall be matched to soffits of the enlarged outgoing pipes.

## 8.4 Pumping Stations

### 8.4.1 Pump station design

a) In the design of pumping stations early consultation with the Engineering Manager is essential.

a) Design of wastewater pumping stations shall enable operation of the station in compliance with industry health and safety requirements.

b) Pumping stations shall be of the wet-well type, fitted with approved types of submersible pumps (FLYGT and PUMPEX are the preferred makes, however other makes may be considered).

c) Pump stations shall comply with TDC requirements and these specific designs are updated on a regular basis. Design will be dependent on a number of factors and should be discussed with the Engineering Manager at an early stage.

d) Pumping stations are to be located where occasional adverse effects of smell and/or noise will have minimum impact, ie, reserve/drainage areas and not within 20m of a residential dwelling. New pump stations will only be accepted by Council when all other practical options have been exhausted. (Filling of sites is a normal practical option to gain the required gravity fall). Pump stations shall not be located in-low lying areas with potential to be subjected to surface flooding.

e) In all pumping stations the following design specifications apply:

i. Sufficient duty pumping capacity is installed to handle the design peak flow rate.
ii. A minimum of two pumps on guide rails with lifting chains shall be installed, with one acting as duty pump and the other on automatic standby. The duty sequence is to be interchangeable. The standby pump shall be equal in capacity to the duty pump.

iii. The wet well shall be of sufficient volume and shape so as to limit the frequency of pump starts, allow cooling of pumps and to minimise potential odours. The dimensions of the wet-well shall be such that under maximum flow conditions the number of starts for the pumps shall not exceed the pump manufacturer's recommendations.

iv. A minimum of six hours on-site emergency storage, not including reticulation storage shall be provided based on the average dry weather flow measured between the overflow and first high level alarm level (measured by Multitrode). The six-hour storage shall be self draining and shall normally be located in an underground approved structure and covered with topsoil or approved alternative.

v. Where it will be located within 100.0m of any stream, body of water and/or within 200m of a Recreation Zone, Open Space Zone or Conservation Zone, the minimum emergency storage capacity shall be increased to 10 hours, and/or when it is located more than one hour's normal driving time from either Richmond CBD or Takaka CBD.

f) Wet wells and, when approved, dry wells, shall be provided with proper ventilation. An approved odour control filtration bed with irrigation facilities as necessary, and an extractor fan, shall be constructed adjacent to the pump station to mitigate odours. Other odour control devices may be approved on a case-by-case basis.

g) Ground floor levels and slab levels of underground structures shall be at least 200mm above finished ground levels in order to exclude surface water.

### 8.4.2 Access and services

a) A 20mm diameter water supply with a standard 15mm brass hose tap must be provided in the immediate vicinity of the pump station. Supply shall be fitted with an approved (reduced pressure zone RPZ) backflow preventer and water meter.

b) Pumping stations shall be sited on a separate lot or a drainage or utility reserve. The lot is to be vested in Council and shall have all-weather access, adequate landscaping and fencing (as required, and at Council's discretion). Pumping stations on road reserves will not generally be accepted due to OSH requirements and disruption to the travelling public.

c) A means of lifting pumps and other heavy equipment, or alternatively access to enable mobile plant to perform this task is to be provided.

d) An approved flow meter shall be installed on the outlet line from the pump station and connected to the telemetry system.

### 8.4.3 Electrical Equipment

An electrical pump control, alarm, and telemetry system is required on site. It shall be assembled and installed in accordance with Council's standard specification, as follows:

a) A stainless steel or powder coated steel cabinet of a colour (normally dark green or beige) approved by the Engineering Manager and built to Council specifications is required to house electrical equipment. Cabinets are to be fitted with an Abloy security lock keyed to Council's security system as instructed by the Engineering Manager.

b) Cabinets shall comply with health and safety requirements which will include secure door stays and could include shelter to the utility operator in inclement weather. Glass reinforced plastic (GRP) cabinets will not be accepted.

c) All electrical switch gear is to be located above ground level to the satisfaction of the Engineering Manager. All electrical equipment is to be assembled and installed in accordance with these standards or the manufacturer's specifications.

d) All equipment must comply with the requirements of the Network Utility Operator (power).

e) Suitable alarm interrogation and transmitting facilities shall be provided to enable the pumping stations to be connected to Council's telemetry system.

f) Cable ducting from the pump station to the control cabinet must be sealed to protect against corrosive gases travelling to the electrical switchboard.

g) All cabinets shall comply with health and safety requirements in regard to working on the cabinets/electrical gear in adverse weather conditions, be protected from corrosive gasses and vermin proof.

h) Single-phase protection to all pump motors is to be provided.

i) Automatic control of the pump operation, together with a manual override facility is to be provided.

j) A standard industrial power connection shall be supplied such that a portable generator can be connected when power failure occurs.

k) Suitable lighting shall be provided for the pump station, cabinets and valve chambers and protected from the corrosive environment.

l) Details on pump/motor components and electrical control equipment shall be incorporated into an Operation and Maintenance Instruction Manual enclosed in a hard copy A4 bound folder.

m) The folder shall include as-built plans of the pump station including electrical wiring and operational schematic diagrams. Four copies of the Operations and Maintenance Instruction Manual shall be supplied to Council on handover of the completed pump station and associated works.

### 8.4.4 Wastewater Rising Mains

Wastewater rising mains shall meet the requirements for the construction of water mains, except that the testing requirements shall require the rising main to withstand the greater of a pressure of 900kpa or 1.5 times the working pressure of the system.

### 8.4.5 Commissioning

On completion of any pump station, and prior to handover to Council, a full commissioning test shall be carried out on all components of the pump station. This commissioning shall be in the presence of a representative of Council and of Council's operations and maintenance contractor.

## 8.5 Construction and Installation

### 8.5.1 Excavation Works

The following standards and conditions apply to the excavation in preparation for pipework laying:

a) All drainage pipelines shall be constructed in accordance with the requirements of NZS7643. All works undertaken on Council sewers shall be undertaken by trained personnel as specified in section 3. A wastewater connection application is to be submitted to Council prior to approval and works commencing (see 8.6.3Appendix 8-1).

b) The maximum width of unshielded trench, measured at the level of the top of the pipe shall not exceed a dimension equal to the external diameter of the pipe plus 300mm.

c) Excavation of manholes shall be only of sufficient size to leave adequate space for construction and for compaction of backfill.

d) Excavations shall be kept free of water during construction.

e) In no circumstances shall stormwater or groundwater be allowed to drain into any existing sewer, and pipe ends shall be plugged to prevent such ingress.

f) Discharge of stormwater or groundwater to existing stormwater drains or the pipes already laid will be permitted providing adequate silt traps prevent debris and suspended matter from entering drains.

g) Should deposits in existing stormwater drains or the pipes already laid occur as a result of the operations of the landowner or the contractor, such deposits shall be cleared forthwith at the landowner's or the contractor's cost as the case may be.

h) Groundwater lowering may be permitted except where this practice may present a risk of subsidence.

i) The contractor or landowner shall cause as little damage or interference to property or persons as possible in disposing of water from the works and shall be responsible for any damage or interference which may be caused. This shall include any damage to the structure of any road. Any dewatering operation must comply with the relevant sections of the TRMP and resource consents gained where applicable.

### 8.5.2 Laying and Jointing

These standards apply to the laying of pipes:

a) The end caps and inside of the end of all new wastewater sewer laterals (after the mini-manhole) must be painted with red acrylic paint to help with future identification. (Note: stormwater laterals are to be marked green).

b) The actual work of laying pipes shall be done by a registered drainlayer approved by Council.

c) A laser shall be used by the contractor for fixing line and grade, for setting the pipes to line and level and for jointing on all major pipe-laying work where possible. Sight boards and boning rods will only be approved on minor works, eg, infill subdivisions, or on steep gradients.

d) The deviation from design level of the pipe invert when laid shall be no greater than 20mm. The horizontal deviation from a straight line between manholes shall be no greater than 50mm. Note this requirement only relates to pipe grades up to 1-in-150 or steeper.

e) Pipes shall not be laid on bricks, blocks and wedges or other temporary or permanent supports except when concrete surround is to be placed.

f) Joints shall be flexible and water tight.

g) Pipes shall be kept clear of dirt, or debris, and any pipes that contain such matter shall be required to be cleaned out. The ends of pipelines are to be temporarily capped at the end of each day's work to prevent animals or foreign matter entering the pipe.

### 8.5.3 Manhole Installation

The following standards apply to manholes and the installation of them:

a) For minimum cover requirements refer to Table 7-8.

b) Manholes shall be constructed in accordance with TDC Drawings 802 and 803.

c) All manholes shall be made water tight by effective sealing of manhole section joints with mastic sealant and around pipe entries, where applicable, using epoxy mortar inside and out.

d) Manholes must be designed to resist uplift especially in areas where high ground water is experienced. One piece manholes (riser and base) are preferred to minimise infiltration.

e) All PVC pipes entering or leaving a manhole shall have one flexible joint within 200mm of the manhole and a second flexible joint within 1200mm of the manhole.

f) The channel through the manhole shall be formed from *in-situ* concrete properly formed to grade and radius sweeps. The channel shall be finished with a smooth, regular half circle invert with falls as specified in TDC Drawing 802. Benching shall be steel float finished to give a regular smooth surface.

g) All manholes shall be tested for water tightness on completion by plugging all entry/exit pipes, and filling the manhole with water to the underside of the cast iron lid ring. A period of ten (10) minutes shall be allowed for absorption of water into the concrete and the water level shall be restored prior to commencement of the test.

h) If manhole cover slabs other than “Humes” or “Hynds” pre-cast concrete cover slabs are to be used then the appropriate certification must be submitted to Council showing that the cover slabs will withstand loadings of 0.85HN (51kN).

i) The opening, picton ring and cover of a manhole (other than a mini-manhole) shall have a minimum diameter of 600mm. Heavy duty cast iron manhole lids are to be used in all road carriageways and in areas where lighter lids are prone to be dislodged.

### 8.5.4 Pumping/Pressure Main Tracer Tape

All wastewater mains are to be marked in the following manner:

a) The location of all pumping or pressure mains shall be marked with an approved foil or wire banded tape, buried in the trench.

b) The tape shall be of 75mm wide or 50mm wide with acid and alkali resistant polythene plastic with a solid aluminium foil or wire core which shall be visible from both sides and coloured red or orange.

c) The foil shall be continuously printed in red “caution wastewater pumping/pressure sewer main buried below” with no ink or printing extending to the edges of the tape. All printing shall be encased to avoid ink rub off.

d) The adhesives that bond the protective plastic jacket to both sides of the foil or wire shall be applied directly to the film and foil layers to provide a continuous metallic seal.

e) The tape shall be buried above the centre line of the pipe within 300mm to 400mm from the finished surface.

f) All joints in the tape (eg, roll ends, accidental breaks and at tees) shall be made electrically conductive with purpose-made splice clips installed to the

specific manufacturer's instructions. Tying together of the tape ends is not acceptable as the polythene coating will prevent electrical conductivity.

g) The tape shall be brought up inside surface box risers at all air valves with a 300mm long tail so that pipe location equipment can be readily connected.

h) When a pumping or pressure pipe is installed by a directional drilling technique or bored through the ground, the pipe shall have a "tracer wire" attached. This wire shall take the form of a continuous 2.5mm$^2$ multi-strand (polythene sleeved) cable, strapped to the pipe wall by means of a minimum of two complete wraps of heavy duty adhesive tape, at a maximum of 3.0m intervals.

### 8.5.5 Connection to Council network

Connection to existing wastewater mains shall not be made until all upstream work has been completed and inspected and approved by Council. Specifically, this shall include flushing and testing of all new pipework, manholes, and other wastewater facilities by the contractor and internal (CCTV) and external inspections by Council.

No contractor is permitted to enter a live wastewater system without the approval of the Engineering Manager and Council's current Operations and Maintenance Contractor.

a) Connection to existing Council wastewater systems shall be made only by Council's current Operations and Maintenance Contractor or by a contractor approved by Council.

b) Contractors authorised to make connections shall have written authorisation from Council and be recorded on a Register of Approved Contractors for work on wastewater systems. An approved contractor will demonstrate to the satisfaction of the Engineering Manager that staff have appropriate training, and the company operates robust quality plans and health and safety plans to adequately protect the staff engaged in such work as well as Council's asset.

c) Where connection is to be made to an existing manhole it shall be carried out in accordance with the relevant detail contained in Drawings 802 to 806.

d) Where connection is made by constructing a new manhole on an existing wastewater sewer it shall be constructed by Council's current Operations and Maintenance Contractor or by a contractor approved by Council. The manhole shall be constructed with appropriate starters and haunching prior to installation. Installation shall be on a level, well compacted gravel base and connection, including specified flexible joints, shall be made to existing pipelines using appropriate adapters and slip collars.

e) New cast *in-situ* manholes over existing wastewater sewers will only be permitted on lines of greater than 150mm diameter. The new entry point shall be at 45 degrees to the direction of flow and the maximum invert at the entry point shall be the vertical tangent point of the live line.

## 8.6 Testing

### 8.6.1 Air or Water Pressure Test

All pipelines to be vested in Council ownership shall pass one of the following air or water pressure tests.

a) Air Test – maximum 50mm drop in manometer tube for 300mm of water over 5 minutes.

b) Water Test – at least 1.5m head at the high end and not more than 6.0m at the low end. Twenty four (24) hour pre-soaking required, measured over 30 minutes with acceptance being no more than 2ml/hr/mm of diameter/metre of pipe length.

Manholes shall be water tested to the lower rim of the cast iron lid.

### 8.6.2 Pipe Gauging

All pipelines to be vested in Council ownership may be required to be tested for roundness using an appropriate gauging tool.

### 8.6.3 Closed-Circuit Television (CCTV) Inspection

a) All pipelines to be vested in Council ownership shall pass a closed circuit television (CCTV) inspection, carried out at an appropriate time agreed by Council or at the completion of the works.

b) A professional operator with proof of experience in operating such devices shall carry out the CCTV inspection using a pan and tilt camera, in accordance with the technical specifications of the NZ Pipe Inspection Manual (published by the New Zealand Water & Wastes Association).

c) The operator shall pan around every joint and check every lateral connection and defect.

d) The video footage in DVD format, and the accompanying CCTV log sheets for each wastewater sewer length (as per the template in the NZ Pipe Inspection Manual), showing the features and condition of all inspected manhole lengths, shall be provided to Council. Video footage supplied without log sheets will not be accepted.

e) All pipelines shall be free of debris and flushed within 24-hours prior to inspection. Inspections of non-cleaned pipelines are not acceptable.

f) A pipeline will fail its inspection if:

   i. The pipe is horizontally misaligned or deformed by more than 5% of the pipe diameter.
   ii. The pipe has visible dips or ponding of water.
   iii. The pipe has visible defects, such as open or displaced joints, defective or protruding laterals, cracked barrels or similar defects.

iv. There is evidence of infiltration at joints or laterals.

g) Other testing as considered appropriate may be required by Council to ensure Council's future infrastructure will meet its projected life cycle.

## Appendix 8-1 Wastewater Connection Application

To the **Engineering Manager**
I wish to apply for a connection to a live Council sewer main
The proposed connection must be either installed or supervised by Council's own contractor.

Service Request No

**DETAILS OF PROPERTY TO BE CONNECTED**: (refer to rate assessment)

Valuation Reference _____

Name of Owner _____

Property Address for connection _____

Road name and address _____

Multi Lot Subdivision connection or Single Lot connection *(choose one)*

**PLEASE PROVIDE DETAILS AND ANY COMMENTS** – Attach sketch / plan:

_____

_____

_____

**LIABILITY FOR CONNECTION COST AND/OR FEE (to be completed by person liable)**

I _____ agree to pay the connection cost and/or fee when invoiced by Council and annual rates/charges thereafter or otherwise provide information that it was paid prior to the issue of a 224 Certificate.

Signature _____ Date _____

Address for Invoice _____

**NAME AND ADDRESS OF APPLICANT**

Applicant's Name _____

Address _____

Signature _____ Contact Phone No _____ Date _____

## Section 8 Drawings

Drawing 800 – Definition of Public Sanitary Sewer

Drawing 801 – Silt & oil trap

Drawing 802 – Standard sewerage manhole details

Drawing 803 – Shallow mini-manholes

Drawing 804 – Internal sewer drop manhole for existing manholes only

Drawing 805 – Sewer drop manhole details

Drawing 806 – Miscellaneous manhole details (access frame clips)

Drawing 807 – Lamphole cleaning eye (LHCE) (Non traffic loaded)

Drawing 808 – Lamphole cleaning eye (LHCE) (right of way traffic loaded)

Drawing 809 – Lamphole Cleaning Eye (LHCE) Location (non traffic loaded)

Drawing 810 – Standard PVC pipe details

Note: The drawings are **not** included in this document. They are available in PDF format or hard copy from the Engineering Secretary (03 543 8524) or email engineeringstandards@tdc.govt.nz

# 9 WATER SUPPLY

## 9.1 Introduction

The purpose of Council's water supply engineering standards is to provide design guidance and minimum standards for the design, construction and maintenance of water supply reticulation.

Design and construction of all water supply works in accordance with these standards will ensure that water is supplied to communities effectively and in a way that is cost-effective in the long-term.

### 9.1.1 Objectives

Council is responsible for all water supply infrastructure assets under its control. It is Council's intention that all parts of the water supply system meet the following objectives:

a) Water is supplied to communities in a way that adequately meets their demand supply volume at a minimum water pressure;

b) The quality of water meets minimum standards for drinking water quality;

c) Water is provided in a safe and reliable manner for fire fighting purposes

d) The water supply network is durable and robust;

e) The water supply network is designed, constructed and maintained to a high standard to minimise risk;

f) The water supply network is easily accessible for maintenance and replacement works as required;

g) The water supply network meets the needs and expectations of the community in terms of the LTCCP.

### 9.1.2 Key References

Table 9-1 sets out external standards that are relevant to the management of water.

These apply and must be taken into account in the design and construction of any water supply asset in the Tasman District.

