



## Specifications

### 1 Preliminary and General

#### 1.1 The Customer Comes First... Working with Tauranga City Council

The following is a summary of “the way we do things at Tauranga City Council”.

It explains in general terms:

- what the city expects from Council
- how we work as an organisation
- the role you could play in helping us achieve our goals for the city

What we do...

Tauranga City Council’s job is to promote the social, economic, environmental and cultural well-being of Tauranga and enable democratic local decision making.

To achieve this we do things like:

- Identify and help solve local needs
- Advocate on behalf of the community
- Develop and manage community assets in a sustainable way
- Plan for the future
- Regulate and fund activities that benefit the community
- Monitor our own progress, performance and achievement
- Keep the community well informed of issues affecting it
- Help people get involved in local decision making

How we do it...

The customer is our first and most important priority at Tauranga City Council. We try very hard to provide outstanding customer service every time. This is done by meeting clearly stated customer service performance levels that encourage us to:

- Be easy to contact
- Listen and learn from customers
- Work with customers to find solutions
- Explain our decisions
- Respond and update customers accurately and promptly
- Give consistent and reliable service
- Keep our promises
- Learn from our mistakes
- Continuously improve our services
- Be friendly and professional

We take pride in making a positive difference to the community in which we live.

What we expect from you...

As an agent of Tauranga City Council we expect you to provide a similar level of customer service. It is essential that the community can rely on consistent performance from Council and anyone acting on our behalf. If you have any questions about what this means for you, please call us on 577 7000.

## **1.2 Site of Works**

The Site is located at the at the base of Mauao or Mount Maunganui, this can be reached by following Maunganui Road from the State Highway Roundabout of Hewletts Road and Maunganui Road heading North.

## **1.3 Principal's Hazard Identification**

The Principal is aware of the following hazards that may be encountered by the Contractor:-

- Working near water and soft ground
- Proximity of public to the works on highly used and visible site
- Maintenance staff/vehicles/machinery

A list of hazards particular to Mauao will be given to contractor and an induction to site undertaken by Mauao Ranger Mark Ray prior to beginning works.

## **1.4 Extent of Contract**

The Contract Works comprise of all construction work required to resurface the Mauao Base Track in accordance with the Drawings and Specifications. The work includes but is not limited to:

- Preparation and Implementation of a Environmental, Health and Safety Plan and Quality Plan;
- Site earthworks and subgrade preparation;
- Import and placement of fill material to form a footpath sub-base;
- Placement of geotextile(Where required);
- Import and placement of metal course to form footpath;
- Testing of subgrade and metal course;
- Installing culverts;
- Grassing, establishment and
- Incidental works.

The supply of all plant, materials and labour necessary to complete the Contract Works shown on the Drawings or described in the Specification.

## **1.5 Drawings**

The following drawings are included and form part of the Contract Documents:

- Aerial Plan showing locations of works and distances
- Photos 1,2,3 showing working in proposed area
- Standard cross-sections of walkways on the flat and also detail showing drainage and pipe works

The Contractor shall inform the Engineer immediately of any apparent errors, inconsistencies or omissions in any of the Drawings. The Engineer will respond to any such information within two Days by means of clarification, confirmation or instruction.

The Contractor shall maintain one full set of figures at the Site at all times specifically for recording As-Built locations and details. One full set of the marked up Drawings shall be supplied to the Engineer by the Contractor on completion of construction with all as-built information marked up legibly in red.

## **1.6 Specifications**

The following specifications form part of the Contract Documents in order of precedence:

Section 1 : Preliminary and General Drawings

Section 2 : Technical Specifications  
Tauranga City Council I.D.C

## **1.7 Site Huts and Toilet**

The Contractor shall provide site huts for the use of his own staff and a sanitary toilet for use of all site personnel.

## **1.8 Power Supply**

The Contractor shall make its own arrangements for a temporary power supply and pay all associated charges.

## **1.9 Water Supply**

The Contractor may either make its own arrangements for a temporary water supply or may make application to Tauranga City Council for a temporary connection. If the latter, Council's standard connection fee will be levied for installation of the temporary service and the Contractor shall pay the normal metered charge for water consumed.

Water may not be taken from a fire hydrant without written approval from Tauranga City Council.

## **1.10 Permits, Fees, Charges and Levies**

The Contractor shall make application for all permits required and pay all fees, charges and levies applicable except that no building permit fee will be required.

## **1.11 Hours of Work**

No Contract Works shall be undertaken, excluding emergency works, between the hours of 7.00 pm to 7.00 am, nor at any time on a Sunday or public holiday without the prior written permission of the Engineer.

## **1.12 Survey and setting out**

The Contractor shall be responsible for setting out. An electronic copy of the alignment will be issued by the Engineer for setting out purposes. The initial set out shall be in conjunction and agreement with the Engineer. The Contractor shall be responsible for maintaining the established set out for the duration of the Works.

The extent of clearing is to be confirmed by the Engineer prior to the removal of any trees, vegetation, buildings and/or structures.

The Contractor should undertake survey during and following construction as required for measuring purposes. It is the Contractor's responsibility to undertake the measurement of levels before the next stage of construction commences.

The Contractor will ensure sufficient gradients of the completed works are such that it does not cause stormwater ponding or change any existing drainage paths.

### **1.13 Noise levels**

Permitted construction noise levels shall be the lesser of those required by the local District Plan and those set out in NZS 6803:1999 "Acoustics – Construction Noise".

### **1.14 Access**

Access to the site shall be arranged with the Mauao Ranger Mark Ray

All accessways shall be reinstated to the existing standard or better at the completion of the Works.

### **1.15 Existing services**

It is possible there will be existing services on site additional to those shown on the Drawings. The Contractor shall proceed with all due care to avoid disruption or damage to any services or utilities that may be present on the Site, and shall advise the Engineer immediately if any existing services or utilities are found or damaged.

