



**Cook Islands Investment Corporation**

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**SPECIFICATION** of work to be done and materials to be used in carrying out the works shown on the accompanying drawings

## **Tereora College - Stage 1 Demolition & Earthworks**

### **Project Specification**

Tereora, Nikao, Rarotonga, Cook Islands

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## 1232 INTERPRETATION & DEFINITIONS

### 1. GENERAL

This general section relates to definitions and interpretation that are used in this specification.

#### Definitions

#### 1.1 DEFINITIONS

Required:	Required by the documents, the New Zealand Building Code or by a statutory authority.
Proprietary:	Identifiable by naming the manufacturer, supplier, installer, trade name, brand name, catalogue or reference number.
Provide and fix:	"Provide" or "fix" or "supply" or "fix" if used separately mean provide and fix unless explicitly stated otherwise.
Review:	Review by the contract administrator is for general compliance only. Review does not remove the need for the contractor to comply with the stated requirements, details and specifications of the manufacturers and suppliers of individual components, materials and finishes. Neither can the review be construed as authorising departures from the contract documents.
Working day:	Working day means a calendar day other than any Saturday, Sunday, public holiday or any day falling within the period from 24 December to 5 January, both days inclusive, irrespective of the days on which work is actually carried out.
Workplace:	Workplace means the place where work is being carried out, or is customarily carried out, for a business or undertaking including any place where a worker goes, or is likely to be, while at work.

#### 1.2 PERSONNEL

Owner:	The person defined as "owner" in the New Zealand Building Code.
Principal:	The person defined as "principal" in the conditions of contract.
Contractor:	The person contracted by the principal to carry out the contract.
Contract administrator:	The person appointed by the principal to administer the contract on the principal's behalf. Where no person has been appointed by the Principal, it means the Principal or the Principal's representative.

#### 1.3 ABBREVIATIONS

The following abbreviations are used throughout the specification:

AAMA	American Architectural Manufacturers Association
ACD	Asbestos containing dust
ACM	Asbestos containing material
AS	Australian Standard
AS/NZS	Joint Australian/New Zealand Standard
ASTM	American Society for Testing and Materials
AWCINZ	Association of Wall and Ceiling Industries of New Zealand Inc.
BCA	Building Consent Authority
BRANZ	Building Research Association of New Zealand
BS	British Standard
COP	Code of practice
CSIRO	Commonwealth Scientific and Industrial Research Organisation
HERA	Heavy Engineering Research Association
IANZ	International Accreditation New Zealand
JMF	Job Mix Formula
LBP	Licensed Building Practitioner
MPD	Maximum Possible Development
MBIE	Ministry of Business, Innovation and Employment
MDPE	Medium density polyethylene
MPNZA	Master Painters New Zealand Association Inc
NBCFCI	National Building Code for Cook Islands

NZBC	New Zealand Building Code: <a href="http://www.building.govt.nz/building-code-compliance/">http://www.building.govt.nz/building-code-compliance/</a>
NZDDA	New Zealand Demolition and Asbestos Association. Best practice guidelines for demolition, NZ: <a href="http://www.business.govt.nz/worksafe/information-guidance/all-guidance-items/best-practice-guidelines-for-demolition-in-new-zealand">http://www.business.govt.nz/worksafe/information-guidance/all-guidance-items/best-practice-guidelines-for-demolition-in-new-zealand</a> . Best practice guidelines for Asbestos, NZ: <a href="http://www.business.govt.nz/worksafe/information-guidance/all-guidance-items/new-zealand-guidelines-for-the-management-and-removal-of-asbestos-3rd-edition">http://www.business.govt.nz/worksafe/information-guidance/all-guidance-items/new-zealand-guidelines-for-the-management-and-removal-of-asbestos-3rd-edition</a>
NZS	New Zealand Standard
NZS/AS	Joint New Zealand/Australian Standard
NUO	Network Utility Operator
PCBU	Person Conducting a Business or Undertaking
OSH	Occupational Safety and Health
TA	Territorial Authority
RBW	Restricted Building Work
RCRRJ	Reinforced Concrete Rubber Ring Joint
SARNZ	Scaffolding and Rigging New Zealand Inc
SED	Specific Engineering Design

#### 1.4 DEFINED WORDS

Words defined in the conditions of contract, New Zealand Standards, or other reference documents, to have the same interpretation and meaning when used in their lower case, title case or upper case form in the specification text.

#### 1.5 WORDS IMPORTING PLURAL AND SINGULAR

Where the context requires, words importing singular only, also include plural and vice versa.

## 1233 REFERENCED DOCUMENTS

### 1. GENERAL

#### 1.1 REFERENCED DOCUMENTS

Throughout this specification, reference is made to various New Zealand Building Code Compliance Documents (NZBC \_\_\_), acceptable solutions (\_\_\_ AS\_) and verification methods (\_\_\_ VM\_) for criteria and/or methods used to establish compliance with the New Zealand Building Code and National Building Code for the Cook Islands.

Reference is also made to various standards produced by Standards New Zealand (NZS, AS/NZS, NZS/AS), overseas standards and to listed Acts, Regulations and various industry codes of practice and practice guides. The latest edition (including amendments and provisional editions) at the date of this specification applies unless stated otherwise.

It is the responsibility of the contractor to be familiar with the materials and expert in the techniques quoted in these publications.

Documents cited both directly and within other cited publications are deemed to form part of this specification. However, this specification takes precedence in the event of it being at variance with the cited documents.

#### 1.2 DOCUMENTS

Documents referred to in the GENERAL sections are:

<a href="#">NZBC F4/AS1</a>	Safety from falling
<a href="#">NZBC F5/AS1</a>	Construction and demolition hazards
NZS/BS 750	Specification for underground fire hydrants and surface box frames & covers
NZS/BS 5163	Specification for predominantly key-operated cast iron gate valves for waterworks purposes
NBCFCI B2	Part B2 Demolition
AS 1432	Copper tubes for plumbing, gas fittings and drainage application
AS 1830	Grey cast iron
AS 2345	Dezincification resistance of copper alloys
AS 3996	Access covers and grates
AS/NZS 1254	PVC-U pipes and fittings for stormwater and surface water
AS/NZS 1260	PVC-U pipes and fittings for drain, waste and vent application
AS/NZS 1477	PVC Pipes and Fittings for Pressure Applications
AS/NZS 2032	Installation of PVC pipe systems
AS/NZS 2033	Installation of polyethylene pipe systems
AS/NZS 2566.2	Buried flexible pipelines - installations
AS/NZS 3012	Electrical installations - Construction and demolition sites
AS/NZS 3725	Design installation of buried concrete pipes
AS/NZS 4058	Precast concrete pipes
AS/NZS 4129	Fittings for polyethylene (PE) pipes for pressure application
AS/NZS 4130	Polyethylene (PE) pipes for pressure applications
AS/NZS 4158	Thermally-bonded polymeric coatings on valves and fittings for water industry purposes
AS/NZS 4441	Oriented PVC (PVC-O) pipes for pressure applications
AS/NZS 4671	Steel reinforcing materials
AS/NZS 5065	Polyethylene and polypropylene pipes and fittings for drainage and sewerage applications
NZS 3104	Specification of concrete production
<a href="#">NZS 3109</a>	Concrete construction
<a href="#">NZS 3114</a>	Specification for concrete surface finishes
NZS 3124	Specification for concrete construction for minor works
<a href="#">NZS 3404:1997</a>	Steel structures standard
NZS 3501	Specification for copper tubes for water, gas and sanitation
NZS 3910	Conditions of contract for building and civil engineering construction
<a href="#">NZS 4210</a>	Masonry construction: Materials and workmanship
NZS 4229	Concrete masonry buildings not requiring specific engineering design.

NZS 4402	Method of testing soils for civil engineering purposes
NZS 4404	Land Development and Subdivision Infrastructure
NZS 4407	Method of sampling and testing road aggregates
NZS 4431	Code of practice for earth fill for residential development
NZS 4442	Specification for welded steel pipes and fittings for water, sewage and medium pressure gas
<a href="#">NZS 6803</a>	Acoustics - Construction Noise
NZS PAS 4509	New Zealand Fire Service fire fighting water supplies code of practice
NCoP Utility Operators	National Code of Practice for Utility Operators' Access to Transport Corridors
Building Regulations 1992	
Health and Safety in Employment Regulations 1995	
Health and Safety at Work (Asbestos) Regulations 2016	
New Zealand Building Code	
Building Controls and Standards Act 1991 - Cook Islands	
Building Control and Standards Regulations 1991 - Cook Islands	
WorkSafe NZ	<a href="#">Guidelines for the provision of facilities and general safety in the construction industry</a>
WorkSafe NZ	Approved code of practice for safety in excavation and shafts for foundations
SARNZ	<a href="#">Best practice guideline for scaffolding, New Zealand</a>
NZDDA	Best practice guidelines for demolition, New Zealand
NZDDA	New Zealand guidelines for the management and removal of asbestos

## 1256 WASTE MANAGEMENT

### 1. GENERAL

This general section relates to the waste generated from the contract works and implementation of a site waste management plan. Solid waste is not warranted for the disposal on the property. It is encourage to adopt the waste management practice of 4R's: Recycle, Reduce, Refuse and Reuse. The material waste during the construction works will consist of Green waste, Demolition waste and Construction waste.

#### 1.1 DOCUMENTS REFERRED TO

Documents referred to in this section are:

Tereora College Redevelopment Project - Stage 1 Environmental Impact Assessment Website: <http://ciiconline.com/advertisements/tereora-college-stage-1-works/>

Documents listed above and cited in the clauses that follow are part of this specification. However, this specification takes precedence in the event of it being at variance with the cited document.

#### 1.2 ABBREVIATIONS

The following abbreviations are used in this specification:

EIA                      Environmental Impact Assessment

#### Requirements

#### 1.3 WASTE MANAGEMENT PLAN

Prepare and submit a waste management plan in line with waste management principals, Reuse; Refuse; Recycle and Reduce

The submitted plan to include the following factors:

- site planning and material storage
- waste management
- purchasing
- recycling
- salvage.

#### 1.4 RECORD KEEPING

Maintain a record of waste materials, recycled, reused and disposed of by the project using the Waste Management Plan by the contractor containing the same information.

- For each material recycled from the project, include the amount (in cubic metres or tonnes), or in the case of reuse, state quantities by number, type and size of items, and the destination (i.e. recycling facility, used building materials yard).
- For each material land filled, include the amount (in cubic metres or tonnes) of material and the identity of the landfill, clean fill and/or transfer station.

If requested, submit to the Contract Administrator Waste Management Plan, Waste Management Forms or bills, invoices and other documentation confirming that all materials have been received at the required locations.

#### Equipment

#### 1.5 CONTAINERS

Provide appropriately sized and sited containers for the storage of reusable, recyclable and waste products. Clearly label each container.

#### Conditions

#### 1.6 STORAGE

Store all materials so they are not damaged prior to use.

#### 1.7 PLANNING

Plan the measurement and ordering of materials and components to minimise waste.

#### APPLICATION

1.8 DEMOLITION

- Demolition of building elements and component's generating waste which is not otherwise salvage or re-used by the MOE, CIIC or Contractor will be removed and disposed of off-site by the Contractor to areas that are not an area of concern under the Environmental Act such as wetland, stream, and foreshore.

1.9 GREEN WASTE

- Trees and vegetation waste can be grind, chip or shredded for mulching and composting on site for landscaping plants or transported to the Contractors yard for disposal, or use as firewood

1.10 SOLID WASTE

- Sort concrete and concrete block waste for recycling as aggregate, sub-base material or fill.
- Sort brick waste for reuse as whole bricks, or re-use as crushed brick for landscape cover, sub-base material or fill.
- Chip untreated timber for off-site mulching and composting
- Treated timber framing to be burnt on-site or disposed off-site.
- Roofing iron waste sent to local refuse tip for recycling.
- Internal plaster, fibre and hard board waste sent to local refuse tip.
- Separate and recycle concrete.

**Completion**

1.11 CLEANING

All cleaning materials used on the project to be biodegradable and non-toxic.



## 2111 DEMOLITION

### 1. GENERAL

This section relates to the waste generated from the project works to the extent necessary to carry out the contract works.

#### 1.1 RELATED WORK

Refer to 1256 for WASTE MANAGEMENT.  
Refer to 2123 for ASBESTOS REMOVAL.

#### Documents

#### 1.2 DOCUMENTS

Refer to the general section 1233 REFERENCED DOCUMENTS. The following documents are specifically referred to in this section:

[NZBC F5/AS1](#) Construction and demolition hazards  
[NZS 6803](#) Acoustics - Construction noise  
NZDAA Best practice guidelines for demolition in New Zealand  
NBCFCI Part B2 National Building Code for the Cook Islands - B2 Demolition  
Health and Safety in Employment Regulations 1995  
Cook Islands Building Control and Standard Act 1991 and regulations.

#### Requirements

#### 1.3 QUALIFICATIONS

Carry out demolition:

- only under the supervision of a suitably experienced person, using only operators and drivers trained for this work
- calling upon engineering or construction expertise in those areas of demolition within the Cook Islands.

#### 1.4 NOTIFIABLE WORK

Notify the appropriate Rarotongan Authorities, Infrastructure Cook Islands (ICI) - Building Control Office, Ministry of Internal Affairs - Labour and employment Officer of work that is notifiable under the Health and Safety in Employment Regulations 1995, 48 hours before starting the work.

#### 1.5 NOISE

Refer to [NZS 6803](#) tables 2 and 3 for the upper limits of construction work noise in residential and industrial areas over the various time periods, particularly 0730 to 1800 hours and plan the work using silenced and noise insulated plant to comply with those requirements. Noise on site is to be limited during school operating hours which are 0800 to 1500. Also during Exam periods all noise from the site is to be eliminated. Do not exceed these limits, or any more stringent limits imposed by the territorial authority.

#### 1.6 HEALTH AND SAFETY

Comply in general with NBCFCI Part B2 Demolition, [NZBC F5/AS1](#) and NZDAA Best practice guidelines for demolition in New Zealand, in particular section 4.8 Site-specific health, safety and environmental (HSE) plan and 4.9 Hazard management and recording

#### Performance

#### 1.7 BUILDING CONSENT REQUIREMENTS

Comply with Cook Island Building Controls and Standards Act 1991 and Building Controls and Standards Regulations 1991. Construction works to be carried according to the Demolition Permit requirements, approved and issued by Infrastructure Cook Islands - Building Control Office.

#### 1.8 INSPECTIONS

If required by the Building Control Office Demolition Permit, inspection of the demolition work to take place at each of the selected building as scheduled in the building consent.

Confirm a written programme to facilitate these inspections, including notification when each building demolition stage of the work is ready for inspection.  
Obtain and pay for any required inspections which are additional to the building consent.

**1.9 DEMOLITION PLAN (METHOD STATEMENT)**

Prepare a written demolition plan including sketches as described in the NZDAA Best practice guidelines for demolition in New Zealand, section 4.7 Demolition plan (method statement) and covering:

- the extent of the work
- the plant being used
- the proposed method for each roof, wall and floor
- hazard identification
- hazard assessment and control
- precautions for safety of employees on site
- precautions for persons in the vicinity
- emergency procedures
- proposed dust controls
- proposed noise controls
- proposed vibration control
- precautions for safety of the public.

**1.10 PLAN APPROVAL**

The demolition of the existing buildings is to be carried out in accordance with the following standards and codes of practice:

NBCFCI Part B2 Demolition  
NZBC F5/AS1 Construction and Demolition Hazards  
NZS 6803 Acoustics - Construction Noise  
NZDAA: Best practice guidelines for demolition on New Zealand

Provide a demolition plan for review by the engineer prior to establishing itself on site.

**2. PRODUCTS**

**Materials**

**2.1 ELEMENTS FOR DEMOLITION AND DISPOSAL**

Demolish, remove from site and dispose of elements and components to be demolished which are not otherwise to be salvaged or re-used.

**2.2 ELEMENTS FOR SALVAGE**

Carefully dismantle, remove and store on site where directed. Protect from damage and weather. Dispose of salvaged elements and components.

**2.3 ELEMENTS FOR RE-USE**

Carefully dismantle, remove and store on site where directed. Protect from damage and weather until required.

**2.4 REMAINING ELEMENTS**

Store all elements not scheduled for salvage or re-use on site until convenient for removal.

**2.5 DEMOLITION RUBBLE FOR RE-USE**

Do not contaminate with other materials and stockpile separately on site where directed and until required.

**2.6 REMOVAL OF DEMOLITION MATERIAL FROM SITE**

Remove demolished material and elements continually from the site through the period of the demolition.

**3. EXECUTION**

**Conditions**

- 3.1 **EXISTING SERVICES**  
Notify the network utility operators and arrange for them to locate the position of all services adjacent to and entering the site. Disconnect and seal off services before work commences. Protect services adjacent to the site.
- 3.2 **USE THE CHECK LISTS**  
Use the checklists included in the NZDAA Best practice guidelines for demolition in New Zealand,
  - Appendix A: Demolition hazards
  - Appendix B: Excavator checklist
  - Appendix C: Pre-demolition checklist
  - Appendix D: Demolition safety checklistto ensure that all major points in this contract are covered.
- 3.3 **SITE INSPECTION**  
Visit and check the site, the building or structural work being demolished and any contents for likely hazards.
- 3.4 **ADJOINING BUILDINGS**  
Check the relationship and condition, including the contents of adjoining buildings to ensure they will not be adversely affected by the demolition work.
- 3.5 **PLANS AND DESCRIPTIONS**  
Carefully examine all available plans of the building, including those of the territorial authority and the network utility operators, all descriptions and past uses, and become totally familiar with the past and present condition and use of the building and its services.
- 3.6 **LOADINGS**  
If intending to use heavy plant and machinery or load debris on roofs and floors, allowable loadings must first be calculated by a suitably qualified person. Use propping or strengthening if necessary.
- 3.7 **EXAMINE STRUCTURE**  
Examine roofs, walls, cantilevered structures and basements as required by the Approved code of practice for demolition and follow their requirements.
- 3.8 **SAFETY DURING DEMOLITION**  
Refer to NBCFCI Part B2 Demolition, [NZBC F5/AS1](#) and the NZDAA Best practice guidelines for demolition in New Zealand. Carry out the requirements laid down in section 5 Demolition safety in respect of:
  - instability
  - supervision
  - plant, tools and equipment
  - personal protective equipment
  - protection of the public
  - unauthorised access to site.
- 3.9 **DEMOLITION PROCEDURES**  
Refer to NZDAA Best practice guidelines for demolition in New Zealand. Carry out demolition to the requirements laid down in section 6 methods of demolition including:
  - scaffolding
  - health
  - disposal of debris and waste material
  - fire protection.
- 3.10 **BUILDINGS**  
Refer to NZDAA Best practice guidelines for demolition in New Zealand. Carry out the requirements in respect of:
  - buildings
  - prestressed concrete structures
  - storage tanks
  - underwater demolition

- fire-damaged buildings.

