

January 2014

# TRENCHING, BEDDING AND BACKFILL FOR UNDERGROUND SERVICES

## PROJECT SPECIFICATION

MP-06-DES-SP Trenching, bedding and backfill for underground services specification

Rev.	Status	Prepared by	Checked by	Date
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# 1 Trenching, bedding and backfilling for underground services

## 1.1 Scope

This Section details the requirements for trenching, bedding and backfilling for pipes and underground services of the form and dimensions shown on the Drawings, and as specified in these Specifications.

Where the words pipe, pipelaying, pipework, etc., are used in this Section to determine phases of work, those words shall include duct, duct laying, duct work, etc., as applicable.

## 1.2 Compliance

Construction work performed under this Section shall comply with the general requirements of the following documents and the specific requirements of this Section:

- NZS 4452 Code of practice for the construction of underground pipe sewers and drains
- The Health and Safety in Employment Act and Regulations.
- Approved Code of Practice for Safety in Excavations and Shafts for Foundations.
- Guidelines for the Provision of Facilities and General Safety in the Construction Industry.
- Excavation Guide, Safety in Construction No. 5 to the extent that it does not conflict with any of the above.
- Local Authority and Government (NZTA) standards.

## 1.3 Dry services

### 1.3.1 Definition

Dry services denote non-drainage and water supply services, i.e. they denote power, gas, telecommunication and CCTV traffic monitoring services.

### 1.3.2 Bedding and backfill materials

Materials for duct bedding and backfill, including their compaction requirements, shall be as shown on the Drawings.

For common trenches accommodating wet (drainage and water supply) services and dry services, the bedding and backfill specified shall be provided for the portion of the trench housing the dry services. Bedding and backfill for the wet services shall be as specified in section 5.4 of this Specification.

### 1.3.3 Electrical Services – Utility Supply

#### a) General

Wellington Electricity Lines Ltd (Wellington Electricity) is responsible for the supply and distribution of power to and through the park, as well as to the street lighting adjacent to the underpass. The demarcation point of the W.E. supply to the park is at the UAB. The installation of new, or relocation of existing power cables for these

services will be undertaken by Wellington Electricity (WE). Trenching and installation of cable ducts in preparation for these works shall be undertaken by the Constructor. The required locations of the ducts are shown on the Drawings.

The Constructor shall notify Wellington Electricity (WE) prior to commencement of construction of any temporary or permanent works affecting these power services. WE contact details are:

Organisation: Wellington Electricity  
 Contact: Peter Robinson  
 Direct Dial: 04 915 6114  
 Mobile: 021 770 875  
 Email: perobinson@welectricity.co.nz  
 Physical address: 75 The Esplanade, Petone

The Constructor shall provide in its programme for early liaising and coordination with Wellington Electricity.

b) Duct Materials

The WE ducting requirements are specified in the table below:

Service Provider	Service	Duct Size (mm)	Duct Material	Duct Strength	Duct Colour	Duct Minimum Bend Radius (mm)	Duct Supplier
Wellington Electricity	Communications (Fibre optic cable)	100	PE	PE80B	Red	1000	WE approved supplier
	Low voltage (LV) 400V and 230V AC	100	PE	PE80B	Orange	1000	
	11kV and direct current (DC)	150	PE	PE80B	Orange	3000	
	Pilot	100	PE	PE80B	Orange	1000	
	Street lighting and Traffic signals	100	PE	PE80B, PN 6.3	Orange	1000	NZTA approved supplier

Ducts shall be joined using spigot-socket glued joints.

Draw wire or a pull string complying with Wellington Electricity specifications shall be installed in each completed overall length of ducting.

Marker tape complying with Wellington Electricity specifications shall be installed 300 mm above the power ducting.