### **1.16 Protection of adjoining public and private property**

The Contractor shall take all necessary care to prevent damage to adjoining public and private property. Any material and rubbish dropped on public or private property shall be removed immediately. No plant, buildings, rocks, earth, slurry, vegetation or other materials shall be placed or allowed to roll, wash, slide or blow across the "Extent of Site" boundaries. The boundaries will be indicated to the Contractor by the Engineer prior to the commencement of work.

### **1.17 Maintenance of Works**

Maintenance of the works includes but is not limited to the following:

- Prevention of erosion and scour, and the restoration of works that has been affected by such.
- Monitoring and maintenance of silt retention devices.
- Monitoring and rectifying any work that has failed due to poor construction or material failure.
- Keeping existing roads and access ways trafficable and free of mud, dust and other debris.
- Grass mowed and maintained at a length between 35 and 50mm.

### **1.18 Resource Management Act**

The Contractor shall execute the Contract Works in accordance with the Resource Management Act.

The Contractor shall programme his operations and construct the Works to ensure that he fully complies with the dust, sediment and erosion control methods outlined in the EBOP erosion and sediment control guidelines.

### **1.19 Safety during construction of the works**

The Contractor shall be responsible for all matters which affect the safety and security of the Site and its employees on the Site. The Contractor shall recognise its accountability and responsibility for the safety of its staff and the staff of others within the confines of the Site.

The Contractor shall exclude all public from the works area. This shall entail as a minimum fencing off access to work areas while undertaking works.

At the end of each day the works shall be made safe for people to use the area.

The Contractor shall observe and comply with all relevant legislative safety precautions including:-

- the Health and Safety in Employment Act and its Regulations
- the Guidelines for the provision of facilities and general safety in the Construction Industry
- the approved Code of Practice for Safety in excavation and shafts for foundations, where relevant
- the requirements of the relevant local authorities,
- specified operating procedures and
- any other conditions which may be agreed to at the Site prior to the issue of any work permit.

The Contractor shall submit for approval a site specific Safety Plan and Site Hazard Identification Schedule, prior to commencement of the work, in accordance with the Health & Safety in Employment Act and its Regulations. The Contractor's Health and Safety Plan shall include:

- a) the identification of a suitably qualified and experienced full-time on site Safety Supervisor
- b) details of how the Contractor will advise his employees of both general and site specific hazards, the means of mitigation and his method of continual monitoring and recording of employees knowledge of and protection from such hazards

The Contractor's attention shall be drawn to Tauranga City Council's health and safety requirements in the Special Conditions of Contract Part B.

A copy of the Contractor's site specific safety plan, including site related training programmes and reporting arrangements shall be provided to the Principal and another copy shall be kept on site at all times for inspection by employees, contractors, the Principal, site visitors and the Engineer. The Contractor shall also forward Health and Safety Plans for all on-site sub-contractors (if any) to the Principal along with the Contractors formal review and acceptance thereof.

The Contractor shall furnish the Engineer with written advice of every personal injury to its own and/or sub contract staff and other accidents that result in loss of progress and/or damage to property.

## **1.20 Programme**

### **1.20.1 General**

The Contractor shall maintain close liaison with the Engineer so as to avoid interference to operations of the Principal's existing installations and to minimise any delays to the Contract Works.

The Contractor shall employ as many workers as are necessary to complete the Works by the Due Date for Completion.

The Contractor shall at all times maximise efficient use of its workforce having regard to actual and expected weather conditions and shall keep the Engineer informed of the planned use of the workforce.

### **1.20.2 Submission of programme**

Prior to commencing work the Contractor shall submit a programme in the form of a bar chart programme and schedule of the proposed work flow. The Contractor shall submit at intervals not exceeding 2 weeks, and in any case with every payment claim, an updated bar chart (in an acceptable form) depicting the progress for all operations, and shall remain responsible for ensuring that the scheduled completion date is achieved.

The programme shall clearly delineate each activity for timing and duration of inputs required from other parties and the earliest and latest starting and finishing times for each activity. The Contractor shall allow to resource the work such that the Due Date for Completion given in the First Schedule to the Conditions of Contract is met, and mobilise additional resources as necessary.

### **1.20.3 Acceptance of programme**

The Engineer will review the programme within 5 Days after receipt of the programme and if, in the opinion of the Engineer, the programme requires amendment so as to make it comply with the requirements of the contract, or to take account of changed or changing circumstances, or for any other reason, then the Engineer will require the Contractor to effect such amendments within 5 Days.

### **1.20.4 Programme review meetings**

The Engineer will schedule on a weekly basis, or at periods otherwise agreed by the Engineer and the Contractor, a programme review meeting to be held on Site or at another convenient location. This review will deal with all matters which have already resulted in, or are likely to cause, deviations from the programme.

### **1.20.5 Amendments to programme**

Where in the opinion of the Engineer the Contractor's progress has deviated from the programme to the extent that it no longer reflects the true situation, the Contractor shall prepare, within the next review period, an amended programme incorporating the latest information. When agreed, this programme shall become the current programme. Acceptance by the Engineer of any programme does not relieve the Contractor of any of his obligations and liabilities under the contract.

### **1.21 Inspection and approval**

In addition to the requirements for inspection contained elsewhere in the contract, the Contractor shall give the Engineer at least 1 working day's (and not less than 24 hours) notice that he wishes to proceed to the following stages of the Works.

- a) Establishment on site, setout and commencement of work;
- b) Completion of subgrade;
- c) Testing of any part of the Works as required under the Contract;
- d) Following pavement construction;
- e) Completion of topsoiling prior to the sowing of grass;
- f) Inspection for Practical Completion;
- g) Defects Liability Completion.

The Contractor shall not proceed to any stage of the Works until the Engineer has inspected, approved and where necessary measured the Works at the previous stage.