- 3.11 **HAND TOOL AND PERSONAL PROTECTIVE EQUIPMENT**  
Refer to the NZDAA Best practice guidelines for demolition in New Zealand. Carry out the requirements laid down in section 5.14 Plant, tools and equipment and section 5.32 Personal protective equipment (PPE) and clothing (PPC), for:
- hand tools
  - power tools
  - personal protective equipment
  - cutting and welding.

#### **Application**

- 3.12 **CARRY OUT DEMOLITION**  
Carry out all demolition to the requirements of the WorkSafe NZ Approved code of practice for demolition.
- 3.13 **METHOD OF DEMOLITION**  
Refer to NZDAA Best practice guidelines for demolition in New Zealand, Section 6 Methods of demolition. Carry out the selected methods in the demolition plan for this work, to the requirements under the following methods of demolition:
- by hand
  - by pusher arm
  - by deliberate collapse
  - by wire rope pulling
  - using power grapples and shears
  - by other methods.
- 3.14 **DIG OUT**  
Dig out foundations, footings, basement, floor slabs, paths, drains, cesspits, septic tanks and manholes that are part of or service the demolished building. The site is to be left in a clean and dressed manner.

#### **Completion**

- 3.15 **MAKE GOOD**  
Make good damage to adjoining buildings or property caused by demolition work.
- 3.16 **REINSTATE**  
Reinstate where any damage is caused by this demolition to those parts of the existing building, other buildings and the remainder of the site being retained.
- 3.17 **LEAVE**  
Leave work to the standard required by following procedures.
- 3.18 **TAKE AWAY**  
Take away from the site all plant, tools and equipment, temporary access works, and demolished materials and elements, to leave the site completely clean and tidy.

## **4. SELECTIONS**

- 4.1 **DEMOLITION TIME RESTRICTIONS**  
Demolition work is restricted to:
- |                  |  |
|------------------|--|
| Weekdays:        | 7am to 7pm   |
| Saturdays:       | 8am to 5pm   |
| Sundays:         | No Works   |
| Public holidays: | No Works permitted Christmas Day, New Years Day & Easter/Good Friday |
- 4.2 **DEMOLITION WASTE REMOVAL RESTRICTIONS**  
The Contractor is responsible for the removal and transport of all waste material from the site. All general waste shall be removed from the site and disposed of at either the

Rarotongan landfill or at an alternative site nominated by the Contractor and approved by the National Environment Service.

#### 4.3 ELEMENTS FOR SPECIAL PROTECTION

Element/component	Location/Special protection required
Enviroflow Wastewater treatment system, Enviroflow Underground storage tank, Stream bank trees, Brown memorial plaque and Kuru Tree, Palm Trees along Western Gate entrance.	See Demolition Management Drawings

#### 4.4 ELEMENTS FOR DEMOLITION AND DISPOSAL

Element/component	Location
Buildings Structures labelled A, B, E, F, G, H and J.	See Demolition Management Drawings

#### 4.5 ELEMENTS FOR SALVAGE AND DELIVERY TO OWNER

Salvage the following elements and deliver to the owner.

Element/component	Location	Delivery requirements
Window Louver Glass and louver frames, Timber and Aluminium Doors and door frames, Light Fixtures and fittings, Power Points and Power Switches	Building structure A (Music), B (Teacher aide Office), D (Textile Technology), F (Counsellors Office), G (Anau Office, Library, Classroom), H (Hard Courts)	Set aside in an areas nominated by Engineer.
Building Structure D & Decking (Food Technology)	Relocation of existing Building structure D (Food Technology Building)	See Demolition Management Drawings

## 2123 ASBESTOS REMOVAL

### 1. GENERAL

This section relates to the removal of asbestos prior to other demolition work, to the extent necessary to carry out the contract works.

#### 1.1 ABBREVIATIONS

The following abbreviations are used throughout this part of the specification:

ACD	Asbestos containing dust or debris (restricted by type of asbestos it comes from)
ACM	Asbestos containing material (usually asbestos bound into a composite material)
NZDAA	New Zealand Demolition and Asbestos Association

#### Documents

#### 1.2 DOCUMENTS

Refer to the general section 1233 REFERENCED DOCUMENTS. The following documents are specifically referred to in this section:

NBCFCI B2	Part B2 Demolition
<a href="#">NZBC F5/AS1</a>	Construction and demolition hazards
NZDAA	<a href="http://www.business.govt.nz/worksafe/information-guidance/all-guidance-items/new-zealand-guidelines-for-the-management-and-removal-of-asbestos-3rd-edition">New Zealand guidelines for the management and removal of asbestos</a> , <a href="http://www.business.govt.nz/worksafe/information-guidance/all-guidance-items/new-zealand-guidelines-for-the-management-and-removal-of-asbestos-3rd-edition">http://www.business.govt.nz/worksafe/information-guidance/all-guidance-items/new-zealand-guidelines-for-the-management-and-removal-of-asbestos-3rd-edition</a>
	<a href="#">Health and Safety at Work (Asbestos) Regulations 2016</a>

#### Requirements

#### 1.3 QUALIFICATIONS

Carry out asbestos removal only under the supervision of a suitably experienced person, using only workers trained for this work.

#### 1.4 WORK PROGRAMME

Provide proposed work program and equipment requirements to carry out asbestos removal:

- Put up barriers around excavation site
- Soil removal and bury
- Remove barriers and bury
- Fill excavated areas with clean soil
- Fill burial hole, compact/level and mark out
- Wash down machinery

#### 1.5 NOTIFIABLE WORK

Appropriately notify Rarotonga National Environment Service - Compliance Division, Internal Affairs - Labour and employment Officer of licensed asbestos removal to the Health and Safety at Work (Asbestos) Regulations 2016, at least 5 days before starting the work.

#### 1.6 IDENTIFIED ASBESTOS TYPE

Refer to SELECTIONS for identified asbestos type(s).

#### 1.7 HEALTH AND SAFETY

Comply with in general, NBCFCI B2, [NZBC F5/AS1](#), WorkSafe NZ requirements, Health and Safety at Work (Asbestos) Regulations 2016 and NZDAA [New Zealand guidelines for the management and removal of asbestos](#).

### 2. PRODUCTS

## 2.1 EQUIPMENT

Protective clothing, respirators, decontamination, isolation facilities, etc as appropriate and as required by the NZDAA. Equipment shall be cleaned or disposed of as directed by the NZDAA [New Zealand guidelines for the management and removal of asbestos](#).

## 3. EXECUTION

**Conditions**

## 3.1 SAFETY DURING ASBESTOS REMOVAL

Refer to NBCFCI B2, [NZBC F5/AS1](#) and the NZDAA [New Zealand guidelines for the management and removal of asbestos](#) and carry out the requirements laid down in section 7: Safe Removal of Friable Asbestos in respect of:

- supervision
- plant, tools and equipment
- personal protective equipment
- protection of the public
- unauthorised access to site.

**Application**

## 3.2 CARRY OUT ASBESTOS REMOVAL

Carry out asbestos removal to the requirements of the NZDAA [New Zealand guidelines for the management and removal of asbestos](#).

## Scope of Works:

1. Put up polythene barrier fencing
2. Dig burial hole and stock-pile soil/earth fill
3. Remove contaminated soil
4. Cart and bury contaminated soil to designated area

## Procedures:

Removal and burial work will be carried out in accordance with the following procedures:

5. Mark out areas where soil will be removed - refer to Demolition Management Drawings
6. Place polythene fence barriers around excavating areas to create contamination enclosure
7. Working in sections dampen soil to be removed
8. Carefully dig out soil and load onto truck - do not overfill tray and create dust
9. Repeat these procedures until all soil has been removed
10. Fill trench using stockpiled material. Compact and level ground
11. Cover burial hole with polythene. Fill with stock-piled material. Compact/level site

## Personal and Public safety procedures:

12. Once removal work commences only approved personnel is allowed on the college grounds
13. Anyone required to be onsite must wear approved 3M safety masks and overalls when entering the grounds. Masks and overalls must and only be removed when leaving the site
14. Used overalls must be placed in rubbish bags and must not leave the site. New overalls must be worn when re-entering the site along with the masks.
15. All machinery used during the removal process must be washed down with water in a designated area before leaving the school grounds.

*Asbestos is a health hazard and there is no cure for the disease caused by inhaling asbestos fibres. Asbestos fibres can only be seen under a microscope, it is invisible to the naked eye. By following the proper safety procedures we reduce the likelihood of fibres becoming airborne. When airborne, the fibres can be inhaled or can attach itself to skin, clothing and shoes without you knowing. If there is dust during the removal work, then it is highly likely that the asbestos fibres have become airborne. Dampening the soil, washing down machinery and wearing personal protection gear will help contain the fibres and reduce exposure.*

**Completion**

- 3.3 **MAKE GOOD**  
Make good damage caused by asbestos removal work.
- 3.4 **REINSTATE**  
Reinstate where any damage is caused by this asbestos removal to those parts of the existing building, other buildings and the remainder of the site being retained.
- 3.5 **LEAVE**  
Leave work to the standard required by following procedures.
- 3.6 **DISPOSAL OF ASBESTOS**  
Store, label and dispose of asbestos to the requirements of NZDAA [New Zealand guidelines for the management and removal of asbestos](#), Section 11: Storage, labelling and Disposal of Asbestos.
- 3.7 **TAKE AWAY**  
Take away from the site all plant, tools and equipment, temporary access works, and demolished materials and elements, to leave the site completely clean and tidy.

#### 4. **SELECTIONS**

##### 4.1 **ASBESTOS TYPE FOR REMOVAL**

TYPE	AREA	LOCATION
Soil Analysis - Chrysotile asbestos	37.7m <sup>2</sup>	Administration Building (Western and Northern Sides Only - Depth 0.1m)
Soil Analysis- Chrysotile & Amosite asbestos	156m <sup>2</sup>	Classroom Building (Northern, Southern and Western Sides Only - Depth 0.3m)
Soil Analysis- Chrysotile & Amosite asbestos	52.4m <sup>2</sup>	Student Counsellors Building (Eastern and Southern Sides Only - Depth 0.1m)



## 2221 REMOVING VEGETATION

### 1. GENERAL

This section relates to the removal of vegetation, trees and shrubs in whole or in part, to the extent necessary to carry out the contract works.

#### Related work

- 1.1 RELATED SECTIONS  
Refer to 8612 for Bulk Earthworks Development.

### 2. EXECUTION

#### Conditions

- 2.1 FIRES  
Do not light rubbish fires on site.
- 2.2 REPORT  
Report any survey pegs, bench marks and the like on any features, leaving them undisturbed until approval is given for removal.
- 2.3 RETAINED TREES AND SHRUBS  
Refer to SELECTIONS/drawings for those to be retained and protected. Mark trees and shrubs using yellow plastic tapes or tags and keep the tapes permanently in place throughout the work.
- 2.4 PROTECT TREES AND SHRUBS  
Protect trees and shrubs being retained from damage with substantially staked and orange plastic netting covered enclosures, 1800mm high and 900mm clear of the trunk.
- 2.5 RETAINED FEATURES  
Refer to SELECTIONS/drawings for those features to be retained. Mark out those features with 1 metre high 50mm x 50mm timber stakes with yellow plastic tape between, to avoid accidental damage.

#### Application

- 2.6 CUT DOWN AND REMOVE  
Except for identified retained vegetation or features, cut down all growth, grub up all major roots and remove from the site. Identify perennial weeds to be removed. Where regrowth can occur from residual plant material, ensure all plant material (including roots) is completely removed. Dispose of safely at authorised refuse transfer station.

#### Completion

- 2.7 LEAVE  
Leave work to the standard required by following procedures.
- 2.8 TAKE AWAY  
Take away from the site all material resulting from clearance of the site, leaving it clear and tidy.

### 3. SELECTIONS

- 3.1 RETAINED TREES AND SHRUBS  
See Demolition Management Plan Drawings
- 3.2 RETAINED FEATURES  
See Demolition Management Plan Drawings

### 3.3 PRUNE OR PARTIALLY REMOVE

## 2241 EXCAVATION

### 1. GENERAL

This section relates to the excavating required for the building works, removing surface soils and the disposal of excavated material.

#### Documents

#### 1.1 DOCUMENTS REFERRED TO

Documents referred to in this section are:

[NZS 4402](#) Methods of testing soils for civil engineering purposes  
 WorkSafe NZ [Approved code of practice for safety in excavation and shafts for foundations](http://www.business.govt.nz/worksafe/information-guidance/all-guidance-items/acop-excavation-and-shafts-for-foundations)  
<http://www.business.govt.nz/worksafe/information-guidance/all-guidance-items/acop-excavation-and-shafts-for-foundations>

Documents listed above and cited in the clauses that follow are part of this specification. However, this specification takes precedence in the event of it being at variance with the cited document.

#### Requirements

#### 1.2 ARCHAEOLOGICAL DISCOVERY

If fossils, antiquities and other items of value are found refer to the Engineer for actions to be taken with archaeological discovery.

#### Performance

#### 1.3 GROUND CONDITIONS

Foundation investigations and drilling have been carried out. Place your own interpretation on this information as no warranty is implied that the information is truly representative or complete. Make such extra investigations as considered necessary.

Copies of bore logs are in Geotechnical Report prepared by TIKE Ltd.

#### 1.4 PROOF DRILLING

Site bores already carried out indicate underlying layers of unsuitable material in certain areas. For the foundations designated on the plan, hand augered proof holes may be required to determine the extent of such material. Include for this work in programming and adjust against provisional quantities scheduled.

#### 1.5 ACCESS FOR MACHINES

Determine working conditions and access for machines. Take into account the time of year, the nature of the ground and subsoil to be excavated, the ground water table and all matters influencing the carrying out of the work.

#### 1.6 SAFE WORKING CONDITIONS

Provide safe working conditions and adequate support to excavations at all times. Cover holes and fence off trenches and banks.

#### 1.7 FOUNDATION BEARING

Request written instructions if a natural bearing is:

- reached at a lesser depth or
- not reached at the depth shown on the drawings.

In made-up ground excavate down to a natural bearing. Remove unsuitable material that is exposed and replace with compacted backfill.

#### 1.8 INSPECTION

Arrange for inspections and before placing any new work. If bearing becomes inadequate due to any cause then stop work and request further instructions.

- 1.9 SITE MEASUREMENT, ROCK  
Where rock is shown to be part of the site condition by the bore logs, all rock removed to be solid measured and the quantity recorded and agreed to in writing as the excavation proceeds.

- 1.10 SITE MEASUREMENT, OTHER FORMATIONS  
If for any reason the excavations have to vary from the drawings, those affected to be solid measured and the quantity recorded and agreed to in writing as the excavation proceeds.

## **2. PRODUCTS**

### **Materials**

- 2.1 TOPSOIL  
Weathered soil, with organic inclusions capable of supporting the growth of vegetation.
- 2.2 CUT MATERIAL  
Consisting of sands, gravels, sedimentary materials, clays, scoria and similar deposits.
- 2.3 ROCK  
Defined as material encountered in excavations which because of its size or position can be removed only by breaking up by explosives or mechanical plant such as jack hammers or percussion drills.
- 2.4 UNCONTROLLED FILL  
Variable fill material placed with little or no compaction control.
- 2.5 EXCAVATED FILL  
Material from other formations in the excavation which may be selected and approved as suitable for filling and complying with [NZS 4402](#) by having grading and moisture content properties that will allow compaction to 95% of maximum density.

## **3. EXECUTION**

### **Conditions**

- 3.1 REPORT  
Report any survey pegs, bench marks, and the like on any features, leaving them undisturbed until approval is given for removal.
- 3.2 RETAINED FEATURES  
See Demolition Management Plan Drawings for those features to be retained. Mark out those features to be retained with 1 metre high 50mm x 50mm timber stakes with yellow plastic tape between, to eliminate accidental damage.
- 3.3 COMPLY  
Comply with the requirements of the WorkSafe NZ publication: [Approved code of practice for safety in excavation and shafts for foundations](#).
- 3.4 WORK BY OTHERS  
Before taking over work done on the site by others check all levels and conditions and report any discrepancies affecting further work.
- 3.5 EXISTING SERVICES AND FOUNDATIONS  
Locate underground services and foundations before work is started. Any information provided regarding the location of these services and foundations is given from available records but with no guarantee of accuracy as regards alignment or depth. Furthermore no guarantee is given or implied that the information provided covers all existing services and foundations. Make good at no extra cost damage to existing services to the satisfaction of the appropriate network utility operator. Protect existing roads, footpaths, gutters, crossings etc from damage during work.

- 3.6 **EXCAVATION NEAR TREES**  
Do not excavate or remove topsoil within the drip line of retained trees unless specifically directed. If excavation is directed, use hand methods, taking care to avoid damage to roots. Do not cut roots greater than 50mm diameter. Do not stockpile spoil against tree trunks or beneath the drip line of retained trees. Report any damage to tree boles or branches, with necessary remedial work by an approved tree surgeon.
- 3.7 **KEEP FREE OF WATER**  
Keep excavations free from water and keep water from excavations clear of other construction work.
- 3.8 **TERRITORIAL AUTHORITY REQUIREMENTS**  
Obtain from the territorial authority requirements for the method of discharging water from the site.
- 3.9 **FORM SUMPS**  
Form sumps outside the line of foundations and deep enough to drain excavations. Pump from sumps without disturbing excavations or any material in place.
- 3.10 **SILT CONTROL**  
Undertake silt control measures required by local authorities and network utility operators in relation to design, location and discharge into the drainage system.

