ANNEX C SPECIFICATIONS

MIDDLE ROAD WATER

MAINS REPLACEMENT

List of Contents

SECTION 01010: SUMMARY OF WORK

PART 1 – GENERAL

1.1 Scope Of Work Covered By Contract Documents

A The Works involve the supply and installation of a replacement 6-inch diameter HDPE water main in Middle Road, Devonshire from Fort Hill Road to Watlington Road West. This will be undertaken in sections of either open trench works or by pulling a new pipe inside an existing 8-inch PVC water main from feed and pull access pits.

B The Works consist of:

A. The excavation of an open trench along Fort Hill Road to install a 6-inch pipe replacement for an existing 4" dia main over a nominal length of 480ft, including backfill and reinstatement of the trench and road surface.
B. The excavation of an open trench along as required in Middle Road to install a 6- inch pipe replacement for an existing 8" dia main over a nominal length of 720ft, including backfill and reinstatement of the trench and road surface.
C. The excavation of 11 access pits along a route of 2,900 ft of 8-inch pipeline, open up existing pipe and pull a new 6-inch HDPE inside of existing PVC pipe. The work will include reconnecting the new to existing at each pit and backfill and reinstatement of the pit and road surface.

C Along the route 6No. Service connections from the new 6" diameter main to ¾" water meters required. A 6" diameter tee off to an isolation valve to be installed to connect to the existing 6" dia PVC water Main at the junction with Tee Street. Installation of 3No. 6" valves.

D The contractor will be responsible for the transport of all materials to storage on site or off site.

E The Project shall be constructed under the FIDIC Conditions of Short Form of Contract.

1.2 Security of the Site

A The contractor is responsible for maintaining the security of the site area.

B The contractor shall ensure that there is no access to the active work site by members of the public during the contract period.

C The contractor is responsible for all traffic regulation to ensure a safe working area.

1.3 Contract Method Of Measurement

A The measure shall be the actual cost of works done excluding any disallowed costs. The actual cost shall be assessed by the Employer's Representative from the supporting information submitted by the Contractor.

B All work to complete the trenching, installation and reinstatement as detailed on the drawings and in these Technical Specifications shall be covered within the prices in Annex B. All prices shall be all-inclusive and include all preliminary set up costs, labour, equipment and materials to complete each task. If a specific task is not identified separately in the Annex B, the Contractor shall assume that it is included as part of another related listed item or items.

1.4 Project Programme of Works

A Contractor shall programme the works coordinating all tasks and activities.

B Work sequence shall take into account the operating hours of the Government waste disposal sites.

1.5 Use Of Premises

A Not Applicable

1.6 Work Under Other Contracts

A Not Applicable

***** END OF SECTION 01010 *****

SECTION 01310 PROJECT MANAGEMENT AND COORDINATION

PART 1 – GENERAL

1.1 Submittals

A Schedule of Work.

B Method Statement for the whole of the works.

C Health and Safety plan including a traffic management plan for the whole of the works.

D Insurances.

1.2 General

A Provide to Employer's Representative for review the submittals specified. Submit with reasonable promptness and in an orderly sequence so as to not cause delay in the Work. Failure to submit in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.

B Do not proceed with Work affected by any submittal until review is complete.

C Review submittals prior to submission to the Employer's Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with the requirements of the Work and Contract Documents. Submittals not stamped, signed, dated and identified as to the specific project will be returned without being examined and will be considered rejected.

D Verify that field measurements and affected adjacent Work are coordinated.

E Contractor's responsibility for errors and omission in submission is not relieved by Employer's Representative review of submittals

F Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Employer's Representative review.

G Keep one review copy of each submission on Site.

1.3 Programme Of Work

A Prepare schedule in the form of a linked bar chart. All events, activities and constraints shall be numbered and shall be given a title. Details to be given for each event, activity or constraint should include:

- its title
- its earliest and latest start and finish dates
- its scheduled start and finish dates
- its duration
- any relevant "must" start or finish dates
- resources (equipment and labour) required.

