

SECTION 511 – WATER SERVICE LINES

511.01 – DESCRIPTION

511.01.01 – GENERAL

This section covers water service lines intended to be used from the connection to the meter valve for meter setting appurtenance in accordance with AWWA C-800 Standard for Underground Service Line Valve and Fitting or as modified herein. All water service lines shall be connected as per city ordinances.

511.01.02 – TYPES

A short service line is a line not in excess of ten (10') feet. All services in excess of ten (10') feet shall be considered long service lines. Extra long services are used for special circumstances and shall be noted on the plans. Service lines shall be single service unless otherwise directed by the Engineer. All long service lines will require a SCH 40 PVC casing pipe under existing or proposed streets and/or sidewalks.

511.02 – MATERIALS

Service lines shall be seamless copper tubing of the designation, "Type K" or Crosslinked Polyethylene "PEX-a" piping. All fittings shall be brass or copper. Substitutions such as plastic or PVC pipe fittings shall not be accepted. One inch (1") service lines meter tailpieces shall be "Type K" copper or Crosslinked Polyethylene "PEX-a" in composition and eighteen (18") inches in length. A brass male or female union shall be required for the last fitting on the City side of the water service. Said union shall not include plastic or galvanized materials and must be a compression type fitting. No "Sharkbite" type fittings are allowed.

A) Copper Tubing

1. Copper tubing shall be "Type K".
2. All fittings shall be brass or copper.
3. ~~1-inch~~ All service lines, requires 18" tailpiece.
4. A brass male or female union shall be required for the last fitting on the City side of water service.
5. No "Sharkbite" type fittings are allowed.

B) PEX-a PIPE

1. **Can only be used for one-inch (1") and smaller services lines.**
2. Crosslinked polyethylene (PEX-a) municipal water service pipe shall be manufactured using the high-pressure peroxide method of crosslinking.
3. Pipe shall be certified to AWWA C 904 Cross-linked Polyethylene (PEX) Pressure Pipe by approved testing agency.

4. Pipe shall be certified to standards ASTM F876, CSA B137.5, NSF 14 and NSF 61, by approved testing agencies, with a standard materials designation code of 3306 or 5306.
5. Pipe shall demonstrate ability to satisfy the performance requirements of section F.7 of PPI TR-3 for PE materials in order to apply a 0.63 design factor resulting in a temperature/pressure rating of:
 - a. 200 psi @ 73.4°F (1380 kPa @ 23°C).
6. Pipe shall be rated for:
 - a. 160 psi @ 73.4°F (1103 kPa @ 23°C)
 - b. 100 psi @ 180°F (690 kPa @ 82°C) per PPI TR-4.
7. Pipe shall have a co-extruded UV Shield made from UV-resistant high-density polyethylene, color Blue.
8. Pipe shall have minimum recommended UV exposure time of six (6) months when tested in accordance with ASTM F2657, or as per manufacturer's recommendations.
9. Pipe shall be compatible with cold-expansion compression-sleeve fittings certified to ASTM F2080 for installations as cold as -40°F (-40°C).
10. Pipe shall be approved for use with AWWA C800 fittings when using manufacturer's recommended insert.
11. Pipe shall be approved by manufacturer for use with manual plastic pipe squeeze-off tools for temporary stoppage of flow.
12. Pipe shall be approved by manufacturer to be repaired using hot air, if kinked in the field.
13. Pipe shall have the minimum markings: PEXa 3306, CSA B137.5, ASTM F876, F2023 and F2080, NSF-pw-g
14. A brass male or female union shall be required for the last fitting on the City side of water service, compression type fitting.
15. No "Sharkbite" type connections are allowed.

C) Meter Setter

1. All brass that comes in contact with potable water conforms to AWWA Standard C800 (ASTM B584, UNS C89833).
2. The product has the letters "NL" cast into the main body for lead-free identification.
3. Brass components that do not come in contact with potable water conform to AWWA Standard C800 (ASTM B62 and ASTM B584, UNS C83600, 85-5-5-5).
4. Copper conforms to ASTM B75 or B88, UNS C12200
5. Saddle nuts hold the meter in place for tightening.
6. Must include lock wing ground key angle meter stop.
7. Must have packing joints connections for service lines.

D) Tracer Wire

1. Tracer wire to be 12-gauge copper and shall have a thermoplastic insulation/nylon sheath to protect against abrasion, heat, moisture, oil and gasoline.
2. Tracer wire to be secured to service line from water main to meter with 1-1/2 inch polyethylene tapped wrapped around twice with a maximum distance of 10 feet between tapped locations. Minimum of two (2) locations is required on all service lines.
3. Secure tracer wire to meter setter with stainless steel clamp.