## Table 9-1 Standards and Publications Related to the Design and Construction of Water Supply Services

| Standard | Comment |
|---|---|
| SNZ PAS 4509 | New Zealand Fire Service Fire Fighting Water Supplies Code of Practice |
| BS 10 | Specification for flanges and bolting for pipes valves and fittings |
| NZS/BS 21 | Pipe threads for tubes and fittings |
| NZS/BS 750 | Underground fire hydrants and surface box frames and fittings |
| AS/NZS1260 | PVC-U Pipes and fittings for drain waste and vent applications |
| AS1646 | Elastometric seals for water works purposes |
| AS/NZS1477 | PVC Pipes and fittings for pressure applications |
| AS/NZS2032 | Installation of PVC pipe systems |
| AS/NZS2033 | Installation of polyethylene pipe systems |
| AS/NZS2280 | Ductile iron pipes and fittings |
| AS/NZS2544 | Grey iron pressure fittings |
| AS/NZS2566 | Buried flexible pipelines – Structural design |
| AS/NZS2638 | Gate valves for water works purpose – resilient-seated |
| NZS4058 | Specification for pre-cast concrete drainage and pressure and non-pressure pipes |
| NZS3109 | Concrete construction |
| NZS3121 | Specification for water and aggregate for concrete |
| BS3412 | Methods of specifying general purpose PE materials for moulding and extrusion |
| AS3572 | Glass filament reinforced plastics |
| NZS3604 | Timber framed buildings |
| AS/NZS3725 | Loads on buried concrete pipes |
| AS/NZS4020 | Testing of products for use in contact with water |
| AS/NZS4087 | Metallic flanges for water works purposes |
| AS/NZS4129 | Fittings for PE pipes for pressure applications |
| AS/NZS4130 | Polyethylene (PE) pipes for pressure applications |
| AS/NZS4158 | Thermal bonded polymeric coatings on valves and fittings for water industry purposes |
| AS4181 | Stainless steel clamps for water purposes |
| AS/NZS4331 | Metallic flanges – Part 2: Cast iron flanges |
| NZS4442 | Welded steel pipes and fittings for water, sewage, and medium pressure gas |
| NZS4501 | Code of practice for the location and marking of fire hydrants |
| NZS/BS5163 | Specification for predominantly key operated cast iron gate valves for water works purposes |
| BS5480 | Glass reinforced plastics (GRP) pipes joints and fittings |
| NZS7643 | Code of practice for the installation of unplasticised PVC pipe systems |
| | The Building Act 2004 |
| DWSNZ | Drinking Water Standards for New Zealand |
| ISO16422 | Pipes and joints made of oriented unplasticised PVC (PVC-O) for the conveyance of water under pressure. Specifications. |

## 9.2 Reticulation design

### 9.2.1 Level of Service

Table 9-2 sets out the minimum levels of service required for urban water supply reticulation. Any proposed water supply system (or extension to an existing water supply system) shall be adequate to meet these levels of service at the time of design and the reasonably foreseeable future.

Council may require water mains or water supply facilities to be installed to a higher specification (capacity or strength) in order to provide for Council's Activity Management Plans for future development. In such cases Council may by agreement:

a) Negotiate with the developer and make a financial contribution to the cost of additional capacity over and above that required for the development; or

b) Install the whole water supply reticulation or facility in anticipation of development, on terms requiring the developer to meet an appropriate proportion of the costs incurred by Council.

All cost contributions shall be agreed in writing with the Engineering Manager prior to construction. Agreement may be reached at a resource consent stage.

**Table 9-2 Water Supply Levels of Service**

| Design Criteria | Level of Service Required |
|---|---|
| SNZ PAS 4509 - NZ Fire Service Fire Fighting Water Supplies Code of Practice | Full compliance in each and every part of the network |
| Connection | Each lot shall have an individual metered connection |
| Minimum flow at each connection | 30 litres per minute for design flows as defined in Table 9-3 |
| Minimum normal working residual pressure | 300 kPa at ground level of each building site |
| Maximum static water pressure | 950k Pa at ground level of each building site |

### 9.2.2 Reticulation Design

All proposed reticulated water supplies must comply with the minimum levels of service shown in Table 9-2 for both normal demand flows and fire fighting flows.

For residential development, network design and pipe sizes will normally be determined by fire fighting flows. As a minimum the Designer must demonstrate compliance with fire fighting requirements. Council, at its discretion, may also require demonstration of compliance for normal demand, or to a nominated higher standard.

For commercial or industrial development, network design may be determined by normal demand flows or fire fighting flows and the Designer must demonstrate analysis of both scenarios.

### 9.2.3 Normal Working Demand Flows

The minimum flow and normal working residual pressure level of service criteria specified in Table 9-2 shall be satisfied for all reticulation when using the following demand flows.

**Table 9-3 Design Demand Flows**

| Development Type | Design Flows |
|---|---|
| Residential | 175 litres per hour per dwelling daily demand<br>700 litres per hour per dwelling peak demand |
| Commercial & Industrial | Specifically assessed by the Designer |

### 9.2.4 Firefighting Demand Flows

All reticulation (and storage) design must fully comply with the requirements of the NZ Fire Service Fire Fighting Water Supplies Code of Practice (SNZ PAS 4509), hereafter called the Code of Practice.

This Code of Practice sets out requirements for firefighting including:

- firefighting flows,
- storage,
- residual pressure and
- hydrant spacing.

Table 9-4 below summarises the more general requirements of the Code of Practice for Normal Reticulation Design and describes the two water supply classes used in common analysis. Further specific reference to the requirements Code of Practice may be required for unusual situations.

**Table 9-4 SNZ PAS 4509:2003 Fire Fighting Flow, Pressure and Storage Requirements**

| Class | Hydrant flow required within a radial distance of 135m (l/s) | Additional Hydrant flow required within a radial distance of 270m (l/s) | Maximum number of fire hydrants to provide flow | Storage Time (min) | Storage Volume ($m^3$) | Residual water pressure at hydrants |
|---|---|---|---|---|---|---|
| W1 | 12.5 | - | 1 | 15 | 11 | 100 kPa |
| W2 | 12.5 | - | 1 | 30 | 23 | 100 kPa |
| W3 | 12.5 | 12.5 | 2 | 30 | 45 | 100 kPa |
| W4 | 25 | 25 | 3 | 60 | 180 | 100 kPa |
| W5 | 50 | 50 | 4 | 90 | 540 | 100 kPa |

**Table 9-5 SNZ PAS 4509 – Water Supply Classes**

| Class | Description |
|---|---|
| W1 Sprinklered Buildings. | Single family homes with a sprinkler system installed. |
| W3 Sprinklered buildings and non-sprinklered buildings. | All buildings with a sprinkler system installed to an approved standard. Housing; includes single family dwellings, multi-unit dwellings, but excludes multi-storey apartment blocks. |
| W2, W4, W5 | Various classifications dictated by floor area and occupation. Refer Table 1 of SNZ PAS 4509. |

Generally for compliance in residential areas under classification W3 a flow of 12.5 l/s is required from each fire hydrant, with maximum hydrant spacing of 135.0m. Each hydrant is to be no closer than 6.0m and no further than 135.0m from the potential fire source.

## 9.3 Pipe Specifications

Table 9-6 sets out the general pipe size, material, and pressure specifications for principal and rider mains.

**Table 9-6 General Pipe Specifications**

| | Principal Mains | Rider Mains |
|---|---|---|
| **Pipe Size** | Generally not less than 150mm ID<br><br>Standard pipe sizes (see Section 9.3.1):<br>100 (with specific approval), 150, 200, 250, 300, 375, 450, 525 and 575mm ID. | Generally not less than 50mm ID<br><br>With specific approval:<br>20mm, 25, 40, 50mm ID provided that the minimum required supply per household can be met. |
| **Acceptable Materials and Specification** | uPVC (Series 1 or 2 dimensions)<br>mPVC/PVC-O on specific approval to AS/NZS1477<br><br>PE 80 Type B (MDPE) to AS/NZS4130<br><br>PE100 (high performance PE) to AS/NZS4130<br><br>Concrete lined steel (arc butt welded) to NZS4442<br><br>Ductile iron to AS/NZS2280<br><br>Hobas GR to AS3572 | PE 80 Type B (MDPE) to AS/NZS4130 |
| **Pressure class** | No less than PN12 (Class D)<br>A higher class may be required in some instances. | |

### 9.3.1 Pipe Size

By convention, PVC pressure pipes in New Zealand and Australia are usually referred to by their nominal internal diameter (ie, DN50, 100, 150 etc) whereas the equivalent size ISO dimension PE pipes are usually referred to and specified by their nominal outside diameter (ie,63, 125, 180 OD).

These standards generally refer to pipe dimensions by internal diameter (ID).

In any instance where an external diameter is shown on a drawing or specified it shall be annotated “OD”. Dimensions in absence of either “ID” or “OD” shall be assumed by Council to refer to an internal diameter.

Minimum and standard pipe sizes for principal and rider mains are shown in Table 9-6. PVC pipes should generally be specified in metric sizes, but imperial sizes may be required in some instances to achieve compatibility with Council's existing pipe system.

Principal mains shall be generally no less than 150mm ID. Table 9-7 sets out instances where smaller principal mains may be permitted, but subject to the levels of service specified in Table 9-2.

**Table 9-7 Reduced Dimension Principal Mains**

| Size of Principal Main (generally uPVC Class D) | Maximum Length | |
|---|---|---|
| | Connected to larger main at one end | Connected to larger main at both ends |
| 100mm ID | 135 m | 400 m |

Rider mains shall be generally no less than 50mm ID. Table 9-8 sets out instances where smaller rider mains may be permitted, but subject to the levels of service specified in Table 9-2.

**Table 9-8 Reduced dimension rider mains**

| Size of Rider Main (minimum PE80 MDPE Class D) | Maximum Number of Domestic Service Connections (Home Units not Lots) | |
|---|---|---|
| | Connected to larger main at one end | Connected to larger main at both ends |
| 20mm ID (25mm OD) | 1 | N/A |
| 25mm ID (32mm OD) | 5 | 10 |
| 40mm ID (50mm OD) | 10 | 20 |
| 50mm ID (63mm OD) | 15 | 32 |

### 9.3.2 Pipe Materials

uPVC pipes are acceptable in all normal circumstances for principal mains. mPVC and PVC-O pipes may be approved on application. The installation shall be to AS/NZS2032 and AS/NZS2566, with particular attention to the anchoring of valves and hydrants against displacement in operation. Refer TDC Drawings 900 and 901.

PE pipes shall be normally used in all rider mains.

PE pipes may be appropriate for principal mains in special cases and shall require specific approval by the Engineering Manager. For PE pipes generally PE80 material is the standard used; however PE100 may be used where higher pipe strength is required or increased capacity is an important criterion. Pipes of differing compositions shall not be mixed within a common pipe length, (ie, valve-to-valve). Installation of PE pipes shall be to AS/NZS2033 and AS/NZS2566.

Concrete lined steel pipes may be required in potentially unstable ground, for lengths of exposed pipe, or in other special cases, and shall be the subject of specific design. Suitable corrosion protection shall be provided. Steel pipes laid underground shall have an extruded blue or black HDPE external coating. Pipe laid above ground shall have a black HDPE coating or shall have an approved epoxy coating applied by a specialist applicator.

Ductile iron pipes may be appropriate in special cases and shall require specific approval of Council. Ductile iron pipes shall be sleeved with a polythene sleeve.

## 9.4 Pipe Joints

### 9.4.1 Connection of Rider Mains to Principal Main

Where a rider main is to be extended at right angles to a principal main, it shall normally be connected with a tapping band without ferrule (TDC Drawing 910), where the size of the principal main and rider main allow this, otherwise an elongated gibault is to be used (TDC Drawing 901).

Where a rider main is to be extended along the same alignment beyond the end of the principal main, it shall normally be connected in a similar manner (TDC Drawing 910) with an anchored blank end plate, and with a vertical socket and right angle (De-zincification resistant) bronze bend.

### 9.4.2 Unrestrained Mechanical Couplings

Unrestrained mechanical couplings shall be designed for a 50-year life and to the required Australian/New Zealand Standard.

### 9.4.3 PVC Pipe Joints

Joints for uPVC pipes shall be spigot and socket rubber ring type (z joints) and a biocidal lubricant.

Elastometric seal rings shall conform to NZS/BS 2494 or AS 1646.

### 9.4.4 PE Pipe Joints

All PE pipe less than 100mm ID (125mm OD) shall be jointed by seal ring compression joints to AS/NZS4129, appropriate for the type of pipe (eg, “Philmac”) and rated to PN16 maximum working pressure.

Pipes greater than 100mm ID (125mm OD) may be jointed by the use of a butt welding or electrofusion technique. Electrofusion fittings shall conform to AS/NZS4129.

The pipes shall be installed in accordance with AS2033 and AS/NZS2566.

Certified tradespersons approved by Council, shall be employed with equipment specifically designed for the task. The contractor shall provide their own power source and earth leakage protection for the safety of their personnel.

For electrofusion jointing only personnel trained and holding a current certificate of competency in the system to be used, will be permitted by Council to carry out the work.

### 9.4.5 Welded Steel Pipe Joints

Welded joints in steel pipes shall be either butt joints, with an external welding band, spigot and socket joints, or as otherwise approved by Council.

All welds shall be fillet welds of 7mm or larger, applied in the field.

Flange joints shall be to AS/NZS4087.

Where butt jointed pipes are used the ends shall be neatly butted where possible with a seal weld applied from the outside before the welding band is affixed. Steel pipes shall be cut to a neat and true line with an abrasive saw.

After welding and testing (if required) all unprotected metal inside and outside shall be thoroughly cleaned by appropriate methods. The exposed steel shall be protected promptly and damaged protective coating repaired in an approved manner by the application of one of the treatments listed below:

a) Emer-tan rust converter; Emer-guard primer; Emer-clad membrane, or
b) Polyken Synergy™ which includes an appropriate primer coat, or
c) Carbomastic 15 primer; Servi-Wrap R15A membrane; Servi-Wrap Outerwrap.

Joints shall be internally protected with a mortar lining to give a smooth internal bore. Materials for the mortar shall comply with the requirements of NZS3121. It is important to get a satisfactory mortar consistency to prevent the mortar from sagging or dropping out.

The pipe joint shall be plugged with a suitable plunger prior to applying the mortar and then withdrawn evenly to smooth out the mortar joint.

Epoxy mortar (suitable with potable water) shall be used for making good the mortar lining where pipes have been cut for mitred joints, or the fitting of flanges etc.

### 9.4.6 Gibault Joints

Gibault joints shall only be used with specific approval. This will generally be for connection to existing principal mains where no feasible alternative is available (such as for repair of asbestos cement or PVC pipe).

## 9.5 Fittings

### 9.5.1 Pipe Fittings

The following standards apply to pipe fittings:

a) Ductile iron and cast iron fittings such as tees, hydrant tees, crosses, tapers, hydrant risers, blank caps, plugs and bends shall be blue nylon coated in accordance with AS/NZS4158. Where uPVC or polythene pipe is used, the respective purpose-made fittings shall be used. Bends shall be Z ring, swept bends; solvent cement and elbow bends shall not be used

b) Flanges shall be to Table 9 of AS/NZS4331.2 and BS10. Fittings laid adjacent to other fittings shall have flanges.

c) All bolts, nuts and washers shall be 316 stainless steel with molybond anti galling coating.

d) Graphite greases, packing and compounds shall not be used in contact with stainless steel.

e) Where dissimilar metals are used, purpose-made delrin thermoplastic inserts shall be installed in the flanges to prevent electrolytic action.

f) Where fittings are used which do not have bolts, nuts and washers which are 316 stainless steel or fittings which are non-nylon coated in accordance with the Australian/New Zealand standards, then these fittings shall be wrapped as detailed in TDC Drawings 905 and 906.

### 9.5.2 Corrosion Protection

These standards apply to the protection of flange and unrestrained mechanical couplings:

a) Protection shall normally be provided by the use of 316 stainless steel bolts, nuts and washers and fittings coated to Australian/New Zealand standards

b) Where metallic pipes and fittings are not coated delrin thermoplastic inserts shall be installed in the flange to prevent electrolytic action. Steel and grey cast iron flanges shall be further protected by a wrapping system.

c) Corrosion protection will be required (as follows) for all new flange and unrestrained mechanical couplings, where materials other than 316 stainless steel and coatings to Australian/New Zealand standards are used.

d) For flanges see TDC Drawing 905. For Unrestrained Mechanical Couplings see TDC Drawing 906.

### 9.5.3 Hydrants

The following standards must be met in respect of supply hydrants:

a) Fire hydrants shall be installed on all principal mains in accordance with the requirements of the New Zealand Fire Service Code of Practice.

b) Hydrants must be readily accessible for fire appliances and should generally be positioned near road/street intersections in conjunction with valves.

c) A fire hydrant shall be located at each road/street intersection and not be positioned closer than 6.0m from any dwelling.

d) In a cul-de-sac or other terminal streets, the last hydrant shall be at the head of the cul-de-sac.

e) The distance between the hydrants and from the hydrants to the furthest building platform shall not exceed 135.0m.

f) Where a residential private way is more than 65m long, a hydrant shall be sited 20m either side of the right-of-way/access, or on the other side of the road/street immediately opposite the entrance where practical. A principal main shall be constructed and hydrant(s) placed within the private access way in

order to ensure each building is within a distance of a fire hydrant as specified above. The width of the private access way shall be no less than 3.0m and sufficient to enable a fire appliance access to the hydrant.

g) Should a fire hydrant be approved by Council up a private way, then Council will require an Easement In Gross in favour of Council over that line from the principal main to the hydrant.

h) Hydrants shall be screw-down type to BS 750. Normally the medium pattern shall be used, except where Council may approve or require the tall pattern for extra flow capacity. Hydrants shall not be self-draining. Hydrants shall be blue nylon coated inside and out (location dependent) and be clockwise closing.

i) In some high risk areas hydrants shall be installed in pairs to provide better water flows.

j) Hydrant tees shall be flanged if laid next to other fittings. Otherwise flexible Z ring joints are permitted. Refer TDC Drawings 900 and 903.

k) Hydrant risers shall be used or the water main laid deeper where necessary, in order to ensure that the top of the spindle is between 150mm and 250mm below finished surface level.

l) Hydrants shall be installed so the spindle cap and riser connection are in line with the water main below.

m) The manufacture and installation of hydrant boxes shall be to BS 750. Hydrant boxes shall be aligned in the direction of the water main. Heavy pattern hydrant boxes shall be used.

n) Hydrants shall be marked in accordance with SNZ PAS 4509 Appendix G. Hydrants shall be marked in accordance with NZS4501 with raised blue reflectorised markers together with painted triangle and painted fire hydrant box and circle as shown on TDC Drawing 907.

o) Hydrant boxes shall be set on approved pre-cast concrete sections down to the level of the hydrant base flange, placed so as not to transfer loads to the mains.

p) All surface boxes shall be left 10mm proud of the adjacent seal in new vested roads, otherwise flush with the final ground/sealed surface.