B Provide a separate bar for each event, activity, operation or constraint. Show proposed progress of all activities for main work items. All construction activities must be identified. Where applicable, indicate labour, construction crews, plant and equipment to be employed.

C The project Programme of Works shall provide at least the level of detail listed below:

- Trenching works, installation of replacement water main and reinstatement of road surface along Fort Hill Road
- Trenching works, installation of water main and reinstatement of verge and road surface along Middle Road
- Excavation works for pull pits, installation of water main and reinstatement of road surface along Middle Road
- Transportation of construction debris to approved site
- Making good the site area

D The key milestones in the construction process shall also be identified. Schedule milestones will include but not be limited to the following:

- Start date on site.
- Delivery dates for equipment and materials.
- Completion of trenching on each road segment.
- Completion of water main installation and connection to existing watermains on each road segment to minimise the time the supply is shut down
- Reconnection of service connections along the route
- Completion of road reinstatement on each road segment
- Final handover (final completion).

E Revise and resubmit programme every two weeks to reflect actual progress on the Works.

F With schedule updates, provide written explanations to Employer's Representative as to why previously reviewed programme is not being met (if applicable).

G Show changes in operations proposed (if required), to complete construction works within Contract Time.

H No progress payments will be approved until receipt of programme updates acceptable to the Employer's Representative.

1.4 Work Hours

A The Work shall be carried out during normal working hours (7.00 am until 6.00pm Monday to Saturday) unless the Works are unavoidable or necessary for saving life or property or for the safety of the Works, or as per any instruction form an applicable governmental authority. In such cases the Contractor shall advise the Employer's Representative of the need to perform such extraordinary Works.

B The Employer will not accept claims for overtime unless the Works are as a result of an unforeseen condition.

C The Contractor is aware that the Works are to be carried out on public roads which may cause interruption to the Works during peak traffic times.

1.5 Method Statements

A Provide Method Statement for each key activity, as requested by Employer's Representative, to show construction methods, equipment and general methodology for carrying out the Work. Relate Method Statement to activities shown on Construction Programme.

B Method Statement shall identify, among other things:

- Sequencing of works.
- Methods of excavation.
- Methods of water mains installation and connections to minimise the shut down of customer supplies.
- Methods to ensure appropriate environmental protection.
- Risk assessment of the hazards involved in the works.
- Other key tasks as specified in the Contract Documents, and/or as requested by the Employer's Representative.

1.6 Certificates

A Contractor shall be required to obtain a Trenching License and other required approvals from the Ministry of Works and Engineering, Government of Bermuda.

A Within 5 working days after award of Contract, submit certificates of insurances.

1.7 Utilities

A The Contractor shall contact representatives of all utilities to ascertain the location of all underground services. All such services positions shall be clearly marked at the surface PRIOR to any trenching works commencing.

B The Contractor shall be fully responsible for any damage to services that were clearly marked at the surface caused by the Contractors work and shall fully indemnifies the Employer from any liability arising from any such damages.

C The Contractor shall maintain such markings at the surface at all times.

D When approaching underground services, the Contractor shall cease mechanical digging when machinery is within three (3) feet of the service location or when digging indicates that a service is present. Hand digging shall be used when crossing and exposing utilities and mechanical digging shall only be resumed once the utility service has been fully exposed and confirmed to be undamaged.

1.8 Daily Records

A The Contractor shall maintain accurate daily records of all works undertaken, all resources present on site, and of the progress.

B Records shall be submitted to the Employer at least weekly and the Contractor may inform the Employer's Representative at any time that it is recording pertinent information.

C Records of any Works that have or have not been carried out that may affect the Schedule shall be used to update the Schedule.

1.9 Inspections

A At all times the Employer's Representative shall be allowed to visit the Site to inspect the Works.

B Prior to closing in any part of the Works, the Contractor shall notify the Employer's Representative with at least 48 hours notice and afford him full opportunity to examine the Works before it becomes inaccessible.

C Any trench works closed before the pipe work has been hydro-tested shall be at a minimum, uncovered at the joints to allow the Employer's Representative to inspect the joints during the test. Such Works shall be to the account of the Contractor.