### **1.22 Approved materials**

In all cases where plant or equipment of "approved" design or make is required by the terms of the Specification and/or Drawings, the Contractor shall obtain the approval of the Engineer in writing before such plant or equipment is constructed or ordered.

Where the Contract requires the Contractor to work in accordance with a given manufacturer's recommendations or requirements, the Contractor shall contact the manufacturer(s) and/or supplier(s) concerned, ascertain the relevant criteria and where appropriate arrange for the manufacturer's representative to be on Site while the relevant work is undertaken.

In all cases where a particular brand or product is specified, the Contractor may, subject to the approval of the Engineer, and at no additional cost to the Principal, substitute an alternative product or brand of the same kind, size and equal or better quality.

### **1.23 Clean up on Completion**

During the course of construction the Site shall be kept as clean and as tidy as possible, and any damage caused to any property or existing works or services shall be rectified immediately.

On completion of the Contract Works, the Contractor shall remove all plant, surplus or waste materials from the Site and leave the Site clean and tidy and in as good a condition as it was at the Date of Acceptance of Tender.

### **1.24 As-Built Drawings**

Where as-built drawings are required in section 5.18.1(a) of Part A – Specific Conditions of Contract, the Contractor shall provide the following information to the Engineer:

- Where the Contractor is not responsible for the design, a complete set of construction drawings, neatly marked up in red ink with all as-built information where it differs from the information shown on the set issued by the Engineer for

construction shall be provided. Both draft and final as-built drawings shall be prepared in this format.

- The Contractor shall also provide electronic as-builts of the alignment of the footpath in accordance with TCC's Code of Practice for Development Appendix A.

### **1.25 Advertising and publicity**

The Contractor shall not use or cause to be used any advertising or publicity matter, photographs, notice boards or other media in connection with the Contract Works without the prior approval in writing of the Principal.

### **1.26 Statutes and Regulations**

The Contractor shall at all times during the period of the Contract comply with the provisions, obligations and requirements of all relevant statutes and bylaws. In particular:

- Resource Management Act 1991
- Health & Safety in Employment Act 1992
- Construction Act 1959 & Construction regulations 1961
- Building Act 1991 and Building Regulations 1992

## **2 Technical Specification**

### **2.1 Bulk Earthworks**

#### **2.1.1 Scope**

This section covers all the works necessary to cut and fill the Site to the required levels, grades and standards. Works covered include:

- a) Clearing the site
- b) Stripping grass and topsoil
- c) Excavation of unsuitable materials to waste or designated areas
- d) Cut to waste or fill
- e) Controlled filling using on-site or imported approved materials
- f) Topsoil placing

#### **2.1.2 Standard Specifications, Resource Consents and Guidelines**

Construction work performed under this Section shall :

- a) Be carried out in accordance with Transit New Zealand (TNZ) Specification F/1 : 1997 except where modified in this Specification
- b) Comply with the general requirements of the latest revisions of the following documents :

NZS 4402 : 1986	Methods of Testing Soils for Civil Engineering Purposes
BS 1377 : 1999	Methods of Test for Soils for Civil Engineering Purposes
NZS 3111 : 1986	Methods of Test for Water and Aggregate for Concrete
NZS 4407 : 1991	Methods of sampling and Testing Road Aggregate

- c) Comply with the general requirements of the latest revisions of all other Standards, specifications and Codes of Practice referenced in these Contract Documents
- d) Comply with the specific requirements of this Section and the Contract Drawings
- e) Be carried out in accordance with the "Erosion and Sediment Control Guidelines for Land Disturbing Activities, Guideline No. 2001/03" September 2001, issued by EBoP.

The Specification shall be read in conjunction with the above Standards and documents, which are deemed to form a part of this Specification. In the event of any requirements of this Specification being at variance with any of the above Standards and documents then the requirements of this Specification take precedence.

#### **2.1.3 Definition of Fill Types**

##### **2.1.3.1 Bulk Fill**

Defines all general fill placed to form the required levels and to provide founding for the structures, access roads, services and similar. Bulk fill shall be a well graded coarse sand or gravelly sand with up to 20 mm maximum characteristic dimension. Bulk fill shall contain no unsuitable material, rubbish or topsoil. It shall not be

placed at slopes no steeper than 1V:3H unless otherwise instructed by the Engineer.

The Contractors shall advise at the time of tender his proposed bulk fill material.

#### **2.1.3.2 Granular Fill**

Defines a well graded aggregate, with slightly weathered to unweathered fragments of rock up to maximum 65 mm characteristic dimension and which is relatively free of fines and other mineral matter such that when compacted the rock fragments can achieve point-to-point contact. Rock is as defined in TNZ F/1, (i.e. any igneous, sedimentary, or metamorphic stone which is solidly bonded, or cemented together and which occurs in masses, ledges, seams, or layers).

#### **2.1.3.3 Unsuitable Material**

Defines material that is either organic material, other than topsoil, within cuts or fill areas, or material which by its inherent nature cannot be satisfactorily reconditioned by wetting and drying for use as Rock, Structural, Buttress, Bulk or Landscape fill. Unsuitable materials shall be placed in areas designated on the Contract Drawings, placed in on-site stockpiles, sent to an off-site disposal area or otherwise disposed of as instructed by the Engineer.

#### **2.1.3.4 Rubbish**

Rubbish is defined as inorganic material e.g. steel, concrete, plastic, refuse and other debris found during cut and fill operations and is categorised as Unsuitable Material unless otherwise approved by the Engineer.

#### **2.1.3.5 Topsoil**

Topsoil is defined as the layer of organic material immediately below the ground level that is unsuitable for use as Bulk, Rock, Structural, Buttress or Landscape fill, but which is considered by the Engineer to be suitable for re-spreading as a surface soil layer for establishing vegetation growth at the completion of the works.

