



For the Government of Niue

Liolau Accommodation Upper Block

MES: 400 Building Services

Plumbing Services Specification





For the Government of Niue

Liolau Accommodation

Upper Block

MES: 400 Building Services

Plumbing Services Specification

Prepared By

.....
Matthew Kingsford
Engineering Technician

Opus International Consultants Ltd
Auckland M&E
The Westhaven, 100 Beaumont St
PO Box 5848, Auckland 1141
New Zealand

Reviewed By

.....
Allan Vernon
National Technical Director Building Services

Telephone: +64 9 355 9500
Facsimile: +64 9 355 9583

Date: 22 June 2017
Reference: 1-43085.00
Status: Issue 1 – Construction

Contents

MES: 404 DRAINAGE & PLUMBING - SANITARY PLUMBING	1
1 GENERAL.....	1
1.1 Introduction.....	1
2 SCOPE.....	1
3 REGULATIONS	1
4 DESCRIPTION OF SYSTEMS.....	2
4.1 Water Supplies	2
4.2 Sanitary Plumbing System.....	2
4.3 Rainwater System.....	2
5 STANDARDS	3
6 GENERAL.....	5
6.1 Competence	5
6.2 Handling & Storage	5
6.3 Work by Other Trades.....	5
6.4 Contact of Metals.....	5
6.5 Identification of Pipelines.....	6
6.6 Services Penetrations	6
7 DOCUMENTATION	6
8 MATERIALS	6
8.1 General.....	6
8.2 Copper Piping:.....	7
8.3 Un-plasticized Polyvinyl Chloride Pipe ‘PVC’:	7
8.4 Polypropylene Piping:.....	7
8.5 Schedule of Materials.....	7
9 SANITARY FIXTURES.....	8
9.1 General.....	8
10 ACCESSORIES.....	8
10.1 Metering.....	8
10.2 Valves	8
10.3 Filters/ Strainers	9
10.4 Sink and Basin Traps	9
10.5 Shower Traps	9
10.6 Floor Drains.....	9

10.7	Rainwater Outlets.....	9
11	SOLAR HOT WATER	9
12	INSTALLATION.....	9
12.1	General.....	9
12.2	Valve Access.....	10
12.3	Seismic Restraints	10
12.4	Labelling	10
12.5	Electrical Earthing	10
12.6	Pipe Joints And Fittings.....	10
12.7	Polypropylene (PP) and polyethylene (PE) water supply piping.....	10
12.8	Copper To Copper Joints	10
12.9	PVC pressure pipes and pipe fittings	11
12.10	Polypropylene Waste (Trap) Fittings.....	11
12.11	Pipe Installation	11
12.12	Pipe Supports	12
13	POLYPROPYLENE (PP) AND POLYETHYLENE (PE) WATER SUPPLY PIPING	12
13.2	Where Offered As An Alternative.....	12
13.3	Pipe Supports	13
13.4	Pipe Movement including Thermal Expansion and Contraction	13
13.5	Pipe Joints	13
13.6	Pipe Testing and Commissioning.....	13
14	COLD WATER SUPPLY	13
15	HOT WATER SUPPLY	14
16	INSULATION.....	14
17	DRAINAGE.....	14
18	COMPLETION	14
	MES: 405 DRAINAGE & PLUMBING - DRAINAGE	15
19	SCOPE AND DESCRIPTION.....	15
20	STANDARDS	15
21	REGULATIONS	16
22	MATERIALS	16

23	DRAINLAYING	16
24	JOINTING	17
25	OVERFLOW RELIEF GULLY TRAPS	17
26	INSPECTION CHAMBERS, MANHOLES & AND ACCESS POINTS	17
27	COVERS AND GRATINGS	18
28	BACKFILLING	18
	MES: 424 DRAINAGE & PLUMBING - TESTING & COMMISSIONING	18
29	GENERAL	18
30	COMMISSIONING PROCEDURES	19
	30.1 General.....	19
	30.2 Drainage Systems	19
	30.3 Plumbing Systems	19
	30.4 Fixtures, Fittings and Appliances.....	20
	MES: 425 DRAINAGE & PLUMBING - MAINTENANCE	20
31	GENERAL	20
32	MAINTENANCE CHECK LISTS	20
	32.1 Daily	20
	32.2 Three monthly	20
	32.3 Annually.....	21

MES: 404

DRAINAGE & PLUMBING - SANITARY PLUMBING

1 GENERAL

1.1 Introduction

This contract is for the Plumbing services required for a Government of Niue project refurbishing the Liolau Accommodation, Upper Block, located in Avatele, Niue.

The following scope section describes the work under this contract and the sections beyond the Scope are in the form of a Standard Technical specification (called upon on technical requirement of the discipline where specified). The detailed scope take precedence over general items in the specification. If in doubt or if there is considered ambiguity in the documents, confirm items with the Engineer through the Project Manager.

This specification shall be read in conjunction with MES 200: Preliminary and General Services Specification.

2 SCOPE

- a. Building Services P&G section MES 201 applies to this section of the work.
- b. This section is for the supply, installation and commissioning of:
 - i. Domestic hot and cold water systems.
 - ii. Foul water system
 - iii. Sanitary fixtures (fixing only).
- c. Provision of as-built drawings, operating and maintenance manuals as part of the commissioning requirements.
- d. Refer to the Architectural drawings and specification for details of all sanitary fixtures.

3 REGULATIONS

- a. All work undertaken shall comply with the requirements of the New Zealand Building Code (NZBC).
- b. Safety procedures shall comply with the requirements of the Health and Safety in Employment Act 1992.
- c. All work shall be carried out under the direct supervision of a plumber registered under the Plumbers, Gasfitters and Drainlayers Act.