D The Employer's Representative shall reasonably make himself available at the request of the Contractor.

1.9 Safety and Health

A All Works shall be conducted in accordance with the Health and Safety at Work Act 1982. The Contractor shall erect appropriate traffic warning signs and safety barriers. Safe access must be maintained to all public and private properties at all times.

B All workers under the employ of the Contractor, including any sub contractors it may employ shall comply with the Health and Safety at Work Act 1982 and at a minimum wear at all times.

1. A hard hat
2. Metal toe safety boots
3. Reflective vests.

Any workers not wearing appropriate safety gear may be requested by the Employer's Representative to leave the Site, at which time they shall inform the Contractor that they have been requested to leave, and not return until they comply with the Applicable Law or regulations.

C All staff and sub-contractors, under the employ of the Contractor, shall be supplied with written health and safety instructions which they shall read, date and sign prior to commencing work. The signed instructions shall be held by the Contractor and copies shall be provided to the Employer.

D When the Site includes public property such as roads or parks the Site shall be protected from public access with temporary barriers and signs which shall provide appropriate warnings, the Contractors name and a contact telephone number.

E In completing the Works, the Contractor shall comply with all Health and Safety requirements of Applicable Law including all licenses issued by the Bermuda Government to permit the Works including, without limitation, the trenching license obtained by the Contractor to complete the Works (the "Trenching License")

***** END OF SECTION 01300 *****

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 deg F (7.2 to 12.7 deg 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 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 01700: PROJECT CLOSEOUT

PART 1 - GENERAL

1.1 Cleaning

A Use cleaning materials as recommended by product manufacturers and appropriate specification sections. Employ experienced workmen or professional cleaners.

B Before inspection for substantial completion, do all necessary cleaning, including the following:

1. Remove dust, dirt and debris from all surfaces

2. Remove, clean all surfaces of oils, stains, weld splatters, etc as required.

3. Refer to specification sections for additional requirements for particular surfaces.

1.2 Substantial Completion And Final Inspection

A Submit written certification that project, or designated portion of project, is substantially complete, and request, in writing, an inspection. The Employer's Representative will make an inspection within 10 days of receipt of request.

B Should the Employer's Representative determine that the work is substantially complete, he will prepare a punch list of deficiencies that need to be corrected before final inspection and issue a notice of substantial completion with the deficiencies noted.

C Should the Employer's Representative determine that the work is not substantially complete, he will immediately notify Contractor, in writing, stating reasons. After Contractor completes work, he shall re-submit certification and request for final inspection.

1.3 Close-Out Submittals

A The project shall be closed out when all items have been completed and accepted by the Employer's Representative.

B Refer to **EXECUTION** portion of each specification section for closeout requirements, including submission of certifications, test reports, etc.; provision of spare parts and maintenance materials, all of which shall be neatly wrapped or packaged in standard sizes and clearly labeled.

C Certificate of insurance for products and completed operations.

D Typed list of all major subcontractors and suppliers with addresses and telephone numbers.

1.4 Acceptance Of The Work

A After all deficiencies have been corrected and the work has undergone a final inspection with no deficiencies, a Taking-Over Certificate will be issued. If only designated portions of the project have been inspected and accepted, a Taking Over-Certificate will be issued for that portion of the Work.

B Until receipt of Taking-Over Certificate, Contractor shall be responsible for the work of this Contract.

PART 2 PRODUCTS

A Not Applicable

PART 3 EXECUTION

A Not Applicable

***** END OF SECTION 01700 *****

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 ins 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 subbase 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 Subbase 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.

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 width of 18 ins on each side of pipe.

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 4 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 in Annex B.

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 subbase material, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the utility pipe or conduit.

1. 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 The Contractor shall comply with all requirements of the Trenching License and shall indemnify the Employer against any claim under the terms of the Trenching License for the end of maintenance requirements, specifically Clause 8 of the Trenching License Standard Conditions.