#### **Application**

- 3.11 **STRIP TOPSOIL**  
Strip topsoil carefully over the whole site and stockpile where directed on the site, on the prepared subgrade, for re-spreading at the completion of the contract.
- 3.12 **STRIP TO SUBGRADE**  
Strip the soil over the whole site to form a subgrade generally, but at a minimum of 200mm below the original ground level. Leave the subgrade level, clear of all loose material and with no impediment for the excavation work.
- 3.13 **DIVERT WATERWAYS**  
Temporarily divert as necessary all ditches, field drains and other waterways encountered during the excavations and reinstate to approval on completion.
- 3.14 **DIVERT DRAINS AND SERVICE LINES**  
Divert services, drains and field drains encountered in the excavations to new routes clear of the building and reconnect to the requirements of the network utility operator.
- 3.15 **BREAK OUT**  
Break out and remove old foundations, floor slabs, drains, manholes and septic tanks, seal up connections and remove contaminated soil. Grub out roots in excess of 75mm diameter to a minimum of 500mm below the bottom level of footings or paving. Backfill with selected excavated material, well rammed in layers.  
  
Take special care when working close to retained trees and shrubs.
- 3.16 **EXCAVATION GENERALLY**  
Excavate for pads, strip foundations and tie beams to the profiles and levels shown on the drawings. Allow clearance for working space and formwork as necessary. Trim to required profiles, falls and levels. If pouring against natural ground excavate an extra 25mm that side to provide 75mm minimum cover to reinforcement horizontally. Bench surface of sloping ground to receive filling.
- 3.17 **OVER EXCAVATION**  
Make good with well compacted backfill.

- 3.18 **EXCAVATED BACKFILL**  
Stockpile selected excavated backfill on site where directed so that it does not impede continuing works until it is required.

**Finishing**

- 3.19 **BATTERS, TEMPORARY PROTECTION**  
Protect batters with a change of level between crest and toe of more than 1.5 metres from weather erosion with a waterproof covering of either hessian and tar, or heavy duty black polythene sheet. Seal at joints and securely fix down at crest and toe. Maintain coverings in good condition until the ground is secured by permanent construction.

**Completion**

- 3.20 **LEAVE**  
Leave work to the standard required by following procedures.
- 3.21 **SURPLUS TOPSOIL**  
Remove unwanted stripped soil from the site continually as the work proceeds. Clean up continually any soil if dropped on footpaths or roads.
- 3.22 **SURPLUS MATERIAL**  
Remove surplus excavated material from the site continually as the excavation proceeds. Clean up continually any excavated material dropped on footpaths or roads.

**4. SELECTIONS**

- 4.1 **BORE LOGS**  
Copies of bore logs are provided in Attachment of the Contract/Tender Documents.
- 4.2 **NON ENGINEERED FILL**  
Non-engineered fill has been encountered in the existing tennis court area where the Technology Block is to be built. The fill material is to be removed down to natural materials and re-used as directed by the Geotechnical Engineer.

## 2242 BACKFILLING

### 1. GENERAL

This section relates to the supply, placing and compaction of materials for backfill or built-up ground, as required for the contract civil works.

#### Documents

#### 1.1 DOCUMENTS REFERRED TO

Documents referred to in this section are:

<a href="#">NZS 3104</a>	Specification for concrete production
<a href="#">NZS 4229</a>	Concrete masonry buildings not requiring specific engineering design
<a href="#">NZS 4431</a>	Code of practice for earth fill for residential development
<a href="#">NZS 4402</a>	Methods of testing soils for civil engineering purposes
<a href="#">TNZ M/04</a>	Specification for basecourse aggregate
TNZ F/2	Specification for pipe subsoil drain construction

Documents listed above and cited in the clauses that follow are part of this specification. However, this specification takes precedence in the event of it being at variance with the cited document.

#### Requirements

#### 1.2 AS BUILT DOCUMENTS - NZS 4431

Refer to the general section 1238 AS BUILT DOCUMENTATION for the requirements for submission and review of as built documents and records.

Provide the following as built documents and records:

- Provide as built contour plan relating final topography to original topography.
  - Record areas of filled ground including areas of low density filling and areas not considered to meet the standard.
  - Record location of associated drainage.
  - Record location and relative levels of levelling points and benchmarks, including the date of the levelling
  - Provide draft as built information prior to practical completion.
  - Provide final as built information prior to the end of the defects liability period.
  - Provide copies to the owner of the land and to the TA
- Levelling points are required for fill in excess of 10 m vertical depth.

The general section 1238 AS BUILT DOCUMENTATION describes the process of submission and review of as built documentation. Use this clause to describe the specific requirements of what the required as built documents are to include.

#### 1.3 CONTROL TESTING FOR FILLS - NZS 4431

During construction of earth fills undertake required quantitative control tests on the fill material.

#### 1.4 INSPECTION NOTIFICATION - NZS 4431

Notify the inspecting engineer of the times required for inspection.

#### 1.5 INSPECTION NOTIFICATION

Notify the inspecting engineer of the times required for inspection.

### 2. PRODUCTS

#### Earth fill materials

#### 2.1 EARTH FILL

Earth fill as specified/ identified by the inspecting engineer. Refer to SELECTIONS.

#### Site concrete

- 2.2 SITE CONCRETE  
Low strength concrete 10 MPa with minimum water for workability, all materials and batching to [NZS 3104](#), table 3.1, **Prescribed mixes (P)**.

**Service trench backfill material**

- 2.3 GRANULAR BEDDING  
Clean granular non-cohesive material with a maximum particle size of 20mm.
- 2.4 GRANULAR BEDDING AND SURROUND  
Clean granular non-cohesive material with a maximum particle size of 20mm.
- 2.5 ORDINARY FILL  
Use material previously excavated from the trench.
- 2.6 COMPACTED SELECTED FILL  
Granular material free from topsoil and rubbish and has a maximum particle size of 20mm.
- 2.7 BEDDING & SURROUND – FOUL AND STORM WATER PIPES  
Sand.
- 2.8 MARKING TAPE  
Marking tape, refer to SELECTIONS

**3. EXECUTION**

**Conditions**

- 3.1 UNSUITABLE MATERIALS  
Remove from site all unsuitable filling material.
- 3.2 REMOVE SURPLUS  
Remove surplus imported filling materials from the site.
- 3.3 SPREAD SURPLUS  
Spread and level surplus imported filling materials where directed.
- 3.4 PLACE FILLING  
Place filling using approved methods, to required dimensions, levels, lines and profiles.
- 3.5 PROTECTION OF FORMATION  
Do not allow construction traffic on filling until the level has been raised not less than 150mm above formation level by properly compacted temporary protective filling.  
Remove temporary protective filling from the site before beginning permanent construction. Do not stockpile materials on newly filled areas without permission.
- 3.6 EARTHMOVING EQUIPMENT  
Do not use earthmoving equipment for compaction.
- 3.7 COMPACTION NEAR EDGE SUPPORTS  
Ensure that edge supports are strong enough to support compaction forces without movement, cracking or other damage. Make good damage caused by compaction.
- 3.8 MOISTURE CONTENT, GENERAL FILL  
Moisture content at time of compaction to be within the range of optimum less 6% up to optimum. Do not use filling with moisture content above optimum value. If necessary:  
- adjust moisture content of filling by turning and drying  
- provide water sprinkling equipment if fill is too dry.

**Application - Earth fill materials**



- 3.9 **SITE PREPARATION - NZS 4431**  
Before fill is placed on stripped natural ground, the ground surface shall be smoothed and compacted in a manner similar to that to be used on the layers of fill.
- 3.10 **FILL PLACING - NZS 4431**  
Fill shall be placed in a systematic manner, with near-horizontal layers of uniform thickness of material each being deposited progressively across the fill area. The uncompacted thickness of a layer shall be no greater than 230 mm. Fill water content control and uniformity to the requirements of [NZS 4431](#).
- 3.11 **FILL COMPACTION - NZS 4431**  
Each layer shall be compacted as a specific construction operation, using plant specifically assigned to the compaction task and following systematic patterns of travel tracks which progressively work across the surface of the fill. Recompact any compacted layer that has deteriorated after the interruption of the work.

#### **Application - Service trench backfill**

- 3.12 **GRANULAR BEDDING– FOUL WATER & STORM WATER PIPES**  
Place granular bedding in layers no greater than 100mm loose thickness. Compact by tamping by hand using a rod with a pad foot (having an area  $75 \pm 25\text{mm}$  by  $75 \pm 25\text{mm}$ ) over the entire surface of each layer to produce a compact layer without obvious voids.
- 3.13 **GRANULAR BEDDING AND SURROUND – FOUL WATER & STORM SURFACE WATER PIPES**  
Place granular bedding and surround in layers no greater than 100mm loose thickness and compact by tamping by hand using a rod with a pad foot (having an area  $75 \pm 25\text{mm}$  by  $75 \pm 25\text{mm}$ ) over the entire surface of each layer to produce a compact layer without obvious voids.
- 3.14 **COMPACTED SELECTED FILL – FOUL WATER & STORM SURFACE WATER PIPES**  
Place selected fill in layers no greater than 100mm loose thickness and compact. Up to 300mm above the pipe, compaction shall be by tamping by hand using a rod with a pad foot (having an area  $75 \pm 25\text{mm}$  by  $75 \pm 25\text{mm}$ ) over the entire surface of each layer to produce a compact layer without obvious voids. For selected fill more than 300mm above the pipe compact layers with at least four passes of a mechanical tamping foot compactor (whacker type) with a minimum weight of 75kg.
- 3.15 **ORDINARY FILL – FOUL WATER & SURFACE WATER PIPES**  
Place ordinary fill in layers no greater than 100mm
- 3.16 **MARKING TAPE**  
Install marking tape at required level during backfilling process.

#### **Completion**

- 3.17 **LEVELLING POINTS - NZS 4431**  
Set permanent levelling points in the upper surface of the fill to the requirements of [NZS 4431](#).
- 3.18 **TAKE AWAY**  
Take away from the site all selected excavated material or brought-in material not used for backfilling, leaving the site clear and tidy.
- 3.19 **LEAVE**  
Leave work to the standard required by following procedures.
- 3.20 **REMOVE**  
Remove all debris and unused materials from the site.

## **4. SELECTIONS**

### **Earth fill**

## 4.1 EARTH FILL

- Location: Existing Court Areas - New Technology Block  
 Type: Existing Non-Engineered Fill  
 Procedure Option 1: Existing material excavated, and temporarily stockpiled, down to good natural material as directed by Geotechnical Engineer. Material removed is to be re-used and replaced in slightly wet condition above optimum moisture content (OMC). Contractor will be required to test to determine required OMC. Material is to be free of organic material etc.  
 Procedure Option 2: Existing material excavated, and temporarily stockpiled, down to good natural material as directed by Geotechnical Engineer. Material removed is to be compacted in layers of 150mm with a 12tn roller, with minimum 6 passes. A tracked excavator can be used in place of roller if needed. Material is to be free of organic material etc. Contractor to confirm methodology and testing with the Engineer before commencing works
- Location: New Administration Building  
 Type: Existing Volcanic/Alluvium  
 Procedure Option 1: Existing material excavated, and temporarily stockpiled, down to good natural material as directed by Geotechnical Engineer. Material removed is to be re-used and replaced in slightly wet condition above optimum moisture content (OMC). Contractor will be required to test to determine required OMC. Material is to be free of organic material etc.  
 Procedure Option 2: Existing material excavated, and temporarily stockpiled, down to good natural material as directed by Geotechnical Engineer. Material removed is to be compacted in layers of 150mm with a 12tn roller, with minimum 6 passes. A tracked excavator can be used in place of roller if needed. Material is to be free of organic material etc. Contractor to confirm methodology and testing with the Engineer before commencing works

**Service trench backfill material**

## 4.2 SERVICE TRENCH - GRANULAR BEDDING &gt;500MM ABOVE CROWN OF PIPE WORK

- Location: See C1 Utilities Plan Drawing  
 Type: Clean granular non-cohesive material with a maximum particle size of 20mm

## 4.3 SERVICE TRENCH - GRANULAR BEDDING AND SURROUND &lt;500MM ABOVE CROWN OF PIPE WORK

- Location: See C1 Utilities Plan Drawing  
 Type: Clean granular non-cohesive material with a maximum particle size of 20mm.

## 4.4 SERVICE TRENCH - ORDINARY FILL

- Location: See C1 Utilities Plan Drawing  
 Type: Use material previously excavated from the trench.

## 4.5 SERVICE TRENCH - COMPACTED SELECTED FILL &gt;500MM ABOVE CROWN OF PIPE WORK SUBJECT TO LIGHT TRAFFIC LOADS

- Location: See C1 Utilities Plan Drawings  
 Type: Granular material free from topsoil and rubbish and has a maximum particle size of 20mm.

**Marking Tape**

## 4.6 MARKING TAPE

- Location: All new sewer sanitary and storm water pipe line  
 Type: Non-detectable

## 7701 ELECTRICAL BASIC

### 1. GENERAL

This section relates to the wiring for small scale commercial installations, including:

- new underground mains power supply to the existing Tereora College Administration Building from TAU Pole 108/A7 terminating into a meter box enclosure fix to the existing building
- disconnect service cable from existing Tereora College Administration Building from TAU Pole 108/A7/2A
- wire service cable into meter box enclosure connecting to 32A circuit breaker

#### 1.1 ABBREVIATIONS AND DEFINITIONS

Refer to the general section 1232 INTERPRETATION & DEFINITIONS for abbreviations and definitions used throughout the specification.

The following abbreviations apply specifically to this section:

CFL	compact fluorescent lamp
ELV	extra low voltage
GLS	general lighting service
IP	international (ingress) protection classification
LCD	liquid crystal display
LED	light emitting diode
MCB	miniature circuit breaker
NUO	Network Utility Operator
PCB	printed circuit board
PIR	passive infrared
RCBO	residual current-operated circuit breaker with over current protection
RCCB	residual current-operated circuit breakers
RCD	residual current device
SIA	security integration architecture
TPS	tough plastic sheathed
<u>TCF</u>	Telecommunications Carriers' Forum

#### Documents

#### 1.2 DOCUMENTS

Refer to the general section 1233 REFERENCED DOCUMENTS. The following documents are specifically referred to in this section:

<u>NZBC E2/AS1</u>	External moisture
<u>NZBC F6/AS1</u>	Visibility in escape routes
<u>NZBC F7/AS1</u>	Warning systems
<u>NZBC G4/AS1</u>	Ventilation
<u>NZBC G9/AS1</u>	Electricity
<u>AS/NZS 1125</u>	Conductors in insulated electric cables and flexible cord
<u>AS/NZS 1768</u>	Lightning protection
<u>AS/NZS 2201.1</u>	Intruder alarm systems - Client's premises - Design, installation, commissioning and maintenance
<u>AS 2293.1</u>	Emergency escape lighting and exit signs for buildings - System design, installation and operation
<u>AS 2293.3</u>	Emergency escape lighting and exit signs for buildings - Emergency escape luminaires and exit signs
<u>AS/NZS 3000</u>	Electrical installations (known as the Australian/New Zealand Wiring Rules)
<u>AS/NZS 3008.1.2</u>	Electrical installations - Selection of cables - Cables for alternating voltages up to and including 0.6/1 kV - Typical New Zealand installation conditions
<u>AS/NZS 3100</u>	Approval and test specification-general requirements for electrical equipment
<u>AS/NZS 3112</u>	Approval and test specification - Plugs and socket-outlets
<u>AS/NZS 3113</u>	Approval and test specification - Ceiling roses
<u>AS/NZS 3190</u>	Approval and test specification - Residual current devices (current-operated earth-leakage devices)

<a href="#">AS/NZS 3350.1</a>	Safety of household and similar electrical appliances - General requirements
<a href="#">AS/NZS 3439.3</a>	Low-voltage switchgear and controlgear assemblies - Particular requirements for low-voltage switchgear and controlgear assemblies intended to be installed in places where unskilled persons have access for their use - Distribution boards
AS 3786	Smoke alarms
NZS 4514	Interconnected smoke alarms for houses
<a href="#">AS/NZS 5000.2</a>	Electric cables - Polymeric insulated - for working voltages up to and including 450/750v
<a href="#">AS/NZS 60598.2.2</a> :2001	Luminaires - Particular requirements - Recessed luminaires
IEC 61643	Components for low voltage surge protection devices
<a href="#">Electricity (Safety) Regulations 2010</a> (Reprint as at 4 April 2016)	
<a href="#">TCF</a> Premises Wiring Code of Practice 2011	

## Warranties

### 1.3 WARRANTY

Warrant the complete electrical installation under normal environmental and use conditions against failure of materials and execution.

1 year: Warranty period

Refer to the general section for the required form of 1237WA WARRANTY AGREEMENT and details of when completed warranty must be submitted.

## Requirements

### 1.4 COMPLY

Comply with the Electricity (Safety) Regulations 2010, [AS/NZS 3000](#), [AS/NZS 3008.1.2](#) and [TCF](#) Premises Wiring Code of Practice for listed and prescribed work and with the utility network operator's requirements. Apply for the service connection. Arrange for the required inspections of listed work. Pay all fees.

### 1.5 QUALIFICATIONS

Carry out work under the supervision of an electrical licensed supervisor.

### 1.6 SAFETY OF INSTALLATION - DESIGN BY ELECTRICIAN

Before installation work commences provide a Certified Design. The Certified Design is to comply with the Electrical (Safety) Regulations (2010), regulations 58. It must be signed by the designer of the installation.

### 1.7 ELECTRICAL CERTIFICATE OF COMPLIANCE

Supply a certificate of compliance (CoC) to the owner, and if required the NUO, as required by the Electricity (Safety) Regulations (2010), prior to connection.

- Arrange for the NUO to inspect before the meter installation, listed work inspection, polarity check and supply becoming live.
- Arrange for an inspector to inspect as required by regulation 70.

### 1.8 ELECTRICAL SAFETY CERTIFICATE

Provide an Electrical Safety Certificate (ESC), as required by the Electrical (Safety) Regulations 2010, to the owner and when required the BCA. To be provided no later than 20 working days after connection and prior to Practical Completion.

## 2. PRODUCTS

### 2.1 MAINS SUPPLY, THREE PHASE

Tough plastic sheathed neutral screened cable to AS/NZS 4961 and [AS/NZS 3008.1.2](#), with a minimum rating of 60 amps per phase. Include pilot cable where required by network utility company.

## 2.2

**CABLES**

Tough plastic sheathed copper conductors to [AS/NZS 5000.2](#), stranded above 1.0mm<sup>2</sup>, and to [AS/NZS 3008.1.2](#). Minimum sizes as below. Increase sizes if the method of installation, thermal insulation, cable length or load will reduce the cable rating below that of the MCB rating, or produce an excessive voltage drop.