Ducts shall be installed in clean, gravel material as shown on the Drawings.

c) Duct Installation

Gravel compaction beneath and around the ducts shall be as shown on the Drawings. The ends of overall lengths of ducts shall be satisfactorily plugged to prevent material ingress into the ducts.

d) As-built information

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Installed ducts shall be photographed and their location recorded by registered survey prior to backfilling over the ducts.

#### 1.3.4 Electrical Services – Park Supplies

##### a) General

The nominated electrical contractor shall be responsible for the installation of all electrical reticulation from the UAB to the park site and the installation shall comply with AS/NZS 3000.

Conduit shall be sized in accordance with AS/NZS 3000 requirements. Consideration of cable de-rating shall apply. Conduit shall be high impact PVC except where surface mounted conduit may be subjected to mechanical damage or where specific additional electrical screening is nominated in which case hot dipped galvanised (HDG) steel conduit shall be used.

All surface and concealed commercial conduit shall be run either parallel or perpendicular to main building lines. Horizontal paths at low levels along walls should be minimised.

##### b) Cable Drawing

The Main Electrical Contractor shall supply all installation equipment including stands, rollers, winch, and cable pulling socks necessary for the installation of the cable. The manufacturer's recommended maximum pulling tension shall not be exceeded during installation and where a winch or other pulling method is used this shall be controlled by a dynamometer or equivalent system. The Main Electrical Contractor shall lubricate cable ducts before pulling cable through ducts. Connection to the cable shall be via an approved pulling sock. Rollers shall be used to support the cable and at bends. At bends the bending radius shall not be less than that specified by AS/NZS3000, AS3008 or the manufacturer's recommendations. The Main Electrical Contractor is to prove the ducts prior to any pull.

##### c) Rigid PVC Conduit

Rigid PVC conduit shall comply with AS2053 and electrical conduit shall be orange coloured high impact Class B type. Instrumentation conduit shall generally be grey in colour. Surface conduit on concrete shall be saddled and fixed via stainless steel saddles and anchors. Saddle spacing shall be such so as to avoid sagging and long sections shall be fitted with expansion joints. Small diameter protective conduit (up to 50mm) to external or internal switchboard/equipment enclosures shall be glanded onto the cabinet.

PVC conduits shall be jointed using coloured PVC solvent cement applied in accordance to manufacturer's instructions and shall be water tight.

##### d) Buried Conduit

Buried conduit shall be PVC rigid high impact orange installed in accordance with AS/NZS 3000. Long radius bends shall be to facilitate drawing of cables and no short elbows are permitted. All conduit runs shall be sealed against water ingress. All unused conduits shall be fitted with non-corroding draw-wires and capped. All completed cable run conduit ends shall be sealed with foam filler.

##### e) Cable Pits for Buried Cable

Cable pits are to be provided at all cable turn points and otherwise at intervals as shown on the drawings. The cable pit shall be sized to accommodate the cable radiuses expected for drawing in the associated cables. Typical cable pit details shall be provided.

**1.3.5 Gas Services**

a) General

Powerco is responsible for the public gas supply system in the vicinity of the works. Any relocation of gas pipes required under the project will be undertaken by Powerco. Trenching and installation of ducts in preparation for the installation of the gas shall be undertaken by the Constructor. The required locations of the ducts are shown on the Drawings.

The Constructor shall notify Powerco prior to commencement of construction of any temporary or permanent works affecting gas services. Powerco contact details are:

Organisation: Powerco  
 Contact: Mark Morrison  
 Direct Dial: 04 978 0525  
 Mobile: 022 262 7576  
 Email: mark.morrison@powerco.co.nz  
 Physical address: The Gas Hub, 1 Market Grove, Lower Hutt

The Constructor shall provide in its programme for early liaising and coordination with Powerco.

b) Duct Materials

The Powerco ducting requirements are specified in the table below:

Service Provider	Duct Size (mm)	Duct Material	Duct Strength	Duct Colour	Duct Supplier
Powerco	150 (Or as specified on Drawings)	UPVC	PN6	White	Powerco approved supplier

Ducts shall be joined using solvent glued joints.