4 DESCRIPTION OF SYSTEMS

This specification covers the plumbing and drainage services as shown on the plumbing and drainage services drawings (MEP series) and connection to the civil sewerage and drainage services as shown on the civil works drawings. The demarcation between trades is generally as shown on the drawings; typically with the plumbing & drainage services trade connecting to either manholes or main drains installed by the civil works trade.

Systems description is detailed as follows:

4.1 Water Supplies

Water supplies system consists of the following

- a. Mains pressure cold water (WH) from the site supply complete with meter and back-flow prevention device to NZBC and Territorial Authority's specification and to meet the hazard requirements specified by NZBC, reticulated throughout the building to sanitary fixtures and appliances.
- b. The contractor is responsible for the design and construction of thrust blocks at junctions and changes of direction of the buried water supply mains to comply with NZBC and AS/NZS 3500 requirements.
- c. Hot water (HW) from :
 - i. Roof package solar hot water heating system, the design and schematic drawings of this system is indicative, this system is to be installed to meet NZBC, AS/NZS 3500, manufacturer and health and safety requirements and to be coordinated with the cold water system and relevant electric boosted hot water heaters to ensure proper integration and operation of the whole water supply system
- d. The water supply to the building is not part of this contract, allow to coordinate with the civil contractor for connection location.

4.2 Sanitary Plumbing System

Sanitary plumbing and drainage from fixtures and appliances to discharge into the site main sewerage system, plumbing and drainage in accordance with AS/NZS 3500 Part 2 and Acceptable Solution G13/AS1 and AS2 of the New Zealand Building Code. The system will incorporate soil and waste stacks, vents and drainage pipes as detailed in drawings.

Contractor is to install floor wastes/gully traps as shown in layouts. Contractor is to coordinate the floor waste installation work with other contractors to ensure that the floor is graded to these floor wastes. Floor waste/gully traps shall be charged from adjacent basins and/or water taps in accordance to NZBC and AS/NZS 3500 requirements.

4.3 Rainwater System

Not part of this contract, refer to the architectural drawings and specification.

5 STANDARDS

The following documents shall apply, unless expressly modified herein:

- NZS 1822 Half inch high-pressure ball valves (NZ type) excluding floats
- NZS 2271 Copper and copper alloy traps
- NZS 3107 Specification for pre-cast concrete drainage and pressure pipes.
- NZS 3441 Hot-dipped zinc-coated steel coil and cut lengths
- NZS 3501 Copper tubes for water, gas, and sanitation
- NZS 4219 Seismic resistance of engineering services in buildings
- NZS 4442 Welded steel pipes and fittings for water, sewage, and medium pressure gas
- NZS 4452 Construction of underground sewers and drains
- NZS 4602 Low pressure copper thermal storage electric water heaters
- NZS 4603 Installation of low pressure thermal storage electric water heaters with copper cylinders (open vented systems)
- NZS 4606 Storage water heaters Part 1:1989 General requirements
- NZS 4607 Installation of thermal storage electric water heaters: valve vented systems
- NZS 4608 Control valves for hot water systems
- NZS 5261 Code of Practice for the installation of gas burning appliances and equipment.
- NZS 5807 Industrial identification by colour, wording or other coding
- NZS 7643 C.O.P. for the installation of uPVC pipe systems
- AS/NZS1254 PVC pipes and fittings for storm and surface water applications.
- AS/NZS1260 PVC pipes and fittings for drain, waste and vent applications
- 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 2492 Cross-linked polyethylene pipe systems
- AS/NZS 2537 Mechanical jointing fittings for use with cross-linked polyethylene (PE-X) pipe for hot and cold water.....
- AS/NZS 2566 Buried flexible pipelines.

- AS/NZS 3500 Part 0 Glossary of terms.
- AS/NZS 3500 Part 1 Water supply.
- AS/NZS 3500 Part 2 Sanitary plumbing and drainage.
- AS/NZS 3500 Part 3 Stormwater drainage.
- AS/NZS 3500 Part 4 Hot water supply systems.
- AS 4032 Thermostatic mixing valves- materials, design and performance requirements.
- AS 4072 Components for the protection of openings in fire-resistant separating elements.
Part 1 Service penetrations and control joints.
- AS/NZS 4129 Fittings for polyethylene (PE) pipes for pressure applications
- AS/NZS 4130 Polyethylene (PE) pipes for pressure applications
- AS/NZS 4401 Plastics piping systems for soil and waste discharge (low and high temperature) inside buildings.....
- AS/NZS 2845.1 Water supply – backflow prevention devices – Materials, design and performance requirements
- BS 21 Pipe threads for tubes and fittings...
- BS 1212 Float operated valves
- BS 1387 Steel tubes suitable for welding or for screwing to BS 21 pipe threads
- BS 1470 Wrought aluminium and aluminium alloys for general engineering purposes: plate, sheet and strip
- BS 1845 Specification for filler metals for brazing
- BS 2870 Specification for rolled copper and copper alloys: sheet, strip and foil
- BS 3974 Pt 1 1974 Pipe Hangers, slider and roller type supports
- BS 5154 Specification for copper alloy globe, globe stop and check, check and gate valves.
- BS 6920 Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of the water.
- BS 6956 Jointing materials and compounds (relevant parts)
- BSEN 12540: 2000 Corrosion protection of metals
- DIN 8077 Polypropylene (PP) pipes, dimensions.
- DIN 8088 Polypropylene (PP) pipes, general quality requirements

DIN 16962 Pipe joints assemblies and fittings for polypropylene pressure pipes

AS/NZS 5065:2005 Polyethylene and polypropylene pipes and fittings for drainage and sewerage application

AS/NZS 7610 Blue polyethylene pipes up to a nominal size 63 for below ground potable use.