### **2.1.4 General Requirements**

#### **2.1.4.1 Drainage Control**

All earthworks shall be carried out in fully drained conditions with no free water on the working surfaces. All preparatory excavation work and subsequent excavations in borrow areas or areas to be filled shall be kept effectively drained at all times. Cut and fill areas shall be sloped and graded adequately at all times so that they do not pond water or allow water to infiltrate. Temporary drains shall be installed or pumping carried out as necessary on a regular basis to remove or deflect water from the areas of operations, or to drain water as soon as it is seen to pond. If the Contractor considers it impracticable to maintain excavations or areas to be filled in a fully drained condition he shall propose, for the Engineer's approval, any measures to revise these drainage requirements.

Any fill or final excavation surface materials which have been allowed to become too wet or soft shall be removed and dried, or replaced. All fill surfaces shall be graded and rolled at the end of each day's work to prevent any ponding and erosion. Prior to commencement of the following day's filling operations, the previously graded and rolled surface shall be scarified by approved plant to remove

any softened materials and to prevent the formation of sub-standard, or weak layers within the fill.

#### **2.1.4.2 Erosion and Sediment Control**

Earthworks shall be undertaken in a controlled manner so that erosion of disturbed areas is kept to a practical minimum and eroded material is confined on site as far as possible. Haul roads shall be treated as disturbed areas. Without exception, any stormwater from disturbed areas shall be directed to temporary retention areas with erosion and sediment controlled in accordance with EBoP's "Erosion and Sediment Control Guidelines for Land Disturbing Activities, Guideline No. 2001/03".

Any necessary temporary silt control measures for a particular area of the Works shall be in place and operational before commencing any earthworks in that area. It is anticipated that as a minimum a bund formed of stripped topsoil will be formed on the downhill side of the excavation area with controlled outlets. The silt control measures shall be adequately maintained throughout the period of any earthworks in that area. Wherever possible, clean water from catchment areas above any exposed earthworks areas shall be diverted around those areas in order to avoid contamination and reduce erosion.

#### **2.1.4.3 Dust Control**

Earthmoving shall be carried out and cut/fill areas maintained so that dust is not raised near or blown over the working area and adjacent properties. The sites shall be kept watered as necessary to meet this requirement until covered by dust-free materials, mulch, or established grass cover.

#### **2.1.4.4 Clearing and Removal of Vegetation and Rubbish**

The Contractor shall remove all vegetation from the area of earthworks, and shall clear all obstructions and rubbish from the area of the Works except those specifically identified by the Engineer as remaining. Clearing shall mean the removal of all growth, (other than grass and weeds), extraction of stumps, and rubbish. Extraction of stumps (if any) shall remove all roots greater than 25 mm diameter. The removal of grass and weeds shall be provided for under removal of topsoil.

Rubbish shall be removed offsite or placed in a location on-site approved by the Engineer.

Care must be exercised to prevent clearing of designated bush or trees and to restrict clearing to only those areas designated in the Contract Drawings, or as approved by the Engineer.

#### **2.1.4.5 Interpretation of Contract Drawings**

Contract Drawings generally show earthworks with batter intersecting original ground at a sharp change in direction. The Contractor shall round off all the tops of cuts and bottoms of fill batters and shall shape ends of cuts, fills and water table turnouts so as to blend into the surrounding topography. Particular care will be needed at the end of benches to meet any requirement for access whilst blending into the surrounding landform and providing control of stormwater runoff.

The Contractor shall be responsible for setting out the earthworks to the required set-out given in the Contract Drawings, or as otherwise instructed. The actual

limits of the works shall be defined on site prior to work commencing, and shall define on site, in advance of any stripping, clearing, or earthworks, the actual limits of the earthworks, clearing and stripping. Should the Contractor identify discrepancies between the Contract Drawings, or as otherwise instructed, and the actual ground profiles when setting out the works then they shall immediately bring such discrepancies to the notice of the Engineer.

#### **2.1.4.6 Over-excavation**

The Contractor shall direct their operations to avoid excavating beyond designated profiles except where specifically instructed. Any excavation beyond these profiles carried out without the express instruction of the Engineer shall be made good, to the approval of the Engineer, with any necessary additional subsoil drainage and appropriately placed, compacted and structurally keyed fill of equal quality to the excavated profile. Such works shall be at the Contractor's own cost.

#### **2.1.4.7 Preservation and Maintenance**

The Contractor shall preserve and maintain all earthworks, including partly completed earthworks, within their relevant specified standards, and shall make good, at his own cost, any earthworks which have deteriorated below the specified standards.

The Contractor shall carry out the works so as to minimise passage of construction plant over areas of fill or cut formed to final profiles. Areas of fill or cut that are softened or otherwise damaged due to repeated passage of construction plant shall be undercut and replaced. The Engineer shall inspect and approve the depth and extent of any such undercutting and the requirements for the replacement materials, which will be at the Contractor's own cost.

#### **2.1.4.8 Tolerances**

All earthworks shall be carried out to the lines, levels and grades shown on the Contract Drawings or as otherwise instructed by the Engineer. The accuracy of surfaces to be overlain by metal courses or by concrete structures shall be such as to preserve the minimum thicknesses of the overlying layers. Tolerances shall otherwise be as follows:

- |                          |                    |
|--------------------------|--------------------|
| • Pathway Finished Level | +20mm to -0mm      |
| • Pathway Subgrades      | +10 mm to - 30 mm  |
| • Batters                | 0 mm to +100 mm    |
| • Other Surfaces         | -50 mm to + 100 mm |

#### **2.1.4.9 Inspections and Approvals**

Before cut is commenced or fill is placed in any area, including borrow areas, the Engineer shall be notified so that he can inspect the stripped surface and instruct whether further excavation and/or undercutting and backfilling is required or other works such as drainage are necessary. No cut or fill shall be undertaken in an area until such inspections of the stripped surface, and any other works that may be required below the stripped surface, have been made and the Engineer has approved the commencement of cut and/or fill.