E) Fittings

1. All fittings shall be Brass Compression Joint fittings which shall be manufactured in accordance with AWWA C800.
2. No crimp or clamp still fittings or valves will be allowed.

511.04 – CONSTRUCTION METHODS

The following are general construction requirements only. Additional plumbing code and other requirements may be applicable, which are not included herein.

A) General - Service lines shall be one-inch (1") **and larger** for new installations. Existing service lines 3/4" and larger may be replaced with the original size. Joints in water lines less than one and one-half (1-1/2") inch in diameter shall not be soldered. No unnecessary unions shall be permitted.

B) Boring / Casing (**PEX only**)

- a. Service lines under street pavement shall not be spliced.
- b. Street bores shall be a minimum of thirty (30") inches below the bottom of the street.
- c. Bores for service lines shall not be larger than the casing pipe.
- d. All long service lines with material type PEX-a shall be encased under existing or proposed roads by trenching or boring with SCH 40 PVC.
- e. Copper service lines do not require PVC casing pipe.
- f. Encasement pipe shall extend twelve (12") inches past curb lines.
- g. Service line bores shall be level and at the same depth as the main.

Service Line Size		Casing Size		
<i>Nominal</i>	<i>O.D.</i>	<i>Nominal</i>	<i>I.D.</i>	<i>O.D.</i>
1"	1.13	1-1/2"	1.59	1.90
1-1/2"	1.63	2"	2.05	2.38
2"	2.13	3"	3.04	3.50

511.06 – METHOD OF MEASUREMENT

The price established shall be full compensation for all materials including service lines, tracing wire, boring, fittings, meter setter, valves, boxes and when required service line check valve, connections to meter, labor, tools, equipment, and incidentals necessary to complete this item of work.

511.07 – BASIS OF PAYMENT

The items measured as provided above will be paid for at the contract unit price bid:

SINGLE SHORT SERVICE (SIZE) EA.

SINGLE LONG SERVICE (SIZE) EA.

SINGLE EXTRA LONG SERVICE (SIZE) EA.

Such payment shall be compensation in full for furnishing all materials, labor, equipment, tools and incidentals, and for performing the work in accordance with these specifications.

TECHNICAL SPECIFICATION FOR PLASTIC (PEX-a) WATER SERVICE LINE PIPING

PART 1 - GENERAL

1.01 SUMMARY

- A. **For** One-inch (1") **and smaller** municipal water service piping system, where shown on the Drawings and Schedules, shall be crosslinked polyethylene pipe, and shall include the following:
1. Crosslinked polyethylene (PEX-a) piping.
 2. Produced in accordance with AWWA C904.
 3. Chlorine resistance in accordance with ASTM F2023.
 4. Required six (6) months UV resistance rating when evaluated in accordance with ASTM F876.
 5. Copper Tube Size (CTS) Dimensions with SDR-9 wall thickness.
 6. Compatible with AWWA C800 compression joint valves and fittings and suitable for buried applications.
 7. Designation Code 3306 or 5306 is acceptable.
 8. No. 12 gauge insulated copper tracer wire shall be installed on top of service line and secured with 1-1/2" polyethylene tape wrapped around twice with a maximum distance of 10 feet between taped locations with a minimum of two (2) secured locations.
 9. Metter Setter is required when using PEX-a pipe for service connections. Tracer wire to be secured to setter with stainless steel clamp.
 10. All long services shall require a SCH 40 PVC pipe casing.

1.02 REFERENCES

- A. Publications listed here are part of this specification to the extent they are referenced. Where no specific edition of the standard or publication is identified, the current edition shall apply.
- B. ASTM International (American Society for Testing and Materials)
1. ASTM F876 – Standard Specification for Crosslinked Polyethylene (PEX) Tubing
 2. ASTM F2023 – Standard Test Method for Evaluating the Oxidative Resistance of Crosslinked Polyethylene (PEX) Tubing and Systems to Hot Chlorinated Water
 3. ASTM F2080 – Standard Specification for Cold-Expansion Fittings with Metal Compression-Sleeves for Crosslinked Polyethylene (PEX) Pipe
 4. ASTM F2657 - Standard Test Method for Outdoor Weathering Exposure of Crosslinked Polyethylene (PEX) Tubing
 5. ASTM D 2765 Test Methods for Determination of Gel Content and Swell Ratio of Crosslinked Ethylene Plastics.
 6. ASTM D 3350 Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
 7. ASTM D 6394 Specification for Sulfone Plastics (SP).
 8. ASTM F714 Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.
 9. ASTM F877 Standard Specification for Crosslinked Polyethylene (PEX) Plastic Hot- and Cold-Water Distribution Systems.
 10. ASTM F1960 Standard Specification for Cold Expansion Fittings with PEX Reinforcing Rings for Use with Crosslinked Polyethylene (PEX) Tubing.

