



Infrastructure Cook Islands

Specifications for Supply of Products

Stormwater Drainage Material Supply

Contract No. CK181918, Date of Release: 28 March 2019

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1 Specifications Stormwater Drainage Material Supply

The Cook Islands Government through Infrastructure Cook Islands (ICI) is seeking a suitable supplier to provide materials for the construction of stormwater drainage assets in the Cook Islands.

Suppliers are to provide the required materials as per the RFT document in compliance with the appropriate sections of this specification and the accompanying drawings.

Specifications are detailed below and should be read in conjunction with the other sections of this RFT including drawings and supporting or referenced documents. It is noted that specifications in some instances includes installation requirements which are not part of the RFT scope but have been included for completeness.



300 STORMWATER DRAINAGE

300.1 General

Refer to the General Conditions of Contract, which are equally binding on all trades. The requirements of the various sections of this Specification are inter-related. Therefore, it is necessary that this section of the Specification be read in conjunction with all other sections.

300.2 Scope of works

The work comprises the construction complete of all drains, junctions, bends, special fittings, manholes and any ancillary work necessary for the completion of the works in accordance with the Contract Drawings, this Specification and the General and Special Conditions of Contract.

300.3 Related documents

This section makes reference to various standards or documents, which form part of this Specification unless otherwise qualified by this or other contract documents. It should be noted that these documents in turn require reference to other standards. In all cases the standards or other documents are to include the latest version and all amendments current at the time of tender.

Concrete Pipes

- AS/NZS 3725 *Design for installation of buried (plus Supplement 1) concrete pipes.*
- AS/NZS 4058 *Precast concrete pipes (pressure and non-pressure)*

Plastic Pipes

- AS/NZS1254 *PVC pipes and fittings for stormwater and surface water applications.*
- AS/NZS4058 *UPVC pipes and fittings for drain, waste, and vent applications)*
- AS/NZS 5065 Polyethylene and polypropylene pipes and fittings for drainage and sewerage applications
- AS/NZS2032 *Installation of PVC pipe systems*
- AS/NZS 2033 Installation of polyethylene pipe systems
- AS/NZS7643 *Code of practice for installation of unplasticised PVC pipe systems*

Other

- NZS3109 (plus amendments 1 and 2) *Concrete construction*
- BS7874 *Method of test for elastomeric seals and joints in pipework and pipelines.*
- BS EN 1561 Founding - Grey cast irons
- NZS 4452 Construction of underground pipe sewers and drains
- AS/NZS2566 (plus supplements 1 and 2) *Buried flexible pipelines — structural design and installation.*
- NZS4404 *Land Development and Subdivision Infrastructure.*

300.4 MATERIALS

300.4.1 Pipes

Pipes shall be of the material, class and jointing type nominated on the Drawings and shall comply with the relevant specification listed in TNZ F/3, NZS 3725, NZS 2566, NZS 4452 and AS/NZS 5065.

It is noted that all drainage pipes shall include a suitable jointing system that is water tight and that will limit potential displacement between pipes to the satisfaction of the Engineer.



300.4.2 Castings

Castings shall be made from grey iron of a quality not less than that specified as grade ENGJL-150 in BS EN 1561 and shall be free from all defects. Castings shall be hot dipped in bitumen. Covers and grates shall not rock in their frames. Where shown in the Drawings castings shall be "Gatic Non-Roc".

300.4.3 Step Irons

Step irons for manholes shall be of the type as detailed in NZS 4404 formed from 20mm diameter round Type 316 stainless steel rod.

300.4.4 Concrete

Concrete work shall be in accordance with this Specification. Unless stated otherwise, concrete shall have minimum 28 day strength (f'c) of 20MPa.

300.4.5 Granular Pipe Bedding

Granular pipe bedding shall be AP20 gravel or crushed stone complying with the grading requirements of NZS 4452. The compaction fraction shall be less than 0.1.

300.4.6 Hardfill

Hardfill shall be GAP65 satisfying the requirements of NZS 3725 and NZS 2566, unless specified otherwise on the Drawings. Crushed demolition material shall not be used as hardfill in trenches.

300.4.7 Sand

Sand for pipe bedding and backfilling shall be clean sharp sand.

300.5 CONSTRUCTION

300.5.1 General

Construction of pipe drains and culverts shall be carried out in accordance with TNZ F/3 and/or NZS 4452 as applicable.

Where required, all drainage work shall be carried out by a suitably experienced and competent drain layer using best trade practice. Works shall also meet the requirements of the Cook Islands Building Code as required.

Special consideration is to be given to the proper bedding out at the spigots of reinforced concrete pipes to ensure that the full length of each pipe barrel is completely supported by bedding material, and is not subjected to bending and possible circumferential cracking.