Lighting circuits: Domestic: 1.5mm<sup>2</sup> on 10 amp MCBs

Lighting circuits: Commercial: 1.5mm<sup>2</sup> on 16 amp MCBs

Power circuits: 2.5mm<sup>2</sup> on 16 amp MCBs for domestic and unenclosed or unfilled cavity construction  
 2.5mm<sup>2</sup> on 16 amp MCBs for domestic insulated construction, or filled cavity  
 2.5mm<sup>2</sup> on 20 amp MCBs for unenclosed or unfilled cavity construction  
 2.5mm<sup>2</sup> on 16 amp MCBs for insulated construction, or filled cavity, or lengths over 30 metres

Hot water cylinder circuits: Single phase: 2.5mm<sup>2</sup> on 20 amp MCBs

Range/oven/hob circuits: Single phase: 6mm<sup>2</sup> on 32 amp MCBs

Heat resistant cable for final connections to all heated appliances, and high temperature cable in ambient conditions that may be above 35°C.

## 2.3

**METER BOX**

Proprietary manufactured, zinc plated powder coated metal case, or ABS plastic, with glazed panel door, weatherproof where mounted outdoors, and complete with meter mounting, main switch and fuse.

**3.****EXECUTION**

## 3.1

**MAIN SUPPLY**

Lay underground mains to the NUO requirements. Excavate trench, install cable and marker tape and backfill.

## 3.2

**METER BOX**

Fit to meter box manufacturer's and Electricity Retailer's requirements. Recess into external wall in sheltered area and flash to weatherproof to [NZBC E2/AS1](#) fig 69. Arrange for meter installation and connection.

## 3.3

**EARTH BONDS**

Bond together and to earth all plumbing fittings not adequately isolated, to [AS/NZS 3000](#), the Electricity (Safety) Regulations 2010 and the fitting manufacturer's requirements.

## 3.4

**MAIN EARTH**

Provide a plastic toby box to contain and protect the earth electrode. Fix the connecting earth wiring closely and securely against wall surfaces.

## 3.5

**RCD - SPECIFIC INSTALLATIONS**

Install 30mA RCDs at the distribution board.

Install fixed wired RCD protected outlets (SRCD) in the following areas:

- Wet areas: bathrooms, laundries, kitchens.
- Near pools and water features.
- Where intended for use with cleaning equipment.
- Hand-held tools subject to movement in use, i.e. work-shops, garages.

## 3.6

**SET-OUT**

The position of outlets and equipment shown on drawings is indicative of requirements. Confirm documents and site conditions are not in conflict with other services or features. Resolve conflicts and discrepancies before proceeding with work affected. Confirm on site the exact location, disposition and mounting heights of all outlets, fittings, equipment, penetrations, and use of exposed wiring. Fix outlet items level, plumb and in line.

## 3.7

**CABLING**

Install wiring systems to [AS/NZS 3000](#). All cabling run concealed. No TPS cable laid directly in concrete. Locate holes in timber framing for the passage of cables at the

centre line of the timber member. Install cable in conduits where required to pass through concrete or underground. In walls run cabling horizontally and vertically in straight lines. In ceilings either run cabling along ceiling framing or attached to catenary wires. Clip cabling to ceiling framing/catenary wires.

### 3.8 CABLING CIRCUITS

Install all circuits with the appropriately rated cable and circuit protection. Install with a maximum of 8 light switch units or 4 double or single switched socket units on any circuit. Minimum 2 lighting circuits per floor. Separate circuits for all electric heating appliances. Kitchen sockets to be on at least two different circuits.

### 3.9 ELECTRIC POWERED FITTINGS AND EQUIPMENT

Install and wire fittings and equipment to individual fittings and equipment manufacturer's requirements. Refer to the drawings for required layouts and locations for equipment. Refer to SELECTIONS for schedules of fittings.

### 3.10 LABELLING

Include label under each controller, switch and circuit breaker on distribution boards. Include a warning notice if light dimmers are used in the installation. List the rating of each circuit.

### **Completion**

### 3.11 COMPLETION

Leave installation operating correctly, with equipment clean and operational.

## 4. SELECTIONS

### **Materials**

### 4.1 SELECTIONS - FITTINGS AND HARDWARE

Confirm selections of all outlet fittings and hardware with the owner in writing before ordering.

### 4.2 METER BOX

Location:	Exterior of existing Tereora College Administration building
Brand / type:	Zinc plated powder coated metal box or ABS plastic box

## 8600 CIVIL - COMMON REQUIREMENTS

### 1. GENERAL

This section relates to general matters relating to medium to large scale Civil Engineering works, including;

- demolition works
- asbestos removal work
- excavation and backfilling work
- vegetation removal work
- bulk earthworks
- service mains for sanitary sewer, storm water drainage

#### 1.1 RELATED WORK

Refer to the following relevant documents;

2111 DEMOLITION  
 2123 ASBESTOS REMOVAL  
 2241 EXCAVATION  
 2242 BACKFILLING  
 2221 REMOVING VEGETATION  
 8612 BULK EARTHWORKS DEVELOPMENT  
 8621 STORM WATER DRAINAGE  
 8622 SANITARY SEWERS  
 8624 SUBSOIL AND SUBGRADE DRAINAGE

#### Documents

#### 1.2 DOCUMENTS

Refer to the general section 1233 REFERENCED DOCUMENTS. The following documents are specifically referred to in this section:

[NZS 3910](#) Conditions of contract for building and civil engineering construction  
[NZS 4404](#) Land Development and Subdivision Infrastructure

#### Compliance information

#### 1.3 INFORMATION REQUIRED FOR CODE COMPLIANCE

Provide the following compliance documentation: -

- Producer Statement - Construction from the appropriate contractor
- Producer Statement - Construction Review from an acceptable suitably qualified person
- Other information required in the approved documents by the BCA, Territorial Authority.

#### Other property

#### 1.4 PROTECTION OF EXISTING PROPERTY

Adequately protect existing buildings, paths and roadways and other property on or adjoining the site and make good any damage to them caused by construction operations.

Before excavation is commenced inspect, together with a representative of the adjoining property owner, any adjoining buildings or structures potentially close enough to be affected. Agree and document all visible defects.

#### 1.5 WORK ON PRIVATE PROPERTY

Should the Contract Works require the entry of the Contractor onto property adjoining the site, the Engineer will arrange the necessary consent to enter. Do not enter until written consent is received.

Where trench excavations, embankments, cuttings or any other works encroach on private property, landscape and plant the finished surface in such a way that the standard of finish shall not in any case be less than that existing before the commencement of the works. Refer to 8612 BULK EARTHWORKS DEVELOPMENT. Reinstate drives, paths, fences walls and any other appurtenances of private property in the same or agreed

similar materials to those existing at the commencement of the Contract Works unless specified otherwise.

Give a minimum of one weeks notice to the occupant of any private property of the intention to enter to carry out necessary work or reinstatement.

#### 1.6 PROPERTY ACCESS

Ensure that access to property adjoining the site is interrupted as little as possible during the course of the Contract Works and when such interruption is unavoidable keep the property owners/occupiers fully informed of the situation prior to and during the interruption. The cost of making good any damage to property occurring as a result of the Contractors activities shall be borne by the Contractor.

#### 1.7 EXISTING SERVICES

The Principal will arrange and pay for the relocation of the following, only if proved necessary as a result of the contract works, but the Contractor shall co-operate and co-ordinate the work as required by the Conditions of Contract.

- Power, lighting and telephone poles
- Water mains
- Underground cables
- Drainage lines

Verify the location of all existing services and provide protection to them during the course of the Contract Works.

### **General Requirements**

#### 1.8 SURFACE BOXES, COVERS AND SIGNPOSTS

Firmly reset all surface boxes, markers and signs disturbed in any way by the contract works to suit the new levels or positions. Leave covers to hydrants and water main specials readily accessible at all times and keep clear of any sealing binder. Provide and maintain temporary markers wherever possible. Do not disturb Telecom, Power Authority and/or other junction boxes without prior approval by the Engineer and the relevant service authority or NUO.

#### 1.9 SETTING OUT, CHECKING & INSPECTION OF WORK

To [NZS 3910](#), 5.8 Setting Out, and any related Special Conditions of Contract.

The Engineer will check the accuracy of the works periodically and this may be done specifically at Practical Completion, and at the end of the Defects Notification Period. Provide, free of cost, such assistance as is required for this purpose.

Check and verify on site any dimensions relating to existing work, before related fabrication or other work is commenced. Report to the Engineer any discrepancies or conflict of dimensions and resolve the matter before work is commenced.

#### 1.10 EXCAVATIONS TO BE KEPT DRY

Keep all excavated areas, sumps and pits dry and free from ponded water during the progress of the Contract Works. Where necessary provide pumps and any other equipment required to manage such conditions.

#### 1.11 NO SUBSTITUTIONS

Where specifically stated in the section, substitutions are not permitted. Where they are permitted submit equivalent alternatives for approval. Do not use alternatives in the Contract Works unless written approval has been obtained.

Where any materials, goods or construction is specified to be to the approval of the Engineer, obtain such approval before work concerning the item is commenced.

#### 1.12 PROPRIETARY PROCESSES

To the manufacturers/suppliers instructions and the requirements of this specification. Where options are allowed use those which ensure the best result.



1.13 PROTECTION

Cover and protect all materials which may be affected by the weather to keep them free from damage while they are being transported to site. The Contractor shall be responsible for the proper care, safe keeping and protection of all materials and equipment after they have been delivered to site.

When any existing building or space is used as a shop or storeroom, the Contractor will be held responsible for any needed repairs, patching or cleaning arising from such use.

Protect from damage all fittings and make good any damage or loss which does occur without cost to the Principal.

1.14 TIDY UP

To [NZS 3910](#), 5.15.1 Clearance of site, remove all demolition materials, rubbish, spoil and excess materials from the site progressively as it accumulates unless directed to dump it on the site. Keep the site and/or premises clean at all times, and this requirement must be strictly observed to the complete satisfaction of the Engineer.

1.15 WORK STANDARDS

Carry out all Contract Works relating to land development, including the appropriate notifications and testing, in accordance with [NZS 4404](#) and related standards referenced in that standard, and in accordance with the relevant Territorial Standards.

1.16 CONSENTS

Most work undertaken by a Contractor is subject to a Resource Consent, Engineering Approval or a Building Consent. Confirm that the appropriate consents have been obtained prior to commencing any phase of the Contract Work, and comply with any conditions imposed by those consents.

## 8612 BULK EARTHWORKS DEVELOPMENT

### 1. GENERAL

This section relates to all earthworks including clearing, stripping, excavating, cutting and the construction of earth fills to the subgrade level of building platforms, roads and pavements, importing of fill materials and removal and disposal of waste items.

Copies of bore logs are in Geotechnical Report prepared by TIKE.

#### 1.1 RELATED WORK

Refer to 8600 CIVIL - COMMON REQUIREMENTS

#### Documents

#### 1.2 DOCUMENTS

Refer to the general section REFERENCED DOCUMENTS. The following documents are specifically referred to in this section:

<a href="#">NZS 4402.2.1</a>	Methods of testing soils for civil engineering purposes - Soil classification tests - Test 2.1 Determination of the water content
<a href="#">NZS 4402.4.1.1</a>	Soil compaction tests - Determination of the dry density/water content relationship - Test 4.1.1 New Zealand standard compaction test
<a href="#">NZS 4402.4.1.3</a>	Soil compaction tests - Determination of the dry density/water content relationship - Test 4.1.3 New Zealand vibrating hammer compaction test.
<a href="#">NZS 4402.5.1.1</a>	Solid density tests - Determination of the density of soil - Test 5.1.1 Sand replacement method for the determination of in situ density
<a href="#">NZS 4402.5.1.3</a>	Solid density tests - Determination of the density of soil - Test 5.1.3 Sampling tube method for the determination of the in situ density
<a href="#">NZS 4402.6.1.3</a>	Soil strength tests - Determination of the California Bearing Ratio (CBR) Test 6.1.3 Standard method for insitu tests
<a href="#">NZS 4402.6.5.2.</a>	Soil strength tests - Determination of the penetration resistance of a soil - Test 6.5.2 Hand method using a dynamic cone penetrometer
<a href="#">NZS 4404</a>	Land Development and Subdivision Infrastructure
<a href="#">NZS 4407</a>	Methods of sampling and testing road aggregates
<a href="#">NZS 4431</a>	Code of practice for Earth Fill for Residential Development
<a href="#">TNZ F/1</a>	Specification for earthworks construction
<a href="#">TNZ F/7</a>	Specification for geotextiles
<a href="#">TNZ T/1</a>	Standard Test Procedure for Benkelman Beam Deflection Measurements

#### Requirements

#### 1.3 QUALIFICATIONS

Workers to be experienced, competent trades people and operators familiar with the materials, equipment and techniques specified.

Geotechnical Engineers who provide professional opinion for the suitability of earth fill, to be Professional Geotechnical Engineers or Chartered Professional Engineers experienced in the field of soils engineering. Soils testing to be undertaken by IANZ accredited soils laboratories.

#### 1.4 AS BUILT DOCUMENTS

Refer to the general section 1238 AS BUILT DOCUMENTATION for the requirements for submission and review of as built documents and records.

Provide the following as built documents and records:

- Finished levels and datum
- Fill Isopach contours
- Areas of Undercut below subgrade
- Location and level of all geotextiles and geogrid
- All underfill drains, drainage blanket and vertical drains
- Monitoring Geotechnical Instruments base readings (where specified)

**Compliance information****1.5 INFORMATION REQUIRED FOR CODE COMPLIANCE**

Provide the following compliance documentation: -

- Producer statement - Statement of Suitability of Earth Fill for Residential Development by Chartered Engineer.
- Other information required in the approved documents by the BCA, Territorial Authority or NZTA

**Quality control and assurance****1.6 TESTING**

Test all earth-fills other than those specifically identified as uncontrolled fill in accordance with [NZS 4431](#) using standard testing procedures as set out in [NZS 4402](#).

In any situation where the engineer is not satisfied that the plant operator is operating the test equipment efficiently, in order to test the particular material the engineer may at the contractors cost arrange for an independent operator and/or item of equipment to be brought to the site to undertake the test.

To permit the Engineer to conduct any inspections and tests required with complete safety and accuracy of test results, work may be interrupted and/or operations diverted and surface materials removed to expose soils at the levels too be inspected required at no extra cost.

Control testing for fill shall be carried out in accordance with the following test methods; [NZS 4402.2.1](#), [NZS 4402.4.1.1](#), [NZS 4402.4.1.3](#), [NZS 4402.5.1.1](#), [NZS 4402.5.1.3](#), [NZS 4402.6.1.3](#), [NZS 4402.6.5.2](#), [TNZ T/1](#).

NZS 4407, test methods, 3.6, 3.7, 3.8, 3.10, 3.11, 3.15.

**1.7 INSPECTIONS**

Facilitate inspection by the engineer at all times during construction.

- After setting out of clearing area and prior to all clearing and stripping, and before the placing of any fill material on that ground.
- After all topsoil has been removed prior to earthworks. (This may also be required for survey purposes).
- Inspection that all unsuitable material has been removed prior to filling. (This may also be required for survey purposes).
- After any drain has been constructed, and before that drain is covered by fill material.
- Batters and benches prior to filling.
- Shape, level and consistency of subgrade and associated drainage.
- As necessary to assess the standard of fill material and its compaction.
- As necessary to carry out check tests of the soil properties, moisture content and the standard of compaction being achieved in the fill, to confirm it meets the requirements of [NZS 4431](#).
- Finished surfaces prior to topsoiling. (This may also be required for survey purposes).
- Completed topsoil prior to final levelling and seeding.
- Arrange fill construction to permit testing to be carried out as work proceeds.
- Provide excavating equipment and remove material from above the test level (if necessary) and subsequently backfill.

**1.8 PROTECTION**

Provide safety protection for personnel carrying out testing, when earthmoving, compacting or similar work is being carried out in the vicinity.

**1.9 PROGRAMME**

Co-operate with the engineer in establishing a suitable systematic programme of construction control and testing.

**1.10 MANAGEMENT PLAN**

Prior to commencement of earthworks, prepare and provide an Earthworks Management Plan detailing the following;

- Illustrate by tabulation and graphical presentation the proposed earthworks sequence.

- Monitor volumes in cut and fill areas, including unsuitable materials and disposal areas for all earthworks.
- Report earthworks volume monitoring results and the actions taken and proposed to ensure optimal rate of construction without compromising the standards required by this specification.
- The report shall include a summary tabulation of topsoil, cut-to-fill, cut and undercut to waste, and temporary stockpile volumes for each material type by station distance and intervals not greater than 100m.
- Show how the suitability of materials will be assessed and how required treatment will be determined, in advance of earthwork operations.
- Present earthworks compaction trial details to determine optimum material handling and treatment, including details of proposed conditioning, (wetting/drying methodology), and plant requirements.
- Show how the various Territorial Authority Resource Consent conditions and other environmental compliance requirements affect earthworks operations and how these are to be satisfied.
- Show the location of all landscape fill areas, and the location of undercut areas, subsurface drainage and borrow areas.
- Show how rock crushing operations will be managed.
- Show how temporary dewatering will be undertaken.
- Show how temporary cut slopes will be designed, constructed and maintained during earthwork operations, to ensure adequate drainage and stability.
- Show how the scheduled geotechnical monitoring instrumentation will be installed, maintained, monitored and reported for the duration of the contract.
- Show how the wick drains will be installed, including details of drain materials, installation equipment and procedures.

The Earthworks Management Plan preparation and maintenance shall form part of the reporting requirements.

## 2. PRODUCTS

### 2.1 CLASSIFICATION OF EARTHWORK MATERIALS

Material to be excavated shall be to NZTA [TNZ F/1](#), 8. **Classification of Material** with the exception that Type W material is deleted and considered as Type A material, where the costs of conditioning the wet material are included in the rate.

For any material to be classified as R1 or U, the quantity of that material must exceed 50m<sup>3</sup>, otherwise it shall be classified into the material type which is being excavated alongside the particular area.

### 2.2 IMPORTED COHESIVE FILL

Soils imported to the site must meet the quality standards outlined in the Cleanfill Management Guidelines (published by the Ministry for the Environment).