The Contractor shall allow sufficient time for any subsurface and surface inspections and shall programme his operations and provide drainage, access and survey control so that any further works instructed prior to any filling can be carried out in an orderly manner without delay or damage to the works.

Where there is a delay of more than 24 hours between approval of a stripped area and placement of fill, or rainfall has occurred within the vicinity of the stripped area, the Contractor shall obtain a new approval of the surface finish from the Engineer. The surface shall be maintained in its approved condition until filled over.

#### **2.1.4.10 Haul Roads**

The Contractor shall utilise the alignment of the footpath as the haul route for the Works.

The construction and use of haul roads shall not compromise the construction and future integrity of the permanent works.

#### **2.1.4.11 Temporary Stockpiles**

In order to minimise the potential for slope instability the Contractor shall only place stockpiles in locations approved by the Engineer. Any stockpiles shall be constructed to be free draining with overall grades and profiles such as to avoid ponding and minimise erosion. The Contractor shall employ a suitable dust control measures on all stockpiles.

### **2.1.5 Excavation**

#### **2.1.5.1 General**

Excavation includes removal of topsoil, excavation to form the cut profiles shown on the Contract Drawings where necessary, and removal of unsuitable materials and rubbish.

#### **2.1.5.2 Removal of Topsoil**

The Contractor shall strip all grass, weeds, turf, organic topsoil, roots and the like from the areas subject to earthworks before other operations commence in these areas. The stripped topsoil shall be separated from other stripped material and separately stockpiled for future reuse in locations shown on the Contract Drawings or areas otherwise approved by the Engineer. The stockpiles shall have maximum heights of 2 m, with slopes not steeper than 1V:2H and all changes of grade rounded to conform generally with the surrounding landscape.

The Contractor shall use appropriate equipment and procedures so as to avoid contaminating or otherwise affecting the topsoil's potential for reuse.

The depth of topsoil stripping shall be sufficient to remove all organic material, turf and significant plant roots to expose soil containing an insignificant amount of organic material to the approval of the Engineer. Except where limited by boundaries, existing works or other limiting features, topsoil stripping shall extend 1 metre beyond the limits of areas subject to earthworks or construction. The Contractor shall determine the proposed stripping depth prior to starting operations, and shall avoid unnecessary over-excavation.

#### **2.1.5.3 Excavation Management**

Cut areas shall be progressively excavated to form a uniformly graded surface within the batter limits. The Contractor shall form the excavations in a logical and orderly manner to minimise wastage and shall undertake continuous visual inspections of materials as they are excavated. Any unexpected variations in

material types or properties, evidence of slip debris or slope instability or observations of buried vegetation, groundwater flows, or seepages should be immediately reported to the Engineer.

The earthworks shall be managed so the appropriate materials are used for the various fill types specified for use in the Contract Documents. The Contractor shall plan his earthworks carefully so as to optimise the use of the available fill materials. In particular the Contractor shall assess the volumes of different materials available, their locations relative to proposed fill areas and the degree of drying and conditioning required for the various materials.

All earthworks surfaces shall be sealed off when rain is imminent to minimise erosion and protect exposed materials from strength loss due to increase in moisture content.

#### **2.1.5.4 Cut to Waste**

All cut material other than topsoil and that required for fill or backfill shall be carted to an on-site dump area designated in the Contract Documents or approved by the Engineer. The dumped material shall be track rolled and levelled to the level of the surrounding ground, or as directed.

#### **2.1.5.5 Cut to Fill**

The Contractor shall propose excavation methods and material handling procedures for the Engineers approval as to ensure that the proposed fill materials are not contaminated by organic material or other unsuitables.

The Contractor shall work the excavation and filling operations in a logical and orderly manner so as to minimise wastage and to achieve the surface elevations, grades and levels shown on the Contract Drawings or otherwise specified or instructed by the Engineer for the borrow area.

The Contractor shall undertake continuous visual inspections of materials and shall immediately report to the Engineer any visual changes, slope movement or groundwater that affects the borrow source.

#### **2.1.5.6 General Undercutting**

The requirements for general undercutting, i.e. within gullies, for the fill foundations and below areas of cut, shall be as follows:

- a) All organic materials, other unsuitables, materials with an undrained shear strength of less than 80 kPa, or otherwise shown on the Contract Drawings, or instructed by the Engineer, shall be undercut
- b) The depth of the undercut in materials will be specified by the Engineer when the material at the subgrade level has been exposed and evaluated.
- c) On completion of the undercut, the surface shall be shaped, trimmed and compacted so as not to hold water. The compaction shall be as specified in Clause 2.1.8 and 2.1.9.
- d) The Contractor shall treat any excavated undercut material as unsuitables and dispose of accordingly, unless instructed otherwise by the Engineer.

## **2.1.6 Filling**

### **2.1.6.1 General**

Fill materials shall be sourced from areas of cut or imported as specified and subject to the Engineer's approval. If the Contractor wishes to propose materials from alternative sources then he shall provide details of such sources for the Engineer's approval. Material types are required to be selected, handled and compacted to form zoned fills as shown on the Contract Drawings or as instructed by the Engineer. The compaction standards are specified in Section 2.1.8 and 2.1.9.

The Contractor shall take all precautions and maintain a tidy operation to minimize the presence of any loose, excavated materials that could become wet during rain. It is likely that considerable drying effort will be required for some of the materials if they become too wet to allow the required compaction criteria to be met. The Contractor shall also ensure that all fill is free of organic matter or other unsuitable materials.