Additions and/or modifications to TNZ F/3 and NZS 4452 are set out below.

300.5.2 Salvage of Existing Pipes

Obsolete pipes shall be excavated and removed or grouted, as shown on the Drawings. All removed pipes shall be removed from site, becoming the property of the Contractor.

300.5.3 Trench Excavation

Concrete, asphalt or chip sealed pavements and footpaths shall be saw cut parallel to and 300 mm outside the edges of the proposed trench. The pavement surfacing shall be carefully removed prior to excavation.

The maximum trench width from the trench invert to a height of at least 150 mm above the top of the pipe shall not be greater than the external diameter of the pipe plus 400 mm for pipes up to 600 mm diameter and plus 600 mm for pipes over 600 mm.



The trench width for corrugated steel pipes shall be the external pipe diameter plus one metre or half the pipe diameter either side of the pipe, whichever is the smaller.

300.5.4 Bedding

Pipes shall be laid upon granular pipe bedding except where expressly detailed otherwise in the Drawings.

Corrugated polyethylene pipes shall be laid on compacted granular material of the following minimum thickness:

100 mm in sands and gravel

200 mm in silts and clays

300 mm in rock

Bedding material for corrugated polyethylene pipes shall be shaped to the curvature of the invert and shall be of sufficient width to permit effective compaction of backfill under the haunches of the pipe. A uniform blanket of sand 50 mm thick shall cover the shaped, compacted bedding material before setting the pipe in place.

300.5.5 Pipe Laying and Jointing

Pipes shall be laid to the lines, grades and invert levels indicated on the Drawings. The installed pipeline shall have a uniform gradient and the pipe invert level at any point shall not vary more than ± 10 mm from the specified design invert level, except that where the design gradient is 1% or flatter, the pipe invert level shall not vary more than ± 3 mm from the design invert level.

Pipes shall be clean and free from dirt or mud on the inside and, in the case of pipes requiring concrete surround, on the outside as well, before laying. Debris shall be prevented from entering the pipes during laying.

The method of lifting and installing of pipes shall prevent damage to the pipes and bedding material.

All pipes shall be laid by a suitably experienced and competent drain layer.

The jointing of pipes to a manhole or other structure shall be carried out in accordance with the requirements of NZS 4452 except that:

- Stub connections shall be provided for all pipe connections to a manhole or other structure and shall project not more than 300 mm from the structure for pipes up to 350 mm bore diameter, and not more than 600 mm from the structure for pipes over 350 mm bore diameter. Connections shall be surrounded and haunched with concrete to a minimum distance of 200 mm from the manhole
- Where there is likelihood of relative vertical movement in the case of RC pipes less than 350 mm bore diameter, the RC pipe joined to the stub pipe shall be no longer than one metre and shall be flexibly jointed at both ends
- For flexible pipes into concrete structures the Contractor shall follow the written requirements of the pipe manufacturer

300.5.6 Backfilling

(a) General

No backfilling shall be done until laying and jointing of the line has been checked and certified, in accordance with Contractors QA system.

Backfilling of trenches and around manholes and other drainage structures, constructed outside of pavement areas, shall be completed with "selected fill" complying with and placed and compacted as specified in TNZ F/3, unless where shown otherwise on the Drawings.



Heavy construction equipment shall not be operated over or near such pipes, or within 1m of the trench, until a minimum cover of 0.6 metre compacted depth has been achieved.

Any pipe moved or damaged during compaction shall be replaced.

(b) Hardfill Backfill

In existing paved areas, or where shown on the Drawings for future paved areas, backfill for trenches and around manholes and other drainage structures shall be hardfill as specified. Hardfill backfill shall be placed in layers not exceeding 150 mm loose thickness. Each layer shall be compacted with approved mechanical compaction equipment before the next layer is placed.

Prior to pavement surfacing newly laid small diameter RC pipes (less than 450mm-dia) are to be inspected by CCTV to ensure pipe has not suffered circumferential cracking because of poor bedding or handling. If cracking is evident the defective pipes shall be replaced.

(c) Reinstatement in Existing Pavement Areas

Backfill material in existing pavement areas above subgrade level shall match that of the existing pavement. It shall be placed and compacted in accordance with TNZ B/2.

The surface of the trench shall be reinstated to a standard equivalent to the existing surface.

Any seal edge previously saw cut and subsequently damaged shall be resawn and made good prior to final surfacing works.

(d) Reinstatement in Existing Grassed Areas:

The final 150 mm of backfilling shall be clean topsoil, free from stones, and sown with grass.

300.5.7 Concrete Structures

(a) General

Concrete work shall be carried out in accordance with CONCRETE FOR MINOR WORKS Specification, noting the additions and/or modifications set out below.