AS/NZS 7646 Specification for polyethylene pipes and fittings for gas reticulation

6 GENERAL

6.1 Competence

Contractors are to be experienced and competent workers, familiar with the materials, equipment and installation techniques required for the specified contract works. All work shall be carried out under the direct supervision of a Registered Plumber.

6.2 Handling & Storage

- a. Handle & store pipes, accessories, fixtures, fittings and appliances to avoid loss or damage.
- b. Store pipes and accessories on site, under cover on a clean level area, stacked to eliminate movement and away from work in progress.
- c. Store fixtures, fittings and appliances in a dry and secured area. Retain in the manufacturer's original packaging, complete with all fixings and installation instructions. Label each unit separately with its space (room) and fixture number where applicable.

6.3 Work by Other Trades

- a. Liaise with the building trade for the provision of builder's work for the plumbing & drainage services trade including penetrations through building elements, casting-in of cast-in items (floor drains etc), roofing gutters and down-pipes etc.
- b. Liaise with the civil trade for the provision of civil work for the plumbing & drainage services trade including buried sewer and storm water drainage services, penetrations through paving etc.
- c. Liaise with the network utilities where required for the provision of water supplies and sewage connections.
- d. Liaise with the electrical services for the provision of electrical power supplies for the plumbing services trade including the hot water supply systems, 'Solar water heater' etc as required.
- e. Liaise with the finishing contractor to provide appropriate access to thermostatic mixing valves, isolating valves etc.
- f. Liaise with relevant contractor to ensure that the floor is graded to the floor wastes/gully traps

6.4 Contact of Metals

- a. Ensure electrolytic corrosion is avoided. Only metals of the same type or close on the electrochemical series shall be in contact with each other.

- b. Avoid contact between copper or aluminium and concrete, lime or lime-bearing compounds. Where such contact is unavoidable, use Denso Tape wrapping or a thick coating of bitumen as an insulator.
- c. Aluminium shall be insulated from any treated timber by priming with a zinc chromate primer. Bituminous primer may be used where the aluminium is concealed from view.

6.5 Identification of Pipelines

Refer to NZS 5807, NZBC AS/NZS 3500 and local authorities for the identification requirements for all pipe work.

6.6 Services Penetrations

- a. Check the positions and sizes of openings for plumbing services and equipment as the structure is constructed.
- b. Openings through fire-rated, smoke-rated or acoustically-rated building elements, the openings must be sealed and protected so that the specified integrity of the building element is not compromised (e.g. by use of proprietary fire collars for plastic piping passing through fire-rated walls or floors).
- c. Fire-collars, seals and the like must be installed in accordance with the manufacturer's instructions and recommendations for the application. The fire collars shall be an approved brand.

7 DOCUMENTATION

- a. Provide "Construction" issue documentation in accordance with the New Zealand Construction Industry Council (NZCIC) Design Documentation Guidelines for Hydraulic Services. These are downloadable from - <http://www.nzcic.co.nz/Design/DDG-Hydraulic.pdf>
- b. Provide shop drawings for fabrication and installation of the systems as per the NZCIC guidelines.
- c. Provide construction record 'As-Built' drawings as scheduled in the P&G Section.
- d. Provide Trade literature, products data and catalogue information for inclusion in operating and maintenance manual.
- e. Prepare and submit Operation and Maintenance Manuals and construction record 'As-Built' drawings as specified.

8 MATERIALS

8.1 General

- a. The Engineer reserves the right to call for test certificates of the materials. These certificates must use the tests listed in the appropriate Standard.
- b. Unless otherwise specified materials shall be in accordance with the New Zealand Building Code, relevant standards, and local authority requirements.
- c. Aluminium sheet shall comply with BS 1470, Class NS.3 and shall be suitably tempered for the nature of the work.
- d. Galvanized mild steel sheet shall comply with NZS 3441.

- e. Sheet copper shall comply with BS 2870, half hard or fully annealed as required by the nature of the work.
- f. Stainless steel shall be Type 304 18/8 austenitic steel unless otherwise specified.
- g. Zinc sheets shall be hard, half-hard or flashing grade as required by the nature of the work. Each sheet shall be branded with the name of the manufacturer.
- h. Pipes embedded in concrete shall appropriately protected against damage due to construction, materials etc.

8.2 Copper Piping:

- a. Make freely available to the Engineer all invoices and documents relating to the origin of the piping used.
- b. Half hard copper pipe shall comply with NZS 3501 Table 1 and bear the standard certification mark of the Standards Association of New Zealand or its equivalent.
- c. NZS3501 -Table 3, light gauge copper tube **shall not** be used.

8.3 Un-plasticized Polyvinyl Chloride Pipe ‘PVC’:

- a. Pressure pipe shall comply with AS/NZS 1477 Series 1 metric sizes.
- b. Foul water discharge and ventilating pipe, fittings and accessories shall comply with AS/NZS 1260.
- c. Underground sewer piping shall be PVC to AS/NZS 1260, SN rating as shown on the drawings, installed in compliance with NZS 7643 and/or NZS 4452

8.4 Polypropylene Piping:

- a. Polypropylene waste and ventilating pipes and fittings shall have purpose made double taper compression joints, ‘DUX’ or similar approved.
- b. Polypropylene water supply piping shall be as specified, complying with DIN 8077 and DIN 8078.