11. American National Standards Institute (ANSI)/National Sanitation Foundation (NSF)
12. ANSI/NSF Standard 14 Plastics Piping System Components and Related Materials
13. ANSI/NSF Standard 359 Valves for Crosslinked Polyethylene (PEX) Water Distribution Tubing Systems
14. ANSI/NSF Standard 372 Drinking Water System Components – Lead Content

D. AWWA – American Water Works Association

1. AWWA C904 – Crosslinked Polyethylene (PEX) Pressure Pipe
2. AWWA C800 – Underground Service Line Valves and Fittings

E. ISO – International Organization for Standardization

F. ISO 9001 – Quality Management Systems – Requirements

G. NSF International

1. NSF/ANSI 14 – Plastic Piping System Components and Related Materials
2. NSF/ANSI 61 – Drinking Water System Components – Health Effects

H. Plastic Pipe Institute PPI TR-3

1. Policies and Procedures for Developing Hydrostatic Design Basis (HDB), Hydrostatic Design Stresses (HDS), Pressure Design Basis (PDB), Strength Design Basis (SDB), Minimum Required Strength (MRS) Ratings, and Categorized Required Strength (CRS) for Thermoplastic Piping Materials or Pipe

1.03 DEFINITIONS

- A. Crosslinked polyethylene or PEX is a modified polyethylene material, typically high-density polyethylene (HDPE), which has undergone a change in the molecular structure using a chemical or a physical process whereby the polymer chains are permanently linked to each other. This crosslinking of the polymer chains results in improved performance properties such as elevated temperature strength, chemical resistance, environmental stress crack resistance (ESCR), resistance to slow crack growth (SCG), toughness, and abrasion resistance. Crosslinking also makes PEX a “semi-thermoset” polymer, providing excellent long-term stability.
- B. This specification requires PEX to be designated as PEX-a, the high-pressure peroxide method.

1.04 SYSTEM DESCRIPTION

A. Design Requirements

1. Standard grade hydrostatic pressure ratings from Plastics Pipe Institute in accordance with PPI TR-3. The following standard-grade hydrostatic ratings are required:
 - a. 100 psi at 180°F
 - b. 160 psi at 73.4°F

- B. PEX-a water service pipe shall be required to demonstrate ability to satisfy the performance requirements of section F.7 of PPI TR-3 for PE materials in order to apply a 0.63 design factor resulting in a 200 psi pressure rating at 73.4°F.

- C. PEX-a piping shall be tested to comply with the ASTM F2023 requirement for minimum chlorine resistance at the end use condition of 50% of the time at 140°F at 80 psi gauge pressure.

- D. Performance Requirements: To provide a municipal water piping system, which is manufactured, fabricated, and installed to comply with local requirements and to maintain performance criteria stated by the PEX pipe manufacturer without defects, damage, or failure.

- E. Compliant to the following standards:
 - 1. AWWA C904
 - 2. NSF/ANSI Standards 14 and 61
 - 3. ASTM F876
- F. Pipe shall have ability for kink repair using a heat gun. No need to cut out kink.

1.05 SUBMITTALS

- A. Approval and/or acceptance of all submittals are required prior to installation.
- B. Product Data: Submit manufacturer's product submittal forms, catalog cuts, brochures, specifications, and installation instructions. Submit data in sufficient detail to indicate compliance with the contract documents.
 - 1. Submit manufacturer's instructions for installation.
 - 2. Submit data for equipment, fittings, and associated items necessary for the installation of the piping.
- C. Certification:
 - 1. Submit third-party certification results for the piping systems from an accredited testing laboratory.
- D. Test reports: Upon request, submit test reports from recognized testing laboratories.
- E. Submit the following documentation.
- F. Manufacturer's certificate stating that products comply with specified requirements.
- G. Documentation that the installer is trained to install the manufacturer's products.

1.06 QUALITY ASSURANCE

- A. Manufacturer: Must be a company specializing in the Work of this Section with a minimum of 10 years documented experience.
- B. Pipe shall be manufactured in a facility whose quality management system is certified according to ISO 9001.
- C. Crosslinked polyethylene (PEX-a) pipe shall conform and be certified to AWWA C904 and ASTM F876. Fittings shall conform and be certified to AWWA C800.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver and store pipe in shipping containers with labeling in place.
- B. Pipe shall be kept in original packaging until required for installation.
- C. PEX-a pipe shall be stored in a way that prevents damage as a result of crushing or piercing, excessive heat, harmful chemicals, or exposure to sunlight for excessive periods.
- D. Do not expose pipe to ultraviolet light beyond exposure limits recommended by manufacturer.
- E. Protect pipe from entry of contaminating materials. Install suitable caps or plugs in open pipe ends until installation.
- F. Pipe shall not be dragged across the ground or other surfaces and shall be stored on a flat surface with no sharp edges.