Provide the contamination assessment report for all soils or fill materials imported to the site covering source of the materials with physical address or location, number of samples and methods of sample collected from each soil source and results of all analyses conducted and demonstrate compliance with the Cleanfill Management Guidelines.

Imported clay fill material shall be cohesive clay and free of stones, rubble, organic material, contaminants, stumps, branches, and construction debris. Obtain the approval of the engineer prior to importing the material to site for placement.

### 2.3 IMPORTED NON-COHESIVE FILL

Imported aggregate fill to be well graded virgin GAP40 or GAP 65 supplied from an approved quarry source free of organic matter, clay and other deleterious material.

The material shall have a minimum CBR of 40 to NZS 4407, test method 3.15, be well graded from coarse to fine and have a plasticity index of not more than 5, and a sand equivalent of not less than 25 to NZS 4407, test method 3.6, and have a quality index of AA, AB, AC, BA, BB or CA to NZS 4407, test method 3.11.

Imported recycled aggregate or crushed concrete shall not be imported without approval of the engineer.

#### 2.4 IMPORTED TOPSOIL

Friable, high quality topsoil suitable to support plant life, including a composition of 10-20% sand, 5-20% humus or organic material intermixed with the balance percentage of silt or clay sized particle. It must not contain visible lumps of clay or silt and shall have a ph value of between 5.5 and 7.5.

Topsoil to be free from pollution and all hydrocarbon, organic compounds and heavy metal contamination in accordance with territorial authority acceptance criteria for residential use. It shall be free from stones and debris, concrete, steel, clay lumps, tree roots, sticks (or other inorganic material), weeds and seeds.

Provide a sample load of topsoil delivered to site for inspection and approval by the engineer. Provide laboratory certification of the analysis of the topsoil for hydrocarbon, organic compounds and heavy metals of the topsoil.

#### 2.5 SILT CONTROL DEVICES

These devices shall be as per Environmental Impact Assessment Tereora College Redevelopment Project Stage 1 and National Environment Service guidelines. For best practice examples see Auckland Regional Council, Technical Publication 90.

#### 2.6 GEOTEXTILES

Install geotextiles where shown on the drawings to [TNZ F/7](#) and manufacturers instructions.

### 3. EXECUTION

#### Conditions

#### 3.1 TIDINESS

Carry out the earthworks in a systematic, orderly and tidy manner. Construct fills uniformly and continuously to limit the extent of unprotected soil exposed at one time.

#### 3.2 FENCING

Install permanent fencing where such fencing is not affected by clearing or subsequent works. Install temporary fencing to secure the site where permanent fencing is not installed, to prevent unauthorised access.

#### 3.3 CLEARING

Clear the area required to complete the works or as otherwise indicated on the drawings.

Carry out clearing for earthworks construction to [TNZ F/1](#), 3. Clearing.

Remove all rubbish, trees, stumps, fences, obstacles, vegetation, roots, turf, organic matter and other deleterious or unwanted material from the areas of operation. Include all above and below ground structures and fences within the area of the site to be worked.

Remove tree stumps such that no roots exceeding 100mm remain. Stumps that are 'chipped' shall have chipping material removed from the site.

Materials of value shall be salvaged and stacked as directed on the site. They remain the property of the Principal unless otherwise stated. Refer to SELECTIONS. Cart and dispose of all unwanted materials, vegetation and debris to the Rarotonga landfill or at an alternative site location nominated by the Contractor and approved by the National Environment Services. Burying waste materials is not permitted.

Repair or re-erect boundary fences, structures and other objects of value not scheduled for removal but which are damaged or destroyed by the work.

- 3.4 **DEMOLITION**  
For demolition of buildings, refer to appropriate demolition section.
- 3.5 **ARCHAEOLOGICAL DISCOVERY**  
If fossils, antiquities and other items of value are found refer to Engineer for actions to be taken with archaeological discovery.
- 3.6 **ACCESS ROADS**  
Submit to the engineer for approval, the proposed methodology to gain access from the legal road into the site. Obtain vehicle crossing approval from the territorial authority where necessary. Haul roads proposed along the permanent road alignment will be subject to approval of the engineer where the contractor shall demonstrate that the temporary pavement design will not compromise the permanent pavement on proposed road subgrade.  
  
Maintain access roads to prevent dust nuisance and tracking of soil onto public roads.
- 3.7 **TEMPORARY SUPPORT**  
If earthworks are likely to undermine, cause a slip, or otherwise damage any completed work, adjoining property, street or private way, carry out adequate measures to prevent such damage occurring.
- 3.8 **TEMPORARY STOCKPILING**  
Temporary stockpiling of cut material shall be the responsibility of the contractor. Any such temporary stockpiling shall be located and constructed to ensure the stability of the stockpiled material and underlying ground. No stockpiled material shall be placed within the drip line of any tree to be retained, nor against any fence or structure.
- 3.9 **TEMPORARY DRAINAGE**  
Take all necessary measures to prevent excessive water-logging of surface materials yet to be excavated or compacted or both, and to prevent fill material from being eroded and re-deposited at lower levels. Refer to SELECTIONS for erosion control measures to be adopted.
- 3.10 **GROUNDWATER DRAINAGE**  
Install ground water drainage in the base of fill where seepage occurs. Refer to 8624 SUBSOIL AND SUBGRADE DRAINAGE.
- 3.11 **EXPLOSIVES AND BLASTING FOR EXCAVATION**  
The use of explosives is not permitted.

#### **Cut and Fill Surface Preparation**

- 3.12 **STRIPPING**  
Remove topsoil (including turf) and soil containing organic matter from all cut and fill areas, plus other specified areas, and stockpile on site at convenient locations to facilitate the intended work sequence and for future respreading of topsoil. Recover the maximum amount of clean soil for re-use. Remove from site all excess topsoil not required for respreading or as directed.
- 3.13 **WATERCOURSES, SWAMPS AND DEPRESSIONS**  
Comply with the requirements of the resource consents relating to works in watercourses. Dam and/or divert stream flows to the approval of the territorial authority and the engineer. Thoroughly clean out organic or unsuitable material from these areas and make provision for adequate drainage at the base of the excavation. Organic material shall be stockpiled and used as sub-topsoil material where respreading of topsoil is specified. Unsuitable material shall be removed from the site to an approved landfill.
- 3.14 **BENCHING**  
Benching to [TNZ F/1](#) unless stated otherwise on the drawings.

Where shown on the drawings, or where seepage is encountered, bench the ground and install subsoil drains to collect the seepage and discharge it to an approved location clear of the fill.

### 3.15 PREPARATION

As directed by the engineer, proof roll any prepared surface to identify any soft spots in the ground that may be removed on instruction by the engineer.

Prior to any fill placement, compact the exposed existing natural ground surface to a depth of 150mm to achieve compaction at least equal to that specified for the new fill material. If necessary, to meet this requirement, blade the ground until it is uniform, free of large lumps and brought to a suitable moisture content prior to compaction. If there is a delay between surface preparation and fill placement, the surface shall be protected against drying, wetting or erosion.

Prior to placement of fill, insitu cohesive material shall be tested with a hand held shear vane in accordance with the procedures outlined in the NZ Geotechnical Society Guidelines for Hand Held Shear Vane Test, and classified into the following end uses. Insitu materials to have fill placed over shall be undercut and replaced with engineered fill where the insitu materials fail to meet the following criteria.

Insitu Vane Shear Strength	Proposed Fill Classification
Less than 40 kPa or as specified on the drawings	Waste
40 kPa to 70 kPa	Landscape, Bunds and Surcharge Fill
Greater than 70 kPa	Engineered and Additional Fill

All granular cut is expected to be suitable for use as Engineered Fill, subject to confirmation that it is suitably graded material.

### Excavations

### 3.16 EXCAVATIONS

Construct all excavation in such a manner that the surface is free draining over the entire area. No water to pond on any completed surface.

Neatly cut batters to the slopes indicated on the drawings and trim to give a regular and smooth appearance once finished.

### 3.17 UNDERCUT TO WASTE

Undercut to Waste materials are defined as materials below design sub-grade level that have an in situ Vane Shear Strength of less than 40 kPa measured using a hand held shear vane in accordance with the NZ Geotechnical Society Guidelines for Hand Held Shear Vane Test, or as directed by the engineer.

Remove from site material with high organic content, or if agreed with the engineer, stockpile for use as sub-topsoil.

### 3.18 OFF SITE DISPOSAL

Where material is to be carted off site by public road, it will be identified as Cut to Waste for Off-Site Disposal. Carry out all aspects of the Off Site Disposal, including preparation of an Earthworks Management Plan, obtaining any necessary Land Use Consents and Resource Consents and preparation of an Erosion and Sediment Control Plan where required. Undertake preparatory work and site closure at the disposal site.

### Fill

### 3.19 FILL MATERIAL

Use approved 'on-site' soils or imported material as filling materials, free from vegetation and organic material, large lumps, saturated or soft materials and other deleterious substances.

In areas shown on the drawings, adjust the finished levels as necessary to achieve an optimum balance of quantities in these areas.

When using imported material, obtain the required approvals and consents, and pay all royalties and charges required in connection with its use.

When fill is imported to the site, fill quantities shall be a solid measure of the compacted fill in place established by survey of the original or stripped surface and a further survey after the fill is placed and compacted. No allowance will be made in measurement for any extra quantity of fill that may be required as a result of settlement of fill during earthworks construction.

### 3.20 PLACING FILL MATERIAL

The method of excavation, transport and depositing of fill material shall ensure the fill is as uniform a mixture as possible. Vary the path of transporting plant over the top of the compacted fill surface. Place fill in a systematic manner, with near horizontal layers of uniform thickness of material being deposited progressively across the full area of a fill. The uncompacted thickness of each layer shall be no greater than 200mm, and shall be limited to ensure that the bottom of each layer can be adequately compacted.

Fill batters steeper than 1 vertical to 4 horizontal shall be overfilled and subsequently trimmed to the design lines. This is required to ensure that the specified compaction standards are achieved over the full design embankment cross section.

Before any loose layer of fill material is compacted, break up the soil so that it is free of lumps or rocks which exceed 150mm, and bring to a uniform homogenous mixture and moisture content by mixing.

### 3.21 INCLEMENT WEATHER

Do not place, spread or compact fill material during or immediately following wet weather. Where any interruption in the earthmoving operation has resulted in drying out or cutting up of previously compacted layers, rework these layers prior to placement of new fill by scarifying and recompaction to the specified density and moisture content.

### 3.22 ADJUSTMENT OF MOISTURE CONTENT

Condition wet or dry cohesive soils to achieve moisture contents within the upper and lower bounds from optimum moisture content as specified.

When the moisture content of the fill material is less than that necessary to achieve the specified compaction, water shall be added, apply the water as a fine spray to reduce non-uniform distribution.

Where the moisture content of the fill is too high to achieve specified compaction, air dry the material by discing thin layers of wet material or other means.

Conditioning of the soils is deemed to be included in the work required to place and compact Type A material.

### 3.23 BATTER FACES

Construct fill batter faces as a separate operation either by over filling and cutting back or by rolling with compacting plant working up and down the slope.

## **Compaction**

### 3.24 GENERAL

Compact fill in accordance with [NZS 4402](#) together with the following additional clauses.

Compact each layer of fill material to at least the specified density, using plant specifically designed for compaction of the material classification following patterns of parallel tracks which work progressively across the surface of the fill, with sufficient passes to ensure the specified compaction is achieved.

Select compaction plant to consistently achieve the specified standard of compaction over the entire area of fill. Generally vibrating rollers will be required for non-cohesive materials and tamping type taper foot rollers for cohesive materials. Compaction plant shall be separate from that used for earthmoving.



**3.25 COMPACTION ACCEPTANCE CRITERIA FOR ENGINEERING FILL**

Place and compact fill to [NZS 4431](#) to meet the following.

General fill areas and more than 500mm below road and parking area subgrades, in cohesive soils.

- Average undrained shear strength (by hand vane) of 100 kPa in any group of 10 tests with no single test less than 80 kPa.
- Average air voids of not more than 10% in any group of 10 tests with no single test exceeding 15%.

Within 500mm of road and parking area subgrades, in cohesive soils, average undrained shear strength (by hand vane) of 120 kPa in any group of 10 tests with no single test less than 100 kPa.

- average air voids of not more than 8% in any group of 10 tests with no single test exceeding 12%.
- soaked CBR not less than 5.

In all locations, non-cohesive materials.

- dry density not less than 92% of the maximum dry density of the soil as determined by [NZS 4402](#).4.1.3.

Test frequency shall be one test per 2000m<sup>3</sup> and less than 1.5m depth of fill placed, with the additional criteria that the first 2000m<sup>3</sup> of fill placed shall have 3 sets of tests and all fill shall have a minimum of 5 sets of tests.

As well as accomplishing the minimum standard of compaction as set out above, the contractor must ensure that the fill is not over-compacted to the extent that weaving of the fill is produced.

Differential settlement shall not exceed 25mm over 6.0m horizontally.

The methods adopted for cut and fill operations shall be such as to maintain the moisture content as near as possible to optimum and between the limits of 2% below and 4% above optimum moisture content.

In any areas of fill where tests show that the required compaction has not been obtained, the contractor shall, at his own expense, remove the faulty material and carry out such compaction with or without adjustment of moisture content, as may be necessary to comply with the specification.

**3.26 SETTLEMENT**

Install settlement markers placed at 50.0m centres, on fill exceeding 10.0m total depth, installed immediately on completion of the earthworks. Survey the markers monthly and provide the results of the monitoring in tabular form to the engineer for confirmation that settlement is within acceptable limits and final surfaces can be installed.

**Tolerances****3.27 CUT SLOPES AND FILL EMBANKMENTS**

Form all cut faces and fill slopes true to line, level and grade. The finished surface shall be within 0.2m of the design surface, free of rutting and visual humps and hollows and no steeper than the design grade.

**3.28 FLAT AND PLANER SURFACES, BUILDING AND ROAD SUBGRADES**

Finish all flat surfaces within 100mm and minus nil of the level shown on the drawings, free of visible humps and hollows and graded so that no area ponds in water.

**Erosion Control****3.29 EROSION CONTROL SILT RETENTION MEASURES**

Construct and maintain adequate erosion and sediment control measures during the course of the earthworks as stated on the drawings, by the Territorial Authority and the Resource Consent if applicable. If not stated, install and maintain erosion and sediment

controls in accordance with the requirements of Auckland Council Technical Publication TP90.

Ensure that when all erosion and sediment control measures are in place, those measures are approved by the Territorial Authority prior to commencement of earthworks. Ensure that such measures are maintained during the course of the contract works, including the defects notification period, and until such time as they are deemed to be no longer necessary by the engineer. Remove all erosion and sediment control measures upon completion of the works and backfill to a standard compatible with the surrounding ground.

Comply with standard or special requirements of the Territorial Authority in addition to the following;

- Grade the surfaces of fills and cuts to prevent ponding.
- Construct temporary drains at the toe of steep slopes to intercept surface run-off and to lead drainage away to a stable watercourse or piped stormwater system.
- Prevent surface water from discharging over batter faces by drains formed to intercept surface run-off and discharge via stable channels or pipes, preferably into stable water courses or piped stormwater systems.
- Compact the upper surface of fills with rubber tyred or smooth wheeled plant when rain is impending, or when the site is to be left unattended.
- Compact the completed batter surfaces of fills with sheeps foot or similar non-smooth compaction plant to reduce run off velocities.
- Divert clean water from above the works via stabilized systems past affected areas.

All water from the works area shall be diverted to silt capturing devices being either;

- Silt traps and retention ponds constructed where they are feasible and necessary. These shall be cleaned out as required to ensure that adequate silt storage potential is maintained.
- Temporary barriers or fences choked with brush, sacking or the like. These should be used to reduce flow velocities and to trap silt where appropriate.
- Sections of natural ground left unstripped to act as grass (or other vegetation) filters for run-off from adjacent bare areas where feasible.

All earthwork areas shall be re-topsoiled and grassed or hydro-seeded as soon as possible after completion of the earthworks and drainage works.

Stabilise earth-worked surfaces carried out on the site against erosion as soon as practicable and in a progressive manner as earthworks are finished over various parts of the site. Divert all clean water runoff from stabilised areas and upstream catchments past active earthwork areas.

### 3.30 EROSION AND SEDIMENT CONTROL - INSPECTIONS

Inspect all the erosion and sediment control measures not less than weekly, and/or immediately before and after any significant rainfall event while carrying out earthworks, and at least monthly, or after any significant rainfall event, between earthwork seasons. In addition, whenever a significant storm event is forecasted, inspect and repair all erosion and sediment control measures prior to the storm event (including cleaning out of sediment retention ponds, if required).

During these inspections, determine and log the depth of sediment build - up within the sediment retention ponds. Provide a copy of the log at the scheduled site meetings. Where the silt build up exceeds 15% of the total storage of the pond, clean out the pond of all silt and place silt over fill areas to dry and be incorporated in the fill. Carry out any reasonable modification of existing erosion and sediment control measures requested by the Territorial Authorities during the course of the contract works, including the defects notification period, should this be required.

The Contractor shall be responsible for any damage within or outside the contract area caused by his operations whether this be due to silt or water, and shall be responsible for full reinstatement of such damage to the satisfaction of the engineer.

### **Completion**

3.31 **TOPSOIL SPREADING**

On completion of cut and fill operations and confirmation of the profile by the engineer, scarify clay subgrade by 200mm at 1.0m centres and respread topsoil, trim and lightly roll to the compacted depth shown on the drawings, or as specified. All surplus topsoil will remain the property of the Principal unless it has been approved to be removed from the site.

All debris, rubbish or vegetation shall be raked from the surface and removed from the site.

3.32 **MAINTENANCE**

Be responsible for the stability of all cuttings and embankments until the end of the defects notification period. Make good any subsidence or failure and replace any portions which have been displaced due to unsatisfactory workmanship, attrition by traffic, the failure to provide for adequate protective measures or drainage diversion resulting in scour or any other reasons attributable to the negligent operations of the contractor.

**4. SELECTIONS**

4.1 **EROSION CONTROL MEASURES**

Location: Nearby open drains, sloping land, disturb soils within the project site  
Measure: Sediment barriers, temporary drains, silt fences

## 8621 STORM WATER DRAINAGE

### 1. GENERAL

This section relates to the supply and laying of gravity storm water drainage.