8.5 Schedule of Materials

- a. The schedule of materials to be used for this Contract is :

Service	Material
Mains cold water (WH)	Copper to NZS 3501 Table 1 OR;
	Fusion-welded polypropylene as specified OR;
	Polyethylene to: AS/NZS 4130 OR;
	uPVC to NZS 7648 installed according to NZS 7643
Hot water (HW)	Copper to NZS 3501 Table 1 (table 3 shall not be used) OR;
	Fusion-welded polypropylene as specified
Soil and Waste System (DS)	uPVC to AS/NZS 1260 OR;
	HDPE to AS/NZS 5065

- b. Plastic pipes to be installed in accordance to AS/NZS 3500 requirements

- c. Plastic pressure pipes shall not be installed exposed to the sun

9 SANITARY FIXTURES

9.1 General

- a. Refer to the architectural documentation for types and models of sanitary fixtures, fittings and appliances.
- b. Remove protective coverings only so far as required to permit installation.
- c. Install fixtures, fittings and appliances in accordance with the manufacturer's instructions and recommendations. Install in position level and plumb, flush and rigid without stressing the item or its fixings.
- d. Flush tap ware etc with water on completion.
- e. Seal around fixtures including basins, vanities, baths and WCs using one-part, mildew-resistant silicone sealant (colour white) between sanitary fixtures or accessories and adjoining wall or floor surfaces.

10 ACCESSORIES

Contractor is to refer to Architect specification and documents for sanitary fixtures details and models

10.1 Metering

Arrange with the Approving Authority for the installation of a containment back-flow prevention device and a water meter to their requirements.

10.2 Valves

- a. Water supply valves on buried supply mains of larger than Ø50mm nominal bore shall be proprietary resilient-seated gate valves for water mains service, Humes or equal, installed in a surface 'toby' box.
- b. Hydrant valves on buried water supply mains shall be resilient-seated valves, Humes or equal, installed in a surface 'toby' box.
- c. The isolating valve at the cold-water branch connection to the site mains shall be a proprietary gunmetal gate valve, installed in a surface ('toby') box (if on buried piping).
- d. General isolating valves in the water supply systems shall be high-pressure ball valves with chromed DZR brass body and ball or bronze gates valves. Valve handles shall not be steel.
- e. Isolating valves are to be installed in readily-accessible positions in the locations indicated on the drawings. Ball valves are generally to be used in preference to gate valves for local fixture or branch isolation.
- f. Drain points: provide gunmetal gate valves, complete with hose union where indicated.
- g. Tempering valves shall be as specified on the drawings, complying with NZS 4617.

10.3 Filters/ Strainers

Contractor to install line-sized strainers as shown on drawings. Strainers are to have bronze bodies and removable stainless steel screens with approximately 400 micron openings.

10.4 Sink and Basin Traps

Traps, except where shown otherwise, shall be polypropylene two piece in pattern and size to suit the waste outlet.

10.5 Shower Traps

Traps shall be to the Architect's specification and detail.

10.6 Floor Drains

Floor drains, floor waste gullies etc shall be as detailed on the drawings.

10.7 Rainwater Outlets

Not included in this contract.

11 SOLAR HOT WATER

- a. Hot water is achieved via solar panels with an electric boost element.
- b. Storage type as scheduled on drawings, complete with electric elements and all valves, controls and thermostatic and pressure safety devices to suit the HWC and the installation; valves shall be approved by the cylinder manufacturer.
- c. Drain relief valves and drain trays to suitable discharge points.
- d. Permanently label the local electrical isolator for each controlled hot water cylinder with the switchboard location, circuit number and the words 'remotely controlled, may become live without warning'.
- e. Hot water system shall be installed with the approved controller, cyclone mounting kit as per the manufacturers requirements.

12 INSTALLATION

12.1 General

- a. Refer also to the Architectural documentation for specific installation requirements.
- b. Install all valves and taps in the positions indicated or as required to make the system operational.
- c. Install all materials, accessories and other specified equipment and connect to the appropriate piped service.

12.2 Valve Access

The plumbing contractor shall be responsible for ensuring that access is provided for easy maintenance access to concealed isolating and tempering valves and the likes that are to be installed in the ceiling space or in wall cavities.

The plumber shall consult with and communicate to the builder that access panels be provided and locations of these.

12.3 Seismic Restraints

- a. Support storage tanks, hot water cylinders, associated pipework, etc, where required, against seismic movement, in accordance with NZS 4219.
- b. For hot water cylinders use proprietary galvanised steel strapping and appropriate anchors.

12.4 Labelling

- a. Label all isolating valves, including those within ducts, ceilings and plant areas. Identify areas served by the valves. Labels shall be engraved rigid laminated plastic with 5 mm high white lettering on a black background. Edges of labels shall be bevelled.

12.5 Electrical Earthing

- a. Provide all lugs and clips as necessary and as required by the electrical services.

12.6 Pipe Joints And Fittings

- a. Pipe joints unless otherwise specified, shall comply with the NZ Building Code and good trade practice.
- b. Mechanical joints shall only be used in permanently concealed spaces where approved.

12.7 Polypropylene (PP) and polyethylene (PE) water supply piping

- a. Pipe-to-pipe joints shall be proprietary fusion-welded type, made strictly in accordance with the piping system manufacturer's instructions.
- b. Pipe-to-mechanical (e.g. threaded) connections shall be proprietary fittings from the piping system manufacturer.
- c. Connections to existing water supply mains shall be made using suitable proprietary Gibault flange-adaptor mechanical couplings, Humes, Viking Johnson or equal.
- d. Couplings and other similar components on buried water mains shall be protected against corrosion with proprietary petrolatum-based system, DensoTape or equal, applied in accordance with the manufacturer's instructions and recommendations

12.8 Copper To Copper Joints

- a. Joints connecting copper pipe, up to and including 50 mm diameter, to apparatus shall be brass compression fittings to permit ready disconnection.