### **2.1.6.2 Conditioning and Spreading of Fill**

Before fill is placed in any area, the Contractor shall notify the Engineer that the fill foundation has been stripped, drained, including subsoil drains and prepared as required by the Contract Drawings and Specification and is ready for the Engineer's inspection and approval.

Prior to compaction, the fill materials shall be spread uniformly in horizontal layers and, if necessary, conditioned to an appropriate water content by aeration and drying or wetting (as the case may be), and/or by blending and mixing "wet" and "dry" materials. When soil is to be dried, the Contractor shall disc the soil and allow it to dry uniformly to its full depth. When the soil is to be wetted, this shall be done with sprinkling equipment ensuring uniform and controlled distribution of water in conjunction with blading and discing. In all cases the fill shall be mixed and conditioned thoroughly so that immediately prior to compaction the material type and the water content of the fill is reasonably uniform within one area. The layers prior to compaction shall be less than 200 mm loose thickness with all fragments with less than 100 mm maximum dimension.

No new fill shall be placed over previously placed fill that has not achieved the required standard of compaction, or has become contaminated, or has deteriorated from the required fill standards, or requires testing and approval prior to placement of a new layer. Previously placed fill that does not comply shall be reworked by scarifying, conditioning and recompacting so as to meet the Specification or alternatively it shall be removed and replaced with complying material.

Positive and effective drainage shall be maintained during filling operations to minimize deterioration of material exposed in excavation areas and in the uppermost fill layers. Special care shall be taken to avoid hollows which could pond water. All fill surfaces shall be sealed off with rubber tyre plant when rain is imminent to minimise erosion and protect the fill from strength loss due to increase in moisture content.

Where fill is to be placed against sloping surfaces steeper than 1V : 4H, the sloping surface shall be excavated or "benched" such that horizontal benches at no greater

than 0.5 m height intervals are formed. Adjacent areas of filling shall be carried out such that at no time shall fill levels be more than 0.5m different between the adjacent areas, unless approved by the Engineer.

In order to ensure adequate compaction of the materials forming the final fill surface profile, all fill batter faces shall be overfilled as necessary and carefully trimmed back to the required design profile.

## **2.1.7 Subgrade Preparation**

### **2.1.7.1 Initial Subgrade Assessment**

The Contractor shall inform the Engineer when he proposes to excavate to subgrade levels. The Contractor and Engineer shall inspect the cut surface and shall assess the CBR of the exposed materials prior to any subgrade stabilisation. Such assessment shall be carried out by means of visual inspection, shear vane and scala penetrometer testing at a maximum of 50m centres along the alignment of the footpath, or other method or frequency as determined by the Engineer. Based on the above assessment the Engineer will confirm the requirements, if any, for subgrade undercutting, and any necessary subgrade treatment will then be agreed by the Contractor and the Engineer.

### **2.1.7.2 Final Subgrade Assessment**

Following undercutting and filling operations, the Contractor and the Engineer shall jointly inspect the prepared subgrade surface prior to placing of any geotextile or basecourse layer.

The finished subgrade surface shall be tightly rolled and compacted to achieve a minimum CBR value of 5 prior to placement of basecourse over the subgrade. Testing of the finished subgrade shall be carried out by means of visual inspection, shear vane or scala penetrometer testing (undertaken to a minimum depth of 500mm below the finished subgrade surface) at a maximum of 25m centres along the alignment of the footpath, or other method or frequency as determined by the Engineer.

Placement of the geotextile or basecourse shall only be undertaken following approval of the Engineer.

### **2.1.7.3 Protection of Subgrade**

The Contractor shall programme his work such that the subgrade is at all times protected from the effects of weather, construction plant or similar prior to any undercut treatment and/or placing or road pavement. If the surface of the subgrade becomes damaged or deteriorates prior to subgrade undercut treatment and/or pavement installation then the affected area should be scarified, reshaped, replaced, recompacted or otherwise treated and retested until the requirements for the subgrade are again obtained to the approval of the Engineer.

## **2.1.8 Compaction**

### **2.1.8.1 General**

The Contractor shall employ sufficient dedicated compaction plant so as to achieve the specified compaction. Equipment used in transportation and spreading will not be accepted as compaction plant. Compaction plant shall cover the entire area of each layer of fill and give each layer a uniform degree of compactive effort. The

combined operations of spreading and compacting shall be undertaken using systematic and properly managed procedures, to the Engineer's approval, so as to ensure that each loose layer receives the required passes of the roller or other approved compaction equipment before further loose material is spread.

When soil is to be dried the Contractor shall disc the soil and allow it to dry uniformly to its full depth. When the soil is to be wetted, this shall be done with sprinkling equipment ensuring uniform and controlled distribution of water in conjunction with blading and discing.

Notwithstanding the requirements of Section 2.1.9 of this Specification, the Engineer may carry out check tests of compaction at any time. The Contractor shall stop or divert his machines as required by the Engineer to allow the tests to be carried out. Where field tests indicate that the specified standard of compaction has not been achieved, corrective action shall be taken to bring the fill to the required standard and as required by the Engineer. This may require the affected fill to be reworked by scarifying, conditioning and recompacting so as to meet the specification or alternatively it may need to be removed and replaced with complying material.

Competent and well-experienced Supervisors shall be provided by the Contractor to control procedures and shall carry out their duties primarily at the fill platform and not by delegation.

## **2.1.9 Compaction Standards and Testing**

### **2.1.9.1 General**

The tests and testing frequency described and defined in Section 2.1.9.3 will be used to confirm that the placed fill materials meet the required Contract standards, design criteria and parameter values. At any time either prior to or during the course of construction, the Engineer may direct modifications to the compaction standards, frequencies and test methods defined in this Section with the object of ensuring that the design criteria and objectives for the particular materials and conditions encountered, are achieved.