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 at least one (1) lane of the carriage way open to the public and free of any excavation materials

B The Contractor shall comply with all traffic management requirements of the Trenching License 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 Contractor shall furnish all tools, equipment, materials, and supplies and shall perform all labor required to complete the work as indicated on the Drawings and specified herein.

B This Section covers furnishing and installing High Density Polyethylene (HDPE) pipelines complete, in place, in accordance with the requirements of the Contract Documents.

1.2 Related Work

A Section 02300 Earthwork.

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, fittings, and valve joints shall be joined using butt fusion or flanging. Flanged connections shall be made using a stub and backing ring arrangement, with the use of a suitable gasket material meeting the requirements of ASTM F477.

C High Density Polyethylene piping systems shall have design pressure limit of 100 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 HDPE Tee fittings shall be 6” x 6” EF FPT Red Tee – Main length shall be 2 feet OAL available from Isco Industries.

2.3 Pipe Line Vents

A All vent valves shall be D-040 Combination Air Valve "Barak" with a 2" NPT threaded connection available from A.R.I. Flow Control Accessories Ltd.

2.4 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.

2.5 Service Saddles

Saddles for HDPE pipe shall be full circumference wide band with stainless steel band, nuts, bolts and outlet. Band shall be type 304 Stainless steel of minimum 18 gauge thickness.

PART 3 – EXECUTION

3.1 General

A Not applicable

3.2 Handling and Storage

A Handling: Pipe, fittings and accessories shall be carefully inspected before and after installation and those found defective shall be rejected. Pipe and fittings shall be free from fins and burrs. Before being placed in position, pipe, fittings, and accessories shall be cleaned, and shall be maintained in a clean condition. Proper facilities shall be provided for lowering sections of pipe into trenches. Under no circumstances shall pipe, fittings or any other material be dropped or dumped into trenches.

B Storage: Pipe should be stored, if possible, at the job site in unit packages provided by the manufacturer. Caution should be exercised to avoid compression damage or deformation to bell ends of the pipe. Pipe should be stored in such a way as to prevent sagging or bending and protected from exposure to direct sunlight by covering with an opaque material while permitting adequate air circulation above and around the pipe. Gaskets should be stored in a cool, dark place out of the direct rays of the run, preferably in original cartons.

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 days 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:

1. Weld number.
2. Temperature of heater.
3. Pressure applied during the weld.
4. Time pressure was held for.
5. Date of weld.

H Tracer wire shall be laid flat and securely affixed to the pipe at three metre 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 watermain. 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. **In the case where the pipe is to be pulled the contractor will pressure test the pipe prior to placing in inside the existing pipe.**

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 200 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.

O After Hydrostatic Testing the pipe shall be drained sufficiently to resume the Works.

3.7 Pipe Line Vents and Sample Points

A At all high points in the pipework, the Contractor shall install a venting valve and sampling valve.

B All vent valves and sampling valves shall be fully accessible and at the discretion of the Employer's Representative shall require vaults suitable for full access to the pipeline.

3.8 Thrust Blocks

A All thrust blocks shall be installed at the direction of the Employer's Representative. No concrete supports or thrust blocks shall be buried without the Employer's Representatives approval.

B In all cases, thrust blocks shall be completely buried and not be visible once the Works are complete.

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

SECTION 15672 – WATER MAIN REPLACEMENT BY PULLING

PART 1 - GENERAL

1.1 Requirements

A The Contractor shall furnish all tools, equipment, materials, and supplies and shall perform all labor required to complete the work as indicated on the Drawings and specified herein.

B This Section covers furnishing and installing all labor, materials and equipment required for the installation of a six inch diameter HDPE pipe by pulling the new pipe inside an existing eight inch diameter PVC pipe.

1.2 Related Work

A Section 02300 Earthwork.

PART 2 – PRODUCTS

2.1 General

A The pipe puller materials shall consist of a black high-density polyethylene copolymer resin designed 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 The pipe puller must comply with the following to confirm the pull out resistance and performance of the puller under various Thermal conditions.
Hydrostatic Pressure Test
ASTM D2513, D1599, D1598, F-714
Hydrostatic Test at 80 Degree Centigrade (176 Degree Fahrenheit)
Hoop stress in pipe the 670 PSI and a minimum test time of 170 hours.