- b. Flange connections shall be used for joints to valves and equipment on copper pipe over 50 mm diameter.
- c. Flanges shall be brass, gunmetal or bronze, machined and brazed to the tube. Bolts shall be non-ferrous and jointing shall comply with BS 6956. Alternatively, use pre-formed copper stub-flanges and loose backing-flanges; Kembla 'cop-a-mate' or equal, installed in accordance with the manufacturer's instructions.
- d. Compression fittings of the manipulative (Crox) type are not permitted on hot water pipes above 25 mm diameter.
- e. Tees and branches for half hard pipe shall be capillary or socketed type. Braze joints with an approved silver-bearing low melting-point brazing alloy complying with BS 1845 Type CP1 or CP2.
- f. Solder ring capillary fittings may be used.

12.9 PVC pressure pipes and pipe fittings

- a. PVC pipes and pipe fittings shall be provided by the same manufacturer.
- b. Solvent welded fittings shall be cemented to the pipework in accordance with the manufacturer's recommendations.
- c. Fabrication of pipe fittings shall not be permitted where stock moulded fittings are available.
- d. Where fabrication of fittings is unavoidable, employ only a company specialising in the fabrication of plastic materials.
- e. Site-made heat-welded connections will not be permitted.

12.10 Polypropylene Waste (Trap) Fittings

- a. Polypropylene waste (trap) fitting joints shall be purpose made double taper compression joints.

12.11 Pipe Installation

- a. Set pipes in straight even gradients so as to avoid creating air locks.
- b. Use easy bends. Square elbows are not permitted. All tees shall be swept with the flow.
- c. Bend copper pipes without buckling or damage or reducing the cross-sectional area. If this can not be achieved then use fittings.
- d. Unless otherwise indicated all water connections terminating at fittings are to be made through wingback fittings at wall junctions.
- e. Anchor pipes where necessary, allowing for expansion. Expansion compensation in the water supply systems shall preferably be achieved using the flexibility of the piping rather than by using expansion bellows or other proprietary expansion compensators.
- f. Use vibration-isolation supports with profiled rubber liners to ensure there is no direct contact between the piping and the building structure or other building elements.
- g. Install PVC pipe work in accordance with AS 2032 or NZS 7643 as appropriate.
- h. Conceal pipe work unless otherwise directed by the Architect. Provide escutcheon plates where pipes emerge through floors, walls and ceilings.
- i. Allow to paint piping and fittings that are inside the building and exposed to view. Refer to MES 201 and the architectural documentation.
- j. Install necessary isolating valves on pipes to enable providing necessary and appropriate maintenance to the fixtures and equipment and to install these valves in locations to enable

easy access. Contractor to coordinate with relevant contractors to provide access to these valves.

12.12 Pipe Supports

Adequately support all pipes by properly formed adjustable hangers at distances not exceeding those given in the following table: (in metres, V = vertical, H = horizontal)

Pipe Diameter (mm)	15	20	25	32	40	50	65	80	100	125
CopperV	1.8	2.4	3.0	3.0	3.0	3.0	3.6	3.6	3.6	3.6
CopperH	1.2	1.5	1.5	2.4	2.4	3.0	3.0	3.0	3.0	3.0
PVC pressure V	1.2	1.36	1.5	1.8	1.8	2.1	2.4	2.7	3.0	3.6
PVC pressure H	0.6	0.8	0.8	0.84	0.9	1.1	1.2	1.3	1.5	1.8
PVC sanitary V	-	-	-	0.9	0.9	0.9	-	1.2	1.2	1.8
PVC sanitary H	-	-	-	.45	.45	0.6	-	0.9	0.9	1.2

Supporting of alternative materials shall be in accordance with the manufacturers instructions.

13 POLYPROPYLENE (PP) AND POLYETHYLENE (PE) WATER SUPPLY PIPING

- a. Where permitted under this specification, PP or PE piping may be supplied and installed under this contract, in accordance with the piping system manufacturer's instructions and recommendations, and by appropriately trained and/or qualified trades people.

13.2 Where Offered As An Alternative

- a. Where PP or PE piping is offered as an alternative to the specified piping it is the responsibility of the contractor to:
 - i. Select the appropriate size and specification (including SDR, reinforcing, etc) of piping so that the pressure drop in the piping is no greater than in the specified system,
 - ii. Make due allowance for movement due to changes in temperature, using offsets and expansion loops sized in accordance with the piping manufacturer's instructions and recommendations,
 - iii. Select supports and install these at appropriate spacings,
 - iv. Ensure appropriate protection of piping where subject to U-V radiation,
 - v. Select and install appropriate insulation with a total thermal resistance no less than the specified system, and
 - vi. Ensure that the completed installation is appropriate for the application and operating temperature and pressure of the system, so as to achieve a 50-year design life.

13.3 Pipe Supports

- a. The contractor is to supply and install suitable pipe supports at intervals not more than that specified by the piping system manufacturer at its design operating conditions of temperature and pressure. Refer also to PIPE SUPPORTS.

13.4 Pipe Movement including Thermal Expansion and Contraction

- a. The contractor is to make due allowance for movement due to changes in temperature, using offsets and expansion loops sized in accordance with the piping manufacturer's instructions and recommendations.