Marker tape complying with Powerco specifications shall be installed 300 mm above the gas ducting/pipe.

Ducts shall be installed in clean, gravel material as shown on the Drawings.

c) Duct Installation

Gravel compaction beneath and around the ducts shall be as shown on the Drawings. The ends of overall lengths of ducts shall be satisfactorily plugged to prevent material ingress into the ducts.

d) As-built information

Installed ducts shall be photographed and their location recorded by registered survey prior to backfilling over the ducts.

**1.3.6 Telecommunications Services**

a) General

CityLink, Chorus and TelstraClear have telecommunication services in the vicinity of the works. Any relocation of telecommunication cables required under the project will be undertaken by the respective service providers or their preferred contractor. Trenching and installation of cable ducts in preparation for the installation of the new telecom cables shall be undertaken by the Constructor. The required locations of the ducts are shown on the Drawings.

The Constructor shall notify service providers prior to commencement of construction of any temporary or permanent works affecting their services. Service provider contact details are:

Organisation: Chorus (Downer)  
 Contact: Bill Chadwick  
 Direct Dial: 04 562 6606  
 Mobile: 027 269 5307  
 Email: bill.chadwick@downer.co.nz  
 Physical address: 14-16 Makaro Street, Porirua

Organisation: CityLink  
 Contact: Shane Jones  
 Direct Dial: 04 910 5602  
 Mobile: 021 873 370  
 Email: shane.jones@citylink.co.nz  
 Physical address: CityLink House Level 5/53 Boulcott Street, Wellington

Organisation: TelstraClear  
 Contact: Stephen Martin  
 Direct Dial: 04 920 3074  
 Mobile: 029 920 3074  
 Email: Stephen.martin@telstraclear.co.nz  
 Physical address: Lambton House, Level 1, 160 Lambton Quay, Wellington

The Constructor shall liaise and coordinate the utility service trench works for all telecommunications reticulation. The Constructor shall provide the service provider contact a minimum of 15 working days notice prior to commencement of the work affecting their network.

The Constructor shall provide for in the project programme allocation of time for early liase and coordination with service providers.

b) Duct Materials

The telecommunication service provider ducting requirements are specified in the table below:

Service Provider	Service	Duct Size (mm)	Duct Material	Duct Strength	Duct Colour	Duct Minimum Bend Radius (mm)	Duct Supplier
CityLink	Telecommunication (Fibre optic)	100	uPVC	PN6	Terracotta	900	CityLink

Chorus	Telecommunication (Including Fibre Optic)	100	uPVC	PN6	To be confirmed by Chorus	900	Chorus
TelstraClear	Telecommunication	100		PN6	Light blue	900	TelstraClear

Ducts shall be joined using solvent glued joints.

Warning tape complying with the service provider specifications must be installed 300mm above the ducts/cable.

c) Duct Installation

Gravel compaction beneath and around the ducts shall be as shown on the Drawings. The ends of overall lengths of ducts shall be satisfactorily plugged to prevent material ingress into the ducts.

d) As-Built Information

Installed ducts shall be photographed and their location recorded by registered survey prior to backfilling over the ducts.

### 1.3.7 Traffic Monitoring Services (CCTV)

a) General

NZTA is responsible for Traffic Monitoring services (CCTV) in the vicinity of the works. Any relocation of the Traffic Monitoring services required under the project will be undertaken by NZTA or their preferred contactor. Trenching and installation of ducts in preparation for the installation of the CCTV network shall be undertaken by the Constructor. The required locations of the ducts are shown on the Drawings. The Constructor shall notify NZTA prior to commencement of construction of any temporary or permanent works affecting CCTV services. NZTA contact details are:

Organisation: NZTA (Downer ITS)  
 Contact: John Wilkinson  
 Direct Dial: NA  
 Mobile: 021 921 094  
 Email: john.wilkinson@downer.co.nz  
 Physical address: 14-16 Makaro Street, Porirua

The Constructor shall provide in its programme for early liaising and coordination with NZTA.

b) Duct Materials

The Traffic Monitoring service (CCTV) ducting requirements are specified in the table below:

Service Provider	Duct Size (mm)	Duct Material	Duct Strength	Duct Colour	Duct Supplier
NZTA (CCTV)	100	UPVC	PN6	To be confirmed	NZTA



				by NZTA	approved supplier
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Ducts shall be joined using solvent glued joints.