(b) Sumps (Catchpits)

Sumps shall be constructed as shown on the Drawings. Sumps shall be constructed in the positions and to the invert levels shown on the Drawings.

The quality of materials, formwork and workmanship shall be such that on completion, a smooth even surface is obtained without plastering. The shafts shall be carried up to such height that when cast iron frames are set in position the top of the frame shall be 50 mm below the finished surface of the adjacent channel, roadway or existing ground, as is appropriate, except where otherwise required. Walls shall not be poured directly against the ground.

Precast catchpits meeting the requirements of NZS4404 may be used. Pipe connections shall be haunched and surrounded with concrete to a distance of 150 mm from the catchpit wall.

(c) Cast in Place Manholes

Manholes shall be constructed as detailed in NZS4404 from 20 MPa concrete, unless shown otherwise on the Drawings. Manholes shall be constructed in the positions and to the invert levels shown on the Drawings.

Where practicable, manhole inverts shall be formed with a half pipe centrally bedded in concrete. In all other cases, the channels in the floor of the manholes shall be formed in concrete rendered with cement mortar and finished with a steel tool and neat cement. Leaks shall be carefully stopped and the manholes made watertight. Benching in manholes shall be rendered with cement mortar and finished as above. Pipe ends shall finish 13 mm short of the inside wall and be plastered with cement mortar. Pipes shall be haunched and surrounded with concrete to a minimum distance of 200 mm



from the outside of the manhole. In manholes over 900 mm deep, step irons shall be built into the manhole wall in a line vertically above the outlet pipe.

Manhole roof slabs shall be set to levels to ensure the finished cast iron lid levels and slopes will coincide with the surrounding road, path or ground surface as the case may be. Roof slabs and lids shall be heavy duty unless expressly noted to the contrary.

Where shown on the Drawings, junctions shall be constructed into the manhole. Junctions which are not to be connected during the contract shall be sealed.

(d) Precast Manholes

Precast manhole components shall be assembled and jointed strictly in accordance with the manufacturer's written recommendations, and shall consist of centrifugally spun reinforced concrete flush-jointed pipes of the diameters shown on the Drawings. Holes for step irons shall be factory made with step irons bolted into the manhole wall and the outer end of the holes filled flush with mortar. The base benching and mortar shall be constructed in accordance with the detail shown in NZS 4404, unless shown otherwise on the Drawings. Connections shall be haunched as specified above.

Manholes 2.4 m and less to invert shall be constructed from one precast section. Manholes over 2.4 m deep shall have a bottom section of minimum length 1.8 m. Excepting at the base, all joints in the manholes shall be sealed with RB 200 sealant and held together with approved stainless steel replaceable tie bolts on the inside of the manholes.

All manholes shall be watertight.

(e) Inlet and Outlet Structures

Inlet and Outlet structures shall be constructed in accordance with the Drawings complete with concrete apron and flow-dissipation and riprap. (f) Junction and Branch Connections

Where shown on the Drawings, 'Y' Junctions shall be laid in the new drainage lines for future connections. All connections shall be fitted with factory sealed stoppers.

300.5.8 Concrete Encasing and Capping

Where concrete encasing or capping is required, 17.5 MPa concrete shall be used. Unless otherwise detailed, concrete encasing shall be discontinuous at each pipe joint.

300.5.9 Boring and Jacking Installation

Installation shall be carried out with an approved system by an experienced operator and so that no disruption to traffic or damage to the roadway occurs. Pipe shall be installed concurrent with the boring operations unless a jacking sleeve is used. Water shall be prevented from entering the excavation.

300.6 TESTING AND ACCEPTANCE

All pipelines shall be inspected both before backfilling the trench and after all backfilling and surface reinstatement is completed.

The following tests shall be undertaken:

All pipelines and associated sumps, catchpits and other elements shall be surveyed to confirm final position and grade

All pipelines shall be inspected for line and grade. Sighting through each line between manholes and/or outlets after backfilling shall show a full circle at the far end with all pipes concentric

Inspection before final surfacing of 450Ømm diameter or less RC pipe to check for possible cracking resulting from poor bedding or handling. Prior to inspection the pipelines shall be cleaned by flushing



Any elements not meeting the requirements shall be re-laid.



400 CONCRETE FOR MINOR WORKS

400.1 General

Refer to the general Conditions of Contract, which are equally binding on all trades. The requirements of the various sections of this Specification are inter-related. Therefore, it is necessary that this section of the Specification be read in conjunction with all other sections.

400.2 Scope

This specification covers supplying and placing portland cement concrete for minor structures and incidental construction, and includes reinforcing steel and formwork.

400.3 Related Documents

This section makes reference to various standards and TNZ Specifications; the main ones referred to are listed below, but it should be noted that these in turn require reference to other standards. In all cases the standards are to include all amendments current at the time of tender.