13.5 Pipe Joints

- a. Pipe-to-pipe joints shall be proprietary fusion-welded type or electro-fusion type using the piping system manufacturer's proprietary fittings and made strictly in accordance with the piping system manufacturer's instructions and recommendations.
- b. Mechanical joints e.g. threaded or union connections shall not be concealed behind wall linings or other permanent building elements.
- c. Pipe-to-mechanical (e.g. threaded) connections shall be proprietary fittings from the piping system manufacturer, and shall be used at connections to valves or equipment.
- d. Connections to existing water supply mains shall be made using suitable proprietary Gibault flange-adaptor mechanical couplings, Humes, Viking Johnson or equal.
- e. Couplings and other similar components on buried water mains shall be protected against corrosion with proprietary petrolatum-based system, DensoTape or equal, applied in accordance with the manufacturer's instructions and recommendations

13.6 Pipe Testing and Commissioning

- a. The contractor is to test and commission the piping in accordance with the piping system manufacturer's instructions and recommendations, and is to ensure that all relevant certification and guarantees are completed. Refer also to other sections of the specification on COMPLETION and TESTING & COMMISSIONING.

14 COLD WATER SUPPLY

- a. Supply and install in copper to NZS 3501 Table 1, wrapped in Densotape where embedded in concrete or buried underground.
- b. Install water meter, filters and valves in accordance with Territorial Authority requirements.
- c. Unless otherwise required by the Network Utility or relevant standards, lay buried water supply piping a minimum of 500 mm below non-trafficable ground level or a minimum of 600 mm below trafficable ground level. Lay metallised marker tape or marker tape with tracer wire in the back-fill approximately 300 mm above the water main.
- d. Contractor to install water and sanitary and drain pipes at distances from other services wires, cables and pipes in accordance to AS/NZS 3500 and other relevant standards and to meet local authority and health and safety requirements.

15 HOT WATER SUPPLY

- a. Pipes shall be copper to NZS 3501 Table 1 as specified.
- b. Insulate hot and tempered hot water supply pipes in accordance with NZBC H12/AS1 and the insulation manufacturer's instructions & recommendations, or with 25 mm fibreglass insulation; AHI or equal; whichever is the greater.
- c. Contractor is to allow in his piping and equipment installation the expansion and contraction effect of the systems.

16 INSULATION

- a. Where there is a risk of condensation occurring and where the condensation may cause damage then insulate all cold water pipe work from building entry to storage tanks and fittings with closed-cell foam pipe insulation to avoid condensation problems. Suitable type: Armaflex, 9.5 mm thick.
- b. Insulate hot water and tempered water supply pipes (excepting that such insulation may be omitted from buried polypropylene branch piping) as follows:
 - i. Copper pipe: 25 mm thick AHI fibreglass, or equivalent on all pumped or circulating hot water pipe work.
 - ii. Polypropylene pipe: 9.5 mm thick closed-cell foam insulation, Armaflex, or equal.

17 DRAINAGE

Refer also to MES 405. Supply and install in PVC as specified. Shallow drainage pipes are to be protected by concrete-encasement, against damage due to vehicles and construction traffic.

18 COMPLETION

Refer also to MES 201 and MES 424. Test and commission the installations as specified.

- a. Commission appliances including hot water systems in accordance with the manufacturer's instructions and recommendations.
- b. Prepare and submit Operation & Maintenance Manuals and construction record 'As-Built' drawings as specified.
- c. Remove protective coverings. Clean fixtures, fittings and appliances including tapware. Remove all unused materials, off-cuts, packaging materials etc from the site.

MES: 405

DRAINAGE & PLUMBING - DRAINAGE

19 SCOPE AND DESCRIPTION

- a. Building Services P&G section MES 200 applies to this section of the work.
- b. This section of the specification details specific requirements for the supply, installation and commissioning of sanitary, rainwater and ground water drainage systems.
- c. This specification covers the plumbing and drainage services as shown on the plumbing and drainage services drawings (P series). The demarcation between trades is generally as shown on the drawings; typically with the plumbing & drainage services trade connecting to manholes installed by the civil works trade.
- d. The scope of works includes the provision of as built drawings as required by the Territorial Authority and this specification.
- e. The contractor is to take particular care to ensure that the required minimum gradients are achieved (in accordance to AS/NZS 3500.2 requirements), that piping is adequately supported to prevent loss of gradient due to settlement, and that piping is suitably protected against damage during and post-construction.

20 STANDARDS

The following documents shall apply, unless expressly modified herein:

- NZS 3107 Specification for pre-cast concrete drainage and pressure pipes.
- NZS 3501 Copper Tubes for Water, Gas and Sanitation.
- NZS 4452 Construction of Underground Pipe Sewers and Drains.
- NZS 7643 C.O.P. for the Installation of Unplasticized PVC Pipe Systems.
- AS/NZS 1477 PVC pipes and fittings for pressure applications
- AS/NZS1254 PVC pipes and fittings for storm and surface water applications.
- AS/NZS 1260 PVC pipes and fittings for drain, waste and vent applications
- AS/NZS 2032 Installation of PVC pipe systems.
- AS/NZS 2566.2 Buried Flexible Pipelines - Installation
- AS/NZS 3500 All parts
- NZS 7650 Performance Requirements for Plastic Pipe for Use as Light Duty Sub-soil Drains.

AS/NZS 5065 Polyethylene and polypropylene pipes and fittings for drainage and sewerage application

21 REGULATIONS

- a. The NZ Building Code acceptable solutions E1/AS1 for rain water drainage, and G13/AS2 for foul water drainage or G13/AS3 and AS/NZS 3500.2, shall apply in the absence of any other standard specification or code of practice required by the Territorial Authority or stated in this specification.
- b. Safety procedures shall comply with the requirements of the Health and Safety in Employment Act 1992 and NZS 4452.

