

WATER DISTRIBUTION MAINS

SPECIFICATION

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SECTION 01500: TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 Summary

A This Section includes requirements for temporary facilities and controls, including temporary utilities, support facilities, and security and protection facilities.

1.2 Use Charges

A The Contractor will be responsible for all temporary works required and shall be required to test, repair/replace or enhance the utility services as necessary to facilitate the Works.

B The Contractor shall allow other entities to use temporary services and facilities without cost, including, but not limited to, Employer's Representative, testing and inspecting agencies and personnel of authorities having jurisdiction.

1.3 Temporary Utility Installation

A Electrical Service:

Where necessary, engage appropriate local utility company to install temporary service or connect to existing service. Where utility company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with utility company recommendations.

1. Arrange with utility company, Employer, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
2. Provide adequate capacity at each stage of construction. Before temporary utility is available, provide alternate services.

B Sanitary Facilities:

Provide temporary toilets, wash facilities, and drinking-water fixtures. Comply with regulations and health codes for type, number, location, operation, and maintenance of fixtures and facilities.

Disposable Supplies: Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Maintain adequate supply. Provide covered waste containers for disposal of used material.

Toilets: Install self-contained toilet units. Shield toilets to ensure privacy.

Wash Facilities: Supply cleaning compounds appropriate for each type of material handled.

Drinking-Water Facilities: Provide bottled-water, drinking-water units. Where power is accessible, provide electric water coolers to maintain dispensed water temperature at 45 to 55 degrees F (7.2 to 12.7 degrees C).

SECTION 01561: ENVIRONMENTAL PROTECTION

PART 1 - GENERAL

1.1 Environmental Measures

- A** Meet or exceed the requirements of all Bermuda environmental legislation and regulations, including all amendments up to project date provided that in any case of conflict or discrepancy, the more stringent requirements shall apply.
- B** At all times during the Works the Contractor shall maintain the Site and surrounding areas in a clean and orderly manner.

PART 2 – PRODUCTS

- A** Not Applicable.

PART 3 - EXECUTION

3.1 Fires

- A** Fires and burning of rubbish on site will not be permitted.

3.2 Disposal Of Wastes

- A** Burying of rubbish and waste materials on site will not be permitted.
- B** Collect all rubbish and waste material and dispose of in accordance with the latest editions of the Ministry of Works and Engineering, Waste Management Plan.
- C** Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers.
- D** When cleaning with needle scabblers, provide enclosures, screens and traps to confine and contain all material and paint debris and other extraneous material.
- E** Do not allow any paint debris or other foreign material to enter the water.
- F** Hazardous waste such as lead paint debris should be double-bagged (as asbestos would be) and sent to proper waste stations. Manifest will be required by the Employer's Representative.

3.4 Drainage

- A** Provide temporary drainage and pumping as necessary to keep site free from water.
- B** Do not pump water containing suspended materials into waterways, sewer or drainage systems.
- C** Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with Bermuda authority requirements.

3.5 Plant Protection

- A** When, in opinion of Employer's Representative, negligence of Contractor results in damage or destruction of vegetation, or other environmental or aesthetic features beyond work areas as shown on contract drawings, the Contractor shall be responsible, at his expense, for complete restoration including replacement of trees, shrubs, grass, etc. to satisfaction of Employer's Representative.

3.6 Pollution Control

- A** Maintain temporary erosion and pollution control features installed under contract.
- B** Control emissions from equipment and plant to Bermuda authorities' emission requirements.
- C** Prevent extraneous materials from contaminating air, land or water, by vacuum, temporary enclosures, screens, traps or other devices.
- D** Spills of deleterious substances should be immediately contained and cleaned up in accordance with provincial regulatory requirements. Spills should be reported forthwith to the Employer's Representative.
- E** Noise levels emitted from construction activities are subject to Bermuda Government requirements.

3.7

Storage And Handling Of Fuels And Dangerous Fluids

- A** Locate fuel storage facility a minimum of 100 m from any waterbody in an area approved by the Employer's Representative and construct impermeable dykes so that any spillage is contained
- B** Prevent spillage of gasoline, diesel fuel and other oil products into the water and on land. Clean up spills promptly at own cost in accordance with Bermuda regulatory requirements. Report any fuel spills immediately to Employer's Representative
- C** Proper use of primers, grouts, bonding adhesives and other hazardous substances will be undertaken to prevent their entry into the water. Substances are to be stored and mixed on protected surfaces away from site to prevent their entry into waterways and contamination of soils.
- D** Collect and dispose of used oil filter cartridges and other products of equipment maintenance at industrial waste facility to satisfaction of Employer's Representative.