Marker tape complying with NZTA specifications shall be installed 300 mm above the ducting.

Ducts shall be installed in clean, gravel material as shown on the Drawings.

c) Duct Installation

Gravel compaction beneath and around the ducts shall be as shown on the Drawings. The ends of overall lengths of ducts shall be satisfactorily plugged to prevent material ingress into the ducts.

d) As-built information

Installed ducts shall be photographed and their location recorded by registered survey prior to backfilling over the ducts.

**1.4 Drainage and water pressure pipe services**

**1.4.1 Bedding and backfill**

Materials for pipe bedding and backfill for drainage pipes shall be as specified on standard Drawing No. DR03 of the Wellington City Council Regional Standard for Water Services (WCC Regional Standards) and as specified in this Specification. Materials for pipe bedding and backfill for pressure pipes shall be as shown in Wellington City Council Water Supply Specification, June 2004, Appendix 4.

For common trenches accommodating wet (drainage and water supply) services and dry services, the bedding and backfill specified above shall be provided for the portion of the trench housing the wet services. Bedding and backfill for the dry services shall be as specified in section 5.3 of this Specification.

Where excavated material from the site does not meet the requirements for backfill, suitable material meeting these requirements and being compatible with adjacent materials shall be imported.

**1.4.2 Subsoil Drains with Filter Fabric**

**1.4.2.1 Filter fabric**

The fabric filter cloth (woven or non-woven) shall be a polymeric fabric formed from a plastic yarn of a long-chain synthetic polymer composed of at least 85% by weight of propylene, ethylene, amide, ester or vinylidenechloride and shall contain stabilisers and/or inhibitors added to the base plastic to make the filaments resistant to deterioration due to ultraviolet and heat exposure.

The fibres shall be rot proof, chemically stable and have low water absorbency. The filter network (woven or non-woven) shall be dimensionally stable (i.e. fibres shall maintain their relative position with respect to each other) and resistant to delamination. The fabric shall be free of defects or flaws which significantly affect its physical and/or filtering properties.

Storage and handling of fabric shall be in accordance with the manufacturer's recommendations except that in no case shall the fabric be exposed to heat or direct

sunlight to the extent that its strength or toughness are diminished. Fabric which is not to be installed immediately shall not be stored in direct sunlight.

Fabric shall not be stored directly on the ground. The storage area shall be such that the cloth is protected from mud, soil, dust, and debris. Torn or punctured fabric shall not be used.

The filter fabric shall have the following physical requirements when tested wet or dry by the specified test methods.

i.	Strip tensile strength	200 N/25 mm	ASTM D 5035
	Grab tensile strength	200 N/25 mm	ASTM D 5035
ii.	Elongation	20% min	ASTM D 5035
iii.	Pore size distribution,	100 æm min	NRB T/6
	average pore size	300 æm max	
	Permeability (head loss at	1 mm min	NRB T/7
	velocity of 10 mm/sec)	10 mm max	
iv.	Weight	100 gm/m <sup>2</sup> min	ASTM D 3779-79
		[Bidim A12 is acceptable]	

#### 1.4.2.2 Drainage aggregate

The drainage aggregate when sieved in accordance with NZS 4402 Part 1, test 9B shall comply with the following gradings:

Standard Sieve Aperture Size	Percentage Passing
26.5 mm	100
9.5 mm	10 max

#### 1.4.3 Subsoil drains without filter fabric

The pipes shall be laid as shown on the Drawings, or if not specified then trenches shall have a minimum gradient of 1 in 100, vertical sides from the trench bottom to a minimum of 300 mm above the top of the pipe and a minimum depth that will ensure that when the pipes are laid, the invert level shall not be less than 800 mm below finished level. Subsoil drain filter material shall be clean durable stone, and when wet sieved in accordance with NZS 4402 Part 1: Test 9B, shall comply with the following gradings:

Standard Sieve	Percentage Passing
Aperture Size	
26.5 mm	100
13.2 mm	85 - 100
9.3 mm	80 - 95
4.75 mm	65 - 85
2.36 mm	50 - 70
1.18 mm	35 - 55

Standard Sieve	Percentage Passing
600 µm	18 - 40
300 µm	3 - 25
150 µm	0 - 8
75 µm	0

The trench shall be backfilled with filter material placed in layers not exceeding 150 mm loose depth and shall be compacted to a density at least equivalent to that of the surrounding material.

**1.4.4 Competent rock**

Competent rock is defined as rock which cannot be excavated by a 20 tonne excavator, equipped with a 300mm wide bucket with tines.

**1.5 Construction**

**1.5.1 Trenching**

**1.5.1.1 Excavation**

Trenches for wet services shall be excavated in accordance with the longitudinal sections and the typical cross sections shown on drawing No DR03 of the WCC Regional Standards. For common trenches accommodating wet and dry services, the trench widths shall be increased to suit the layout of the services as shown on the Drawings.

For nominal pipe diameters less than 700 mm, trench sides shall be vertical from the pipe invert to at least 150 mm above the pipe crown. For common trenches accommodating multiple services, the minimum depth of bedding material shown on Drawing DR03 shall extend to below the lowest service; also, the trench sides shall be vertical to at least 150 mm above the crown of the highest service.

For nominal pipe diameters between 700 mm and 1000 mm the maximum trench width at the crown of the pipe shall be O.D. + 500 mm. For common trenches accommodating multiple services, the trench widths shall be increased to suit the layout of the services shown on the Drawings.

Trench excavation shall be carried out expeditiously, and subject to all specific requirements of the contract. Other than in grassed areas, all surfaces shall be neatly sawcut prior to the commencement of excavation.

Excavated material shall be stacked well clear of the edge of the excavation and the size of the stockpile shall be limited to avoid any danger to the stability of the trench or adjacent services and facilities. Any surplus material shall be disposed of off-site.

The Constructor shall not open the trench more than 50 metres ahead of the pipelayers and, where soft ground is encountered, not further than approved by the Construction Manager. The open trench length may also be limited for excavations close to buildings and structures and when there is a risk of wet weather disruption.

Unsuitable excavated material shall be loaded out and removed immediately from the Site. The trench invert shall be tested for strength to determine if it has sufficient strength or if over-excavation and material replacement is required. A hand held Shear Vane or Scala Penetrometer shall be used depending on the material type and depth of testing required. A Clegg Hammer may be used if the foundation material is non-cohesive. The test results

shall be used to derive equivalent California Bearing Ratio (CBR) strength values using the correlations in Table 1 below.

The test frequency shall be 20 m maximum for trenches in non-road areas and 5 m maximum for trenches in permanent or temporary road areas. Subject to initial results, the test frequency may be adjusted.

**Table 1 — Material Strength Test Correlations**

Estimated CBR value	Scala Penetrometer Number of blows per 50 mm penetration	Approximate Shear Vane soil strength (kPa)	Approximate Clegg Impact Hammer value (CIV)
3.5	1	50	7
5	1.5	75	8
8	2	100	10
10	2.5	150	12
13	3	200	14

#### 1.5.1.2 Shoring

Shoring shall be provided as necessary to ensure the security of the work and safety of workmen, and to comply with the Health and Safety in Employment Act and its related Regulations and Codes of Practice. Notwithstanding the above excavations with a depth greater than the width and exceeding 1.5 m depth shall be shored unless the excavated sides are battered to a stable slope.