#### 1.1 RELATED WORK

Refer to 8600 CIVIL - COMMON REQUIREMENTS

Refer to 8622 SANITARY SEWERS for Sanitary Sewers

#### 1.2 ABBREVIATIONS AND DEFINITIONS

Refer to the general section 1232 INTERPRETATION & DEFINITIONS for abbreviations and definitions used throughout the specification.

The following abbreviations apply specifically to this section:

RCRRJ                      Reinforced Concrete Rubber Ring Jointed

#### Documents

#### 1.3 DOCUMENTS

Refer to the general section 1233 REFERENCED DOCUMENTS. The following documents are specifically referred to in this section:

<a href="#">AS/NZS 1254</a>	PVC-U pipes and fittings for stormwater and surface water applications
AS 1830	Grey cast iron
<a href="#">AS/NZS 2032</a>	Installation of PVC pipe systems
<a href="#">AS/NZS 2033</a>	Installation of polyethylene pipe systems
<a href="#">NZS 3104</a>	Specification for concrete production
<a href="#">NZS 3124</a>	Specification for concrete construction for minor works
<a href="#">AS/NZS 3725</a>	Design for installation of buried concrete pipes
AS 3996	Access covers and grates
<a href="#">AS/NZS 4058</a>	Precast concrete pipes (pressure and non-pressure)
<a href="#">NZS 4404</a>	Land Development and Subdivision Infrastructure
<a href="#">NZS 4442</a>	Specification for Welded steel pipes and fittings for water, sewage and medium pressure gas
<a href="#">AS/NZS 4671</a>	Steel reinforcing materials
<a href="#">AS/NZS 5065</a>	Polyethylene and polypropylene pipes and fittings for drainage and sewerage applications
<a href="#">NZTA F2</a>	Specification for Pipe Subsoil Drain Construction
<a href="#">NZTA Z/5</a>	Minimum Standard Z/5 - Health and Safety Compliance Notice
<a href="#">TNZ F/1</a>	Specification for Earthworks construction
<a href="#">Health and Safety at Work Act 2015</a>	

#### 1.4 SAFETY AND TRAFFIC MANAGEMENT

Carry out all safety procedures as required by the WorkSafe NZ publication: [Approved Code of Practice for Safety in Excavation and Shafts for Foundations](#) and the [Health and Safety at Work Act 2015](#), regarding notifiable work and timbering.

All works undertaken on behalf of New Zealand Transport Agency to [NZTA Z/5](#).

#### 1.5 TESTS

Using the method as set out in [NZS 4404](#) or as modified by the territorial authority inspector, test and inspect pipelines before backfilling to ensure required acceptance levels are achieved.

Arrange for observation of the tests by the supervising engineer or territorial authority as required by the territorial authority.

Where required by the engineer or territorial authority, CCTV video survey all new pipework and provide copies of the video and log sheets.

In any situation where the engineer is not satisfied that the plant operator is operating the test equipment efficiently, in order to test the particular material the engineer may at the

contractors cost arrange for an independent operator and/or item of equipment to be brought to the site to undertake the test.

- 1.6 **RECORDS**  
Keep records of all tests and provide copies to the Engineer before Practical Completion.

- 1.7 **SITE CONDITIONS CONNECTION TO EXISTING STRUCTURES**  
Prior to commencement of drainage work, check existing structures and points of connection are located to the positions shown and to the levels shown on the drawings, and where discrepancies are identified, seek instruction for changes to the design. Locate existing structures and crossing services to confirm no clash in line or level.

### **Performance - Adjoining Properties**

- 1.8 **PROTECTION OF ADJOINING PROPERTY**  
Take all necessary precautions to protect existing and adjoining property from damage or risk of damage arising from excavation and drainage work. Make good any damage caused by construction operations as soon as possible. Where work will encroach close enough to existing property, that property damage could occur, undertake a pre-condition survey of the property with the appropriate owner, and agree all existing defects prior to excavation commencing.

Where drainage work is required on adjacent property, the Principal will arrange for consent to enter. Do not enter such property until written approval has been received. Where drainage work is not required but the Contractor wishes access to assist the execution of the works, approval from the adjacent property owner (and occupier) to be obtained by the Contractor. (Note: approval may be withheld).

### **Requirements**

- 1.9 **QUALIFICATIONS**  
Drainage construction work must be carried out or supervised by a registered drainlayer who is authorised to supply producer statements.  
Works must be implemented in accordance with the requirements of the territorial authority.
- 1.10 **AS BUILT DOCUMENTS**  
Refer to the general section 1238 AS BUILT DOCUMENTATION for the requirements for submission and review of as built documents and records.  
Provide the following as built documents and records:  
As soon as possible on completion, and before Practical Completion, provide the following as built drawings prepared to the requirements of the relevant acceptance authority for new and/or modified reticulation.
- Length, diameter, type and class of pipe.
  - Pipe grade and flow direction.
  - Trench undercut depth and locations.
  - Manhole lid level and invert levels of all incoming and outgoing pipes.
  - Invert levels of all drop connections at pipe grade line.
  - Distance in meters from downstream manhole to all pipe junctions.
  - NZMP coordinates of all manholes and pipe terminations.
- 1.11 **INFORMATION REQUIRED FOR CODE COMPLIANCE**  
Provide the following compliance documentation: -
- Producer Statement - Construction from the installer
  - Producer Statement - Construction Review from an acceptable suitably qualified person
  - Other information required in the approved documents by the BCA, Territorial Authority or NZTA

## **2. PRODUCTS**

- 2.1 **CONCRETE PIPES**  
Precast concrete, spigot and socket, rubber ring jointed to [AS/NZS 4058](#).

- 2.2 **PVC-U PIPES AND FITTINGS**  
Unplasticised PVC pipe and fittings to [AS/NZS 1254](#), refer to SELECTIONS.
- | <b>Classification</b> | <b>Use</b>                                |
|-----------------------|---|
| SN4 - SN6             | Domestic & light load areas               |
| SN8 - SN10            | Commercial & Industrial medium load areas |
| SN16                  | Public roads & high load areas            |
- 2.3 **CONCRETE**  
All concrete for cast in-situ structures to be ordinary grade concrete in accordance with [NZS 3104](#), having a minimum crushing strength of 20.0 MPa at 28 days.
- Bedding, capping and surround concrete, where specified, to be normal grade concrete with a minimum crushing strength of 20.0 Mpa at 28 days.
- 2.4 **REINFORCING STEEL**  
Grade 300 deformed bars to [AS/NZS 4671](#), and mesh to [AS/NZS 4671](#).
- 2.5 **CONCRETE CONSTRUCTION**  
Construction to [NZS 3124](#). Nothing shall prevent the use of High or Special Grade concrete produced in accordance with [NZS 3104](#), and/or construction to [NZS 3109](#).
- 2.6 **MANHOLES**  
Standard precast concrete to [NZS 3109](#). Construct to [NZS 4404](#) figure CM-004, CM-005 and CM-006 or as shown on the drawings or specific Territorial Authority detail.
- 2.7 **MANHOLE TOP SLAB**  
Manhole covers to [NZS 4404](#), or as shown on the specific Territorial Authority detail.
- 2.8 **MANHOLE LIDS**  
Metal lids and frames to suit application. Cast Iron to AS 1830, ductile iron and metal lids to AS 3996. Loading conditions to AS 3996, Class B to Class G. Class A only to be used if specifically stated.
- 2.9 **STEP IRONS**  
Standard hot dip galvanised steel step irons.
- 2.10 **ANTI-SCOUR BLOCKS**  
Anti-scour blocks to be concrete bulkhead detail as shown on drawing [NZS 4404](#) CM003.
- 2.11 **BEDDING MATERIALS**  
Bedding and side zone backfill for uPVC and ceramic pipe to be GAP 7.  
Bedding for concrete pipes to be GAP 20.  
Side and overlay zone backfill for concrete pipes to [AS/NZS 3725](#), GAP 20.  
Side zone backfill for concrete pipes to [NZS 4404](#), selected site won material free from stones larger than 40mm in diameter or other material liable to damage the pipes.  
Bedding and surround for perforated drainage pipes to [NZTA F2](#).
- Form weak concrete bedding with a strength of between 5 MPa and 7 MPa by adding 12mm 'all in' clean aggregate mixed with sufficient cement to the granular bedding material.
- 2.12 **BACKFILL - UNDERCUT AREAS**  
Backfill to undercut areas to be well graded GAP 65.
- 2.13 **BACKFILL - OUTSIDE PAVEMENT AREAS**  
The first 300mm of backfill above the pipe, and 1.0m outside pavement areas to be selected site won material free from stones larger than 40mm in diameter or other material liable to damage the pipes. The balance of the backfill to be approved site won material.

- 2.14 **BACKFILL - INSIDE PAVEMENT AREAS**  
The first 300mm of backfill above the pipe and 1.0m inside pavement areas to be well grade GAP 20. The balance of the backfill to subgrade level to be well graded GAP 65

- 2.15 **CLASSIFICATION OF EARTHWORK MATERIALS IN NARROW TRENCHES**  
Material to be excavated to be classified in accordance with NZTA [TNZ F/1](#), 8.  
**Classification of Material.** The exception being Type R1 material, defined as material which cannot be excavated with a hydraulic excavator of not less than 20-24 tonnes weight, fitted with a digging bucket not exceeding 600mm in width, fitted with rock teeth. (As defined in the latest issue of NZ Contractors Federation Guide to Plant Hire Rates).

For any material to be classified as R1, R2 or U, the quantity must exceed 5m<sup>3</sup>, otherwise it shall be classified into the material type which is being excavated alongside the particular area.

### 3. EXECUTION

- 3.1 **HANDLING AND STORAGE**  
Provide adequate labour and facilities for the unloading and safe storage of all materials. Adhere to manufacturers recommendations. Do not roll pipes on ramps or the ground. Take particular care in the storage of plastic pipes to avoid distortion.

- 3.2 **INSPECTION AND APPROVAL**  
All materials are to be inspected and to the engineers approval before use, and are to remain so during the works. Those which fail to gain approval are to be immediately removed from site.

- 3.3 **SETTING OUT**  
Lay drainage true to line and grade using laser equipment methods.  
Any pipe laid to a grade of less than 1 in 150 to be checked by survey and approved prior to backfill of the trench.  
Set out manhole locations by survey to locations shown on the drawings.

- 3.4 **LOCATE SERVICES**  
Locate all underground services as far as possible before excavation is commenced. Ensure the appropriate service provider is brought to the site to identify and locate a service where required. Information on the drawings, or otherwise provided regarding their location is given in good faith but with no guarantee to the accuracy or depth or alignment. Furthermore, no guarantee is given or implied that the information given covers all existing services.

Take care to ensure that underground services are not interfered with or damaged during construction. Should damage to such services occur, immediately reinstate the service at no cost to the Principal.

- 3.5 **TEMPORARY ACCESS**  
Unless alternative arrangements are made to the satisfaction of the engineer, provide temporary access over the trench line to private property until permanent access has been reinstated.

- 3.6 **EXPLOSIVES**  
The use of explosives is not permitted.

- 3.7 **PRIVATE PROPERTY**  
Where work is to be carried out through private property, the Principal will obtain necessary permissions and provide a summary of agreed site management and remediation details. Notify all affected residents/occupiers concerned one week before entry onto the property is required, and ensure that the necessary authority has been obtained before entering. Advise the engineer immediately if permission is denied. All works to be undertaken in accordance with the agreed site management and remediation details. No materials (other than trench spoil) to be stockpiled on private property. Where variation to the agreed site management and remediation details is

sought by the contractor, permissions for the variation in scope will be obtained by the contractor. Denial of approval shall not be grounds for a variation.  
On completion of the works on any private property, obtain written approval from the property owner, that the remediation work is accepted.

### **Excavation**

#### **3.8 CLEARING**

Dismantle fences and structures with care to permit reconstruction with the same materials. Excavate small shrubs and trees where replanting is achievable and maintain with water and shade. Remove and dispose of off-site all other structures and vegetation not able to be retained, and not shown on the drawings to be retained.

Concrete and asphalt surfacing to be saw cut in straight lines without saw tooth effect beyond trench excavation, to prevent over break. Broken edges of pavement to be recut and reinstated at Contractors expense on completion of the works.

Stockpile the topsoil separate from subsoils, for use in reinstatements.

#### **3.9 TRENCH EXCAVATION**

Excavate to the grades and levels shown on the drawings by open cut unless otherwise approved by the engineer in writing. Make the trench of a sufficient width to permit all operations necessary for the trimming or placing of bedding and for jointing of pipes to be carried out effectively. Prevent excavated material rolling into trenches in all excavation works.

Trench widths and foundation depths to be specific for each pipe type and size to [AS/NZS 2032](#) and [AS/NZS 2033](#) for PVC and polyethylene pipes respectively, and [AS/NZS 3725](#) for concrete pipes, or as shown on the drawings.

#### **3.10 SHORING**

Support the trench walls where necessary with a shield or suitable timber placed so that it will not interfere with the work of pipe laying or jointing. It shall be the contractors responsibility to determine when timbering is necessary or required, to comply with all statutory requirements in this connection, and for all safety measures, and it will be deemed that all necessary allowances have been made to the contract price to cover this work.

Remove all timbering before backfilling unless otherwise instructed by the engineer. Under certain circumstances a good deal of care may be necessary in the removal of timber to ensure that excessive trench collapse does not occur.

#### **3.11 OVER EXCAVATION**

Excavate only such ground as is necessary for the proper execution of the work, and if any excavation is made deeper or wider than required, reinstate as follows at no extra cost.

Where the trench or structure void is excavated below the grade specified in the drawings, without specific instructions to do so, it shall be refilled to grade at the contractors expense with crushed rock compacted as specified.

Where the trench or structure void is excavated to a greater width than is shown on the drawings or specified, the engineer may require extra work or remedial measures to be carried out by the contractor at the contractors expense. If in the opinion of the engineer any extra width will result in more load being placed on the pipe than it can safely carry, the contractor will be required to provide improved concrete bedding or stronger pipes or make the trench narrower by pouring low grade 10 MPa concrete along the sides of the trench so that the clear distance between opposite faces does not exceed the distance shown on the drawings. The width of the trench for this purpose is between excavated surfaces, and includes the thickness of any timbering or shoring.

Shoring of trenches is the contractors responsibility and the cost and time implications of reinstatement resulting from trench wall collapse lies with the contractor.

Any delay, and any costs resulting from such delay that may thus result, shall be the responsibility of the contractor.



### 3.12 WEAK FOUNDATIONS

Where bad ground is encountered, deepen the trench or structure excavation to approved solid ground as directed by the engineer, and the extra depth backfilled and thoroughly compacted to grade with approved hardfill. Dispose of all unsuitable excavated material clear of the works.

#### Laying

### 3.13 SUBSOIL WATER

Keep subsoil water below the level of joints or concrete or moisture sensitive fine grained bedding by means of approved side channels or perforated pipes and pumping as necessary, until the concrete has set sufficiently to prevent damage occurring or backfill extends above the top of the pipe.

Pumped water to be discharged to sediment treatment devices to the approval of the territorial authority, prior to discharge to the stormwater system or watercourse.

Control groundwater levels to prevent floatation of pipes.

### 3.14 BUOYANCY

Take precautions at all times to ensure that no pipeline floats or is displaced or damaged due to buoyancy.

### 3.15 BEDDING, HAUNCHING, SIDE AND OVERLAY ZONES

Bedding, haunching, side and overlay zones to be specific for each pipe type and size to [AS/NZS 2032](#) for PVC pipes, [AS/NZS 2033](#) for Polyethylene pipes and [AS/NZS 3725](#) for concrete pipes.

### 3.16 BEDDING, HAUNCHING, SIDE AND OVERLAY ZONES TO NZS 4404

Bedding, side support and overlay zones to be specific for each pipe type and size as specified in [NZS 4404](#).CM-001, and [NZS 4404](#).CM002. Allow for Type 1 to 4 granular bedding as shown on the details.

### 3.17 CONCRETE ENCASING

Concrete encasement to be as detailed in the design drawings, in accordance with [NZS 4404](#).CM 003. Concrete encasing to be discontinuous at each pipe joint with board placed at each pipe joint prior to pouring.

Concrete used for bedding to be Ordinary Grade Concrete to [NZS 3104](#).

Do not place concrete under water without special permission from the Engineer. In such special cases, the proportion of cement in the mix to be increased by 15% and special precautions taken to see that the concrete is placed by tremmie without loss of cement. Do not place scoria concrete under water.

### 3.18 STEEP GRADIENTS

Where the gradient of the pipe is 1 in 10 or steeper, add sufficient cement to the granular bedding material to produce a weak concrete with a strength of not less than 7MPa.

Where the gradient of the pipe is 1 in 5 or steeper, install anti-scour blocks to be located at pipe sockets at no less than 6.0m centres.

### 3.19 LAYING

Lay in straight lines between changes of line or grade from the lower end of the pipeline with sockets pointing uphill, each pipe set true to line and grade, and each joint completed before the next pipe is laid. Install PVC Pipes to [AS/NZS 2032](#). Install polyethylene pipes to [AS/NZS 2033](#). Install concrete pipes to [AS/NZS 3725](#).

To prevent entry of foreign matter cap ends of uncompleted runs each day. Test drains and backfill progressively to minimise site disruption.

Cut into the bedding as required to make provision for collars so that the barrel of the pipe is firmly supported for its full length.

### 3.20 JOINTING

Jointing to the recommendations of the pipe manufacturer.

Thoroughly clean spigots and sockets of the pipes immediately before jointing. Rubber rings and other fittings must be free from dust, dirt or grease.

When standard rubber rings are used, these shall be evenly mounted on the extreme end of spigots, and pipes lined up and supported so as to be concentric with the pipes already laid in the same line. Push the spigot firmly into the socket of the previously laid adjacent pipe until the end of the spigot bears against the shoulder of the socket.

### **Backfilling**

#### **3.21 BACKFILLING**

Compact carefully in pipe side zones in 150mm layers by means of a mechanical tamper or hand rammed as appropriate. Consolidate the remainder of the trench using plant or mechanical tampers in 200mm layers until the backfill material is at least as dense as the surrounding undisturbed ground or as approved.

#### **3.22 COVER**

The minimum cover to be 750mm beneath berms and landscape areas, and 1.0m beneath pavements, shared use paths and other areas subject to wheel loads. Where these requirements cannot be met protect the pipes by concrete capping constructed from 100mm of 20MPa concrete over the full width of the trench.