### 9.5.4 Positioning of Valves

a) Valves shall generally be placed on all the three legs of a tee intersection to optimise control of the water supply system and minimise the number of customers without water in case of a shut-down. Where practical, valves shall be located in berms.

b) Sluice valves shall be flanged and bolted to each leg of the “tee” to form a single assembly. A hydrant will be included between the valves.

c) Line valves shall be installed where the distance between other control valves exceeds 250m. For water mains over 200mm diameter, line valves shall be required every 450m and shall be positioned as agreed by Council. Rider mains shall have valves at both ends, located as close to the principal main as practical, but within the berm or footpath.

### 9.5.5 Sluice Valves

a) The valves on all principal water mains shall comply with AS2638.2, Class 16 (a class higher than 16 may be required in certain circumstances). Valves shall be resilient seated and anti clockwise closing with a stem sealed by “o” rings capable of being replaced under pressure. They shall have external and internal polymeric coating to AS/NZS4158, be pressure rated to PN16 and be flanged.

b) Specific design, subject to the approval of Council, shall be required for valves over 250mm NB.

c) The valve shall be capable of bi-directional flow of water. Valves shall be set so that the spindle is truly vertical. Bolted joints shall be wrapped with a wrapping system, see TDC Drawings 905 to 906.

d) Sluice valves shall be installed in accordance with TDC Drawings 902 and 904 and shall be marked as per TDC Drawing 907.

e) Approval of any particular sluice or gate valve shall be entirely at the discretion of the Engineering Manager.

### 9.5.6 Rider Main Valves

Valves on rider mains shall be approved high quality gate valves, be clockwise closing, comply with BS 5154, have a pressure rating of PN16 or better, have a hand wheel with open spokes and protective coating made of either cast iron or malleable iron. They shall have a body manufactured from cast bronze with all other components from DR copper alloy or grade 316 stainless steel and be indelibly marked with manufacturer’s identity, pressure rating, size, and stamped “DR”.

### 9.5.7 Air Release Valves

a) Water mains shall be laid to grade such that, for the purpose of the release of the air, a fire hydrant, an automatic air valve or a 20mm diameter ferrule and gate valve in a permanent surface box shall be installed at high points or in locations required by Council. They shall be installed so that ground water cannot enter the main at negative main pressure.

b) Automatic air valves shall an approved valve, single or double, large or small orifice, and of appropriate nominal bore. Automatic air valves shall be flanged and be mounted on flanged risers with an integral isolating valve accessible from ground level. Automatic air valves shall be installed within a standard manhole with positive drainage to an outlet such that ground water cannot enter the main at negative mains pressure.

### 9.5.8 Scour Valves

a) Scour valves shall be either a fire hydrant or valve as for air release above and shall be installed at low points or to facilitate draining of a water main where required by Council.

b) All dead end mains or rider mains shall be fitted with permanent scour valves complete with valve box.

c) In areas where the scouring of mains is needed as a frequent operation, a connection to the stormwater kerb outlets, open channels or sumps shall be provided. The connection of a scour valve to stormwater pipes or manholes is not permitted.

d) The box shall be similar to a fire hydrant box but shall be marked “AV” rather than “FH”.

### 9.5.9 Butterfly Valves

Butterfly valves shall only be used with the specific approval of Council. Butterfly valves shall be located in concrete valve chambers.

### 9.5.10 Non-Return Valves

a) Non-return valves shall be installed at reservoir and tank outlets and at reservoir inlets and at the lower extremity of the tank reticulation zone.

b) 50mm diameter swing check valves shall be an approved bronze valve. Valves larger than 50mm diameter shall be approved swing check valves, with external arm. Non-return valves shall be capable of being serviced without removal from the main. Cast iron swing check valves shall be fusion bonded thermoplastic coated or epoxy coated. All coatings shall be compatible with potable water and shall be coloured blue.

c) Below ground swing check valves shall be within a standard manhole.

d) “Wafer” check valves may be approved for specific applications.

### 9.5.11 Valve Boxes

a) All valves shall be fitted with an approved square pattern cast iron surface box with the lid marked “SV” or “V” and a 150mm lid on a PVC riser pipe. Heavy duty lids shall be used in trafficable areas.

b) The riser pipe shall extend from the valve bonnet to 80mm below the finished surface and be placed vertically over the valve. The valve box shall be supported on a firm foundation so that no direct loading is transmitted from the box to the main or riser.

c) Valve surface boxes shall be left 10mm proud of seal in newly formed road carriageways and flush with finished surfaces in all other instances.

d) If the distance between the finished surface level and the top of the valve is greater than 900mm, a valve key extension shall be fitted.

e) Valve boxes shall be painted white with a 300mm wide kerb flash adjacent to the valve. See TDC Drawing 907.

## 9.6 Anchorage and Thrust Blocks

a) Cast *in-situ* concrete anchor blocks shall be provided on mains 50mm ID or greater, at all points where an unbalanced thrust occurs. This shall include all bends, tapers, valves, pressure reducing valves, tees and blank ends.

b) For butt welded and electrofused PE pipework up to 150mm ID, anchor blocks are not required. Where PE pipes connect to other pipework or fittings with flexible joints, anchor blocks are required.

c) The design of anchor blocks shall be based on “good ground” soil bearing capacity (as defined in NZS3604) or the ultimate bearing capacity of the site soils, whichever is lesser. A safety factor of between 1.5 and 2 shall be used in the design. Anchor block bearing area calculations shall be submitted with the engineering plans for checking and approval.

d) The inner face of the block shall not be of a lesser thickness than the diameter of the fittings, and shall be so constructed as not to impair access to the bolts on the fittings. Concrete shall have a minimum compressive strength of 17.5mPa at twenty eight (28) days.

e) All concrete blocks shall be cast *in-situ*. Pre-cast concrete blocks are not permitted.

f) A protective membrane of not less than three layers of 250 micron polythene sheet or similar shall be provided between the pipe (irrespective of the pipe material) and the concrete anchor and thrust blocks to prevent abrasive damage to the water main.

g) Valves and hydrants on uPVC pipe lines require anchorage to resist torque when the valve is operated.

h) Valves shall be anchored as shown on TDC Drawing 904. A fish-tailed galvanised flat steel bar shall be attached to the bottom bolt on each flange of the valve and incorporated into a cast *in-situ* concrete pad 200mm deep, of the same width as the trench and extending 150mm beyond each anchor bar. Care shall be taken to ensure that all bolts can be removed for future maintenance and are not obstructed by concrete.

i) Hydrant tees, when flanged, shall be anchored as valves – refer TDC Drawing 904.

j) Hydrant tees with rubber ring joints shall be anchored as shown on TDC Drawing 903. The tee shall be anchored by in a concrete pad 200mm deep, of the same width as the trench and not extending beyond the length of the tee. Care shall be taken to ensure that the flexible joints are not encased.

### 9.6.1 Thrust Block Design

In designing water main thrust blocks, the following formula shall be used:

Thrust Force $R = 15.7\ Hd^2 \sin(\theta/2)$
R = thrust in kN
Where H = head of water in metres, ie, 180m max
d = diameter of pipe in metres
θ = angle of deflection

| Pipe dia - d | θ -11.25º bend | θ -22.5º bend | θ -45º bend | θ -90º bend |
|---|---|---|---|---|
| 100 | 2.77 | 5.51 | 10.81 | 19.98 |
| 150 | 6.23 | 12.40 | 24.33 | 44.96 |
| 200 | 11.08 | 22.05 | 43.26 | 79.93 |

R – thrust in kN for each diameter and bend

When the thrust force is known as above, the following formula can be used to ascertain the face dimensions – $m^2$ or weight of concrete – $m^3$ to be used for the thrust block in the following table:

**Case 1: Vertical Downward Thrust**

$A\ (m^2) = FOS \times R\ (kN) / q_u\ (kPa)$ (but not less than 0.09m)

$q_u$ = Ultimate bearing capacity
R = Thrust force
FOS = Factor of safety = 2

**Case 2: Vertical Upward Thrust**

$V\ (m3) = FOS \times R\ (kN) / \gamma_c\ (kN/m^3)$

$\gamma_c$ = Unit weight of concrete (24 $kN/m^3$)
FOS = 1.5

**Case 3: Horizontal Thrust**

$A\ (m^2) = FOS \times R\ (kN) / [K_a \times (kN/m^3) \times \gamma\ (h\ (mm) + 100)/1000]$

$K_a$ = Coefficient of passive pressure (=(1+sinΦ)/(1-sinΦ) = (1+sin35)/(1-sin35) = 3.6)
$\gamma$ = Unit weight of soil (19 $kN/m^3$)
h = depth of cover, 100mm added for extra FOS
FOS = 2.0

Table 9-9 is a guide only for design.

**Table 9-9 Pipe Thrust Design**

| | Pipe diameter | Face area $m^2$ or $m^3$ | 11.25º Angle of deflection | 22.5º Angle of deflection | 45º Angle of deflection | 90º Angle of deflection |
|---|---|---|---|---|---|---|
| Vertical downward thrust | 100 | $m^2$ | 0.09* | 0.09* | 0.09* | 0.13 |
| | 150 | $m^2$ | 0.09* | 0.09* | 0.16 | 0.30 |
| | 200 | $m^2$ | 0.09* | 0.15 | 0.29 | 0.53 |
| Vertical upward thrust | 100 | $m^3$ | 0.17 | 0.34 | 0.68 | 1.25 |
| | 150 | $m^3$ | 0.39 | 0.74 | 1.52 | 2.81 |
| | 200 | $m^3$ | 0.69 | 1.34 | 2.70 | 5.00 |
| Horizontal sideways thrust | 100 | $m^2$ | 0.12 | 0.23 | 0.45 | 0.83 |
| | 150 | $m^2$ | 0.26 | 0.52 | 1.02 | 1.88 |
| | 200 | $m^2$ | 0.46 | 0.92 | 1.81 | 3.34 |

*Notes*
1.* Minimum thrust block size 300 x 300 x 300
2. Table is a guide only
3. Soil parameters are classed as “good ground” in accordance with NZS3604.
4. Test head 180m and factor of safety of 2 for all applications.

## 9.7 Water Supply Connections

### 9.7.1 Point of supply

The point of metering will be the point of supply. The point at which the private supply line connects to the meter outlet is designated as the point at which Council’s responsibility for supply ceases and the property owner’s responsibility for repairs and maintenance begins.

TDC Drawings 909 and 911 illustrate the point of supply for a number of instances.

Each individual dwelling or unit shall have a single point of water supply and a meter immediately adjacent to the road boundary. For rear lots, the point of metering shall be at or adjacent to the road entrance to the property, with separate, private, supply lines laid in the access strip or right-of-way to the lots being serviced.

Premises of multiple ownership (including body corporate, strata title and leasehold or tenancy-in-common scheme) shall be supplied and metered in accordance with TDC Drawing 911.

The supply pipe for one lot shall not pass through another lot unless there is physically no alternative (eg no water main in the road/street or insufficient water pressure in the main at the road/street boundary). In such a case an easement shall be required to protect the line of the supply pipe.

Thread sealing PTFE thread seal tape is only permitted on plastic threads. All metal threads shall be sealed with hemp and graphite jointing compound.

### 9.7.2 Approved Connections

Table 9-10 lists approved water supply connection assemblies.

**Table 9-10 Approved Connections**

| Connection size | Valve | Backflow preventer | Meter | Meter box |
|---|---|---|---|---|
| 20mm ID*<br>25mm ID | Acuflo GM900S MKII manifold assembly | Acuflo GM900S MKII manifold assembly | Invensys/Sensus 620M Qn 1.5 Class C, or Kent/ESLER MSM Qn 1.5 Class C. | Acuflo AMB300 box AMB006 base |
| 40mm ID<br>50mm ID | Approved gate valve | "Wilkins" 950 (low risk)<br>'Wilkins' 975 (RPZ protection) | Kent Helix 4000 | Approved box and base |
| 80mm ID<br>100mm ID<br>150mm ID | Approved sluice valve at main and meter | Approved backflow preventer | Kent Helix | Approved box and base |
| *A 20mm ID connection may not be adequate for residential fire sprinkler systems.<br>Combination meters may be required in special instances (eg, fire supply connections) | | | | |

### 9.7.3 Connection Type

Service connection pipes shall be PE80 Type B (MDPE), minimum PN12 pressure rating, complying with AS/NZS4130 and coloured blue.

Each service connection to a principal main or a rider main shall be by means of a tapping band and a "Talbot" swivel ferrule, with the flow of water controlled by a screwed brass plug. Refer TDC Drawings 909 and 910.

Tapping bands shall be made of LG2 gunmetal with captivated 316 stainless steel bolts and nuts. The band shall have a nitrite rubber sealing ring secured in a recess to prevent blow out under pressure. When tightening the pipe, the upper and lower halves shall make face-to-face contact. The band shall have clear identification of manufacturer, nominal pipe size and pipe material and stamped D/R and be corrosion protected.

If the required connection is larger than is possible to connect with a tapping band (refer Table 9-11), the main connection shall be by a tee or a tapped elongated joint having a vertically connected ferrule. Connections larger than 50mm ID shall be by tee with an additional sluice valve at the main.

Table 9-11 specifies the maximum size of rider main connections using a standard tapping band.

**Table 9-11 Maximum Ferrule for Service Connections**

| Diameter of Main | Max Size of Ferrule |
|---|---|
| 38mm | 12mm |
| 50mm | 19mm |
| 100mm | 25mm |
| 150mm | 32mm |
| 200-450mm | To be determined |

### 9.7.4 Backflow Prevention

a) Backflow prevention devices are required to be installed on all connections including private residential connections. The minimum standard of backflow prevention on any connection shall be a double check valve fitted downstream of any strainer.

b) All new industrial and commercial properties shall have an approved (reduced pressure zone – RPZ) backflow preventer installed on the owner's side at or as close as practical to the point of supply (these may require specific design). It shall be mounted above ground level, in accordance with the manufacturer's specification, in a steel mesh frame with locking lid. The type and location of backflow preventers shall comply with the Building Act and Water Supply Protection Regulations 1961.

c) The devices shall have a regular 12-monthly inspection if required by the resource consent, without interruption to supply, by a certified installer. These results demonstrating compliance shall be submitted to Council.

### 9.7.5 Meter Box Location

The meter box shall be within 300mm of the road/street boundary on the road/street side of the boundary, clear of regular vehicle traffic movement and close to side boundaries (ie, near power box or telephone pillars).

Where there is a right-of-way serving more than one property, the meter assemblies shall be located at the road/street boundary, clear of vehicle traffic movements.

The meter box shall be placed on a firm base so that it will not be depressed below the finished surface by settlement or occasional vehicular traffic.

The pipe work at the meter box shall have minimum cover of 300mm.

### 9.7.6 Re-Use of Existing Service Connections

A proposal to re-use an existing service will only be approved if the service is of adequate size and the following conditions apply:

a) The service is to continue supplying the same building that it was originally intended for and no others; and

b) The internal diameter of the service is not less than 20mm.

This policy applies only to Council portion of the water service, ie, from the main up to and including the meter assembly.

### 9.7.7 Disconnections

a) Redundant services shall be disconnected from the tapping band or ferrule at the main or rider main. The ferrule shall be removed or plugged to the satisfaction of Council.

b) The meter box, manifold assembly and meter remain the property of Tasman District Council and shall be removed and delivered to Council.

### 9.7.8 Fire Sprinkler Supply

A fire sprinkler supply, if installed, shall come off the Individual water supply after the TDC water meter assembly. This may require specific design. All above ground valves shall be suitably protected from vandalism or accidental damage.

Fire sprinkler supply connections may require combination metering.

Designs for fire sprinkler and reticulation shall allow for pressure reductions due to backflow prevention devices.

## 9.8 Pumping and Storage

The following matters relate to the source of water supply and connection to existing reticulation:

a) Tasman District Council has a number of reticulation systems and reservoirs. Levels are available from Council's Engineering Department. For development above these levels, developers will be required to provide a pumping and storage system. Generally, where the development contains public roads above the designated levels, the reticulation will be vested in Council and where the development is served by rights-of-way the reticulation will remain private and be treated as if it is a rear lot.

b) Where the reticulation system is to be vested in Council, the pump station and reservoir shall be continuously monitored and the information transmitted back to Council offices, or approved consultant's offices, via Council's telemetry system. The reservoir and pump station design and list of equipment to be installed shall be subject to specific Council approval. Easements in favour of Council will be required on mains if through private property as outlined above.

c) As-built plans are required of all pump stations, equipment, electrical and telemetry, ie, make, model, size, supplier etc.

d) Pump details are also to include duty points and four copies of the operation and maintenance instruction manuals are to be provided (A4-bound) to the asset owner on completion of the works.

e) Developments that will be bridging two or more pressure zones will require to be supplied from different supply points and may need dual reticulation

operating at different pressures to ensure flow continuity. A shut valve shall be provided at each zone boundary.

### 9.8.1 Security of Water Supply Facilities

The following additional requirements will ensure the security of facilities:

a) Locks shall be provided on all doors, lids, chamber covers and gates that require limited access for operational or security purposes. All newly constructed facilities shall be keyed (master keyed) to Council security systems.

b) Appropriate locks shall be ordered through Council's Utilities Asset Engineer and fitted to facilities prior to application for 224 certification. The developer shall be responsible for all costs associated with the supply and fitting of locks.

c) Once Council locks are fitted to water supply facilities only Council or their maintenance and engineering consultancy staff shall have access to the equipment.

d) Council's maintenance contractor will assume responsibility for routine maintenance of the asset but any work arising from failure of equipment or materials, or faulty workmanship will be on-charged to the Developer during the prescribed maintenance or guarantee period.