22 MATERIALS

- a. Materials unless otherwise specified shall be in accordance with the NZ Building Code Approved Documents.
- b. Sub soil ground water drainage pipes and fittings shall be Novaflo, Novacoil, or other approved proprietary system.
- c. Embedded pipes (in and under concrete slab as well as under paved areas) shall be appropriately protected against damage due to construction, materials etc. E.g. copper piping shall be wrapped in Densotape and encased in a Novacoil or similar outer sheath.
- d. Underground PVC drain pipe and fittings shall comply with AS/NZS 1254 or AS/NZS 1260 as specified, SN rating as shown on the drawings.
- e. Bedding material including initial back-fill shall be clean sand, graded GAP7 or pea gravel not exceeding 10mm diameter as appropriate and in accordance with AS/NZS2566.2.
- f. Trench backfill shall be well-graded, compacted AP40 base course.
- g. Final backfill in grassed areas shall be topsoil as shown on the drawings. Final backfill under slabs and paved areas shall be base-course backfill.

23 DRAINLAYING

- a. Excavate for drain laying in accordance with the requirements of the NZBC and/ or the Approving Authority, as appropriate.
- b. The contractor is to take particular care to ensure that the required minimum gradients specified by NZBC and/or AS/NZS 3500 are achieved, that piping is adequately supported to prevent loss of gradient due to settlement, and that piping is suitably protected against damage during and post-construction.
- c. Piping in trafficable areas with less than 400 mm cover (top of pipe to finished ground level) and other piping where shown on the drawings is to be concrete encased, with due provision for movement at joints.
- d. Lay pipes on smoothly graded bedding material complying with the standard relevant to the pipe material used and type of ground.
- e. Lay pipes to the lines and invert levels indicated or to submitted plans if design - build. No deviation shall be permitted without prior approval.
- f. Grades steeper than 1 in 100: Lay pipes so that the invert depths at the set out pegs will be accurate to ± 3 mm. Ensure that the alignment is perfectly straight.
- g. Deviations: Immediately on completion of that portion of the work, provide the Engineer with a scale drawing of the work as laid.

- h. Granular bedding: Lay pipes on a granular bedding having a minimum thickness of 100 mm below the pipe barrel.
- i. PVC drain pipes shall be laid in compliance with NZS 7643.
- j. Pipes in and under floor slab:
 - i. Where pipes are embedded in the slab between reinforcing layers or embedded in site concrete under slab, the pipe shall be protected with a pipe sleeve, one diameter larger, along the entire embedded length. Submit details of alternative systems for approval before installation.
 - ii. Pipes in slab shall be supported to provide the required gradient and restrained to resist flotation forces imposed during concrete placement.
 - iii. Pipes under slab shall be laid in accordance with details on drawing.
- k. Rainwater surcharge:
 - i. Provide a rainwater surcharge point for down pipes by way of an air gap where the down-pipe discharges into the underground drainage system. Refer to the Architectural documentation for details of roofing including gutters, outlets, down-pipes and the provision of gutter overflows.

24 JOINTING

- a. PVC pipes shall be jointed using seal ring mechanical joints.
- b. Pipes of other materials shall be jointed to the manufacturer's recommendations.

25 OVERFLOW RELIEF GULLY TRAPS

Install gully traps in accordance with the NZ Building Code section G13/AS2 or Territorial Authority requirements. Refer to 'Covers and Gratings' for requirements for gratings.

26 INSPECTION CHAMBERS, MANHOLES & AND ACCESS POINTS

- a. Provide inspection chambers & manholes as indicated.
- b. Inspection chambers are no deeper than 600mm and shall be 600 mm ID.
- c. Manholes are deeper than 600mm, and shall be 1050 mm ID in one piece riser up to 2.4 m depth. Deeper manholes shall have 2.4 m riser on bottom.
- d. Manholes shall be provided with step-irons.
- e. Install on concrete bases and to Territorial Authority requirements.
- f. Place circular chambers with the centre coinciding with the intersection of the centre lines of the connecting drains.
- g. Use proprietary splayed pipe/ channel fittings.
- h. Bench the manhole from the channels at a minimum of 1 in 10 for storm water and 1 in 6 for sewer.
- i. Covers shall be heavy duty type, (see also 'Covers and Gratings' below).
- j. Position covers flush with the local finished surface level.

- k. Provide access point, inspection openings and inspection shafts for cleaning, rodding and maintenance in according to NZBC requirements

27 COVERS AND GRATINGS

Covers for 'toby' (surface) boxes, manholes, inspection chambers, and gratings for gully traps shall be as follows:

- a. Toby (surface) boxes: covers are to be proprietary injection-moulded plastic or cast-iron.
- b. Manholes and inspection chambers: covers and frames are to be heavy-duty cast-iron. Covers shall not rock in their frames.
- c. Gully traps: gully traps including covers are to be proprietary PVC units.

