ARTICLE XXI - WATER SYSTEM

21.1 DESCRIPTION

This work includes the reconstruction, rehabilitation and repairs of portions of the fire protection water line system, fire hydrants and appurtenances.

21.2 GENERAL REQUIREMENTS

(A) The American Water Works Association (AWWA) and American National Standards Institute (ANSI) C623-22 First Edition on Cured-In-Place Pipe (CIPP) Rehabilitation of Pressurized Potable Water Pipelines, 4-inches and Larger Standards are attached to Article XXI. In general, Section 2 of the above mentioned attachment contains additional references used in this standard.

(B) In general, the provisions of Section 624 - Water System of the "Standard Specifications" shall apply except as hereinafter modified.

(C) The following construction standards, with certain modifications as hereinafter specified, are hereby incorporated into and made a part of these specifications by reference and shall be applicable to all work performed by the Contractor under this section.

1. "Water System Standards", dated 2002, of the Board of Water Supply, City and County of Honolulu.

   a) Paragraphs relating to Measurement and Payment in the Standards are not applicable to the project.

   b) The sixth paragraph of Section 302.22 shall be revised to read as follows:

      "Due to varying soil conditions, whenever test or thrust blocks or beams for horizontal or horizontal-vertical bends are required, the stamped and signed dimensions and details of the blocks or beams shall be furnished by a licensed structural engineer in the State of Hawaii retained by the Contractor. The design of the blocks shall be furnished by the licensed structural engineer after the Contractor has excavated the trench at the required location to verify the ground conditions."

(D) Contract time of completion includes all connections to existing water systems, payment of Water System Facilities Charges, chlorination, testing, and initiation of water service.

(E) Hydrotesting activities shall conform to the requirements of Article XXVI – Temporary Water Pollution, Dust, and Erosion Control.

21.3 CURED-IN-PLACE PIPE (CIPPP) REHABILITATION

(A) The Contractor shall submit a detailed CIPP Installation Plan and CIPP Manufacturer's detailed product fact sheet to the Construction Engineer at least 10 days before work commences. Materials shall comply with the requirements of the Safe Drinking Water Act and applicable federal, state, and local regulations for potable water systems.

(B) Textile tube shall consist of multiple layers of woven synthetic materials, fiber reinforcement, flexible needle punched felt or equivalent synthetic material, or a combination of those materials capable of carrying resin, able to withstand installation loads, curing temperatures, operational and test pressures, and shall be compatible with the resin system used by the installer. If the textile tube is capable of adapting to fit irregular pipe sections and negotiate bends, it shall do so without excessive folds or wrinkles. Textile tube shall be fabricated to a size that fits tightly to the internal circumference and length of the host pipe when installed. Preliners can be used when recommended by the manufacturer and approved by the Engineer and shall have no detrimental effects on the stabilized CIPP performance.

(C) CIPP installations shall be completed in accordance with the manufacturer's requirements and recommendations for pipes that have been properly cleaned and prepared for CIPP rehabilitation, where the lengths and diameters of the water main sections to be cleaned have been field verified by visual and camera CCTV inspection prior to the start of work.

(D) The number and location of access pits shall be based on the alignment of the host pipe, presence of appurtenances, and the length of the installations of the CIPP. Excavation and trenching operations shall be completed in accordance with Article XIII Demolition and Removal Work. Excavations shall be properly and safely dimensioned to accommodate the CIPP installation equipment and process. Immediately upon opening the host main at the access points, and prior to starting any installation, the ends of the adjacent water mains that are not to be rehabilitated at the insertion and extraction points shall be securely covered or plugged to prevent debris from entering during the installation process.

(E) The cleaning method used should be compatible with the CIPP manufacturer's guidelines and shall be approved by the Engineer. The cleaning method shall not damage the host pipe, service connection or any appurtenances. The cleaned and prepared interior shall be free of sharp edges, deposits, debris, and protrusions that pay cause point loads on the CIPP.

(F) Prior to the CIPP installation, verification of pipe cleanliness and readiness to install the CIPP shall be performed by a recorded video inspection of the full length of the pipeline to be rehabilitated shall be submitted to the Engineer. Video recording log shall be retained by the Contractor.

(G) Resin impregnation or wet-out shall be completed in accordance with the manufacturer's recommendations to achieve full and consistent resin distribution. The manufacturer shall specify the process to be used, the volume of resin required and control provisions and applicable parameters used. The installation shall be in accordance with the manufacturer's recommendations. Contractor shall obtain the manufacturer's installation procedures and submit to the Engineer for review, including minimum pressure required to hold resin textile tube tight against the host pipe and the maximum allowable pressures. Contractor shall maintain recommended pressure and document the pressures during the installation. Curing shall be in accordance with manufacturer's recommendations and procedures for installation.

(H) After completion of all rehabilitation work, and before returning the pipeline to service, a pipe cleaning and recorded inspection of the repaired section shall be made. A camera CCTV inspection shall be used to confirm fit and finish, continuous

CIPP over length of the section being rehabilitated, and that CIPP is free of visual defects, sags, tears, bubbles, delamination, defects or anomalies.