All Joint Assembly to the puller and pipe shall be in accordance with the manufacturer's recommended assembly procedure

PART 3 – EXECUTION

3.1 General

A During Pulling operations all unqualified persons are to remain clear of the working area.

B Ensure all safety guards are in place and in good repair prior to commencing a pull

3.2 Handling and Storage

A Handling: All pulling equipment and accessories shall be carefully inspected before and after installation and those found defective shall not be used.

3.3 Safety

A The contractor shall carry out operations in strict accordance with all applicable OSHA Standards. All pulling operations must be carried out in accordance with recognized safety standards involving high tensile strain on cables and pipes. Particular attention is drawn to those safety requirements involving work entry into confined spaces. It shall be the contractor's responsibility to familiarize all its employees with OSHA Standards and regulations pertaining to all aspects of the work.

3.4 Pulling Operations

A The location and number of insertion and receiving excavations shall be planned by the contractor and submitted in writing for approval by the Engineer 10 days (or as determined by the Engineer) prior to excavation. If for any section it is determined that the construction site access is limited or restrictions on street and lane blockage is restricted or prohibited the Engineer will decide on alternative open trench installation.

B **To minimize customer supply disruption each section to be pulled shall be completed as a discrete operation with the new pipe reconnected to the existing pipe at the conclusion of each pull. It is envisaged that a single pull will be carried out each week to allow the system to be refilled and allow customers to take water for a minimum of three days in each week.**

C Before any excavation, it will be the responsibility of the contractor to check with the various utility companies and determine the location of existing utilities in the vicinity of the work area. The contractor at no cost to the Ministry, if required, will arrange temporary construction easement and/or right-of-way areas.

D Damage to utilities and the resulting repair, temporary service cost, etc., shall be borne by the contractor. Access pits shall be backfilled in accordance with the appropriate specifications.

E All excavations shall be properly sheeted/shored in accordance with relevant specifications for trench safety systems. Any damage resulting from improperly shored excavations shall be corrected to the satisfaction of the Engineer with no compensation due to the contractor.

F All open excavations shall be kept secure at all times by the use of barricades with appropriate lights and signs, construction tape, covering with steel plates, etc., or as directed by the Engineer.

G One or more receiving pits shall be excavated at the end(s) of the existing water main to be replaced or at appropriate points within the length of the existing pipe. Pit shall be centered over the existing pipe.

H The number of pits for machine and pipe insertion shall be the minimum necessary to most efficiently accomplish the work. The contractor shall give consideration to the use of excavation required for other purposes such as for water service reconnections and inline valve replacement.

I Prior to the commencement of pulling operations a CCTV camera will be used to provide a video survey of the existing pipe internal condition together with identifying any possible obstructions or water service connections to the existing pipeline.

SECTION 15675 – RESILIENT-SEATED GATE VALVE

PART 1 - GENERAL

1.1 Requirements

A The Contractor shall furnish all tools, equipment, materials, and supplies and shall perform all labor required to complete the work as indicated on the Drawings and specified herein.

B This Section covers furnishing and installing all labor, materials and equipment required for the installation of two inch through four inch resilient-seated gate valves, all in accordance with the details shown on the plans and requirements of these specifications. Metal-sealed gate valves shall not be used.

1.2 Related Work

A Section 02300 Earthwork.

PART 2 – PRODUCTS

2.1 General

A Pressure Class. Design pressure for resilient-seated gate valves shall be 200 psi for diameters up to 12 inches. Valves for operating pressures other than the above shall be as specified on the plans or in the special specifications.

B Component Parts. Unless otherwise provided herein, component parts for resilient seated gate valves shall be in accordance with AWWA C509 and C515. All components of resilient seated valves shall be tested and certified by an approved testing laboratory located in the United States. All parts shall be readily available.

(1) The valve manufacturer's name and valve model number, size, and year of manufacture shall be cast on the body.