In situations where pipes are installed beneath pavement areas and are dependent upon pavement courses being in place to achieve the minimum cover requirement, the contractor shall be responsible for protecting those pipes against damage from construction loads until such time as pavement construction has been completed.

#### **3.23 TEMPORARY BRIDGES**

Provide temporary bridges over trenches to prevent heavy construction traffic damaging pipes after backfilling.

### **Manholes**

#### **3.24 CONSTRUCT MANHOLES**

Manholes to be precast 1050mm diameter unless shown otherwise. The base for a precast manhole shall be cast in-situ concrete a minimum of 150mm thick below the lower pipe invert and to a diameter of 1500mm, or at least 300mm greater than the external diameter of the manhole. Lower the manhole risers into the base concrete and trowel the concrete neatly to a 45° finish at least 150mm up the outside of the riser. Select riser sections to suit the height of the manhole. Clean both faces of the joint before placing each riser section. Seal joints with a rubber/bitumen preformed sealing strip laid in the joint before placing each riser section. Carefully stop all leaks and make the manhole watertight.

Place and align precast sections to provide vertical sides and vertical alignment of the ladder rungs over the outlet hole. Place the access hole in the lid over the ladder rungs, sealing the joint with preformed strip.

Clamp joints with standard clamps to maintain strength and water-tightness.

#### **3.25 HAUNCHING**

Form the manhole invert either with a half straight pipe or half pipe specials, for straight through manholes, adapted to the inverts of branch pipes etc. Alternatively, where approved, form curved channels in concrete with a steel tool to a smooth profile free of protrusions, and with a cross section at least equal to the diameter of the inlet pipe. Unless specified otherwise, the fall through a manhole to be the inlet pipe grade fall plus 10mm.

#### **3.26 PRECAST TOPSLAB**

Standard flat precast top slabs to [NZS 4404](#), fig CM004, heavy duty 150mm thick for road carriageways and road berms, 100mm thick elsewhere.

#### **3.27 MANHOLE LIDS**

Cast iron to AS 3996, heavy duty for road carriageways, pavement areas and road berms, light duty elsewhere.

Set manhole lid frames in normal grade concrete to ensure that the tops lie flush with and have the same cross fall as the final ground levels. Use precast adjustment rings if

necessary to maximum 450mm total throat height (including lid and top slab). Fix or cast in the lid frame to the manhole top slab, to the manufacturers requirements.

### 3.28 STEP IRONS

Where manhole depths exceed 1200mm, fit standard galvanised steel step irons at 300mm centres, starting 600mm below the cover. Do not break holes in the wall of the manhole for the step irons, use the preformed holes.

### 3.29 EXISTING MANHOLES

Where pipes are to be cut into existing manholes, maintain the performance of the existing system. Temporary damming of the flows will be permitted only to the extent that the volume capacity of the system can cope with the load, otherwise make temporary bypass connections. Alter benching to provide for the new patterns, and construct to the standard specified for new manholes.

Where sides of existing manholes are to be broken into to accommodate new pipes, form the hole using specialised diamond cutting tools. Do not under any circumstances use sledge hammers for this purpose. Repair the broken edges with cement mortar to a good standard of finish, and make the manhole leak-proof.

### 3.30 CATCHPITS

Catchpit leads to be 225mm RCRRJ.

Where required by the territorial authority, install siphons in catchpits to the territorial authority standard details.

Catchpits to be pre-cast as indicated on the drawings. Bed on 50mm minimum depth of low grade concrete and not directly on the excavated ground. Catchpit outlet pipe diameters should be shown on the drawings.

Set catchpit gratings in a concrete surround as shown on the drawings. On completion, fill catchpits with water to the outlet invert level. Any catchpits which are found not to be watertight to be repaired at the contractors expense. Clear out all catchpit silt chambers on Practical Completion of the Contract Works.

## Connections

### 3.31 CONNECTIONS AND JUNCTIONS

Provide connections for all building lots to be served by any particular line. In lines of less than 300mm diameter, make connections by the insertion of factory made and sealed Y junctions to [NZS 4404](#).

Concrete pipes 300mm and over in diameter, saddle the junctions as shown on detail drawings, the following requirements will apply.

- Make the junction using a standard saddle, or if saddles are not available, by means of a short length of the same pipe diameter as proposed for the connection, cut to fit the curvature of the pipe.
- Cut a hole in the upper half of the pipe to accommodate the saddle or other junction pipe; then bend up the exposed reinforcing wire along the outside of the junction pipe and surround the whole with 100mm of 10.0MPa concrete.
- Plaster the joint of the saddle or other junction pipe and the pipe with cement mortar on the inside to give a smooth finish and ensure that all reinforcing wires are covered by at least 12mm of mortar. Do not lay pipes from such junctions nor seal junctions until inspected and approved.

Saddling of pipes for connections is not permitted on pipes less than 300mm diameter. Where saddle connections are made, or where Y junctions are built into a line on concrete bedding, encase the whole junction in concrete.

Where Y junctions are inserted by means of rubber ringed specials, support from the bottom of the trench by 10.0 MPa concrete 225mm wide, extending half way up the junction pipe.

Where stormwater lines are more than 1.8m below ground level, bring up service connections to within 1.2m of the ground surface and embed the whole in 300mm of 10.0 MPa concrete which shall be carried down to the bottom of the trench. Take particular care not to disturb such connections during backfilling.

Finish all house and private connections within the property to be served, and terminate with an approved "stopper junction".

Mark all service connections with a 50mm x 50mm timber stake driven down to the end of the service pipe and projecting 300mm above ground level.

### **Finished ground**

#### **3.32 REINSTATEMENT**

On completion of the backfilling and compaction to subsoil level, spread, place and compact previously stockpiled topsoil evenly over the area from which it has been removed. Supply, place and compact imported topsoil where insufficient topsoil has been saved from excavation works. Where, in the opinion of the engineer, the contractor has failed to adequately separate and preserve existing topsoil for re-use, the supply of imported topsoil to be at the contractors expense. Apply grass seed at the rate of 20 grams per square metre to areas to be grassed, and harrow into top 25mm of topsoil. Reinstall all fences and other parts of the property which may have been disturbed or damaged by the Contract Works.

Where existing roads, kerbs, crossings or footpaths have been disturbed in excavation, carefully carry out reinstatement to match existing. Construction to be to relevant standards published by the relevant Territorial Authority or New Zealand Transport Agency as appropriate and is to match existing depths of basecourse or other construction. Compaction to be such that no subsequent settlement occurs.

Before resurfacing carriageways, trim the existing surfacing with sawcuts to form neat parallel lines traversing the carriageway.

Reinstall kerbs, channels, footpaths and crossings to straight sawcut lines or to existing straight joints.

Reinstatement which fails or settles within 12 months of construction shall be remedied by the Contractor at no extra cost, irrespective of the issue of Practical Completion.

### **Completion**

#### **3.33 ROUTINE CLEANING**

Carry out routine trade cleaning of this part of the work including periodic removal of all debris, unused materials and elements from the site.

#### **3.34 DEFECTIVE OR DAMAGED WORK**

Repair damaged or marked elements. Replace damaged or marked elements where repair is not possible or will not be acceptable.

### **Commissioning**

#### **3.35 TESTING**

Pre-test all pipework during construction. On completion of the work and before approval for acceptance of the pipelines, carry out a final test to the approval of the engineer and if required witnessed by the representative of the territorial authority.

## **4. SELECTIONS**

### **4.1 UPVC PIPES**

Location: See C1 Utilities Plan Drawings  
 Diameter: 225mm  
 Material: uPVC  
 Jointing: Rubber Ring  
 Class: SN4-SN6 Domestic & light load areas or SN8-SN10 Commercial & Industrial medium load areas or SN Public roads & high load areas.

### **4.2 BEDDING, HAUNCHING AND SURROUND**

Location	Road Carriageway and Hardstand	All other areas
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Flexible pipes	To <a href="#">AS/NZS 2032</a>	To <a href="#">AS/NZS 2032</a>
Rigid Pipes	HS2 to <a href="#">AS/NZS 3725</a>	H2 to <a href="#">AS/NZS 3725</a>

## 4.3 BACKFILL

Location	Within 1.0m of road carriageway, vehicle crossings, hardstands	All other areas
All pipes	Compacted hard fill	Compacted ordinary fill

## 4.4 REINSTATEMENT

Location	Type of Reinstatement
Road carriageway and hardstand	Full pavement reinstatement
Domestic paving	match existing
Grassed areas	Topsoil and grass

## 4.5 TESTS

Pipe	Test	Acceptance Criteria
All Pipes	Visual	Full bore
All Pipes	Ponding	No ponding
Flexible Pipe	Low pressure Air Test to Appendix C. <a href="#">NZS 4404</a>	To Appendix C. <a href="#">NZS 4404</a>
Rigid Ceramic Pipe	Low pressure Air Test to Appendix C. <a href="#">NZS 4404</a>	To Appendix C. <a href="#">NZS 4404</a>
Rigid Concrete Pipe	Hydrostatic Test to Appendix C. <a href="#">NZS 4404</a>	To Appendix C. <a href="#">NZS 4404</a>
Manholes	Infiltration	No visible infiltration

**Drainage Structures**

- 4.6 CATCHPITS  
Syphons: See C1 Utilities Plan Drawings
- 4.7 MANHOLES  
Location: See C1 Utilities Plan Drawings
- 4.8 MANHOLE LIDS  
Location: See C1 Utilities Plan Drawings
- 4.9 STEP IRONS  
Location: See C1 Utilities Plan Drawings

## 8622 SANITARY SEWERS

### 1. GENERAL

This section relates to the supply and laying of gravity sanitary sewers.

#### 1.1 RELATED WORK

Refer to 8600 CIVIL - COMMON REQUIREMENTS

Refer to 8621 STORM WATER DRAINAGE for Storm Water

Refer to 8624 SUBSOIL AND SUBGRADE DRAINAGE for Subsoil Drainage

#### Documents

#### 1.2 DOCUMENTS

Refer to the general section 1233 REFERENCED DOCUMENTS. The following documents are specifically referred to in this section:

<a href="#">AS/NZS 1260</a>	PVC-U pipes and fittings for drain, waste and vent application
<a href="#">AS/NZS 2032</a>	Installation of PVC pipe systems
<a href="#">AS/NZS 2033</a>	Installation of polyethylene pipe systems
<a href="#">NZS 3104</a>	Specification for concrete production
<a href="#">NZS 3124</a>	Specification for concrete construction for minor works
<a href="#">AS/NZS 3725</a>	Design for installation of buried concrete pipes
AS 3996	Access covers and grates
<a href="#">AS/NZS 4058</a>	Specification for Precast Concrete Pipes
<a href="#">NZS 4404</a>	Land development and subdivision infrastructure
<a href="#">NZS 4442</a>	Welded Steel Pipes and Fittings for Water, Sewage and Medium Pressure Gas
<a href="#">AS/NZS 4671</a>	Steel reinforcing materials
<a href="#">AS/NZS 5065</a>	Polyethylene and polypropylene pipes and fittings for drainage and sewerage applications
<a href="#">NZTA Z/5</a>	Minimum Standard Z/5 - Health and Safety Compliance Notice.
<a href="#">NZTA F2</a>	Specification for Pipe Subsoil Drain Construction
<a href="#">TNZ F/1</a>	Specification for Earthworks construction
<a href="#">Health and Safety at Work Act 2015</a>	

#### 1.3 SAFETY

Carry out all safety procedures as required by the WorkSafe NZ publication: [Approved Code of Practice for Safety in Excavation and Shafts for Foundations](#) and the [Health and Safety at Work Act 2015](#), regarding notifiable work and timbering.

Assess and provide for safe working procedures to AS 2865.

All work undertaken on behalf of New Zealand Transport Agency to [NZTA Z/5](#).

#### 1.4 TESTS

Using the method as set out in [NZS 4404](#) or as modified by the territorial authority (Infrastructure Cook Islands - WATSAN), test and inspect pipelines before backfilling to ensure required acceptance levels are achieved, and on completion of the final backfill immediately prior to acceptance by the territorial authority to ensure required acceptance.

Test manholes for infiltration as required by the Territorial Authority or Engineer.

Arrange for observation of the tests by the supervising engineer or the Territorial Authority as required by the Territorial Authority and not less than 24 hours before test.

Where required by the Engineer or Territorial Authority, CCTV video survey all new pipework and provide copies of the video and log sheets.  
Refer to SELECTIONS for test requirements.

In any situation where the engineer is not satisfied that the plant operator is operating the test equipment efficiently, in order to test the particular material the engineer may at the contractors cost arrange for an independent operator and/or item of equipment to be brought to the site to undertake the test.

- 1.5 **RECORDS**  
Keep records of all tests and provide copies to the Engineer before Practical Completion.

- 1.6 **SITE MEETING**  
Meet with the territorial authority drainage inspector and engineer to confirm the drainage layout in relation to site conditions. Confirm changes resulting and seek written site instruction before carrying out any work.

- 1.7 **CONNECTION TO EXISTING STRUCTURES**  
Prior to commencement of drainage work, check existing structures and points of connection are located to the positions and levels shown on the drawings, and where discrepancies are identified seek instruction from the engineer.

Prior to commencement of drainage work, locate existing structures and crossing services to confirm no clash in line or level.

### **Performance - Adjoining Properties**

- 1.8 **PROTECTION OF ADJOINING PROPERTY**  
Take all necessary precautions to protect existing and adjoining property from damage or risk of damage arising from excavation and drainage work. Make good any damage caused by construction operations as soon as possible. Where work will encroach close enough to existing property, that property damage could occur, undertake a pre-condition survey of the property with the appropriate owner, and agree all existing defects prior to excavation commencing.

Where drainage work is required on adjacent property, the Principal will arrange for consent to enter. Do not enter such property until written approval has been received. Where drainage work is not required but the contractor wishes access to assist the execution of the works, approval from the adjacent property owner (and occupier) shall be obtained by the contractor.

### **Requirements**

- 1.9 **QUALIFICATIONS**  
Drainage construction work must be carried out, or supervised by a registered drainlayer and works implemented in accordance with the requirements of the territorial authority and authorised to supply producer statements as a Licenced Building Practitioner.

- 1.10 **AS BUILT DOCUMENTS**  
Refer to the general section 1238 AS BUILT DOCUMENTATION for the requirements for submission and review of as built documents and records.

As soon as possible on completion and before Practical Completion, provide the following as built drawings, prepared to the requirements of the relevant acceptance authority for new and/or modified reticulation.

- Length, diameter, type and class of pipe.
- Pipe grade and flow direction.
- Trench undercut depth and locations
- Manhole lid level and invert levels of all incoming and outgoing pipes.
- Invert levels of all drop connections at pipe grade line.
- Distance in metres from downstream manhole to all pipe junctions.
- NZMP coordinates of all manholes and pipe terminations.

- 1.11 **INFORMATION REQUIRED FOR CODE COMPLIANCE**  
Provide the following compliance documentation: -
- Producer Statement - Construction from the installer
  - Producer Statement - Construction Review from an acceptable suitably qualified person
  - Other information required in the approved documents by the BCA, Territorial Authority or NZTA

## **2. PRODUCTS**

- 2.1 **PVC-U PIPES AND FITTINGS**  
Unplasticised PVC pipe and fittings to [AS/NZS 1260](#), refer to SELECTIONS.
- | <b>Classification</b> | <b>Use</b>                                |
|-----------------------|---|
| SN4 - SN6             | Domestic & light load areas               |
| SN8 - SN10            | Commercial & Industrial medium load areas |
| SN16                  | Public roads & high load areas            |
- 2.2 **CONCRETE**  
All concrete for cast in-situ structures shall be ordinary grade concrete in accordance with [NZS 3104](#), having a minimum crushing strength of 20.0MPa at 28 days.  
Bedding, capping and surround concrete, where specified, shall be normal grade concrete with a minimum crushing strength of 20.0MPa at 28 days.
- 2.3 **REINFORCING STEEL**  
Grade 300 deformed bars to [AS/NZS 4671](#), and mesh to [AS/NZS 4671](#).
- 2.4 **CONCRETE CONSTRUCTION**  
Carry out construction to [NZS 3124](#). Nothing shall prevent the use of High or Special Grade concrete produced to [NZS 3104](#), and/or construction to [NZS 3109](#).
- 2.5 **MANHOLES**  
Standard precast concrete to [NZS 3109](#). Construct to [NZS 4404](#) figure CM-004, CM-005 and CM-006 or as shown on the specific Territorial Authority detail.
- 2.6 **MANHOLE TOP SLAB**  
Hardware for manholes and manhole covers to [NZS 4404](#), or as shown on the specific Territorial Authority detail.
- 2.7 **MANHOLE LIDS**  
Metal lids and frames to suit application. Cast Iron to AS 1830, ductile iron and metal lids to AS 3996. Loading conditions to AS 3996, Class B to Class G. Class A only to be used if specifically stated.
- 2.8 **STEP IRONS**  
Standard hot dip galvanised steel step irons.
- 2.9 **BEDDING MATERIALS**
- Bedding and side zone backfill for uPVC and ceramic pipe shall be GAP 7.
  - Bedding for concrete pipes shall be GAP 20.
  - Side and overlay zone backfill for concrete pipes laid in accordance with AS/NZS 3735 shall be GAP 20.
  - Side zone backfill for concrete pipes laid in accordance with [NZS 4404](#) shall be selected site won material free from stones larger than 40mm in diameter or other material liable to damage the pipes.
  - Bedding and surround for perforated drainage pipes shall be as specified in [NZTA F2](#).
  - Weak concrete bedding consisting of 12mm all in clean aggregate mixed with sufficient cement shall be added to the granular bedding material to provide a weak concrete with strength of between 5 MPa and 7 MPa.
- 2.10 **ANTI SCOUR BLOCKS**  
Anti-scour blocks to be "Concrete Bulkhead Detail" as shown on drawing [NZS 4404](#) CM 003.
- 2.11 **BACKFILL**  
Backfill to undercut areas shall be well graded GAP 65.  
The first 300mm of backfill above the pipe and 1.0m outside pavement areas shall be selected site won material free from stones larger than 40mm in diameter or other material liable to damage the pipes. The balance of the backfill shall be approved site won material.