***** END OF SECTION 01561 *****

SECTION 02300 - EARTHWORK

PART 1 - GENERAL

1.1 Summary

A This Section includes the following:

1. Excavating and backfilling for utility trenches.

1.2 Definitions

A Backfill: Soil material used to fill an excavation

1. Initial Backfill: Backfill placed beside and 12 inches over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B Base Course: Course placed between the sub-base course and hot-mix asphalt paving.

C Bedding Course: Course placed over the excavated subgrade in a trench before laying pipe.

D Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Employer's Representative. Authorized additional excavation and replacement material will be paid for according to Contract provisions changes in the Work.
2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Employer's Representative. Unauthorized excavation, as well as remedial work directed by Employer's Representative, shall be without additional compensation

F Sub-base Course: Course placed between the subgrade and base course for hot-mix asphalt pavement, or course placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk

G Utilities: On-site underground pipes, conduits, ducts, and cables.

1.3 Project Conditions

- A** Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Employer's Representative and then only after arranging to provide temporary utility services according to requirements indicated. Any damage due to contractor's activities shall be made good at the contractor's expense.

PART 2 - PRODUCTS

2.1 Soil Materials

- A** General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B** Bedding Course & Initial Backfill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

PART 3 - EXECUTION

3.1 Preparation

- A** Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

3.2 Excavation for Utility Trenches

- A** Excavate trenches to indicated gradients, lines, depths, and elevations.
- B** Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 30 inches higher than top of pipe or conduit, unless otherwise indicated.
1. Clearance: Excavate a minimum trench width of 18 in.
- C** Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
1. Excavate trenches 3 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

3.3 Hard Rock

A In the event that the trenching machine cannot remove harder than normal rock during excavations then, after notification to, and by agreement with, the Employer's Representative this rock shall be removed by hammering. The rates for hammering shall be charged on an hourly basis as per the prices described in Schedule of Rates on The Form Of Tender.

3.4 Unforeseen Conditions

A In the event that during excavations, the Contractor encounters conditions that are deemed by agreement with the Employer's Representative to be outside the conditions expected, it may make a claim for both an extension of time and increased costs to continue with the excavations.

B Hard Rock shall not be deemed to be an unforeseen condition.

C Unforeseen conditions shall require immediate notification to the Employer's Representative who shall inspect the Works immediately.

3.5 Utility Trench Backfill

A Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

B Place and compact initial backfill of sub-base material, free of particles larger than 1 inch in any direction, to a height of 12 inches over the utility pipe or conduit. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

C Place and compact final backfill of satisfactory soil to final subgrade elevation.

3.6 Compaction of Soil Backfills

A Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by hand-operated tampers.

3.7 Protection

A Where settling occurs before the Maintenance Period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

3.8 Reinstatement

A Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible. Permanent re-instatement of all public and private property shall be completed no later than three months after backfilling of trenches.

B Reinstatement may be completed in stages and the warranty shall be started for each stage upon its completion. Percentage of completed Works shall be by agreement with the Employer's Representative.

C In asphalt paved areas a minimum of 5" of compacted asphalt shall be laid to finish flush with adjacent surfaces. Existing asphalt surfaces adjacent to trench to be saw cut to provide a uniform edge.

3.9 Disposal of Surplus and Waste Materials

A Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it.

B Since the Works are to be carried out on public roads, debris shall not be allowed to accumulate and the Contractor shall remove any debris at the instruction of the Employer's Representative should he deem it to be a hazard to the public.

3.10 Traffic Management

A The Contractor shall at all times maintain existing conditions for vehicular traffic open to the public and free of any excavation materials throughout period of contract. Existing conditions for vehicular traffic can be restricted as follows:

1. The North-East portion of Headquarters Hill (East of moat) can be closed to traffic with Engineer's approval upon 5 day advance notice of any period of traffic interruption.
2. If requested by the Engineer or Emergency Services, restore crossing to traffic service immediately.

B The Contractor shall comply with all traffic management requirements of the Highways Section of the Ministry of Public Works and any other governmental authority requirements of Applicable Law.

***** END OF SECTION 02300 *****

SECTION 15670 - HIGH DENSITY POLYETHYLENE (HDPE) PIPE

PART 1 - GENERAL

1.1 Requirements

- A** The Supplier shall furnish all tools, equipment, materials, and supplies to complete the supply as specified herein.
- B** This Section covers furnishing of High Density Polyethylene (HDPE) pipe.