NZS 3104:2003	Concrete Production
NZS 3112:1986	Methods of Test for Concrete
	Part 1: Tests relating to fresh concrete
	Part 2: Tests relating to the determination of strength of concrete
NZS 3114:1987	Concrete surface finishes
NZS 3121:1986	Water and aggregate for concrete
NZS 3122:2009	Portland and blended cements
NZS 3124:1987	Concrete Construction for Minor Works
AS/NZS 4671:2001	Steel bars for reinforcement of concrete

400.4 MATERIALS

400.4.1 Water and Aggregates

Water and aggregates for concrete shall comply with NZS 3121.

400.4.2 Cement

Cement shall comply with NZS 3122, Type GP.

400.4.3 Concrete

All concrete except site concrete shall be manufactured by an approved readymix plant.

Slump shall be in accordance with Table 4 of NZS 3124. The nominal maximum aggregate size shall be 19 mm.

Concrete for structures shall have a minimum crushing strength of 20 MPa at 28 days except where otherwise specified.

Weak concrete where required shall consist of 1 part of Portland cement to 6 parts of AP20 aggregate by volume.

400.4.4 Mortar

Mortar shall consist of two or three parts of fine, sharp, well graded sand to one part of cement measured by dry loose volume, well mixed by hand or in a suitable mechanical mixer with just sufficient water to make it slightly moist. It shall be mixed in small quantities as required. Any mortar not used within 30 minutes of mixing shall be discarded.



400.4.5 Reinforcing

Reinforcing shall be grade 300 bars unless otherwise shown. Welded wire fabric shall comply with AS/NZS 4671.

400.4.6 Marine Grade Concrete

Where required on the Drawings, marine grade concrete shall be used, having the following properties:

Minimum Compressive Strength at 28 days (f'c)	30 MPa
Cement Content (minimum)	380 kg/m ³
Maximum Water Cement Ratio	0.45
Minimum Water Cement Ratio	0.40

400.5 CONSTRUCTION

400.5.1 Excavation and Foundations

Structures shall be constructed on foundations of equal or better strength than specified for subgrade. Excavation including undercut shall be in accordance best practice and as directed by the Engineer. Undercuts shall be backfilled with compacted hardfill.

400.5.2 Formwork

Formwork shall be to the requirements of NZS 3124 as appropriate for this type of construction.

400.5.3 Reinforcing

Reinforcing steel shall be bent and placed in accordance with NZS 3124. Spacers and supports shall be either proprietary or purpose-made using 20 MPa concrete. Bricks, wood or concrete masonry shall not be used as spacers or supports.

400.5.4 Concreting

No concrete shall be placed until the formwork and reinforcing has been inspected and approved.

Concrete shall be placed in accordance with NZS 3124 and as near as possible to its final position. Vibrators shall not be used to move concrete along forms. Vibrators are to be of the immersion type unless otherwise approved.

400.5.5 Finish

Unless specified on the Drawings, surface finishes shall be of the following classes defined in NZS 3114:

- (a) Formed surfaces to be backfilled shall be Class F1.
- (b) Exposed formed surfaces shall be Class F3.
- (c) Unformed surfaces to be backfilled shall be Class U1.
- (d) Unformed surfaces exposed to weathering shall be Class U3.

400.5.6 Tolerances

Unless otherwise specified, tolerances shall be in accordance with Table 2 of NZS 3124.

400.5.7 Defective Concrete Finishes

Concrete that is damaged from any cause, and concrete that is honey-combed, fractured or otherwise defective, and concrete which has surface depressions outside the tolerances specified, shall be cut out and replaced. Minor bulges and abrupt irregularities beyond the specified limits shall be reduced by grinding to approved tolerances. Minor depressions and defects may be repaired by filling. All fillings shall be bonded tightly to the surface of the holes and shall be sound and free from shrinkage cracks and hollow areas after the fillings have been cured and dried. The Engineer shall determine



whether a bulge or depression can be repaired or cut out. Where the repair requires the concrete to be cut out, appropriate size repairs must be made as directed by the Engineer.

Repair of defective concrete finish other than that due to minor porosity of the surface shall be carried out by one or more of the following methods as accepted by the Engineer:

- Concrete removal and replacement
- Hand placed cement mortar
- Pneumatically placed cement mortar
- Epoxy mortar

A method statement for the repair of damaged or defective concrete shall be provided and approved prior to carrying out remedial works.

400.5.8 Backfill to Concrete Structures

All spaces which have been excavated, and the volumes of which are not occupied by the concrete structure, shall be backfilled with suitable material compacted in layers in accordance with the provisions of the specification, or as directed by the Engineer.