Compaction and test requirements have been defined in this specification for the materials expected to be used for the construction of the works. Should alternative materials be proposed by the Contractor then they shall also propose appropriate Quality Control testing methods and procedures in order to demonstrate to the Engineer that the necessary design criteria can be achieved.

The tests to confirm the Contract requirements shall be undertaken using the fully specified methods set out herein, but the Engineer may approve more approximate and rapid methods on a day-to-day basis for preliminary assessment. Where an adequate correlation is established between the rapid and fully specified methods, the Engineer may rely on the results of the rapid methods. Where rapid methods are used, and there are discrepancies between the results obtained by rapid and fully specified methods the Engineer shall decide which tests apply. Results obtained by rapid methods shall not be used for final acceptance purposes unless approved by the Engineer.

All testing, both in-situ and laboratory, is to be carried out using an IANZ accredited testing organisation, with all equipment calibrated to relevant standards at the

required frequency. Full details of the proposed testing organisation(s) shall be submitted to the Engineer for his approval.

If the Engineer is satisfied that quality of materials is consistent and that the work is being carried out in a systematic and consistent manner, then may he instruct that the frequency of testing given in Table II can be reduced.

### 2.1.9.2 Fill Test Methods

The fill testing methods have been defined in Table I for the materials expected to be used for the construction of the works. Should alternative materials be proposed by the Contractor then he shall also propose appropriate quality control testing methods and procedures in order to demonstrate to the Engineer's approval that the necessary design criteria can be achieved.

**Table I : Fill Test Methods**

Parameter	Test Description	Test Method
<b>In-situ Density</b>	"Rapid"	NZS 4407:1991, Test 4.2.1 (Nuclear Densometer Direct Mode) or NZS 4407:1991, Test 4.2.2 (Nuclear Densometer Backscatter Mode)
	"Fully Specified"	NZS 4402:1986, Test 5.1.1, 5.1.2, 5.1.3 (Sand replacement, balloon densometer or core cutter)
<b>Maximum Dry Density &amp; OMC determination</b>	Standard Compaction	NZS 4402:1986, Test 4.1.1
	Heavy Compaction	NZS 4402:1986, Test 4.1.2
<b>Strength</b>	Scala Penetrometer	NZS 4402:1986, Test 6.5.2
	Pilcon Shear Vane	NZ Geotechnical Society Inc. "Guideline for hand held shear vane"
	Clegg Impact Test	ASTM D5874-95
<b>Solid Density</b>	Solid Density	NZS 4402:1986, Test 2.7.1
<b>Moisture Content</b>	Moisture Content	NZS 4402:1986, Test 2.1

**Note 1:** In the water content test the oven performance and forced ventilation requirements shall be waived provided that operating temperature range is verified and checked daily. Before the mass of a dried sample is accepted, it shall be dried for at least 14 hours, and be weighed at least twice at periods not less than four hours apart until the loss in mass between successive weighing is less than 0.1 grams per 100 grams.

**Note 2:** In-situ Density: The air voids content of the compacted soil at any test location shall be taken as the mean of the air voids results from a set of

density tests. A set of density tests shall comprise two or more individual tests made within an area of 0.5 m<sup>2</sup>.

**Note 3:** The solid density test shall be performed using a sample at natural water content, not an oven-dried sample.

**Note 4:** In-situ density tests may be replaced by the rapid method offered by a nuclear densometer (test method NZS4407 Test 4.2.1) with prior approval of the Engineer.

**Note 5:** Before a new shear vane is first used it should be calibrated to obtain values of torque versus spring deflection. It should be re-calibrated at intervals of not more than 12 months.

### 2.1.9.3 Compaction Standards

Fill materials shall be compacted so as to achieve the standards defined below the frequency of those tests as defined in Table II in Section 2.1.9.3 :

- a) Cohesive material such as bulk fill:
  - i) Average vane strength over 10 consecutive readings shall not be less than 80 kPa with no individual reading less than 70 kPa
  - ii) The air voids shall not exceed 10%.
- b) Cohesionless material such as bulk fill shall be placed in uniform layers not greater than 150 mm loose thickness.

Compaction on each layer of fill materials so placed shall be sufficient to obtain the following standards :

- i) The in-situ dry density shall be not less than 95 % of the maximum dry density as determined by Test 4.1.3, NZS 4402
  - ii) The number of blows to drive the Scala Penetrometer from a depth of 50 to 200 mm below the fill surface shall be not less than 8. The number of blows to drive the Scala Penetrometer from a depth of 200 to 500 mm below the fill surface shall be not less than 18.
- d) Cohesionless material such as aggregate forming the footpath basecourse shall be placed in uniform layers not greater than 150 mm loose thickness. Compaction on each layer of fill materials so placed shall be sufficient to obtain the following standards :
  - i) The Clegg Impact Value for a test undertaken at the top of the basecourse layer shall not be less than 20.

In-situ materials at the base of the excavation shall be compacted and tested to the relevant standard specified above for fill.

The frequency of testing shall be as described below in Table II and is the minimum considered acceptable. Additional tests and/or changes to the testing frequency may be instructed by the Engineer as the works proceed.

The Contractor shall control the earthworks operation so as to minimise the failure rate of any tests carried out as part of the Quality Control testing programme. Should any test result fail to meet the required design criteria the Contractor shall be required to propose remedial measures for the Engineer's approval. Such measures are expected to usually comprise the removal, replacement and satisfactory retesting of any fill within the agreed area of influence of the failed test location.

The Contractor shall rework and re-compact any area disturbed by any testing undertaken within the site, to the Engineer's approval.