PART 2 – PRODUCTS

2.1 General

- A** Materials shall consist of a black high-density polyethylene copolymer resin designed for extrusion for potable water and industrial applications per ASTM D1248 Type III Class C. The resin shall have a PE 3408 rating. The Manufacturer shall be ISO 9001 certified.
- B** All pipe, shall be in accordance with AWWA C906 suitable to be joined using butt fusion or Electro fusion.
- C** High Density Polyethylene piping systems shall have a minimum design pressure limit of 160 psig at SDR = 11, unless otherwise noted.
- D** High Density Polyethylene piping systems shall have design temperature limit of 120 degree F, unless otherwise noted.

2.2 Pipe

- A** HDPE pipe shall have SDR = 11 per ASTM D1248 Type III Class.
- B** The base polymer shall be a single grade of polyethylene, PE 100 with a derived density greater than 0.93g/cm³ tested at 20°C.
- C** No rework material is allowed to be used for the manufacture of the pipes.
- D** No additives that can contribute to toxic hazard, impair the fabrication of properties and chemical and physical properties in particular to long term mechanical and strength is allowed.
- E** The color of the pipes shall be black. Each pipe shall contain minimum two (2) equispaced factory colour coded longitudinal stripes on opposite sides of the pipe designating the pipe use. The material for stripes shall be of the same type of resin as used in the compound for the pipe.

Blue stripes – Drinking water
 Green stripes – Sewer waste
 Purple (Pantone Purple 522C)stripes – Reclaimed water

F Wall thickness and nominal diameter are given below:

Nominal Dia	Average OD	Min Wall Thickness	Average ID	Weight lb/ft	Maximum out of Roundness
¾ -inch	1.050	0.095	.0839	0.13	1.2
2-inch	2.375	0.216	1.92	0.64	1.4
3-inch	3.5	0.318	2.83	1.39	1.6
4-inch	4.5	0.409	3.63	2.30	2.2
6-inch	6.625	0.602	5.35	4.99	3.2

G The internal diameter and external surfaces of pipes must be smooth, clean and free from scoring, cavities and other surface defects which may affect pipe performance.

H The ends of pipe shall cut cleanly and square to the axis of the pipe. Appearance shall be checked at the point of manufacture

I The pipe shall be marked at least every 4ft of the pipe. All pipes must have the markings at least with the following information:

- a) 'HDPE' letters
- b) Month and year of manufacture
- c) Brand
- d) Nominal diameter
- e) Minimum wall thickness
- f) The material grade (PE100)
- g) Nominal Pressure (PN)

2.3 Tracer Wire

A Tracing wire shall be T.W.U., number eight gauge, stranded, insulated copper wire with 60 mil of black, cross-linked polyethylene (XLPE) insulation specifically manufactured for direct burial applications.

PART 3 – EXECUTION

3.1 General

A Not applicable

3.2 Handling and Storage

A Handling: Pipe, shall be carefully inspected before and after shipping and those found defective shall be rejected. Pipe shall be free from fins and burrs.

B Storage: All pipe stacks should be made on sufficiently firm, flat ground to support the weight of the pipes and any necessary lifting equipment. Stacking heights should be generally be kept to a minimum and adequate space allocated for lifting machinery to maneuver without causing accidental damage. For safety and convenience of handling the stacking height of bundles should not be more than 10ft to prevent possible deformation of the pipes, bundles must be stored timber to timber. For similar reasons coiled pipe shall be stored flat in stacks not exceeding 3 coils per stack. At all times pipes should be stored away from exhaust outlets and all other high temperature sources. Care should be taken to avoid contact with lubricating or hydraulic oils, gasoline, solvents and other aggressive chemicals.

3.3 Trenching and Backfill

A Trench excavation and backfill shall conform to the requirements of Section 02300 "Earthwork," and as specified herein.

3.4 Pipe Installation in Trenches

A Pipe shall be graded in straight lines, taking care to avoid the formation of any dips or low points. Pipe shall not be laid when the conditions of trench or weather are unsuitable. At the end of each day's work, open ends of pipe shall be closed temporarily with bulkheads.

B Joints shall be installed according to manufacturer's recommendations. Trenches shall be kept free of water until joints have been properly made. The maximum combined deflection at any coupling shall be in accordance with the manufacturer's recommendations.

C Pipe shall be cut by means of saws, power driven abrasive wheels or pipe cutters, which will produce a square cut. No wedge-type roller cutters will be permitted. After cutting, the end of the pipe shall be beveled using a beveling tool, portable type sander or abrasive disc.

D Joints shall be butt fused or flanged in accordance with the manufacturer's instructions.