## 9.9 Water Main Installation

### 9.9.1 Depth of Water Mains

The following standards apply to the installation of water mains:

a) Compliance with TDC Drawing 908.

b) Both principal mains and rider mains shall have the following cover, except in circumstances requiring special protection. Greater depth shall be provided if required by Council.

c) Under grass berms, the top of pipe is 600mm below finished surface (minimum) and 900mm (maximum) for water mains in residential areas. Top of pipe is 750mm (minimum) and 1000mm (maximum) below finished surface for water mains in commercial and industrial areas and for rural pipelines.

d) Council will not permit water mains to be laid under footpaths (longitudinal length).

e) Under carriageways, the top of pipe is 750mm (minimum) and 1000mm (maximum) below finished surface level, measured at the lowest point of the carriageway.

f) The sections of watermain adjacent to a driveway/vehicle crossing shall be gradually deepened, to allow the specified cover under the driveway/vehicle

crossing without the provision of vertical bends. Similar provision shall be made to give the specified cover over valve and hydrant spindles.

g) In berms, service connection pipes shall have a minimum cover of 350mm and maximum cover of 500mm. In the carriageway, right-of-way or accessway, service connection pipes shall have a minimum cover of 450m and maximum cover of 750mm. At the meter box or rider main valve, the pipe is permitted to have lesser cover where it is raised to suit the fitting height.

h) Council will not accept public water supply pipes located through private property, other than rural pipeline supplies.

### 9.9.2 Pipe Bedding and Surround

a) For PVC, PE and Ductile Iron Pipe: - pipe bedding and surround shall consist of a uniformly graded chip all passing a 9.5mm sieve and all retained on 4.75mm sieve.

b) The requirement for bedding and surround of PVC and PE pipe is set out in AS2032 and AS/NZS2566. Refer TDC Drawings 908 and 1000.

c) The water mains crossing under existing vehicle crossings, footpaths, carriageways and in the vicinity of tree roots shall normally be thrust or bored to keep the disruption of access to properties and damage to surfaces and vegetation to a minimum.

d) Depth of thrusts or drilling shall be the same as for general pipe-laying. The pipes shall be installed in a straight line or in a smooth curve. The alignment deviation – both vertical and horizontal – shall not exceed 150mm.

e) Where the new pipe crosses other services, a clearance of 200mm to those services shall be maintained.

f) All precautions shall be taken to ensure that the end of the pipe to be passed through the bore is sealed to prevent the ingress of earth or other foreign matter into the pipe.

### 9.9.3 Construction of Connections

a) Tapping bands and ferrules on the water mains shall be fitted when mains are first laid.

b) In commercial and industrial subdivisions tapping bands and service connections may be omitted until the specific requirements of the consumer are known. (This shall be made known to the potential purchaser by the land owner prior to sale). In this instance the mains and rider mains shall be laid in the road berms outside the lots to be served.

c) Where Council requires the consent holder who applies for a connection to lay the service connections, this shall be to, and include the, manifold and meter box.

d) These connections shall be temporarily supported on “waratahs” or similar standards until after the electric power or any other services have been laid between the water main and the boundary.

e) Service connections shall be laid at right angles to the frontage.

### 9.9.4 Pipeline Tracer Tape

**Requirement**
The location of all non-metallic (eg, PE and all PVC) water mains and rider mains shall be marked with a foil tape buried in the trench. This is for all installations ie, residential, rural and rural-residential.

**Tape**
The tape shall be of 75mm wide (or 50mm wide with warp reinforcing) acid and alkali resistant polythene plastic with a solid aluminium foil or wire core which shall be visible from both sides and coloured “blue”.

The foil shall be continuously printed in blue “CAUTION WATER MAIN BURIED BELOW”, with no inks or printing extending to the edges of the tape. All printing shall be encased to avoid ink rub off.

The adhesives that bond the protective plastic jacket to both sides of the foil or wire shall be applied directly to the film and foil layers to provide a continuous seal.

**Installation**
The tape shall be buried above the centre line of the pipe within 250mm to 300mm from the finished surface. Refer TDC Drawing 908.

All joints in the tape (eg, roll ends, accidental breaks and at tees) shall be made electrically conductive with purpose made splice clips installed to the specific manufacturer’s instructions. Tying together of the tape ends is not acceptable as the polythene coating will prevent electrical conductivity.

The tape shall be brought up inside the surface box risers at all valves and hydrants with a 300mm long tail so that pipe location equipment can be readily connected.

**Tracer Wire**
When a pipe is installed by a directional drilling technique or bored (ploughed for rural) through the ground, the pipe shall have a “tracer wire” attached. This wire shall take the form of a continuous 2.5mm$^2$ multi-strand (polythene sleeved) cable, strapped to the pipe wall by means of a minimum of two complete wraps of heavy duty adhesive tape, at a maximum of 3.0m intervals. See also 9.9.4 above.

### 9.9.5 Testing

**Preparation for Test**
Before joints (pipe lines less than 60.0m in length, joints can be left covered) and fittings are covered, but after anchor blocks are completed, each section of the reticulation, together with all specials and fittings connected thereto shall be tested by the contractor

in the presence the Designer's representative and Council's representative. The test shall be carried out, and all necessary apparatus supplied by the Designer. Provision shall be made for the insertion of a test gauge in the test pipe work by Council's representative, if required.

**Test Procedure**
The test procedure shall be as detailed in section 9.11.

**Final Test**
Before arranging connection to the existing reticulation, Council may require a similar test after completion of backfilling and any other adjoining works which may affect the water reticulation.

### 9.9.6 Disinfecting

After backfilling and before being put into service, all pipes, valves, house connections and other fittings shall be disinfected using the mixture rates shown in Table 9-12.

The method to be adopted shall be approved by Council.

**Table 9-12 Minimum Chlorination Disinfection Requirements**

| **Quantity (Grams) of HTH powder required to chlorinate each 100 metres of water main** | | |
|---|---|---|
| Diameter of water main in mm (DN) | HTH for dose of 50 mg/l | Volume $m^3$ |
| 100 | 65 grams | 0.8 |
| 150 | 150 grams | 1.8 |
| 200 | 260 grams | 3.2 |
| 250 | 400 grams | 4.0 |
| 300 | 600 grams | 7.0 |

After flushing and disposal of chlorinated water, the line is to be kept loaded for a period of 30 minutes, flushed vigorously for a minimum of 10 minutes, kept loaded for a further 30 minutes then flushed again for a minimum of 10 minutes. Flushing shall be sufficient to ensure the water in the main is changed at least once on each occasion.

### 9.9.7 Water Mains to be Kept Charged

After any water main has been laid and tested and disinfected, it shall be kept continually charged with water, and under pressure. If the permanent connection to the existing reticulation is delayed, a temporary small diameter connection shall be made from the existing reticulation. The pressure must be maintained while electric power and other underground services are being laid in the vicinity of the main.

### 9.9.8 Connection of Reticulation to Council supply

The physical work of connecting to the existing reticulation shall be by a Council-approved contractor after the new reticulation has been tested and passed as satisfactory. The cost of this shall be met by the developer/consent holder.

## 9.10 Rural Water Supply

Council operates low-flow rural water supplies outside urban centres over large sections of the Waimea and Moutere areas. Many of the pipelines (laid with the permission of the "then" owner) serving these schemes are not protected by easements but cross large tracts of private land. Connection to some of the schemes is limited by pipeline capacity or by allocation limits imposed under the RMA and TRMP.

### 9.10.1 Connection to Existing Rural Water Supplies

When contemplating subdivisions or development in rural areas, Designers should first ascertain the existence of a water supply reticulation system in the area. Should one exist, the developer or subdivider will require confirmation from Council that capacity for connection is available.

Designers will need to:

- consult the New Zealand Fire Service for cluster developments, to satisfy SNZ PAS4509:2003,
- demonstrate that capacity is available for proposed and foreseeable future flows, and
- verify that an easement for a pipe line can be secured.

Written confirmation of the above shall be attached to the subdivision consent application.

### 9.10.2 Relocation of Rural Supply Pipelines

Where any development requires relocation of rural water supply pipelines the cost of relocation shall be a charge against the developer.

### 9.10.3 New Rural Supply

If no public rural water reticulation schemes are available for connection, the consent holder shall prove that at least 1.0$m^3$ of potable water per day per lot is available to serve the subdivision. Easements may be required to the water source to secure the supply. (Due to the lack of consistent rainfall in the Tasman area, roof water supply alone cannot be relied upon to service the subdivision). Also an approved water take may be required as set out in the TRMP.

### 9.10.4 Rural Connections

Each lot shall be serviced by a minimum 20mm diameter service pipe with a meter and/or restrictor valve as approved by Council to limit supply.

Where water is available, reticulation shall be installed and the consent holder shall pay the applicable fee for joining and connection of each lot. Joining fees for each scheme together with charges are set out in Council's LTCCP.

### 9.10.5 As-Built Drawings

The developers shall, whether or not connections are made to the rural scheme, provide as-built plans of the position of rural water supply pipelines relative to the boundaries within the development.

### 9.10.6 Rural Fire Fighting Supply

a) It is a requirement of the TRMP that each residential lot shall have an additional tank of at least 23,000 litres (25,000 litres ideal) provided in an approved location solely for fire fighting purposes. The tank shall be fitted with approved camlock fittings and remain full at all times.

b) Additional water for rural fire fighting can be achieved from a number of sources; dams, water tanks, pools and lakes, streams and rivers, sea water.

c) A fire appliance should be able to sit on a hard standing area and be no more than 6.0m from the water source. The water source should be no more than 3.0m below, and no more than 10.0m above the appliance pump inlet.

d) When rural supplies require tanks with capacity of 23,000 litres or more to enable connection of fire fighting equipment, a camlock coupling shall be fitted to these. Appropriate all-weather access for a two axle truck shall be provided to the tank site.

e) In cluster housing developments in rural supply areas, a storage capacity of 90,000 litres for fire fighting may be combined into a group of linked tanks above house levels and sited to mitigate visual impact on the landscape (as an alternative to individual tanks on each property). These tanks may be fed from the rural restrictor supply and/or from roof supply and pumps. These shall be provided with access, reticulation (a minimum 100mm diameter main), fittings for fire fighting purposes and a hard standing area reserved for fire appliances. The fire service couplings shall be no further than 90.0m from, and no closer than 6.0m to the hazard.

## 9.11 Field Acceptance Pressure Testing for Water Supply Pipelines

### 9.11.1 Introduction and General Comments

To date the acceptance pressure test requirements used for water supply pipelines have generally been too insensitive. It is believed that many pipelines have been allowed to pass with unacceptable leaks, generally through ineffective testing procedures and/or low acceptance requirements. The procedures detailed in this document represent the latest acceptance requirements and procedures from Australia and Europe.

Section 9.12 gives general pressure test requirements for all pressure testing including detailed material-specific test methods. Appendix 9-2 has a pressure test record and Section 9.12.5 has some general comments on the measurement of make up water volume and pressure measuring equipment.

### 9.11.2 Acceptance Pressure Tests for all Pipeline Materials

**General**
Every pressure pipeline is required to pass a water pressure test to verify the integrity of the pipes, joints, fittings and other components such as thrust blocks.

For drinking water pipelines, the test medium shall be potable water that may contain sufficient additional disinfectant to minimise the risk of the commissioned pipeline containing potentially harmful organisms. For safety reasons, compressed air shall not be used for pressure testing.

**Health and Safety Issues**
Appropriate safety equipment shall be available on-site prior to commencement of any pressure testing operations. Only suitably qualified personnel shall carry out and oversee the testing and shall have appropriate protective clothing.

All excavations shall be adequately barricaded. Work in pipe trenches that is not related to the pressure test shall not be permitted during the pressure test.

All test equipment shall be correctly calibrated, in good working order, suitable for the test procedure and be correctly fitted to the pipeline.

The section to be tested shall be completed in accordance with the specification and the pipes and fittings etc adequately restrained. Any permanent or temporary concrete thrust blocks shall be designed for and have attained sufficient compressive strength to resist the test thrusts. No temporary thrust blocks or supports shall be removed until the pipeline is depressurised.

Where water for testing purposes is derived from a potable water supply, appropriate backflow prevention equipment shall be incorporated in the connection to the potable water supply to minimise the risk of accidental backflow and possible contamination of the potable water supply.

The contractor shall have contingency plans and sufficient equipment on-site to deal with any bursts or other foreseeable emergency that may arise during testing.

**Personnel Qualifications**
The testing of all pipelines shall only be carried out and supervised by acceptably qualified or accredited personnel. Refer Table 3-1.

Qualified or accredited personnel shall:

- hold appropriate qualifications issued by a registered training organisation; or
- have attended a relevant training course and received accreditation relating to the work being undertaken; and
- show competence and knowledge of the relevant testing methods and procedures

**Filling the Pipeline**
New pipelines should preferably be filled from the low end of the line. The rate of flow and time of day for filling may be controlled by the availability of water. Where the pipeline is to be charged with water from the existing reticulation network, the flow rate when filling should not cause a pressure drop that will be noticeable or cause inconvenience to consumers. Water from an alternative source shall not be used to fill pipelines for testing purposes unless the quality of the water complies in all respects with grade B (or better) for water source and treatment of the Public Health Grading of Drinking Water Supplies.

It may be necessary to carry out the filling, flushing or swabbing operations at times that do not coincide with peak demands on the reticulation network. The pipeline designer should specify the time of day for filling and rates of flow, especially where large diameter pipelines are involved.

Suitable means of introducing flushing water, including temporary facilities for launching and release of swabs (as appropriate) shall be installed as part of the testing procedure and a means provided for the safe disposal of any water that is flushed from the pipeline.

A suitable backflow preventer shall be used on any connection made to fill, flush out or to drive a swab or swabs through a new pipeline. A dual check valve (without test facilities) will be suitable provided its use is approved by the Engineering Manager.

**Pressure and Volume Measurement**
The accuracy and readability of pressure monitoring and make up volume measurement equipment used for pressure testing can have a significant bearing on the interpretation of pressure tests. This is particularly so when a pipeline contains a significant amount of air.

Appendix 9-2 gives detailed requirements for volume and pressure measurement equipment.

**Test Section Length**
The portion of pipeline length tested, may be either a section of the pipeline or the whole pipeline, depending on the length and diameter on the line, the availability of water, and the spacing between sectioning valves or blank ends. When installing long pipelines, it is advisable to begin testing early in the installation to confirm the adequacy of the laying procedures, and to increase the length tested progressively as experience is gained. The specifications may contain requirements that effectively control the length/s to be tested.

*Note: Long sections may incorporate large numbers of mechanical joints that may need to be checked for leakage if there is a test failure. Leaks become harder and more costly to pinpoint in longer test sections.*

Pipeline test sections longer than 1,000 metres may need to be tested in shorter sections. If long lengths are to be tested, the use of radios or cell phones may be necessary to facilitate the testing procedure.

Pipelines should be tested in suitable lengths so that:

- the overall pressure at the lowest point of the line does not exceed the STP;
- the pressure at the highest point in the section is at least equal to the MDP;
- Sufficient suitable water is available for the test and there are appropriate plans in place for the disposal of the test water (including disinfection residual if applicable); and
- Site considerations such as mixed pipe materials, locations of blank ends to ensure safe and convenience accessibility etc are taken into account.

**Test Duration**
The test duration will vary depending on the testing method used. The main test phase for any method will be at least an hour and may take more than one working day. The test duration given in the specification or in the approved methodology shall be used.

**Pipe Temperature**
The temperature of the pipe may need to be taken into account when testing plastic pipes. If the average temperature of the pipe wall is greater than 23$^{o}$C the test pressure may have to be reduced to allow for pipe material de-rating requirements. This situation can occur where pipelines are not buried, but are exposed to the sun.

Refer also to Section 9.8 for additional comments on temperature effects.

**Test Methodology**
The contractor shall provide a test methodology for the Engineer's approval prior to testing commencing. The methodology shall include at least the following:

- Names and experience/qualifications of the personnel to be used;
- Details of the test length (including any changes in diameter or pipe material) marked on a longitudinal profile of the pipeline;
- Details of temporary anchors or thrust blocks and sectioning valves;
- Timing of, method proposed for and rate of filling the pipeline (including details of backflow prevention equipment proposed);
- Details of method for removal of air from the line;
- Details of the pressurising pump, its capacity and the method proposed for controlling pulsations and ensuring that the System test pressure (STP) is not exceeded;
- Pressure rating of the lowest rated pipeline component;
- System test pressure (STP);
- Test duration;
- Details of the test rig (pressure gauges and/or transducer and data logger to be used);
- Details of the method (and equipment) proposed for determining make up water volume, or volume discharged, in confirming the remaining air for the rebound test;
- Method for ensuring that line valves seal satisfactorily;
- Acceptance criteria for the method proposed;
- Maximum allowable concentration of total available chlorine that can be discharged to a stormwater system or natural channel (if applicable);
- Proposals for disposal of water drained on completion of the test, including the method of de-chlorination and the means of measuring the chlorine residual to ensure it does not exceed the allowable value (if applicable);
- Test record sheet proposed.

## 9.12 Acceptance Test Requirements

**General Requirements**
The length to be tested shall be as scheduled in the specifications or as planned by the contractor in the approved methodology. If any test proves to be unsatisfactory, detect and rectify the fault/s and re-test. Even if testing procedures produce a satisfactory result, any visible leaks that are discovered shall be rectified and the pipeline re-tested.