28 BACKFILLING

- a. No backfilling shall commence until the testing of that section of the pipe installation is complete.
- b. Initial back-filling material shall be the same as the bedding material (refer drain laying), and shall be to a minimum depth of 100mm above the top of the pipe.
- c. Trenches shall be backfilled and consolidated with selected backfill, free of large stones, carefully tamped by hand around the pipe installation in 80 to 150 mm thick layers to 300 mm above the crown of the pipe. Complete backfilling with normal fill, compacted to the same density as the undisturbed ground in the trench sides.
- d. Trenches containing PVC pipe installations shall be backfilled and consolidated in accordance with NZS 7643.
- e. Excepting where concrete-encased as specified, PVC pipes traversing under roadways, drives and hard standing areas shall be protected with a 100 mm thick concrete slab extending across the full width of the trench situated on hard fill 100mm above the top of the PVC pipe, in accordance with NZS 7643.
- f. The remainder of the trench shall be backfilled and consolidated in accordance with NZS 7643.
- g. Reinstatement the ground surface to match the original and surrounding area, unless instructed otherwise by the Architect.

MES: 424

DRAINAGE & PLUMBING - TESTING & COMMISSIONING

29 GENERAL

- a. Building Services P&G section specification MES201 applies to this section of the work.
- b. The Contractor is responsible for the commissioning and shall provide all labour, tools, and instruments as required for the full and proper testing and commissioning of the services included within the contract works.

- c. The Engineer and/or the Architect may witness sufficient of the testing and commissioning to demonstrate that the installed systems have been appropriately tested and properly commissioned.
- d. The scope of the commissioning shall be to prove:
 - i. Compliance with all statutory and design requirements.
 - ii. Safe and proper working of the installation in all respects.
- e. The Contractor shall prepare programmes for the commissioning for approval by the Engineer.
- f. The Contractor shall give notice of tests to the Engineer in advance by a period of time mutually agreed early in the contract period.

30 COMMISSIONING PROCEDURES

30.1 General

- a. Testing shall be undertaken before concealing the piping, and prior to the final connection of fixtures, fittings and appliances.
- b. In the event that any test is failed, the contractor is to repair any defects found, and the affected system shall be re-tested.
- c. Commissioning procedures shall generally comprise visual inspection at all installation stages, testing of all systems (staged where required), followed by setting the installation to work, checking operation and certification.
- d. Proprietary systems shall be commissioned in accordance with the manufacturers recommendations.

30.2 Drainage Systems

- a. Drains must be tested for correct installation (laying and jointing), continuity of fall and concentricity, before backfilling. Check continuity of fall and concentricity again after backfilling.
- b. Use the test procedures specified in NZS 7643, and any additional tests required that has been adopted by the Territorial Authority. Where relevant, the requirements of NZS 7643 shall be complied with.
- c. Flood test drainage piping as per plumbing systems.

30.3 Plumbing Systems

- a. Check for leaks at fixtures, fittings and appliances.
- b. Pressure-test all water supply pipe work for a minimum of sixty minutes at not less than 1.5 times the working pressure to the approval of the Engineer.
- c. Commission any back-flow prevention devices installed under this contract in accordance with the manufacturer's instructions and the requirements of the Territorial Authority. Include copies of test certificates in the Operation & maintenance Manual records
- d. Sanitary plumbing systems shall be flood-tested, using test-bungs to isolate sections of plumbing piping, filling the piping to overflow level and checking for leaks. Following successful flood-testing, drain and reconnect the piping as required, and check for adequate drainage.

- e. Buried storm water drainage systems shall be flood-tested, using test-bungs to isolate sections of piping, filling the piping to overflow level and checking for leaks. Following successful flood-testing, drain the piping as required, and check for adequate drainage.
- f. Smoke-test all relief vent piping and check for leaks.

30.4 Fixtures, Fittings and Appliances

- a. Check the operation of all fixtures, fittings and appliances installed under this contract. Adjust set-points as necessary to give proper operation.
- b. Test and commission appliances including the hot water systems in accordance with the manufacturer's instructions and recommendations.
- c. Adjust hot water system set-points to the specified supply temperatures.
- d. Read any water or gas meters installed under this contract. Record the readings including the units of measurement and the date, in the Operation & Maintenance Manual records.

MES: 425 DRAINAGE & PLUMBING - MAINTENANCE

31 GENERAL

- a. Building Services P&G specification section MES:201 applies to this section of the work.
- b. Maintain this installation for the period of twelve months after completion of the contract
- c. Instruct nominated personnel in the correct operation and maintenance of the systems.
- d. During the maintenance period make any additional adjustments as found necessary under full occupancy conditions.
- e. Provide fault correction service during office hours.
- f. Permanent maintenance staff for the building will carry out the routine maintenance checks listed below. Train the permanent maintenance staff in the correct operation, adjustment and maintenance of the systems and supervise them for the first year of operation.
- g. Remedy any faults located.
- h. Record all checks in the maintenance manual.
- i. Carry out all maintenance recommended by the manufacturers of equipment and appliances installed under the contract.

32 MAINTENANCE CHECK LISTS

32.1 Daily

Check for fault indication.

32.2 Three monthly

- a. Water filters:

- i. Rinse filters.
- ii. Replace filter sleeve if damaged or unable to be cleaned satisfactorily.

32.3 Annually

- a. Clean strainers in pipework.
- b. Check water supply temperatures from water heaters and/ or tempering valves and adjust where necessary.
- c. Check the hot water circulation system temperature difference does not exceed the specified limit.
- d. Check pipe work for leaks.
- e. Check operation of tapware including for signs of leakage past washer/ cartridge. Correct any faults found.
- f. Check any back-flow prevention devices installed under this contract.
- g. Test any testable back-flow prevention devices installed under this contract in accordance with the manufacturer's instructions and the requirements of the Territorial Authority.



Opus International Consultants Ltd
The Westhaven, 100 Beaumont St
PO Box 5848, Auckland 1141
New Zealand

t: +64 9 355 9500
f: +64 9 355 9583
w: www.opus.co.nz