**Table II: Minimum Testing Frequency**

Fill Type	Parameter	Test Type	Test Frequency
<b>Cohesive (In situ subgrade &amp; Bulk fill)</b>	Strength	Shear Vane	1 set per 200 m <sup>3</sup> <u>and</u> 1 set per 25m linear length of footpath
<b>Cohesionless (In situ subgrade &amp; Bulk fill)</b>	Strength	Scala Penetrometer	1 set per 200 m <sup>3</sup> <u>and</u> 1 set per 25m linear length of footpath
<b>Cohesionless (Basecourse)</b>	Strength	Clegg Impact Test	1 set per 25m linear length of footpath

**Note 1:** The Contractor shall make every effort to ensure an even spread of test locations, both vertically and horizontally, through all fill areas. Spatial separation of tests within the completed fill areas shall be such that at least one set of tests is completed within any given continuous 0.5m thickness of fill. For the purposes of this clause a "fill area" is defined as the area or zone of continuous fill placed on a particular working day.

## 2.2 Geotextiles

### 2.2.1 General

Geotextile fabric shall be located as shown on the Drawings and be laid out on accurately profiled surfaces without wrinkles and with 300mm minimum length laps. Fabric shall be stored, erected and covered with fill so as to avoid deterioration by ultra violet light and be held in place against uplift by wind until covered, by means of temporary weights, local mounds of fill or similar, but shall not be pinned or otherwise punctured. The fabric shall be the grade of Bidim specified on the Drawings, as supplied by Maccaferri or other similar product approved by the Engineer.

### 2.3 Grassing

The specifications in this section apply generally to all areas that are to be grassed as part of any development and for the reinstatement of all grassed areas that are damaged as part of an infrastructure development contract.

### 2.3.1 Preparation for Sowing

- a) Fertilising and grassing shall be carried out over all existing grassed areas disturbed by contract activity and other specified areas which may require reinstatement. In existing grassed areas, excessive compaction of the subsoil shall be relieved by subsoiling (i.e. deep ripping or similar) as required to achieve satisfactory long term growing conditions.
- b) All topsoil removed to permit development or contract works to be carried out shall be stockpiled for reuse or otherwise as directed by the Engineer.
- c) All new grass areas shall be built on subgrades prepared to a California Bearing Ratio (CBR) of not less than 5. A minimum 100mm layer of clean, friable peat loam or sandy loam topsoil free of all perennial weeds, stones and rubbish shall be placed on the subgrade.
- d) The topsoil shall be lightly compacted or consolidated and may be laid proud of adjoining features (such as kerb and channel, path, crossings, etc) by not more than 25mm to allow for settlement provided that it does not cause water to pond on any footpath or vehicle crossing area. All finished levels shall be those specified on the approved design plans or to a 2 to 2.5% minimum slope. New areas shall be neatly contoured into adjoining grassed areas. The top 25mm of topsoil shall have a loose tilth. No soil shall be cultivated or handled when the moisture content is at a level where soil structure damage will result.
- e) Perennial weeds shall be sprayed according to manufacturer's instructions and at least 14 days before cultivation with Glyphosate plus Versatil, if clover, thistles, etc. are a problem. All stones, rubbish and foreign materials shall be removed from the areas to be grassed and the whole area rotary hoed to the depth of the topsoil or 150mm whichever is the lesser.

### 2.3.2 Fertilisers

All fertilisers shall be delivered to the site immediately before they are required for spreading and shall be thoroughly mixed on site. The Engineer may prohibit the use of any fertilisers which have deteriorated because of interaction, wetting, etc. Fertilisers shall be lightly harrowed into the topsoil, 2 to 3 days before seed sowing, at the following rates:

30% Potassic superphosphate	150 kg/ha (15g/m <sup>2</sup> )
Sulphate of ammonia	50 kg/ha (5g/m <sup>2</sup> )

This shall be followed one month after sowing with an application of the following:

Di-ammonium Phosphate (DAP) 100 kg/ha

### 2.3.3 Sowing

- a) With the exception of the New Zealand Browntop component, all seed shall be certified and less than 12 months old at the time of sowing. A ryegrass component to be certified as having greater than 80% live endophyte content. Seed that has deteriorated because of wetting, fertiliser-burning, etc shall not be used.
- b) Seed mixture is to be:

NZ Browntop (50 kg/ha)

High endophyte Turf Rye (200 kg/ha)

c) On large areas, the seed shall be "check" sown in at least two directions to ensure an even spread and covered by brush harrowing. The surface shall then be lightly rolled with a suitable flat roller.

d) On small areas, grass seed shall be evenly applied to the prepared surface and raked thoroughly into the soil so that little seed remains exposed.

#### **2.3.4 Establishment of Sown Areas**

a) The Contractor shall ensure that the newly established grass is protected from damage by pedestrian and vehicular traffic until such time as the grass growth has reached a self-sustaining state.

b) The Contractor shall be responsible for watering the grassed areas as required to achieve an efficient seed germination and maintain satisfactory growth throughout the defects liability period. Watering shall begin when the root zone moisture is depleted to 50% and shall ensure full re-wetting of the root zone to 200mm depth.

c) During the establishment, the Contractor shall maintain the newly grassed areas as follows:

i) Upon the grass reaching 100mm of height, it shall be cut to 50-60mm high.

ii) For subsequent mowings, the mowing frequency shall be governed by the growth rate or as instructed by the Engineer.

iii) Minimum period of 2 days before second cut to 30-40mm. The second cut shall not remove more than 1/3 of length.

iv) The turf shall be maintained free of all broadleaf weeds.

v) Areas with a poor strike of grass shall be either recultivated and resown or undersown at the Contractor's expense.

vi) Upon completion of mowing, all grass clippings shall be collected and removed from all sown grass areas except non-kerb and channel berms. All clippings shall be removed from adjacent hard surfaces.

vii) Edges of all sown grass adjoining cultivated gardens, borders, hard paving, sealed surfaces or landscape structures shall be trimmed to the edge or controlled by herbicide to within 25mm of flat surfaces or 50mm of vertical structures. Grass shall not be allowed to encroach over flat, sealed or paved surfaces by more than 25mm.