Acceptance testing may be done progressively, but shall not be commenced before:

- at least 24 hours notice of the intention to start testing has been given to the Engineering Manager;
- the contractors written testing methodology and all equipment (including backflow prevention device/s, pressure test rig, makeup volume measurement etc) have been approved;
- suitable means for filling and flushing, including temporary facilities for launching and release of swabs (as appropriate) are in place;
- the Engineering Manager has approved the source of water and the rate of flow for filling the line;
- the section to be tested has been completed and backfilled and is in conformity with the specification;
- any permanent or temporary concrete thrust blocks have been poured and have attained sufficient compressive strength to resist test thrusts;
- end caps (that allow for filling and bleeding of air) and any temporary anchors are in place and are adequately braced to resist test thrusts;
- air valves (if applicable) are installed and their isolating valves are open;
- arrangements have been made for the safe disposal of water flushed from the pipeline;
- contingency plans are in place for dealing with a possible pipeline burst;
- suitably qualified personnel are on site to carry out, oversee and approve the acceptance test;
- appropriate and approved record sheets are available for recording all aspects of the test; and
- chlorinated water shall only be discharged to sewer when chlorine levels have been reached so as not to have an adverse effect on the treatment system ie, chlorine to water strength of 15ppm+- 5ppm.

**Filling the Pipeline**

Tasman District Council will make water available from its reticulation (subject to no water restrictions) for the first filling and flushing operations at no cost to the contractor. Water used for any subsequent fill/s and flushing will be charged at Council's current supply rate. The quantity of water to be charged shall be as measured by meter or as assessed by the Engineering Manager if suitable metering equipment is not used.

The pipeline shall be filled at the approved rate, in accordance with the following conditions:

- Fill from the low end and ensure that air valves and venting points are open and operating;
- Run a polyurethane foam swab along with the filling water to assist with air removal if specified or approved;
- Where swabbing is not carried out, flush (if possible and approved) the pipeline at a rate that will transport construction debris to scour point/s and air to vented connections and air valves;
- Make sure that the filling or flushing operations do not cause an unacceptable pressure drop in the reticulation;
- Make adequate provision for the safe disposal of any flushed water;
- Raise the pressure in the pipeline to the pipeline DP as specified or to 75 ± 5% of the STP if the DP is not specified;
- Repair any leaks or make good any defects that are revealed;

- Allow the pipeline to "soak" for a period of 2 to 24 hours (or more) to allow the temperature to stabilise and any item dependent movement to take place (the longer period may be necessary for saturation of cement mortar linings on pipes or fittings); and
- A disinfection solution may be introduced with the fill water or final flushing water if approved by the Engineering Manager.

**System Test Pressure (STP)**
The STP shall be as set by the system designer. If the STP has not been specified, the pipeline shall be subjected to a pressure that is the lower of:

- 1.25 x PN of the lowest rated pipe or component installed in the section to be tested or
  where surge pressures have been included
- DP + 100 kPa or
  where surge pressures have not been included
- DP + 500 kPa, or 1.5 x DP (whichever is the greater)

Where short lengths of pipeline are tested separately, eg for service pipes of DN <63 and of <100 metres, the STP may be taken as DP unless otherwise specified.

**Pressure Monitoring Point**
The pressure shall be monitored at the lowest part of the pipeline or if that is not possible, at some other convenient point and the STP adjusted to take account of the elevation difference between the pipelines lowest point and the test rig. The adjustment shall be made by subtracting 10 kPa for every metre elevation that the rig is above the lowest part of the line.

### 9.12.1 Pressurising the Pipeline

**Test Pump Capacity**
The pump capacity is an important consideration. If its capacity is too small, it may take too long to reach the test pressure. Conversely, if its capacity is too great, it may not be controllable and could cause over pressurisation.

If a motorised test pump is used, it shall be fitted with an adjustable pressure relief valve that is set to discharge the full flow of the pump at a pressure equal to the PN of the pipe. To pressurise the pipeline, the relief valve setting should be gradually adjusted to raise the pressure in a controlled manner until the STP is reached. Continual discharge from the relief valve is preferable to the possibility of overloading the pipeline. The test pump should not create excessive pulsations that may affect the ability to achieve the STP accurately. A surge-damping device may be needed to control pressure pulsations.

**General Comments**
Pressurising the pipeline above the DP (or 75% of the STP) shall not begin until the Engineering Manager's representative and Designer (if appropriate) are on site to witness the test, unless the Engineering Manager has given prior approval.

The pressure shall be raised steadily and smoothly to the STP and ***must not*** be raised to more than 1.5 x the PN of the lowest rated component in the line.

If over pressurisation is considered by the Engineering Manager's representative to have compromised the pipeline material's integrity, the contractor may be liable for all costs involved in replacing and relaying the over stressed section of pipeline. The degree and duration of the over- pressurisation will have a bearing on the outcome and the Engineering Manager's representative may wish to consult with a recognised expert in pipeline materials before making a ruling. The contractor shall be responsible for any costs incurred and for any delays that may be associated.

**Testing Against a Closed Valve**
Pressure testing against a closed valve is not acceptable. The test line shall be blanked off and suitably anchored.

**Final Pressure Test**
When a pipeline has been divided into two or more test sections for pressure testing and all sections have tested satisfactorily, the total pipeline shall be pressurised to the DP. After one hour at the DP all joints on closer pipes between sections or any additional components that have been installed after the pressure test of the adjacent sections shall be inspected visually for leaks and changes of line or level. This inspection shall only be carried out in dry weather or if a suitable shelter is erected over the joints and the area dried sufficiently to show dripping or weeping.

If for any reason it is not possible to observe leakage at joints on closer sections, the final test shall be carried out using a full test procedure as per the appropriate test method for the pipeline material. The STP for this final test shall be selected so that:

- the pressure at the lowest part of the pipeline does not exceed 1.5 x PN of the lowest rated component in the system; and
- the pressure at the highest part of the line is at least equal to the MDP.

The Engineering Manager shall be advised so that the final test can be witnessed before backfilling. Any leakage or other fault shall be rectified and the test repeated until there is no fault.

**Connections to Existing Pipelines**
No connection to an existing pipeline shall be made until the new pipeline and any connecting pipes and fittings have been disinfected. The joints between the new pipeline and existing pipelines shall be subjected to the operating pressure for at least one hour and then inspected for leakage. This inspection shall only be carried out in dry weather or if a suitable shelter is erected over the joints and the area dried sufficiently to show dripping or weeping.

The Engineering Manager shall be advised so that the final connecting joints can be witnessed before backfilling. Any leakage or other fault shall be rectified and the test repeated until there is no fault.

**Additional or Failed Pressure Tests**
The cost for the Tasman District Council Engineering Manager or representative to attend pressure tests that fail after the first test shall be added to the resource consent cost and will include a 10% on-cost penalty.

**Reporting**
A complete record of all details of the test shall be made. This record shall include the following:

- full details of the pipeline tested (including details of pipe material, diameter and pressure class, pressure rating, manufacturers identification, jointing system, pipeline profile showing changes in pipe material as well as the location of valves and fittings and the location of test sections);
- failure of any thrust block, pipe, fitting or other component;
- any visible leakage detected and repaired;
- a detailed record of the pressure in the pipeline at appropriate time intervals. This may be from a pressure datalogger or by manually recording times and pressure readings at appropriate intervals;
- details of the addition of make up water (either by volume drawn off or volume pumped in);
- the allowable quantity of make up water for the test conditions;
- confirmation that valves sealed when subjected to DP on one side;
- whether the pipeline passed or failed the test; and
- the signatures of the representatives of the DPA and the Engineering Manager's, representative who witnessed the test.

A suitable record form is shown in Appendix 9-1.

**Completion of the Test**
After testing, release the test pressure slowly and if necessary open air valves and drain points to drain the line. If the pipeline has been disinfected, do not drain it until just prior to final commissioning so that the risk of contamination is minimised.

If it is necessary to drain a line that contains a disinfection residual of chlorine, this residual shall be reduced to an acceptable level before being discharged to a stormwater system. Alternatively (and with the engineer's approval), the chlorinated water may be discharged to the sewerage system provided a positive air gap separation is maintained at all times and the rate of discharge does not overload the sewer.

### 9.12.2 Method for Pressure Testing DI, CLS, PVC, PVC-M and GRP Pipelines

**Pressurising the Pipeline**
Pressurising of the pipeline above the DP (or 75% of the STP) shall not begin until the Engineering Manager's representative and Designer (if appropriate) are on site to witness the test.

The pressure shall be raised steadily and smoothly to the STP and ***shall not*** be raised to more than 1.5 x PN of the lowest rated component in the line.

Maintain the STP by pumping at 15–30 minute intervals (if necessary) for the specified test duration (usually at least one hour). Measure and record the quantity of make up water added at each occasion, either by the volume pumped in or the volume drawn off method as detailed in the contractor's approved test methodology or Appendix 9-2. Restore the STP whenever the pressure drops by more than 5%.

**Acceptance Criteria**
The pressure test shall be satisfactory if:

- there is no failure of any thrust block, pipe, fitting or other pipeline component;
- there is no visible leakage – if a leak is suspected but not visible, use aural or ultrasonic assistance to locate; and
- the total make up water volume does not exceed the maximum allowable quantity as calculated from the equation:

  ***Q (litres/hour)<(0.14 x L x D x H)***

  Where: L = Length of pipeline under test (km)
  D = Internal diameter of pipe (m)
  H = Average value of head in the pipeline over the full test length (m)
  Q = is the allowable make up volume (litres/hour)

**Failure of Test**
Should the test fail, the cause shall be located and rectified and the section re-tested until satisfactory results are obtained.

Failure to allow adequate "soak" time for a cement mortar lined pipe or if there is a significant amount of entrapped air in the pipeline may result in an inconclusive test or a marginal failure. In such a case, the test period may be extended for a further one to two hours as may be agreed between the DPA and the Engineering Manager's representative.

Provided the quantity of make up water meets the acceptance criteria during the last hour of this extended period, the pipeline will pass the test.

When PE service connections or sub-mains are tested along with a main pipeline, the visco-elastic creep of these pipes may cause a test failure. It may be necessary to isolate the PE sections and test these separately or to apply the methods given in Sections 5 or 6.

**Reporting**
On satisfactory completion of the test, the test report shall be prepared by the contractor and signed off by the contractor, the DPA and the Engineering Manager's representative witnessing the test.

### 9.12.3 Method for Pressure Testing Visco-Elastic Pipes (PE) – Rebound Method

**General**
Pressurising of the pipeline above the DP (or 75% of the STP) shall not begin until the Engineering Manager's representative and DPA are on site to witness the test, unless the Engineering Manager's representative has given prior approval.

A pressure transducer and datalogger is the preferred means for monitoring the pressure during this test method, however, manual reading of a pressure gauge that complies with the requirements of Section 9, at 2–5 minute intervals will be acceptable.

**Preliminary Phase**
This preliminary phase is necessary before proceeding to the subsequent phases. It is intended to set up the prerequisites for volume alterations that are dependent on pressure, time and temperature.

- After flushing/swabbing and thoroughly venting the pipeline, depressurise to just above atmospheric at the highest point of the line and allow a relaxation period of at least 60 minutes to release pressure related stress. Ensure that no air enters the line.
- After the relaxation period, raise the pressure steadily and smoothly to the STP (it must not be raised to more than 1.5 x PN of the pipe). Maintain the STP for a period of 30 +5 – 0 minutes by pumping continuously or at short intervals. Take care not to exceed the STP. During this time, carry out an inspection to identify any obvious leaks.
- Stop pumping and allow the pressure to decay by visco-elastic creep for one hour.
- Measure the remaining pressure at the end of the hour.

If the pressure has dropped to 70% (or less) of the STP, the pipeline will not pass the test and the cause should be located and rectified. This could be due to leakage or temperature change. If the pressure at the end of the hour >70% of the STP, continue with phase two, the pressure drop test to prove the volume of air in the pipeline is sufficiently low to allow the manual test phase to be carried out.

**Pressure Drop Test**
The main test phase requires that the pipeline has been adequately vented and the volume of remaining air is less than the calculated maximum allowable. The procedure to confirm the air volume is described below. This test (pressure drop test) is carried out immediately after the completion of a successful preliminary phase.

- Reduce the pressure remaining in the pipeline rapidly at the end of the preliminary phase by opening a metered "bleed" connection to produce a pressure drop *(Δp)* of 10–15% of the STP or to the DP (whichever produces the lowest pressure). The bleed time should be kept as short as possible, (preferably less than 2 minutes). A large diameter/volume test section will require a large connection and meter in order to achieve the bleed time requirement – this should be confirmed by calculation.
- Measure accurately and record the volume of water "bled" from the line *(ΔV).*
- Calculate the maximum allowable water loss *($\Delta V_{max}$)* using the following formula. The volume of water removed should not exceed *($\Delta V_{max}$).*
- If $\Delta V$ is more than $\Delta V_{max}$, stop the test and remove excess air.

$$\Delta V_{max} = 1.2 \times V \times \Delta p \times [1/E_w + D/Ee \times E_R)]$$

Where:

| | |
|---|---|
| $\Delta V_{max}$ | allowable water loss in litres |
| $V$ | total volume of the tested pipeline in litres |
| $\Delta p$ | Measured pressure drop in kpa |
| $E_w$ | bulk modulus of water (kPa) @ test temperature (see Table 9-13) |
| $D$ | internal pipe diameter in metres |
| $e$ | wall thickness of the pipe in metres |
| $E_R$ | modulus of elasticity of the pipe wall in kPa (see Table 9-14) |
| 1.2 | an allowance for remaining air |

**Table 9-13 Bulk Modulus of Water at Various Temperatures**

| Temperature $^{o}$C | Bulk Modulus (kPa) |
|---|---|
| 5 | 2080000 |
| 10 | 2110000 |
| 15 | 2140000 |
| 20 | 2170000 |
| 25 | 2210000 |
| 30 | 2230000 |

**Table 9-14 E Modulus of PE 80B and PE 100 at Various Temperatures**

| Temp $^{o}$C | PE 80B – E Modulus (kPa) @ hrs | | | PE 100 – E Modulus (kPa) @ hrs | | |
|---|---|---|---|---|---|---|
| | 1 hour | 2 hours | 3 hours | 1 hour | 2 hours | 3 hours |
| 5 | 740000 | 700000 | 680000 | 990000 | 930000 | 900000 |
| 10 | 670000 | 630000 | 610000 | 900000 | 850000 | 820000 |
| 15 | 600000 | 570000 | 550000 | 820000 | 780000 | 750000 |
| 20 | 550000 | 520000 | 510000 | 750000 | 710000 | 680000 |
| 25 | 510000 | 490000 | 470000 | 690000 | 650000 | 630000 |
| 30 | 470000 | 450000 | 430000 | 640000 | 610000 | 600000 |

Notes:

- the value of $E_R$ should be representative of the temperature and duration of the test (see Table 9-14 above)
- $\Delta p$ and $\Delta V$ should be measured as accurately as possible, especially where the test section volume is small.

**Main Test Phase**

The visco-elastic creep due to the STP is interrupted by the rapid pressure drop described above. The rapid drop in pressure leads to contraction of the pipeline. Observe and record the increase in pressure that results from contraction of the pipeline for a period of 30 or 90 minutes.

**Acceptance Criteria**

The pressure test shall be satisfactory if:

- there is no failure of any thrust block, pipe, fitting or other pipeline component;
- there is no visible leakage;
- the pressure shows a rising tendency throughout the 30 minute period;
- if doubt exists above the pressure recovery, the monitoring period may be increased to 90 minutes and any pressure drop that does occur shall not exceed 20 kPa over the full 90 minute period;
- If the pressure drops by more than 20 kPa during the 90 minute extended period, the test fails; and
- Repetition of the main test phase may only be done by carrying out the whole test procedure including the relaxation period of 60 minutes described in the preliminary phase.

**Failure of Test**
Should the test fail, the cause shall be located, rectified and the section re-tested until satisfactory results are obtained.

**Reporting**
On satisfactory completion of the test, the test report shall be prepared by the contractor and signed off by the contractor, Engineering Manager's representative and DPA witnessing the test.

### 9.12.4 Method for Pressure Testing Visco-Elastic Pipes (PE) – Volumetric Method

**Purpose**
This method is included as a reference method that can quantify the amount of leakage in a visco-elastic pipeline. It will generally require a greater length of time to achieve a result.

**Pressurising the Pipeline**
The pressure shall be raised steadily and smoothly to STP. (It ***must not*** be raised to more than 1.5 x PN of the pipe).

When the STP has been reached, isolate the pipeline and allow the pressure to decay naturally for 12 hours. (The pressure will drop significantly during this pre-stressing period).

After 12 hours, reapply and maintain the STP for five hours as detailed below:

- Restore the STP at the end of the 12 hour pre-stressing period;
- Restore the STP at the end of hour 1;
- Restore the STP at the end of hour 2;
- Measure and record the water volume ($V_1$ Litres) needed to restore the STP at the end of hour 3;
- Restore the STP at the end of hour 4; and
- Measure and record the water volume ($V_2$ Litres) required to restore the STP at the end of hour 5

Calculate:

$$V_2 \geq 0.55 \times V_1 + Q$$

Where Q is the allowable make up volume obtained from the equation:

$$Q \text{ (Litres/h)} < (0.14 \times L \times D \times H)$$

Where: $L$ = Length of pipeline under test (km)
$D$ = Internal diameter of pipe (m)
$H$ = Average value of head in the pipeline (m)

**Acceptance Criteria**
The pressure test shall be satisfactory if:

- There is no failure of any thrust block, pipe, fitting or other pipeline component;

- There is no visible leakage – if a leak is suspected but not visible, use aural or ultrasonic assistance; and
- The make up water volume (*Q*) does not exceed the maximum allowable volume as calculated.

**Failure of Test**
Should the test fail, the cause shall be located, rectified and the section retested until satisfactory results are obtained. Note that the STP and the quantity of water required to restore the STP must be measured as accurately as possible.

**Reporting**

On satisfactory completion of the test, a test report prepared by the contractor shall be signed off by the contractor, Engineering Manager's representative and the DPA witnessing the test.

### 9.12.5 Measurement of Makeup Water Volume

There are two equivalent methods for measuring the volume of makeup water, ie, measurement of the volume drawn off or the volume pumped in.

**Measurement of the Volume Pumped in**
At the end of the test period (or at intervals during the test) measure and record the reduced pressure in the main. Then restore the STP by pumping and measure the volume that is pumped in.

The quantities of water pumped in should be summed if it is necessary to raise the pressure in the line more than once during the test.