The shoring shall protect existing buildings and other structures in the vicinity of the excavation from settlement and damage.

Before commencement of works the Constructor shall supply details of its proposed shoring method and appropriate calculations for the shoring certified by a Chartered Professional Engineer. Acceptance of the proposed method of shoring and calculations shall not relieve the Constructor of responsibility for the adequacy of shoring.

The Constructor shall provide the necessary notifications to the Department of Labour when excavation greater than 1.5 m depth is required.

#### 1.5.1.3 Water in trenches

Should water be present in a trench, the level shall be kept below the level of the top of the bedding until each joint has been made and backfilled.

The Constructor shall provide adequate plant as required to remove and dispose of water without interfering with pipelaying work.

The Constructor shall take precautions to prevent flotation of pipes in locations where open trench excavations may become flooded. The precautions may include partial backfilling of the trench leaving pipe joints exposed while awaiting testing of the joints.

The Constructor shall not permit any flooding of property, footpaths, or roadways to result from pumping operations. All water shall be disposed of at the nearest adequate and approved drain point. Pumping of sand and silt from excavations shall be avoided by providing a suitable trap to prevent such material being uplifted by pumping equipment. Any material inadvertently deposited in adjacent services or surface areas shall be removed immediately.

#### 1.5.1.4 Unsuitable Foundation

Where the material in the trench bottom is not suitable for a pipe foundation, the Constructor shall over-excavate the trench as necessary and backfill with an approved compacted granular replacement material.

A basis for determining whether over-excavation is required is given in Table 2 below.

**Table 2 - Trench Invert Strength**

Trench situation		Minimum required CBR value for trench invert
1.	In non-road areas	5
2.	In permanent road areas with pipe cover to road subgrade less than 0.3 m	10
3.	As in 2. but with pipe cover between 0.3 m and 1.0 m	8
4.	As in 2. but with pipe cover greater than 1.0 m	5
5.	Beneath temporary construction haul roads	10

Over-excavation shall be carried out if the strength of the trench invert is less than the CBR values in Table 2. The depth of over-excavation shall extend to foundation material with the above strength values or as directed by the Design Manager.

Replacement material shall be compacted in layers not exceeding 150 mm thickness after compaction. The replacement material shall be tested for strength using a Clegg Hammer or Scala Penetrometer and shall achieve CBR strength values at least those given in Table 2. The test frequency shall be at 10 m maximum centres.

#### 1.5.1.5 Maintenance of Trenches

Where trenches are excavated for pipes or services to be supplied and laid by others, the open trenches shall be suitably maintained to the satisfaction of the Construction Manager.

#### 1.5.2 Pipe bedding and support

Pipe bedding is the layer on which the pipe is laid. Pipe support is the material above the bedding layer and surrounding the pipe up to 150 mm above the top of the pipe.

Bedding shall not commence until the base of the trench has been inspected and approved.

The types of pipe bedding and support required including the degree of compaction are defined on the Drawings.

Bedding shall be spread evenly on the trench invert and well compacted. The bedding shall be shaped to receive the pipe which shall bear firmly on the bedding along the full length of the pipe barrel. Socket holes shall be provided beneath each pipe joint to permit jointing of the pipe and allow the barrel to rest firmly on the bedding. Where unreinforced concrete bedding is required the details are shown on the Drawings. A construction joint shall be provided at each pipe joint using a softboard spacer or other method approved by the Design Manager.

The pipe bedding and support layers shall be tested to demonstrate that the compaction requirements defined on the Drawings have been met. Compaction compliance testing shall be conducted as follows:

a. Pipe bedding layer

If compaction compliance is in terms of density, a Nuclear Densometer shall be used.