The first 300mm of backfill above the pipe and 1.0m inside pavement areas shall be well grade GAP 20. The balance of the backfill to subgrade level shall be well graded GAP 65.

## 2.12 CLASSIFICATION OF EARTHWORKS IN NARROW TRENCHES

Materials to be excavated shall be classified in accordance with NZTA [TNZ F/1](#), 8.

**Classification of Material**, with the exception that Type R1 material shall be that which cannot be excavated with a hydraulic excavator of not less than 22 - 24 tonnes weight as defined in the latest issue of NZ Contractors Federation Guide to Plant Hire Rates fitted with a digging bucket not exceeding 600mm in width and fitted with rock teeth.

For any material to be classified as R1, R2 or U, the quantity of that material must exceed 5m<sup>3</sup> otherwise it shall be classed into the material type which is being excavated alongside the particular area.

## 3. EXECUTION

### 3.1 HANDLING AND STORAGE

Provide adequate labour and facilities for the unloading and safe storage of all materials. Adhere to manufacturers recommendations. Do not roll pipes on ramps or the ground. Take particular care in the storage of plastic pipes and manhole structures to avoid distortion.

### 3.2 INSPECTION AND APPROVAL

All materials are to be inspected and to the engineers approval before use, and are to remain so during the works. Those which fail to gain approval are to be immediately removed from site.

### 3.3 SETTING OUT

Lay drainage true to line and grade using laser equipment methods. Any pipe laid to a grade of less than 1 in 150 shall be checked by survey and approved prior to backfill of the trench.

Manhole locations shall be set out by survey to locations shown on drawings.

### 3.4 TEMPORARY ACCESS

Unless alternative arrangements are made to the satisfaction of the engineer, temporary access over the trench line shall be provided to private property until permanent access has been reinstated.

### 3.5 EXPLOSIVES

The use of explosives is not permitted.

### 3.6 PRIVATE PROPERTY

Where work is to be carried out through private property, the Principal will obtain necessary permission and provide a summary of agreed site management and remediation details. Notify all affected residents, occupiers concerned one week before entry onto the property is required, and ensure that the necessary authority has been obtained before entering. Advise the engineer immediately if permission is denied. All works shall be undertaken in accordance with the agreed site management and remediation details. No materials (other than trench spoil) shall be stockpiled on private property. Where variation to the agreed site management plan and remediation details is sought by the contractor, permissions for the variation in scope will be obtained by the contractor. Denial of approval shall not be grounds for a variation.

On completion of the works on any private property, obtain written approval from the property owner, that the remediation work is accepted.

### 3.7 CLEARING

Dismantle fences and structures with care to permit reconstruction of the fence with the same materials. Excavate small shrubs and trees when replanting is achievable and maintain with water and shade. Remove and dispose of off-site all other structures and vegetation not able to be retained, and not shown on the drawings to be retained.

Saw cut concrete and asphalt surfacing in straight lines without saw tooth effect beyond trench excavation, to prevent over break. Re-cut broken edges of pavement and reinstate at Contractors expense on completion of the works.

Stockpile topsoil separately from sub-soils, for re-use in reinstatement.

## **Excavation**

### **3.8 TRENCH EXCAVATION**

Excavate to the grades and levels shown on the drawings by open cut unless otherwise approved by the engineer in writing. Make the trench of a sufficient width to permit all operations necessary for the trimming or placing of bedding and for jointing of pipes to be carried out effectively. Prevent excavated material rolling into trenches in all excavation works.

### **3.9 TRENCH DEPTHS**

Trench widths and foundation depths shall be specific for each pipe type and size to [AS/NZS 2032](#) for PVC pipes, [AS/NZS 2033](#) for polyethylene pipes, and [AS/NZS 3725](#) for concrete pipes.

Excavation shall not be less nor greater than 100mm of that specified. Battering or benching of trench side walls shall not commence less than 300mm above the top of the pipe.

Trench excavation shall not extend more than 20 metres ahead of pipe laying or 40 metres ahead of backfilling.

No spoil, plant or materials shall be placed against any fence, building or within the drip line of any tree.

Where rock is encountered in the nominal trench excavation, notify the engineer of the presence and volume of rock prior to backfill for verification.

### **3.10 SHORING**

Support the trench walls where necessary with a shield or suitable timber placed so that it will not interfere with the work of pipe laying or jointing. It shall be the contractors responsibility to determine when timbering is necessary or required, to comply with all statutory requirements in this connection, and for all safety measures, and it will be deemed that all necessary allowances have been made to the contract price to cover this work.

Remove all timbering before backfilling unless otherwise instructed by the engineer.

Under certain circumstances a good deal of care may be necessary in the removal of timber to ensure that trench collapse does not occur.

### **3.11 OVER EXCAVATION**

Excavate only such ground as is necessary for the proper execution of the work, and if any excavation is made deeper or wider than required, reinstate as follows, at no extra cost.

Where the trench or structure void is excavated below the grade called for in the drawings without specific instruction to do so, it shall be refilled to grade at the contractors expense with crushed rock, compacted as specified below.

Where the trench or structure void is excavated to a greater width than is shown in the drawings or specified, the engineer may require extra work or remedial measures to be carried out by the contractor at the contractors expense. If, in the opinion of the engineer any extra width will result in more load being placed on the pipe than it can safely carry, the contractor will be required to provide improved concrete bedding or stronger pipes, or make the trench narrower by pouring low grade 10MPa concrete along the sides of the trench, so that the clear distance between opposite faces does not exceed the distance shown on the drawings. The width of the trench for this purpose is between excavated surfaces, and includes the thickness of any timbering and shoring.

Shoring of trenches is the contractors responsibility and the time and cost implications of reinstatement resulting from trench wall collapse lies with the contractor. Any delay, and any costs resulting from such delay that may thus result, shall be the responsibility of the contractor.

- 3.12 **WEAK FOUNDATIONS**  
Where bad ground is encountered, deepen the trench or structure excavation to approved solid ground as directed by the engineer, and the extra depth backfilled and thoroughly compacted to grade with approved hardfill. Dispose of all unsuitable excavated material clear of the works.
- Laying**
- 3.13 **SUBSOIL WATER**  
Keep subsoil water below the level of joints or concrete or moisture sensitive fine grained bedding by means of approved side channels or perforated pipes and pumping as necessary, until the concrete has set sufficiently to prevent damage occurring or backfill extends above the top of the pipe.  
Discharge pumped water to sediment treatment devices to the approval of the territorial authority, prior to discharge to the stormwater system or watercourse.  
Control groundwater levels to prevent floatation of pipes.  
Provide copies of bore logs showing soil types and ground water levels if available.  
Obtain information and assess the level of trench de-watering required.
- 3.14 **BUOYANCY**  
Take precautions at all times to ensure that no pipeline floats or is displaced or damaged due to buoyancy.
- 3.15 **STEEP GRADIENTS**  
Where the gradient of the pipe is 1 in 10 or steeper, add sufficient cement to the granular bedding material to produce a weak concrete with a strength of not less than 7MPa.  
Where the gradient of the pipe is 1 in 5 or steeper, install anti-scour blocks to be located at pipe sockets at no less than 6.0m centres.
- 3.16 **BEDDING, HAUNCHING, SIDE AND OVERLAY ZONES**  
Bedding, haunching, side and overlay zones shall be specific for each pipe type and size to [AS/NZS 2032](#) for PVC pipes, [AS/NZS 2033](#) for Polyethylene pipes and [AS/NZS 3725](#) for concrete pipes.
- 3.17 **CONCRETE ENCASING**  
Concrete encasement shall be as detailed in the design drawings, in accordance with [NZS 4404](#).CM 003. Concrete encasing shall be discontinuous at each pipe joint with board placed at each pipe joint prior to pouring.  
Use Ordinary Grade Concrete to [NZS 3104](#) for bedding.
- Do not place concrete under water without special permission from the Engineer. In such special cases, increase the proportion of cement in the mix by 15% and take special precautions to see that the concrete is placed by tremmie without loss of cement. Do not place scoria concrete under water.
- 3.18 **LAYING**  
Lay in straight lines between changes of line or grade from the lower end of the pipeline with sockets pointing uphill, each pipe set true to line and grade and each joint completed before the next pipe is laid. Install PVC Pipes to [AS/NZS 2032](#) Install polyethylene Pipes to [AS/NZS 2033](#). Install concrete pipes to [AS/NZS 3725](#). To prevent entry of foreign matter cap ends of uncompleted runs each day. Test drains and backfill progressively to minimise site disruption. Concrete cap trenches to all drains with less than 375mm cover. Cut into the bedding as required to make provision for collars so that the barrel of the pipe is firmly supported for its full length.
- 3.19 **JOINTING**  
Joining to the recommendations of the pipe manufacturer.  
Spigots and sockets of the pipes must be thoroughly clean immediately before jointing, and rubber rings and other fittings, must be free from dust, dirt or grease.
- When standard rubber rings are used, these shall be evenly mounted on the extreme end of spigots, and pipes lined up and supported so as to be concentric with the pipes already

laid in the same line. The spigot shall then be pushed firmly into the socket of the previously laid adjacent pipe until the end of the spigot bears against the shoulder of the socket.

### **Backfilling**

#### **3.20 BACKFILLING**

Carry out backfilling so that no subsidence will take place after the work has been completed.

Compact carefully in pipe side zones in 150mm layers by means of a mechanical tamper or hand rammed as appropriate. Consolidate the remainder of the trench using plant or mechanical tampers in 200mm layers until the backfill material is at least as dense as the surrounding undisturbed ground or as approved.

#### **3.21 COVER**

Minimum cover 750mm beneath berms and landscape areas, and 1.0m beneath pavements, shared use paths and other areas subject to wheel loads. Where these requirements cannot be met protect the pipes by concrete capping constructed from 100mm of 20MPa concrete over the full width of the trench.

In situations where pipes are installed beneath pavement areas and are dependent upon pavement courses being in place to achieve the minimum cover requirement, the Contractor shall be responsible for protecting those pipes against damage from construction loads until such time as pavement construction has been completed.

### **Manholes**

#### **3.22 CONSTRUCT MANHOLES**

Manholes 1050mm diameter unless shown otherwise. The base for precast manholes to be cast in-situ concrete a minimum of 150mm thick below the lower pipe invert and to a diameter of 1500mm, or at least 300mm greater than the external diameter of the manhole. The manhole risers shall be lowered into the base concrete and the concrete neatly trowelled to a 45° finish at least 150mm up the outside of the riser.

Select riser sections to suit the height of the manhole. Clean both faces of the joint before placing each riser section. Seal joints with a rubber/bitumen preformed sealing strip laid in the joint before placing each riser section. Carefully stop all leaks and make the manhole watertight.

Place and align precast sections to provide vertical sides and vertical alignment of the ladder rungs over the outlet hole. Place the access hole in the lid over the ladder rungs, sealing the joint with preformed strip.

Clamp joints with standard clamps to maintain strength and water-tightness.

#### **3.23 HAUNCHING**

Form the manhole invert either with a half straight pipe or half pipe specials, for straight through manholes, adapted to the inverts of branch pipes etc. Alternatively, where approved, form curved channels in concrete with a steel tool to a smooth profile free of protrusions, and with a cross section at least equal to the diameter of the inlet pipe. Unless specified otherwise, the fall through a manhole shall be the inlet pipe grade fall plus 10mm.

#### **3.24 PRECAST TOPSLAB**

Standard flat precast top slabs to [NZS 4404](#), fig CM004, heavy duty 150mm thick for road carriageways and road berms, and 100mm thick elsewhere.

#### **3.25 MANHOLE LIDS**

Cast iron lids to AS 3996, heavy duty for road carriageways, pavement areas and road berms, and light duty elsewhere. Set manhole lid frames in normal grade concrete to ensure that the tops lie flush with and have the same cross fall as the final ground levels. Use precast adjustment rings if necessary to maximum 450mm total throat height (including lid and top slab). Fix or cast in the lid frame to the manhole top slab, to the manufacturers requirements.

**3.26 STEP IRONS**

Where manhole depths exceed 1200mm, fit standard galvanised steel step irons at 300mm centres, starting 600mm below the cover. Do not break holes in the wall of the manhole for the step irons, use the preformed holes.

**3.27 EXISTING MANHOLES**

Where pipes are to be cut into existing manholes, maintain the performance of the existing system. Temporary damming of the flows will be permitted only to the extent that the volume capacity of the system can cope with the load, otherwise make temporary bypass connections. Alter benching to provide for the new patterns, and construct to the standard specified for new manholes.

Where sides of existing manholes are to be broken into to accommodate new pipes, make the hole using specialised diamond cutting tools and under no circumstances shall sledge hammers be used for this purpose. Repair the broken edges with cement mortar to a good standard of finish, and make the manhole leak-proof.

**Connections****3.28 CONNECTIONS AND JUNCTIONS**

Provide connections for all building lots to be served by any particular line. In lines of less than 300mm diameter, make connections by the insertion of factory made and sealed Y junctions to [NZS 4404](#).

Concrete pipes 300mm and over in diameter, saddle the junctions as shown on detail drawings, the following requirements will apply.

- Make the junction using a standard earthenware saddle, or if saddles are not available, by means of a short length of the same pipe diameter as the proposed connection, cut to fit the curvature of the sewer pipe.
- Cut a hole in the upper half of the sewer pipe to accommodate the saddle or other junction pipe; then bend up the exposed reinforcing wire along the outside of the junction pipe and surround the whole with 100mm of 10.0MPa concrete.
- Plaster the joint of the saddle or other junction pipe and the sewer pipe with cement mortar on the inside to give a smooth finish and ensure that all reinforcing wires are covered by at least 12mm of mortar. No pipes shall be laid from such junctions nor shall junctions be sealed until inspected and approved.

Saddling of pipes for connections is not permitted on pipes less than 300mm diameter. Where saddle connections are made, or where Y junctions are built into a line on concrete bedding, encase the whole junction in concrete. Where Y junctions are inserted by means of rubber ringed specials, support from the bottom of the trench with 10.0 MPa concrete 225mm wide, extending half way up the junction pipe.

Where stormwater lines are more than 1.8m below ground level, bring up service connections to within 1.2m of the ground surface and embed the whole in 300mm of 10.0 MPa concrete which shall be carried down to the bottom of the trench. Take particular care not to disturb such connections during backfilling.

Finish all house and private connections within the property to be served, and terminate with an approved "stopper junction".

Mark all service connections with a 50mm x 50mm timber stake driven down to the end of the service pipe and projecting 300mm above ground level.

**Finished ground****3.29 REINSTATEMENT**

On completion of the backfilling and compaction to subsoil level, spread, place and compact the previously stockpiled topsoil evenly over the area from which it has been removed. Supply, place and compact imported topsoil where insufficient topsoil has been saved from excavation works. Where in the opinion of the engineer, the contractor has failed to adequately separate and preserve existing topsoil for re-use, the supply of

imported topsoil shall be at the contractors expense. Apply grass seed at the rate of 20 grams per square metre to areas to be grassed, and harrow into top 25mm of topsoil. Reinststate all fences and other parts of the property which may have been disturbed or damaged by the Contract Works.

Where existing roads, kerbs, crossings or footpaths have been disturbed in excavation, reinstatement shall be carefully carried out to match existing. Construction shall be to relevant standards published by the relevant Territorial Authority or New Zealand Transport Agency as appropriate and is to match existing depths of basecourse or other construction. Compaction shall be such that no subsequent settlement occurs.

Before resurfacing carriageways, trim the existing surfacing with sawcuts to form neat parallel lines traversing the carriageway.

Kerbs, channels, footpaths and crossings shall be reinstated to straight sawcut lines or to existing straight joints.

Reinstatement which fails or settles within 12 months of construction shall be remedied by the Contractor at no extra cost, irrespective of the issue of Practical Completion.

### Completion

- 3.30 ROUTINE CLEANING  
Carry out routine trade cleaning of this part of the work including periodic removal of all debris, unused materials and elements from the site.
- 3.31 DEFECTIVE OR DAMAGED WORK  
Repair damaged or marked elements. Replace damaged or marked elements where repair is not possible or will not be acceptable.

### Commissioning

- 3.32 TESTING  
Pre-test all pipework during construction. On completion of the work and before approval for acceptance of the pipelines, carry out a final test to the approval of the engineer and if required witnessed by the representative of the territorial authority. Refer to SELECTIONS for test requirements.

## 4. SELECTIONS

### Pipes

- 4.1 UPVC PIPES  
Location: See C1 Utilities Plan Drawings  
Diameter: 150mm  
Material: uPVC  
Jointing: Rubber Ring  
Class: SN4-SN6 Domestic & light load areas or SN8-SN10 Commercial & Industrial medium load areas or SN16 Public roads & high load areas

### 4.2 BEDDING, HAUNCHING AND SURROUND

Location	Road Carriageway and Hardstand	All other areas
Flexible pipes	To <a href="#">AS/NZS 2032</a>	To <a href="#">AS/NZS 2032</a>
Rigid Pipes	HS2 to <a href="#">AS/NZS 3725</a>	H2 to <a href="#">AS/NZS 3725</a>

### 4.3 BACKFILL

Location	Within 1.0m of road carriageway, vehicle crossings, hardstands	All other areas
All pipes	Compacted hardfill	Compacted ordinary fill

## 4.4 REINSTATEMENT

Location	Type of Reinstatement
Road carriageway and hardstand	Full pavement reinstatement
Domestic paving	match existing
Grassed areas	Topsoil and grass

## 4.5 TESTS

Pipe	Test	Acceptance Criteria
All Pipes	Visual	Full bore
All Pipes	Ponding	No ponding
Flexible Pipe	Low pressure Air Test to Appendix C. <a href="#">NZS 4404</a>	To Appendix C. <a href="#">NZS 4404</a>
Rigid Ceramic Pipe	Low pressure Air Test to Appendix C. <a href="#">NZS 4404</a>	To Appendix C. <a href="#">NZS 4404</a>
Rigid Concrete Pipe	Hydrostatic Test to Appendix C. <a href="#">NZS 4404</a>	To Appendix C. <a href="#">NZS 4404</a>
Manholes	Infiltration	No visible infiltration

**Drainage Structures**

## 4.6 MANHOLES

Location: See C1 Utilities Plan Drawings

## 4.7 MANHOLE LIDS

Location: See C1 Utilities Plan Drawings

## 4.8 STEP IRONS

Location: See C1 Utilities Plan Drawings