The volume of water pumped into the pipeline may be measured by any suitable device. A 15mm or 20mm class C or D water meter may be appropriate, provided the inflow rate is within the meters $Q_{min}$ and $Q_{max}$.

The quantity of water may be quite small (especially for a small diameter and short length of main). If a motorised test pump is used, it may be difficult to control the rate of pressure rise and pump pulsations may affect the water meter's accuracy. If this is the case, the use of a hand pump should be considered or the "volume drawn off" method used.

**Measurement of the Volume Drawn Off**
At the end of the test period (or at intervals during the test) measure and record the reduced pressure in the main. Restore the STP by pumping and measure the volume that has to be drawn off to reach the reduced pressure previously recorded, then restore the STP. This whole operation should be carried out as quickly as possible, consistent with ensuring the accuracy of the pressure and the volume measurement.

The quantities of water drawn off should be summed if it's necessary to restore the pressure in the line more than once during the test.

The volume of water drawn off may be measured by any suitable device. A 15mm or 20mm class C or D water meter may be appropriate, provided the outflow rate is within the meters $Q_{min}$ and $Q_{max}$.

**Accuracy of Pressure and Volume Measurement**
The equipment used to determine the make up volume shall be capable of measuring the quantity of water to an accuracy of ±2% or better.

The precision of the pressure measurement will have an effect on the accuracy of the volume measurements, especially if a significant amount of air remains in the pipeline. The precision with which the STP is set and restored will also have an effect on the test results. Measurement of the volume drawn off may be more precise and controllable than the volume pumped in. The equipment (pressure gauges and volume measuring devices) shall be to the accuracy specified and every care shall be taken to ensure that the results are as accurate as the equipment will allow.

**Acceptable Pressure Measurement Devices**
The accuracy and readability of pressure monitoring equipment used for pressure testing can have a significant bearing on the interpretation of pressure tests. This is particularly so when a pipeline contains a significant amount of air.

The pressure range of the gauges used shall be such that the STP falls within the range 50-90% of the full scale range of the gauge. The main gauge shall have been calibrated within six months of use and have a minimum dial diameter of 100mm (preferably 150mm). A check gauge of a similar pressure range shall also be used to confirm the calibration of the main gauge. (A "test" pressure gauge with an accuracy of ±0.5% of full scale is preferred for the main gauge).

Alternatively, a datalogger maybe used to log the pressure signal from an accurately calibrated pressure transducer. A suitable "check" pressure gauge shall be used in conjunction with the pressure transducer to confirm the calibration of the transducer. The test gauge shall be read at frequent intervals and the readings recorded for later comparison with the datalogger results. The datalogger shall be set to log the pressure at suitable intervals that are not more than two minutes apart for PE pipeline tests and five minutes for testing pipelines of other materials.

Note that pressure pulsations from a motorised test pump may destroy a pressure gauge unless some form of pressure damping is incorporated to protect the gauge.

**Preferred Pressure Test Rig**
The preferred rig shall have a recently calibrated pressure transducer and check pressure gauge.

The transducer shall have:

- Non-linearity and hysteresis within ±0.2%;
- A resolution of 0.02 bar or better;
- A pressure range so that the output at STP is 50–90% of full scale;
- Been checked for calibration within the last six months; and
- A datalogger capable of storing the pressures at two minute intervals over a period of up to 24-hours.

The check pressure gauge shall have:

- a dial of ≥100 mm;

- readability to within 10 kPa;
- a pressure range so that the STP falls within 50–90% of the range; and
- been checked for calibration within the last six months

The transducer and the check gauge shall read within 3% of each other. If they do not agree within this limitation, the cause shall be determined and the faulty unit/s replaced or recalibrated at the contractor's cost.

**Alternative Pressure Test Rig**
The pressure test may be conducted using two pressure gauges. The main "test" gauge shall have:

- an accuracy of ±0.5% of full scale;
- ≥100 mm dial;
- readability of 5 kPa; and
- a pressure range so that the STP falls within 50–90% of the range.

The check gauge shall have:

- an accuracy of ±1% of full scale;
- ≥100 mm dial;
- readability of 10 kPa;
- a pressure range so that the STP falls within 50–90% of the range; and
- been checked for calibration within the last six months

The gauges shall read within 3% of each other. If they do not agree within this limitation, the cause shall be determined and the faulty unit/s replaced or recalibrated at the contractor's cost.

The test rig shall incorporate provision for manually bleeding air as well as an isolated 15mm BSP socket to allow for the installation of an independent check gauge.

In the case of a dispute over a pressure test result, a pressure transducer and datalogger and check gauge shall be used for any re-testing that may be necessary.

**Effects of Entrapped Air**
Air trapped in a pipeline during the test will affect the test results. During filling as much air as possible should be expelled from the pipeline before the pressure test commences. Air removal may necessitate swabbing.

**Pipe Temperature and Temperature Changes during the Test**
The temperature of the pipe may need to be taken into account when testing plastics pipes. If the average temperature of the pipe wall is greater than 23$^{o}$C, the test pressure may have to be reduced to allow for pipe material de-rating requirements. This situation can occur where pipelines are not buried, but are exposed to the sun.

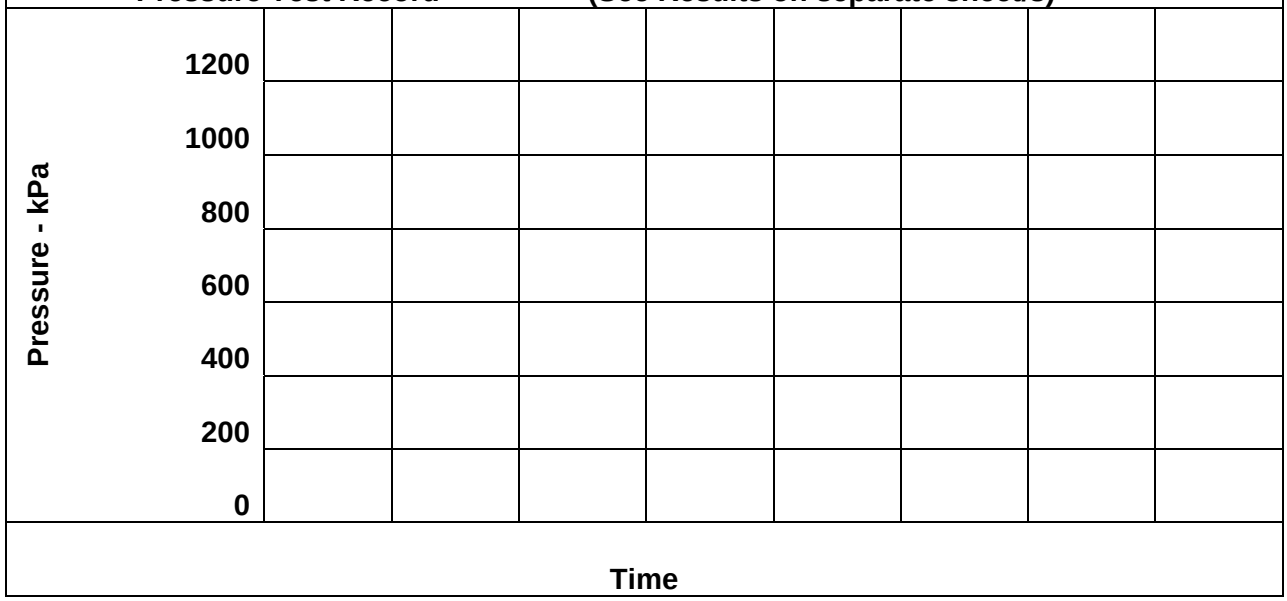
Changes in temperature during the test can have a significant effect on the internal pressure as a temperature change can cause the pipe to expand or contract. Under normal circumstances, the temperature of a buried pipeline will remain relatively constant after initial filling and stabilising.

Note that the temperature of any water added to a pipeline (eg to restore the STP) should be within ±3$^{o}$C of the temperature of the water already in the pipeline

## Appendix 9-1 Pressure Pipeline Test Record

| | |
|---|---|
| Pipe Purpose: | Date: |
| Location: | Designer: |
| Contractor: | Foreman: |
| Consultant Observer: | Council Observer: |
| **Operating and Test Details** | |
| Maximum Operating Pressure: | |
| System Test Pressure: | |
| Pass Criteria: | |
| Passed the Test? | |
| Signatures: | |
| **Main Pipeline Details** | |
| Pipe Make/Description: | |
| Nominal Diameter: | Pipe OD (mm): |
| Pipe Material: | Pressure Class: |
| Jointing System: | Length of Pipe: |
| Pipe Serial Number/s: | |
| **Sub-Main Details** | |
| Pipe Make/Description: | |
| Nominal Diameter: | Pipe OD (mm): |
| Pipe Material: | Pressure Class: |
| Jointing System: | Length of Pipe: |
| Pipe Serial Number/s: | |
| **Service Pipe Details** | |
| Pipe Make/Description: | |
| Nominal Diameter: | Pipe OD (mm): |
| Pipe Material: | Pressure Class: |
| Jointing System: | Length of Pipe: |
| Pipe Serial Number/s: | |

**Pressure Test Record** **(See Results on separate sheet/s)**




Attach a copy of the pressure test methodology and profile of the pipeline.

## Appendix 9-2 Field Pressure Testing Procedures for Water Supply Pipelines

**Record of Pressure Test Results** (including pipeline filling etc)

| Time | Pressure | Remarks |
|---|---|---|
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**Other Comments and notes:**

## Section 9 Drawings

Drawing 900 – Watermain tee junction detail

Drawing 901 – Gibault Rider main connection

Drawing 902 – Sluice valve key cap extension

Drawing 903 – Fire hydrant installation Z ring jointed

Drawing 904 – Sluice valve installation

Drawing 905 – Corrosion protection for flanges

Drawing 906 – Corrosion protection for unrestrained mechanical couplings

Drawing 907 – Standard valve & hydrant road markings

Drawing 908 – Water trenching requirement

Drawing 909 – 20mm service connection detail

Drawing 910 – Tapping band rider 25mm main connection

.Drawing 911 – Water connection policy subdivision, cross lease & ROW

Note: The drawings are **not** included in this document. They are available in PDF format or hard copy from the Engineering Secretary (03 543 8524) or email engineeringstandards@tdc.govt.nz

# 10 ELECTRICAL UTILITIES

## 10.1 Introduction

The purpose of the Electrical Utilities section of the Engineering Standards and Policies is to ensure that all electrical cabling is designed and installed to meet Council and network line operator expectations.

The standards ensure that community expectations for electricity and streetlighting are met in a safe and efficient way, and that access to all underground services is achieved with a minimum of disruption.

### 10.1.1 Objectives

The objectives of the electrical utilities standards are as follows:

a) All new electrical infrastructure meets the needs of people and communities for electricity and streetlighting;

b) All new electrical infrastructure is located within public land, and/or is legally and physically protected where it is located on private property;

c) Access to underground cabling is ensured for ease of repairs and maintenance, with a minimum of disturbance;

d) The location of all electrical services is clearly marked;

e) Streetlighting has been provided to ensure personal and traffic safety; and

f) Streetlighting shall be in keeping with the amenity and character of the environment.

### 10.1.2 Key References

All electricity and streetlighting infrastructure shall be consistent with the standards set out in Table 10-1.

**Table 10-1 External Standards and References for Electrical Utilities**

| Standard/Reference | Description |
|---|---|
| NZ Electricity Code of Practice | Current and voltage ratings |
| New Zealand Electricity Act | Design of reticulation |
| AS/NZS3000 | Electrical installations (Australian/New Zealand wiring rules) |
| Line Operator | Design and Construct and Distribution Codes |

## 10.2 Electrical Reticulation

### 10.2.1 General

The following general standards and conditions apply to the provision of electrical utilities:

a) All new electrical reticulation and service main will be by underground cabling in urban areas.

b) All new service mains will be by underground cabling in “rural areas” or as amended by clause 10.2.5(f).

c) Reinforcement or replacement of existing overhead electrical reticulation will be by underground cabling apart from specific exemption from Council. This will not exclude the line owner carrying out any maintenance (replacement or upgrade) of existing works as long as the land will not be injuriously affected as a result of the maintenance (replacement or upgrade).

d) Any dispensations (exceptional circumstances) given by either the line owner (for dispensation from its own electrical design and construction standards) or Council (for dispensation from its Engineering Standards and Policies) shall be in writing and shall indicate which section and subsection of the relevant standards the dispensation applies to.

e) Existing allotments with no “power to the boundary” and requiring an electrical supply will be by underground cabling.

f) All electrical reticulation assets to be vested with the line owner or network utility operator will meet the line owner’s design and construction standards and the line owner’s distribution code.

g) Any underground or overhead electrical reticulation cable being vested with the line owner and installed on private property including rights-of-way will be secured by way of an easement in favour of the line owner.

h) Service main exclusive fittings owned by a third party will also have private easements registered outside the point of supply if the route crosses titled land not owned by the third party. See section 10.2.8.

i) Where a boundary is adjusted enabling a lot to contain an installation Council will require confirmation from the line owner that the existing electrical reticulation is sufficient to supply another installation.

j) Designers are to liaise with other service authorities to achieve economical use of road reserve area with due consideration given to ease of maintenance to the electrical reticulation system and other services in the road reserve area.

### 10.2.2 Design

The following standards apply to the design of all electrical infrastructure:

a) The design of the electrical reticulation shall, as a minimum requirement, comply with the current Electricity Regulations 1997 and the requirements and standards of the line owner.

b) The design of the electrical reticulation shall give consideration to the likely electrical demand requirements per lot and allow for this in the initial design.

c) Residential subdivisions should allow a minimum of 15kVA with diversity per lot and industrial subdivisions should allow a minimum of 40kVA without diversity per lot.

d) The minimum electrical demand design criteria per lot and allowable after diversity maximum demand factor shall be to the requirements of the line owner.

e) All new residential, commercial and industrial subdivisions shall be reticulated with underground cabling running along each side of the road reserve. Council may allow dispensation for a single sided reticulation in exceptional circumstances (eg, where allotment frontages are greater than 30.0m in length).

f) Provision shall be made by land developers for the continuation of appropriate cabling along road frontages to facilitate the electrical reticulation of adjoining future development. This may be achieved by the installation of cable ducting systems. Council may waive this requirement where it is demonstrated with approval from the line owner that adjacent sub-dividable land may be reticulated from another suitable route.

g) Consideration shall be given to the future extension or reinforcement of the electrical reticulation system without necessitating major road reserve disturbance to achieve such expansion or reinforcement. Where appropriate, spare ducting shall be installed along routes likely to be used for an extension or reinforcement of the electrical reticulation.

h) Road crossings for power cables shall be kept to a minimum and where necessary, shall be at right angles to the carriage way and have a minimum cover of 900mm.

### 10.2.3 Cabling, Ducting and Service Boxes

These standards relate to the installation and design of cabling, ducting and services:

a) Access to a three phase power supply shall be provided at the boundary of the road frontage of each lot of an industrial, commercial or residential subdivision.

b) Subdivisions containing rights-of-way not longer than 60.0m may have individual service duct systems (orange 50mm minimum diameter PVC) or appropriately sized service mains cable installed from a service box on the road frontage down the right-of-way to each rear allotment.

c) Subdivisions containing rights-of-way exceeding 60.0m shall have electrical reticulation to the main body of the rear allotments.

d) Fusing and "network connection points" shall be to the satisfaction of the line owner. No service duct system extending from a service box, within a right-of-way shall be longer than 60.0m. No service duct system in road reserve shall be longer than 10.0m.

e) Where either the service mains or the line owner's electrical reticulation is installed within the sealed area of a right of way the cable is to be installed within a duct or a spare duct is to be laid beside the cable.

f) Appropriate registration of Easements In Gross to the line owner's requirements shall be provided by the landowners prior to livening for all electrical reticulation cables, service boxes and ducting on private property including right-of-ways. Where service cables cross others properties or right-of-ways private easements between lots will be required prior to livening.

g) Where multiple driveways make it impractical to position a service box at a common boundary between lots or where a narrow road frontage width of a lot makes the location of a service box vulnerable to damage, it is permissible to install a service duct (orange 50mm minimum diameter PVC) in the road reserve from a service box offset no more than 10.0m from the affected lot.

h) Any ducting systems installed in the road reserve area shall be considered as part of the electrical reticulation system for the purpose of as-built records.

i) Any excavation within the existing road reserve is subject to Council's approval and a road opening notice permit issued by Council.

### 10.2.4 Location and Capacity

The following standards and conditions relate to the location of cabling and capacity of the reticulations:

a) Voltage drop shall be no greater than permitted under the Electricity Regulations 1997 and subsequent amendments and the requirements and standards of the line owner.

b) Current ratings shall be in accordance with AS/NZ 3000 and the manufacturer's design parameters

c) The design shall take into account the requirements of Section 10.2.2 with specific attention given to the following details relating to likely electrical loads:

   i. Lot size in relation to permissible coverage and anticipated usage of the lot (eg, multiple dwellings, cross-lease and potential subdivision permitted within the zoning).
   ii. An appropriate after diversity maximum demand factor.
   iii. The design of the electrical reticulation shall give consideration to the likely electrical demand requirements per lot and allow for this in the initial design. Residential subdivisions should allow a minimum of 15kVA with

diversity per lot and industrial subdivisions should allow a minimum of 40kVA without diversity per lot.

iv. Future load growth and electrical reticulation expansion or reinforcement.

d) Existing overhead electrical cabling shall be dealt with in accordance with Section 10.2.6.