If compaction compliance is not in terms of density, a Clegg Hammer or other approved device shall be used.

The test frequency shall be at 20 m maximum centres for each placed layer.

b. Pipe support layers

The pipe support layers shall be carefully placed in 150 mm thick layers and compacted using hand-held rammers around and over the pipe to the depth shown in the Drawings.

If compaction compliance for any of the layers is in terms of density, a Nuclear Densometer shall be used.

If compaction compliance is not in terms of density, a Scala Penetrometer, Clegg Hammer or other approved device.

The test frequency shall be at 20 m maximum centres for each placed layer.

### 1.5.3 Backfilling

Backfilling above the pipe support layers and surface reinstatement of the trenches shall commence as soon as possible after laying, inspection and testing (if applicable) of each section of pipeline. Where applicable each trench shall be backfilled with material similar to that excavated from the trench and/or selected or supplied to comply with the requirements for backfill as shown on the Drawings and in this Specification.

The backfill up to the topsoil level in grassed surfaces and gardens or up to subgrade level in driveways, paved areas and roads shall be carefully placed in layers not thicker than 150 mm compacted thickness and compacted by hand operated mechanical equipment. Compacted backfill strength shall be at least equal to that of the adjacent ground as measured by a hand held Shear Vane.

For granular backfill layers, the degree of compaction required shall be in terms of density and strength as shown in Table 3 below.

**Table 3 - Granular Backfill Compaction**

Trench situation	Density requirement for granular backfill (% of maximum dry density)	Strength requirement at road subgrade (CBR value)
1. In non-road areas	85	n/a
2. In permanent road areas with pipe cover to road subgrade less than 0.3 m	93	10
3. As in 2. but with pipe cover 0.3 m to 1.0 m	93 (top layer) 90 (lower layers)	10
4. As in 2. But with pipe cover greater than 1.0 m	93 (top layer) 90 (lower layers)	10
5. Beneath temporary construction haul roads	93 (top layer) 90 (lower layers)	10

Trench backfill testing shall be carried out at a frequency of one test per backfill layer at 20 m maximum centres.

Backfilling around pipes and structures shall be carried out in a manner which does not cause displacement of or excessive stresses in the buried structure. In general the backfill level on one side of the structure shall be within 300 mm of the level of the other side. The compaction techniques employed shall not overstress the structures.

A minimum cover of 0.6 m of compacted material complying with this Specification and the Drawings shall be provided over pipes before heavy vibratory compaction equipment is used in the backfilling process.

#### 1.5.4 Reinstatement

Ground disturbed by works constructed under this Section shall be reinstated to its pre-contract condition, or to such other condition as the MPA require.

All permanent surface reinstatement shall be as defined on the Drawings. Road resurfacing shall be similar in type, quality, texture, skid resistance and strength to the surrounding materials. Any traffic markings present prior to the Works shall be reinstated on completion of the works.

The reinstated finished surface shall match the surrounding surface level. Trench or other excavation over-break will require fresh surface cutting to maintain straight lines and a tidy appearance to the surface finish.

Topsoil layers and surface layers in driveways, paved areas and roads shall be reinstated to match the surrounding surfaces or as shown on the Drawings.

All excess excavated material and any other material not used in the works shall be disposed of off site unless instructed otherwise.

#### 1.5.5 Testing — general

Copies of compaction test results shall be provided to the Engineer for approval prior to construction of any final reinstatement surfacing.

Tests shall be carried out at points varying across the width of the trench. Tests shall also be carried out at excavations around structures such as manholes and catchpits. Along trenches, individual tests shall meet the specified compaction requirements. The Engineer will instruct the Contractor to conduct further tests at the Contractor's expense should any

tests fail. Any remedial work required by the Contractor to provide complying test results shall be done at the Contractor's expense.

A minimum of four tests shall be carried out in backfill at manholes and catchpits.