(2) The resilient seat shall be fastened to the gate by use of either mechanical, stainless steel fasteners, or vulcanizing methods in accordance with the requirements of ASTM D429 and the manufacturer's recommended procedures.

(3) Resilient-seated gate valves shall be provided with a two inch square operating nut. When specified on the plans, a hand wheel shall be used. The direction to open the valve shall be to the left (e.g. counter clockwise). A direction indication for opening the valve shall be cast on the operating nut. Position indicators shall not be required unless specified on the plans or in the special specifications. Valves must have a minimum of 2 turns per inch of diameter.

(4) All interior ferrous surfaces exposed to fluid flow, including the gate, shall be factory coated with a thermo-setting or fusion epoxy coating. The coating shall be safe for potable water systems in accordance with AWWA C550. The minimum coating thickness shall

(5) The wedge shall be manufactured of ductile iron and fully encapsulated in a molded EPDM resilient material resistant to heat, corrosion, hydrolysis, tuberculation, abrasion and bacteria and comply with ASTM D2000.

(6) All exterior ferrous surfaces, including nuts and bolts, shall be field coated with a fast curing sealant from the approved materials list in Appendix A for this use. The application of the sealant shall be accordance with the manufacturer's recommendations. Nuts and bolts may be manufactured of ASTM type 304 or 316 stainless steel in lieu of being coated.

(7) All internal parts shall be accessible for repair or replacement without removing the valve body from the pressure line. The stem shall be sealed by use of a minimum of two O rings. The O-ring(s) shall be located above the stem collar. O-rings shall be replaceable under pressure with the valve in the open position.

(8) The diameter of the internal passageway shall have a nominal inside dimension equal to the valve size or larger. The valve shall provide an unobstructed waterway in the full open position making the valve applicable for tapping applications.

(9) Valve stem shall be a high strength, low zinc bronze, 40,000 psi yield strength, 70,000 psi tensile strength, with not less than ten percent elongation. Stem bronze shall conform to the requirements of Section 2 of AWWA C509.

(10) Valve ends shall be mechanical joint, conforming to AWWA C110, unless otherwise specified in the Contract Documents. Connection bolts and nuts shall be manufactured of cor-ten steel or approved equal in accordance with ASTM A242.

(11) Where specified in the Contract Document, valve ends shall be flanged in accordance with AWWA C110 for 125/150 lb flanges and ASME/ANSI B16.1 FOR 250/300 lb flanges. Connection bolts and washers shall be manufactured of 316 stainless steel and nuts shall be manufactured of 316 stainless steel with a Xylan coating or approved equal. No antiseize compound shall be applied on flanged bolts.

PART 3 – EXECUTION

3.1 General

A Not applicable

3.2 Handling and Storage

A Handling: Valves, fittings and accessories shall be carefully inspected before and after installation and those found defective shall be rejected. Valves and fittings shall be free from fins and burrs. Before being placed in position, valve, fittings, and accessories shall be cleaned, and shall be maintained in a clean condition. Proper facilities shall be provided for lowering valves into trenches. Under no circumstances shall a valve, fittings or any other material be dropped or dumped into trenches.

B Storage: Valves should be stored, if possible, at the job site in unit packages provided by the manufacturer. Caution should be exercised to avoid compression damage or deformation to flange faces of the valve. Gaskets should be stored in a cool, dark place out of the direct rays of the run, preferably in original cartons.

3.3 Installation

A Valves shall be installed in accordance with Section 209 and the valve manufacturer's recommendations. All fittings, valves, flexible couplings and repair clamps shall be encased with a 10 mil polyethylene in accordance with AWWA C105 Method C.

B All personnel of the contractor or subcontractor shall be skilled and knowledgeable with regard to the installation procedures for the valves and appurtenances being installed.

C Prior to installation in the trench, valves shall be fully opened and closed by the contractor to check the operation to ensure that the valve fully seats. A record shall be made of the number of turns required to fully open or close the valve. This record shall be included on the as-built plans. The inside of the valve shall be thoroughly cleaned prior to valve installation

***** END OF SECTION 015675 *****