### 10.2.5 Subdivision Requirements

The following standards apply to the reticulation of electricity within the subdivisions process:

a) Any variations (change to resource consent conditions) issued by Council from resource consent conditions shall be in writing and shall specifically state which condition the dispensation applies to, including how the condition is to be met.

b) New allotments shall be serviced with live 400/230v electrical reticulation to the boundary of each lot.

c) Rear lots down right-of-ways or through front lots may have ducts provided from the road reserve frontage to the rear lots ready for future service mains installation at the owner's cost. Exceptions are catered for where it is impractical to position a supply at a boundary.

d) Where practical, existing overhead 400/230v electrical reticulation or "service mains" crossing new subdivisions shall be placed underground

e) High voltage power lines (greater than 1000 volts) across new subdivisions shall be relocated clear of the subdivisions or placed underground with the agreement of the line owner. Dispensation may be granted by Council where it is demonstrated to be impractical to achieve this requirement.

f) In remote rural subdivisions where the allotments have a large land area and it is demonstrated that the lots are not intended for habitable dwellings or buildings ancillary, Council may waive the requirement for the supply of electrical reticulation to the boundary. A consent notice will be required noting that the site will not have an electrical supply.

g) Where electrical reticulation referred to in the above paragraphs is not practically accessible or economically viable, local generation eg, Hydro, solar, wind, may be considered as an alternative. It shall be demonstrated that local electrical generation of 3kWhr minimum sustainable storage capacity over a 24-hour period per household is feasible for supplying lighting and small electrical appliances with alternative fuel for heating and cooking.

h) All new subdivisions reticulated with service boxes or poles shall have service ducting (50mm orange PVC electrical duct) from the pole or box to 1.0m within the property it is intended to supply. Wide sweeping bends shall be used. Service ducting shall be no deeper than 1.0m, nominally 600mm. Duct ends shall be clearly marked within properties.

### 10.2.6 Rural

a) Recognising the extent of 11kV electrical reticulation in the rural sector, together with the difficulty and high cost of providing underground 11kV cabling, Council may in accordance with Section 35 of the Electricity Act and at its discretion and in agreement with the line owner, allow overhead 11kV electrical reticulation and associated substations in the rural sector.

b) Easements In Gross are to be provided by the land owner, in favour of the line owner, for all new or altered electrical reticulation over private property. All proposed electricity easements over private property, whether the land is owned by the developer or not, must be listed under a memorandum of Easements In Gross on the subdivision plans.

c) Substations may be located on lot boundaries or within the subdivided lots to enable an adequate electrical supply to specified or potential building sites on the allotments.

d) 400/230v electrical reticulation and service mains to individual premises shall be by underground cable unless precluded by ground profiles or other impediments in which case Council may grant dispensation for overhead cables to traverse the area concerned.

e) “Network connection points” to individual lot boundaries shall be located to provide practical and legal access for service mains to specified or potential building sites.

f) Where the length of a service mains cable exceeds 300.0m from a “network connection point” to a specified or potential building site, the electrical reticulation designer shall state on the application drawing, the proposed “service mains” cable size and design criteria applicable to the lot.

g) Subject to existing load and future development the line owner may approve the use of an existing two phase 11kV overhead line for residential and general farming purposes where it is demonstrated that three phase power is not likely to be required for the management of the land (eg, irrigation). The design of any two-phase 11kV line extension shall be to a standard whereby a third phase can be run or livened without changes to poles, cross-arms or guys.

### 10.2.7 Easements (Telecommunications and Similar)

a) It is the responsibility of the Developer to ensure that all easements are obtainable. The Developer shall, where necessary and at their expense, provide any easements and obtain any formal consents required for overhead lines, underground cabling and equipment to be installed or altered in, on, under or over property other than road reserve.

b) Easements In Gross with the line owner as the grantee/transferee shall be obtained and registered on all private land.

Easements are required in the following cases but shall not be limited to:

i. Where new “works” (lines or cables) are located on private properties.
ii. Where a padmount substation, switching station or transformer is to be located on other than road reserve.
iii. Where an overhead line located in a legal road intrudes into a privately owned property. This applies especially to crossarms and conductors where air space is encroached.
iv. Where an existing service main is physically altered, shifted or its status is changed, for example, to supply a new separately subdivided property.
v. Where a network cable is used to supply lot(s) in right-of-ways or access lots.

c) Conditions imposed in the consents granted by Council under section 220 of the RMA generally do not fully describe conditions required by the line owner particularly in relation to easements where neighbouring properties are affected by new or altered network systems. The line owner will have separate conditions that must be met to ensure, for instance, that perpetual right is gained for new or altered “works” and the status of those “works” cannot be compromised by aggrieved property owners wishing to contest the line owners interests. A risk of stranding customers is not an option.

d) Easements required on land being developed under subdivision consent must be described under a “memorandum of easements”. Land outside the subdivision and affected by new or altered network system changes must also be described in a memorandum of easements. Where lot servicing is able to be satisfied using service mains in right-of-ways or access lots, easements shall be prescribed on the deposited plan.

e) Where service mains are used to service lots on a shared right-of-way, access lot, or across private land then an easement in favour of the line owner is not required. However, an easement between the respective parcels of land is necessary with the wording “right to convey electricity, telecommunications and computer data” entered as the purpose description.

f) The line owner will not connect new “works” or allow alterations to its network system which constitutes new “work” by definition in the Electricity Act 1997, until an Easement In Gross has been acknowledged and receipted by the district land registrar on the properties affected. This requirement may be waived for subdivisions approved by Council under section 220 of the RMA where property outside the subdivided property is unaffected and subdivision deposited plans with relevant transfers are lodged to the satisfaction of the line owner

g) Works are to be vested with the line owner prior to connection and livening, and registration of the easement. A separate agreement will be required to confirm vestment conditions and will be signed by approved signatories.

h) Overhead lines require 6.0m wide easement corridors symmetrical to the actual line route.

i) Underground cables require 3.0m wide easement corridors symmetrical to the actual cable route.

## 10.2.8 Physical Location

a) Service boxes shall be set back close to section boundaries and are to be clear of designated vehicular access and pedestrian ways by a minimum of 1.0m.

b) The minimum spacing of any service box from any boundary line or survey peg shall be 150mm so as to enable future fencing construction.

c) Cable and duct locations in the road reserve area shall be in general accordance with TDC Drawing 1000, being 600mm from section boundaries at a nominal laying depth of 1.0m (900mm cover) with provision for shared trenching with communication services.

d) Cable and duct locations down right-of-ways shall, where possible be located 600mm from a boundary in a berm area where provided. Otherwise, the centre of the right-of-way is the preferred location. The standard cable depth shall be 1.0m (900mm cover) and may be in a common trench with water and communication services as shown in TDC Drawings 1000 and 1001. Individual consumer service mains cabling or ducting, within a right-of-way, shall be 600mm minimum depth as shown in TDC Drawing 1001. Any cable installed under seal within a right-of-way must be installed within a duct or with a spare duct beside it.

e) Appropriate mechanical protection shall be provided for any underground electrical reticulation in accordance with NZECP 28 (1993) and AS/NZ 3000. Cable marker warning strip shall be placed along all cable routes at half the cable trench depth.

f) In addition, where electrical reticulation cables are on private property (excluding right-of-ways), visible above ground warning markers shall be placed where cables change direction and in between not more than 10.0m spacing in all but rural areas where the minimum spacing shall not be more than 20.0m. The warning markers shall be as stated in the line owner's design and construction standards.

g) Road crossings for electrical reticulation cables shall be in 100mm minimum orange electrical PVC ducts to the line owner's requirement at a depth of 1.0m (900mm cover)

h) At all sites where cable is installed cable marker warning strip shall be placed along the cable route at half the cable trench depth unless the cable is mole-tunnelled or drilled and ducted.

## 10.2.9 Specific Installation Requirements

a) Substations shall be of adequate design capability to supply the anticipated after diversity maximum demand with due consideration to section 10.2.4.

b) Ground mounted substations will be permitted within new residential, commercial and industrial subdivisions.

c) Pole mounted substations may be permitted in rural subdivisions.

d) Pole mounted substations may be allowed in existing overhead electrical reticulation.

e) Substations shall be located in the berm, clear of designated vehicular access ways by a minimum of 1.0m and close to section frontages (but no closer than 300mm) or, in a recess into a lot or a public reserve, secured either by easement or preferably designated as road reserve. The line owner is to determine the size of the recess.

f) Adequate public protection shall be provided at all substation sites, giving consideration to:

   i. Earthing (NZECP 35);
   ii. Physical location to minimise the risk of damage by vehicles; and
   iii. Security to protect against public access to electrical contents.

### 10.2.10 Design Approvals (Telecommunications and Similar)

Prior to any works commencing on site, the following requirements shall be submitted and approved:

a) A design plan detailing the proposed electrical reticulation and street lighting.

b) The plan shall bear a design statement covering the following:

   i. Before diversity load per lot (ie, 15 kVA per residential lot).
   ii. Compliance with the line owner's design and construction standards.
   iii. Compliance with the Engineering Standards and Policies. and
   iv. A list of easement requirements for any electrical reticulation on private property to be vested with the line owner and a list of reciprocal rights for service main cables or ducts over shared right-of-ways or easements for service main cables crossing private property.

c) Line owner signed approval of the design plan.

d) Council signed approval of the design plan (for subdivision or large area electrical reticulation).

e) Prior to the 224 certification stage, the following details shall be forwarded via the Designer to Council:

   i. A letter of acceptance by the line owner confirming that:
      - As built documentation has been filed; and
      - The electrical reticulation has been livened and fulfils the line owner's design and construction standards and any other line owner requirements.

### 10.2.11 Cable Locations

(a) The location of the duct pipes, pits and manholes shall be shown on the design plan, with all variations authorised by the network line operator's representative.

(b) A shared services trench is likely to be the most economic option. Separation between the services in subdivisions is required. These will be detailed in the laying specification. However, safe working distances are required for all services within minimum separations for power cables.

(c) Table 10-2 shows the minimum clearances from power cables follows. TDC Drawings 1000 and 1001 show the general layout of services.

**Table 10-2 Minimum Separations for Power Cables**

| | At Crossings | | On Parallel Runs | |
|---|---|---|---|---|
| **Voltage and cable type** | **With protection** | **Without protection** | **With protection** | **Without protection** |
| LV, mv neutral screened, or armoured | 50mm | 150mm | 50mm<br>No limit to length | 150mm<br>No limit to length |
| LV, mv neutral screened, or armoured | 50mm | 450mm | 450mm<br>No limit to length | 450mm<br>No limit to length |
| HV, ehv single and multicore | 150mm | 450mm | 450mm<br>2.4km limit to length | 450mm<br>2.4km limit to length |
| LV = Low voltage, up to 250 volts<br>MV = Medium voltage, from 250 volts to 650 volts<br>HV = High voltage, from 650 volts to 6600 volts<br>EHV = Extra high voltage, above 6600 volts | | | | |

a) Protection shall take the form of either:

i. 50mm thick non metallic reinforced concrete slabs (usually 150mm wide and 500mm long); or
ii. 100mm x 50mm ground retention treated timber with a minimum specification of the New Zealand Timber Preservation Authority classification h4 group b; or
iii. 5mm polymeric cable cover.

b) The depth and offset of trenches will be specified on the laying plan provided by telecom. It is essential that these be maintained. Minimum cover shall generally be 450mm in footways and 600mm in roadways.

c) All services crossing the proposed duct pipe route shall be exposed and the necessary clearances maintained to enable other network line operator's ducts to be installed either above or below these other services. Telecommunication ducts shall be laid above power cables.

d) All joints in duct pipe shall be water tight and may be glue jointed with solvent cement or rubber ring seal, depending on the ducting supplied. The rubber “o” ring sealed pipe is the preferred type of duct and will replace solvent cement glued ducting in the long term.

e) The base of the trench shall be level with large objects removed. The duct pipe shall be bedded in suitable fine soil or pea metal if required. The suitability of the bedding material will be assessed by the telecom representative.

### 10.2.12 Installation of Distribution Pits

a) The pits and lids are designed to withstand light vehicular loading only. Therefore installation shall take place only in the footpath or in grassed areas within the defined kerb line. In the location of mountable kerbs they shall be located in grass areas and behind the footpath.

b) The grass berm or footpath shall be excavated to a sufficient depth to ensure that the pit lid will be level with the finished level of the surface. Once the pit has been installed the lid shall be fitted before backfilling and carefully compacted around the sides of the pit. Details will be supplied in the laying specification.

### 10.2.13 Records

a) The network utility operator shall keep and maintain as-built records of their reticulation within the road reserve and on private property where the reticulation will be owned by the network utility operator.

b) The network utility operator shall ensure that they receive and maintain as-built records of the electrical reticulation (works) and ensure that such records are made available upon request and as required, mark out cable routes on site for TDC or contractors carrying out works.

c) Provision of as-built drawings for planned works shall be free of charge to TDC and made available with 24-hours prior notice during normal working hours and for emergency call outs with no prior notice at any time.

## 10.3 Street lighting

### 10.3.1 General

a) Street lighting shall be installed in public roadways and pedestrian and cycle access ways in all residential, commercial and industrial subdivisions to the satisfaction of and vesting with Council.

b) The lighting of private rights-of-way and/or gateway structures is not a requirement.

c) Should a property owner wish to include private right-of-way lighting or lighting of a private sign or structure, all future connection, operating and maintenance costs of such lighting will be met by the property owners benefiting from the

lighting. The lights shall be electrically supplied as a sub-circuit from an appropriate residential installation.

d) Intersection street lighting in rural subdivisions shall be required as shown in the design table in section 6 and be vested with council.

e) Street lighting installations shall comply with section 10.2.10 and 10.3.2 below

f) The design shall give consideration to minimising future operating and maintenance costs and unnecessary light spill.

g) The preferred location of street light columns shall be close to lot boundaries.

h) Where abnormally wide berms or side slopes are encountered, the street light columns should be set back as far as practicable from the kerb edge.

i) Street light columns shall be kept clear of:
- any designated vehicular access or pedestrian way; and
- vegetation that impedes light output or damages the luminaire, ie, trees knocking them in windy conditions.

j) Street light cabling shall be a minimum size of 2-core 2.5mm$^2$ copper neutral screen cable with a sheath thickness of minimum 3.2mm suitable for direct burial and shall comply in all respects to the relevant requirements set down for electrical reticulation design, cabling and fusing. The cable size shall be appropriately sized for the number of light fittings and the distance of cable run.

k) Road crossing ducts shall be not less than 50mm diameter PVC electrical duct (orange) and be installed at 1.0m deep (900mm cover).

l) The on/off control of street lights in “one off” or rural situations may be controlled by a daylight switch. If any daylight switch is mounted in a lantern it must be done in such a way that the heat of the lamp will not damage the switch.

m) Where multiple lights are installed they shall be controlled by ripple control using a suitably rated relay.

n) Council will maintain a schedule of approved street light columns and lanterns that will be made available upon request.

o) Being electrical “works” and as the vested owner of streetlight cable, Council will keep such records and plans of those works as will enable Council if required, to readily locate any fittings of those works. (Current Electrical Regulations).

### 10.3.2 Design Specifications

a) Columns – NZS3404 steel structures standard AS/NZ/1702 Structural Design Actions – Wind Actions

b) Luminaries - AS/NZS60958.23 General requirements and test luminaries for roads and street lighting installation.

c) AS/NZS1158.1.1: Road lighting part 1: vehicular traffic (category V) lighting performance and installation design requirements.

i. AS/NZS1158.1.3 Road lighting part 1.3: vehicular traffic (category V) lighting guide to design, installation, operation and maintenance.

ii. AS/NZS1158.3.1 Road lighting part 3.1: pedestrian area (category P) performance and installation design requirements

**Note:**
Category V lighting is applicable to roads on which the visual requirements of motorists are dominant, eg, main traffic routes.

Category P lighting is applicable to roads on which the visual requirements of pedestrians are dominant, eg, local roads.

In new subdivisions, car parks etc power supply for street lighting shall be vested with Council by means of pilot wire from a TDC control box looped to individual lighting columns keeping all cables and fuses clear of the network line operator's boxes. These control boxes will be ripple controlled and shall be managed by TDC.

### 10.3.3 Rural/Residential Lighting – "P" Standard (Pedestrian)

a) The lighting standard used for rural/residential reflects the lower standard of lighting envisaged for these cluster styles and the mitigation potential for "glare" to surrounding areas and the unnecessary lighting of the night sky. The lighting standards may not meet the New Zealand standards but give pedestrians some guidance for walking at night and may give some benefit to road users.

b) A P4 type 6 light is generally required as per NZS1158. This may be in the form of a bollard light no lower than 800mm in height or a standard light, no higher than 5.0m.

c) The lights shall be vandal proof with no horizontal light spill. Bollards/lights shall be placed strategically at no more than 100m centres and these locations can be at changes of direction and grade of the footpath.

**Note:** Road intersections still require the mandatory flag lights to be installed.

### 10.3.4 Streetlight Data Collection

a) The Designer or the installing contractor shall submit a completed street light data collection form (see Appendix 2-5) to Council for each separate job or section of a continuing job which involves street light construction and an electronic copy of the data in MS Excel format as per Council's template (available on request).

b) The installing contractor shall provide an as-built drawing to the line owner showing the "network connection point" and the cable route (with dimensions) and a copy of the streetlight connection form to enable the line owner to update their records for line charging purposes.

c) Being electrical works and as the vested owner of the streetlight, Council will keep such records and plans of those works as will enable Council, if required, to readily locate any fittings of those works. (Current Electrical Regulations sec 59).

d) For subdivisions, the land owner will be required to meet all power supply charges for livened street lights until the final 224 certificate is issued for the subdivision.

# Section 10 Drawings

Drawing 1000 – Electrical reticulation road reserve

Drawing 1001 – Electrical reticulation right of way

Note: The drawings are **not** included in this document. They are available in PDF format or hard copy from the Engineering Secretary (03 543 8524) or email engineeringstandards@tdc.govt.nz

# 11 TELECOMMUNICATIONS UTILITIES

## 11.1 Introduction

The purpose of the telecommunications section of the Engineering Standards and Policies is to ensure that all telecommunications cabling is designed and installed to meet Council and network utility operator expectations.

The standards ensure that community expectations for telephone, broadband or other communications are met in a safe and efficient way, and that access to all underground services is achieved with a minimum of disruption.

## 11.2 Objectives

The objectives of the telecommunications utilities standards are as follows:

a) All new telecommunications cabling meets the needs of people and communities for telecommunications;

b) All new telecommunications cabling is located within public land, and/or is legally and physically protected where it is located on private property;

c) Access to underground cabling is ensured for ease of repairs and maintenance, with a minimum of disturbance;

d) The location of all telecommunication services is clearly marked;

## 11.3 Key References

All telecommunications infrastructure shall be consistent with the standards set out in Table 11-1.