21.4 MODIFICATIONS TO SECTION 624 - WATER SYSTEM

Make the following amendment to said Section:

(I) Amend **624.02 - Materials** by adding the following:

"Ductile iron pipe for water mains shall conform to "Water System Standards," dated 2002, Section 202 – Ductile Iron Pipe, Fittings, and Appurtenances. All pipes shall be Class 53."

(II) Amend **Section 624.04 - Measurement** to read as follows:

"**(A) Excavation and Backfill.** Quantities for excavation and backfill will not be measured by the Engineer. Payment for backfill shall be included in the various lump sum costs of the water system appurtenances.

(B) Pipe and Fittings. Quantities for pipe will be measured per linear foot by the Engineer. Fittings and warning tape shall not be measured separately, and shall be considered incidental to the pipe.

(C) Water System. Water system appurtenances shall not be measured separately. The Engineer shall consider the items listed incidental to the water system appurtenances in each item of water system appurtenances work.

(1) Gate Valves (Hub Ends, Mechanical Joints and Flanged).

(2) Gate Valve Boxes and Covers.

(3) Copper Pipes and Appurtenances.

(4) Service Laterals, Irrigation Laterals, and Service Connections. Fittings, appurtenances, cutting and plugging, and pipe sleeve installation and other incidentals.

(5) Temporary Bypass for Water Line.

(6) Air Relief Valves.

(7) Air Relief Valve Boxes and Covers.

(8) Fire Hydrants and Fire Hydrant Locator Band.

(9) Test Blocks.

(10) Reinforced Concrete Jacket, Thrust Blocks, and Thrust Beams.

(11) Pipe Test.

(12) Valve Markers.

(13) Electronic Markers.

(14) Pipe Risers, Fittings, and Couplings.

(15) Connections to existing water systems.

(16) Chlorination and Testing

(17) Leak Detection Wells

(18) Any other items related to the construction of the water system appurtenances."

(IV) Amend **Section 624.05 Payment** to read as follows:

"**(A) Excavation and Backfill.** The Engineer will not pay for the accepted quantities of excavation and backfill according to Section 204 – Excavation and Backfill for Miscellaneous Facilities and modified in Subsection 624.04(B) – Backfill.

The price shall be full compensation for furnishing all labor, materials, equipment, tools, and incidentals necessary to complete the work.

(C) Pipe and Fittings. The Engineer will pay for the accepted quantities of pipe and fittings at the contract price per linear foot installed, as shown in the Proposal Schedule.

The price shall be full compensation for furnishing all labor, materials, inclusive of fittings, equipment, tools, and incidentals necessary to complete the work.

(D) Water System Appurtenances. Water system appurtenances shall not be measured separately. The Engineer shall consider the items listed incidental to the water system appurtenances in each item of water system appurtenances work.

(1) Gate Valves (Hub Ends, Mechanical Joints and Flanged).

(2) Gate Valve Boxes and Covers

(3) Copper Pipes and Appurtenances.

(4) Service Laterals, Irrigation Laterals, and Service Connections. Fittings, appurtenances, cutting and plugging, and pipe sleeve installation and other incidentals.

(5) Temporary Bypass for Water Line.

(6) Air Relief Valves.

(7) Air Relief Valve Boxes and Covers

(8) Fire Hydrants and Fire Hydrant Locator Band.

(9) Test Blocks.

(11) Reinforced Concrete Jacket, Thrust Blocks, and Thrust Beams.

(11) Pipe Test.

(12) Water Supply for Construction. The Engineer will not pay for the cost for

the installation and disconnection of the meters, used for water supply, and replacement and repairs separately.

(13) Valve Markers. The Engineer will not pay for furnishing and installing valve markers separately.

(14) Furnishing Material. The Engineer will not pay for the accepted quantities for "furnishing only" of materials that the Board of Water Supply will install at the respective contract unit prices.

The prices shall include the cost of furnishing jointing materials and other accessories and furnishing labors, material, equipment, tools and incidentals necessary to complete the work.

(15) Manufacturer's Certificate of Test. The Engineer will not pay for the cost of the Manufacturer's Certificate of Test according to Subsection 624.02 - Materials. The Engineer will consider them incidental to the various contract items in the proposal.

(16) Electronic Markers.

(17) Electronic Marker Reader.

(18) Pipe Risers, Fittings, and Couplings.

(19) Connections to existing water systems.

(20) Chlorination and Testing (including submittal of chlorination certificate)

(21) Leak Detection Wells

(22) Any other items related to the construction of the water system appurtenances."

The Engineer will make payment under:

ITEM NO.	PAY ITEM	PAY UNIT
3.	6" diameter pipe CIPP rehabilitation of the fire protection water system, inclusive of all labor, material, equipment, tools, camera CCTV inspections and pressure testing, and incidentals required to repair the pipelines, in place, complete.	Linear Foot
4.	12" diameter pipe CIPP rehabilitation of the fire protection water system, inclusive of all labor, material, equipment, tools, camera CCTV inspections and pressure testing, and incidentals required to repair the pipelines, in place, complete.	Linear Foot

END OF ARTICLE