E Pipe installed by the Contractor shall at the end of the completion of Works each day be capped with a temporary protection cap to keep the pipe free of debris and vermin.

F Welding of Pipe: The Ministry has a welding machine available to the contractor for use. Prior to the use of the Ministry machine the Contractor shall provide a demonstration by their staff that they have a full understanding of the use and operation of the machine. Each weld shall have a unique identifying number stamped into the molten weld bead:

G Each weld shall have the following logged by the welder:

Weld number.

Temperature of heater.

Pressure applied during the weld.

Time pressure was held for.

Date of weld.

H Tracer wire shall be laid flat and securely affixed to the pipe at ten foot intervals. The wire shall be protected from damage during the execution of the works. No breaks or cuts in the tracer wire or tracer wire insulation shall be permitted. At water service saddles, the tracer wire shall not be allowed to be placed between the saddle and the water main. Except for approved spliced in connections, tracer wire shall be continuous and without splices from test box to test box.

J Warning tape shall be installed over each pipe in the backfill materials. Warning tape shall be installed no less than 12" above each pipe for the full length of the buried sections.

3.5 Connections to Existing Pipelines

A The Contractor shall locate all underground improvements and install the pipelines to the depths shown on the drawings. Where the new work is to be connected to existing pipelines, the Contractor shall make its arrangements with the serving utility well in advance of the connections, to allow adequate time for dewatering of the existing line, if necessary.

B All service connections to be undertaken upon completion of the laying of the new water main and after the commissioning and testing of the new pipeline.

- C** All Service connections to existing meters shall be laid perpendicular to the main and extended to the existing shut off valve attached to a meter or as directed by the Engineer. Each service, shall be tapped into the main at least 45 degrees above the horizontal. Taps should be at least 12” apart and staggered around the top section of the pipe. Tapping is to be made wet by the Contractor. Connection saddles are required to satisfy this requirement. Tracing wire is to extend to the body of the water meter.
- D** All services shall have a minimum of 18ins of cover. Place and compact 6ins of initial pipe bedding material in accordance with SECTION 02300 – EARTHWORK.

All fittings including connection saddle materials are to be “no lead” or lead free.

3.6 Field Testing and Disinfection

- A** The contractor shall include in the Schedule the points in time at which it intends to perform hydrostatic testing ("Hydrostatic Testing ") of the installed pipe.
- B** The Contractor shall include in his project Method Statement a detailed description of how it intends to conduct the hydrostatic tests.
- C** It is expected that it is not practical to test the pipe on completion of the installation since the pipe shall be installed under major carriageways. Instead, it is expected that the Contractor will excavate a section of trench, lay in the pipe, hydro test it, then backfill and reinstate the trench.
- D** Maximum length of pipe to be tested at any time shall be no more than 750 feet.
- E** At a minimum, no pipe shall be buried at the welds until hydrostatic testing has been performed and the results approved by the Employer’s Representative. The pipe shall be exposed at each weld around its entire circumference for the duration of the hydrostatic test.
- F** The Contractor may elect to leave the entire un-tested section exposed for the hydrostatic tests.
- G** Pipes shall be pressurized to 150 psi gauge pressure, after which time the hydrostatic test pump shall be shut off and the pipe sealed. The allowable test pressure shall be verified and confirmed with the Employer’s Representative prior to performing any tests.
- H** The pipe shall maintain the pressure for 8 hours without the need for restarting of the pump, except for the addition of makeup water as defined in the Hydrostatic Test procedure.
- I** Gauge readings shall be taken at hourly intervals during the hydrostatic test and the readings shall be logged by the Contractor.
- J** The Employer’s Representative shall be notified at least 48 hours in advance of the intent to perform a hydrostatic test and may elect to be present for the duration of the

test.

- K** All joints in the tested section shall be inspected at least twice during the test period.
- L** In the event that the tested section fails the hydrostatic test, the test pressure shall be maintained by operating the pump until the leak is found.
- M** On completion of the repair of any leaks, the pipe shall be retested, until it has passed the test.
- N** All HDPE pipes in the Scope of Works noted above shall be subjected to Hydrostatic Testing.
After Hydrostatic Testing the pipe shall be drained sufficiently to resume the Works.

PART 4 – CERTIFICATION

- A** Manufacturer or supplier are required to provide a copy of raw material approval certificate prior to shipping
- B** Manufacturer or supplier are required to provide a copy of mill certificate for each batch of pipes prior to shipping.
- C** Manufacturer or supplier are required to provide a copy of the certificate and testing report from recognized certification body prior to shipping.

***** END OF SECTION 015670 *****