**Table 11-1 External Standards and References for Electrical Utilities**

| Standard/Reference | Description |
|---|---|
| New Zealand Electricity Code of Practice | Current and voltage ratings |
| AS/NZS3000 | Electrical installations (Australian/New Zealand wiring rules) |
| Line Operator | Design and Construct and Distribution Codes |
| New Zealand Electricity Act | Design of reticulation |
| New Zealand Telecommunications Act 2001 | |

## 11.4 Design

A tentative layout of any future stages in the subdivision would assist the network line operator. This would allow the network line operator to provide for additional stages and minimise the possibility of having to re-excavate the subdivision at a later stage to install additional services.

Approval must be obtained from Council to install services in the road reserve prior to any work commencing on site. A fully detailed design plan must be submitted to Council for checking and approval purposes.

Council will only give approval for services to be installed in road reserve where the service will be owned, maintained, and remain the responsibility of an organisation which has attained “network utility operator” status.

The engineering plans are accompanied by the subdivision reticulation agreement and the required design and supervision fees.

The network design shall provide for a minimum of 10 Mbps transfer speeds with provision for this to be increased to 100Mbps without necessitating major road reserve disturbance.

Service pillars shall be set back close to section boundaries and are to be clear of designated vehicular access and pedestrian ways by a minimum of 1 meter. The minimum spacing of any service box from any boundary line or survey peg shall be 150mm so as to enable future fencing construction.

Cabinets shall be located in the berm, clear of designated vehicular access ways by a minimum of 1 meter and close to section frontages (but no closer than 300mm) or, in a recess into a lot or a public reserve, secured either by easement or preferably designated as ‘Road Reserve'.

All new residential, commercial and industrial subdivisions shall be reticulated with underground cabling running along each side of the road reserve. The Council may allow dispensation for a single sided reticulation in exceptional circumstances (eg where allotment frontages are greater than 30m in length).

## 11.5 Cable Locations

a) The location of the duct pipes, pits and manholes shall be shown on the design plan, with all variations authorised by the network operator’s representative.

b) A shared services trench is likely to be the most economic option. Separation between the services in subdivisions is required. These will be detailed in the laying specification. However, safe working distances are required for all services within minimum separations for power cables.

c) Table 11-2 shows the minimum clearances from utility cables. TDC Drawings 1100 and 1101 show the general layout of services.

**Table 11-2 Minimum Separations for Power and Telecommunication Cables**

| | At Crossings | | On Parallel Runs | |
|---|---|---|---|---|
| **Voltage and cable type** | **With protection** | **Without protection** | **With protection** | **Without protection** |
| LV, mv neutral screened, or armoured | 50mm | 150mm | 50mm<br>No limit to length | 150mm<br>No limit to length |
| LV, mv neutral unscreened, or unarmoured | 50mm | 450mm | 450mm<br>No limit to length | 450mm<br>No limit to length |
| HV, ehv single and multicore | 150mm | 450mm | 450mm<br>2.4km limit to length | 450mm<br>2.4km limit to length |
| LV = Low voltage, up to 250 volts<br>HV = High voltage, from 650 volts to 6600 volts<br>Note: LV power cable is defined in the current electricity regulations as "any voltage exceeding 50 volts a.c. or 120 volts ripple free d.c. but not exceeding 1000 volts a.c. or 1500volts d.c.<br>HV power cable is defined in the current electricity regulations as "any voltage exceeding 1000 volts a.c. or 1500 volts d.c. | | | | |

d) Protection shall take the form of either:

   i. 50mm thick non metallic reinforced concrete slabs (usually 150mm wide and 500mm long); or
   ii. 100mm x 50mm ground retention treated timber with a minimum specification of the New Zealand Timber Preservation Authority classification h4 group b; or
   iii. 5mm polymeric cable cover.

e) The depth and offset of trenches will be specified on the laying plan provided by the network line operator. It is essential that these be maintained. Minimum cover shall generally be 450mm in footways and 600mm in roadways.

f) All services crossing the proposed duct pipe route shall be exposed and the necessary clearances maintained to enable the network line operator's ducts to be installed either above or below these other services. The network line operator's ducts shall be laid above power cables.

g) All joints in duct pipe shall be water tight and may be glue jointed with solvent cement or rubber ring seal, depending on the ducting supplied.

h) The base of the trench shall be level with large objects removed. The duct pipe shall be bedded in suitable fine soil or pea metal if required by the network operator. The suitability of the bedding material will be assessed by the telecommunications representative.

## 11.6 Installation of Distribution Pits

a) The pits and lids are designed to withstand light vehicular loading only. Therefore installation shall take place only in the footpath or in grassed areas

within the defined kerb line. On mountable kerbs they shall be located in grass areas and behind the footpath.

b) The grass berm or footpath shall be excavated to a sufficient depth to ensure that the pit lid will be level with the finished level of the surface. Once the pit has been installed the lid shall be fitted before backfilling and carefully compacted around the sides of the pit. Details will be supplied in the laying specification.

## 11.7 Records

a) The network line operator shall keep and maintain as-built records of their reticulation within the road reserve and on private property where the reticulation will be owned by the network utility operator.

b) The network line operator shall ensure that they receive and maintain as-built records of the telecommunications reticulation (works) and ensure that such records are made available upon request and as required, mark out cable routes on site for TDC or contractors carrying out works.

c) Provision of as-built drawings for planned works shall be free of charge to TDC and made available with 24-hours prior notice during normal working hours and for emergency call outs with no prior notice at any time.

# Section 11 Drawings

Drawing 1100 – Telephone communication service pit depths & clearances

Drawing 1101 – Telephone communication reticulation layout

Note: The drawings are **not** included in this document. They are available in PDF format or hard copy from the Engineering Secretary (03 543 8524) or email engineeringstandards@tdc.govt.nz

# 12 RESERVES

## 12.1 Introduction

A range of reserves and walkways are to be provided throughout the district. All reserves and walkways must be accessible to both residents and visitors and shall contribute to enhancing the quality of life, access and conservation throughout the district.

Tasman District Council purchases and develops reserve land for the following management purposes:

a) Urban Open Space Reserves.
b) Amenity Reserves.
c) Walkway Reserves.
d) Sports Grounds (not usually created at the time of subdivision).
e) Formal Parks and Gardens (not usually created at the time of subdivision).
f) Scenic Reserves and Special Interest Sites.
g) Rural Recreation, Esplanade Reserves and Strips.

Note:

1. All the above reserves are classified as Scenic, Recreation, or Local Purpose Reserves under the Reserves Act 1977 but are placed into one of seven categories, reflecting their main characteristics.

2. Esplanade Strips and Access Strips created under the Resource Management Act 1991 are often a condition of subdivision, particularly on allotments less than four hectares in area which adjoin rivers or the coast.

### 12.1.1 Urban Open Space Reserves

a) The purpose of Urban Open Space Reserves is to provide local urban open space reserves within walking distance of home, providing informal passive and active recreation and play opportunities, open space and amenity values.

b) As a guide urban open space reserves should be located within 400m of all properties within a residential zone and within 5 kilometres within rural zones.

c) The minimum area of Urban Open Space Reserves shall be 2,500m$^2$ with a minimum useable area no less than 1,250m$^2$ unless otherwise agreed with the Community Services Manager prior to lodging subdivision or development applications. Urban Open Space Reserves shall require approval of the Reserves Manager prior to approval of a subdivision/development plan.

d) Urban Open Space Reserves shall have a minimum 30 metre road frontage, with good pedestrian and maintenance vehicle access.

e) Urban Open Space Reserves are intended to be developed with furniture, playgrounds or other buildings unless agreed otherwise with the Community Services Manager.

f) Reserves shall not be located on rear sections or have enclosed spaces. Reserves shall be of an even and regular shape which allows for maximum usable space and ease of maintenance.

g) Reserves shall be designed in such a way that the maximum number of allotments benefit from their provision.

h) Where appropriate natural features or features of local significance such as streams, remnant native forest or specimen trees shall be included within Urban Open Space Reserves.

### 12.1.2 Amenity Reserves

a) The purpose of Amenity Reserves is to provide for a range of community facilities, including play centres and community halls and their associated passive and active recreational activities and provide local reserves within walking distance of home, providing informal passive and active recreation and play opportunities, open space and amenity values.

b) Council shall not usually acquire land on subdivision for Amenity Reserve purposes. If, however, the situation arose where Council wished to provide an Amenity Reserve, as opposed to an Urban Open Space or Rural Recreation Reserve, the area and location of the Amenity Reserve shall be negotiated with Council prior to lodging subdivision/development applications.

c) Amenity Reserves shall be used to provide for a range of community activities, including play centres and halls, and the construction of buildings and facilities shall be permitted with prior approval of Council.

d) Amenity Reserves shall have a minimum 20 metre road frontage, with good pedestrian access and access for maintenance vehicles.

### 12.1.3 Walkway Reserves

a) The primary purposes of Walkway Reserves are to:

- Provide walkways and tracks to offer recreational walking and cycling opportunities consistent with the objectives and policies of the Tasman Resource Management Plan and the Regional Cycling and Walking Strategy 2005; and

- retain and enhance conservation values, using native species where possible, to provide corridors of wildlife habitat through urban and rural areas.

b) Walkway Reserves shall be established where key linkages are identified by Council to assist the creation of loop walkways, provide access to rivers and the coast, between roads, and to link locations (such as reserves) where

recreational opportunities can be provided (i.e. open space areas, play equipment, formal parks and gardens and sports fields).

c) Access ways or road reserve shall be created where the walkway provides a link between two roads.

d) Local Purpose Reserves shall be created where the walkway provides a link to an Urban Open Space or Rural Recreation Reserve or school.

e) Walkways shall be planned so that sightlines are maintained and way-finding is clear. Design of walkways through underpasses shall be avoided but where unavoidable, shall be short, straight and wide with bright lights. Blind corners leading into and out of the underpass must be avoided so that the user can have clear sightlines on entering and exiting the underpass.

f) The walkway formation, surface and structures shall comply with NZSHB8630.

g) The provision of fencing and/or amenity plantings shall vary throughout the District and shall require approval of the Reserves Manager prior to approval of a subdivision or development.

h) The minimum width of a walkway reserve shall be 6 metres unless agreed otherwise with the Community Services manager. The width may vary depending on the location and the expected level and type of use.

i) Existing vegetation shall be retained and/or enhanced in a manner which does not hinder pedestrian access.

### 12.1.4 Scenic Reserves and Special Interest Sites

a) The primary purposes of Scenic Reserves and Special Interest Sites are to:

- protect and preserve specific natural landscapes and provide a range of recreational experiences appropriate to the particular park.
- focus on the retention of natural character, the development of facilities has a lower priority.

b) The area and boundaries of any Scenic Reserve or Special Interest Site shall be negotiated with Council prior to lodging subdivision/development applications. All Scenic Reserves or Special Interest Sites shall require the approval of the Reserves Manager prior to approval of a subdivision/development plan.

c) The Scenic Reserve or Special Interest Sites shall be free of pest plants and other specified unwanted vegetation.

### 12.1.5 Rural Recreation Reserves

a) The primary purposes of Rural Recreation Reserves are to provide open space to enhance and conserve the environment and provide waterway access and a

range of casual recreation opportunities.

b) Rural Recreation Reserves may be provided with public toilets, rubbish disposal and picnic facilities where required

c) The area and location of Rural Recreation Reserves shall be negotiated with Council prior to lodging subdivision or development applications. Reserves shall require approval of the Reserves Manager prior to approval of subdivision or development plan.

d) Rural Recreation Reserves shall have a minimum 30.0m road frontage, with good pedestrian access and access for maintenance vehicles

e) Rural Recreation Reserves shall allow for maximum usable space and ease of maintenance.

### 12.1.6 Esplanade Reserves

The primary purposes of esplanade reserves are;

a) to contribute to the protection of conservation values by, in particular;

- maintaining or enhancing the natural functioning of the adjacent sea, river, or lake; or
- maintaining or enhancing water quality; or
- maintaining or enhancing aquatic habitats; or
- protecting the natural values associated with the esplanade reserve; or
- mitigating natural hazards; or

b) to enable public access to or along any sea, river, or lake; or

c) to enable public recreational use of the esplanade reserve and adjacent sea, river, or lake, where the use is compatible with conservation values.

Esplanade Reserves may be vested in the Crown under Section 237D of the RMA.

Esplanade Reserves shall be recommended on all allotments less than four hectares where the sea, river or lake is not subject to erosion or coasts which, due to gradient, are very susceptible to changes as a result of sea level rise. Esplanade reserves shall have a minimum width of 20.0m unless public access and the protection of conservation values can be adequately achieved within a reduced width.

On allotments greater than four hectares esplanade reserves are recommended where there are special conservation values to be protected or enhanced or where public access is considered a priority and where the level of compensation is considered appropriate.

The width of Esplanade Reserves shall be negotiated with Council prior to lodging subdivision or development applications. All Esplanade Reserves shall require the approval of the Reserves Manager prior to approval of a subdivision.

### 12.1.7 Esplanade Strips

The primary purposes of esplanade strips are;

a) to contribute to the protection of conservation, in particular values by;

- maintaining or enhancing the natural functioning of the adjacent sea, river, or lake; or
- maintaining or enhancing water quality; or
- maintaining or enhancing aquatic habitats; or
- protecting the natural values associated with the esplanade reserve; or
- mitigating natural hazards; or

b) to enable public access to or along any sea, river, or lake; or

c) to enable public recreational use of the esplanade reserve and adjacent sea, river, or lake, where the use is compatible with conservation values.

Esplanade Strips shall be taken along coastal and river margins which are subject to erosion with the purpose of ensuring continued public access over time.

Esplanade Strips shall have a minimum width of 20.0m unless public access and the protection of conservation values can be adequately achieved within a reduced width.

## 12.2 Presentation of Reserves to Vest

Land to be vested for reserve purposes shall be presented for vesting in a manner which at a minimum achieves the following:

a) All boundaries are to be surveyed and clearly pegged.

b) The land is to be free of pest plants, tree stumps (above ground), surface rocks (unless rock formations provide a feature) and other specified unwanted vegetation.

c) The land shall be stable and not subject to a high erosion risk.

d) Any existing specimen and riparian vegetation and habitats that the Reserves Manager considers will contribute to the amenity and conservation value of a reserve are to be left in place.

e) Coastal margins and stream banks must be presented in a stable state, with either soft or hard engineering solutions provided subject to the approval of the Community Services Manager.

f) All land subject to earthworks shall be covered with 150mm topsoil and sown in an approved dwarf rye grass mix, with a minimum 80% coverage.

g) Grassed areas should be free of pest plants and mown to 75mm at least twice before presentation.

h) All previous fences, farm utilities etc., building remains and rubbish are to be removed or disposed of to the satisfaction of the Council.

i) A kerb crossing to residential access standard shall be provided on a case by case basis at an approved access point for service vehicles to the reserve. Crossings shall be reinforced and not located adjacent to boundaries.

## 12.3 Reserve Development

### 12.3.1 Pedestrian Access

Where a Pedestrian Access Strip is required between two urban properties for a distance of 20.0m or more, the access strip shall have a minimum width of 6.0m with the formation standard subject to agreement with the Reserves Manager. Any reduction of the width of the access strip shall be subject to the agreement of the Reserves Manager.

Pedestrian paths should have a minimum of 1.4m-2.0m width. Paths catering for cyclists should have a minimum width of 2.0m.

The access formation, surface and structures shall comply with NZSHB8630.

### 12.3.2 Vehicle Barriers, Fencing, Lighting, Signs, Park Furniture and Services

The provision of barriers, fencing, lighting, signs, park furniture and services shall be dealt with on a case-by-case basis at the discretion of the Reserves Manager. If agreed, the developer shall provide specified facilities in general accordance with the following standards:

### 12.3.3 Vehicle Barriers

Vehicle barriers may be provided to control unauthorised vehicles. This may be in the form of a standard non-mountable kerb or a physical vehicle barrier or bollards (see TDC Drawings 623 to 625). Vehicle barriers should meet the following objectives:

a) prevent vehicles from accessing reserve land;

b) continue to allow pedestrian access and bicycle access if appropriate;

c) be of a design that ensures uniformity with other reserve structures, does not adversely affect the visual amenity of the area, and is able to withstand or discourage vandalism pressure.

### 12.3.4 Fencing

A permanent fence may be required between the reserve and adjacent properties.

Any fence shall meet the following objectives:

- provide physical separation of the reserve from private land; and
- maintain views from neighbouring properties onto the reserve.

The construction standard of reserve accessway fences shall be negotiated with the Reserves Manager on a case-by-case basis. All boundary fencing shall meet the obligations within the Fencing Act 1978.

### 12.3.5 Lighting

Lighting may be required in some Urban Open Space Reserves. Lighting shall be provided in a manner that is not obtrusive and does not adversely affect the aesthetics of the reserve. Consideration shall be given to the brightness, placement and coverage of any lights to ensure adequate illumination where necessary and to prevent adverse effects on adjacent landowners from light spill.

Lighting standards for reserves shall be provided with the approval of the Reserves Manager and shall comply with Category P of NZS1158.

### 12.3.6 Signs, Park Furniture, Services

Urban Open Space and Rural Recreation Reserves may have signs, park benches or tables and rubbish bins.

Provision of these facilities will be negotiated with the Reserves Manager and will be provided on a case-by-case basis.

Urban Open Space and some Rural Recreation Reserves shall be provided with a 20mm diameter water service supply at the boundary. A 100mm diameter sewer connection may be provided to service the reserve at the discretion of the Reserves Manager.

## 12.4 Planting

The provision of amenity planting on reserves to vest shall be provided at the discretion of the Reserves Manager.

Any planting shall be designed to:

a) define space;

b) provide shade and shelter;

c) achieve open space and not impede visibility;

d) control erosion;

e) enhance the recreation and amenity values; and

f) provide habitat and encourage bird life.

All plantings shall be provided in a manner that creates pleasant spaces for active and passive recreation, while maintaining enough openness to maintain a safe environment.

# 13 CONTACT US

If you have any queries about any aspect of these Engineering Standards & Policies 2008 please contact the appropriate Council staff at one of the following locations:

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