- G. Protect materials from damage by other trades.
- H. Pipe shall be protected from oil, grease, paint, and other elements as recommended by manufacturer.

1.08 WARRANTY

- A. Provide manufacturer's standard written warranty.
- B. The pipe manufacturer shall warrant the crosslinked polyethylene pipe to be free from defects in material and workmanship for a period of twenty-five (25) years.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURER

- A. REHAU – Municiplex
- B. Or Approved Equal

2.02 COMPONENTS

A. Piping

1. All pipe shall be crosslinked polyethylene manufactured using the high-pressure peroxide method of crosslinking (known as PEX-a or PEX-A). Pipe shall conform and be third-party certified to AWWA C904, ASTM F876, NSF/ANSI 14 and NSF/ANSI 61.
2. Pipe shall be rated for continuous operation of 100 psi gauge pressure at 180°F temperature, and 160 psi gauge pressure at 73.4°F temperature as defined in AWWA C904.
3. Pipe shall be rated for continuous operation at 200 psi gauge pressure at 73°F temperature when evaluated using a 0.63 design factor.
4. Pipe shall be listed by PPI to standard TR-3 as Standard Grade.
5. Pipe to be tested for resistance to hot chlorinated water in accordance with ASTM F2023.
6. Pipe to have a minimum Class 3 chlorine resistance rating when evaluated to F876 and tested in accordance to F2023.
7. PEX-a pipe shall be listed with a material designation code of “3306” per the ASTM F876 standard and PPI TR-3.
8. Pipe to have a co-extruded UV Shield made from UV-resistant polyethylene blue in color.
9. Pipe to have minimum recommended UV exposure time of 6 months when tested in accordance with ASTM F2657 and evaluated in accordance with ASTM F876.
10. Pipe shall be manufactured in a facility whose quality management system is certified according to ISO 9001.
11. Bend Radius: The minimum bend radius for cold bending of PEX-a pipe shall be not more than six (6) times the outside diameter.

B. Fittings

1. All fittings shall be Brass Compression Joint fittings which shall be manufactured in accordance with AWWA C800.
2. No crimp or clamp still fittings or valves will be allowed.

C. Tracer Wire

1. Tracer wire to be 12-gauge copper and shall have a thermoplastic insulation/nylon sheath to protect against abrasion, heat, moisture, oil and gasoline.
2. Trace wire to be secured to service line from water main to meter with 1-1/2 inch polyethylene tapped wrapped around twice with a maximum distance of 10 feet between tapped locations. Minimum of two (2) locations is required on all service lines.
3. Secure tracer wire to meter setter with stainless steel clamp.

D. Metter Setter

1. All brass that comes in contact with potable water conforms to AWWA Standard C800 (ASTM B584, UNS C89833).
2. The product has the letters "NL" cast into the main body for lead-free identification.
3. Brass components that do not come in contact with potable water conform to AWWA Standard C800 (ASTM B62 and ASTM B584, UNS C83600, 85-5-5-5).
4. Copper conforms to ASTM B75 or B88, UNS C12200
5. Saddle nuts hold the meter in place for tightening.
6. Must include lock wing ground key angle meter stop.
7. Connections to be pack joint connection ends for CTS.
8. Approved Manufactures:
 - a. Ford Meter Box – V-72-7W
 - b. Mueller – P-1470N
 - c. Or Approved Equal

2.03 MARKINGS

A. Pipe shall carry the following markings every three (3) feet:

1. Manufacturer's name and trademark
2. Nominal size
3. Material designation code 3306 or 5306
4. SDR9 (standard dimension ratio)
5. POTABLE TUBING, AWWA C904, ASTM F876 / F2023 / F2080, NSF-pw-g
6. Manufacturing date and footage mark

2.04 PACKAGING

- A. Coiled pipe shall be shipped in protective packaging marked with product name and size.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's published installation manual and/or published guidelines and final shop drawings.

B. Backfill Requirements

1. The piping system will be backfilled with clean sand material.
2. Minimum vertical distance from the bottom of the tubing to the trench floor is 4 inches.
3. Minimum lateral distance from the side of the tubing to the trench wall is 6 inches.
4. Install a minimum of 12 inches of clean fill over the top of the piping.
5. The balance of the trench can be backfilled with native soil void of stone greater than 2 inches in diameter.

C. At connections and fittings, use a plastic pipe cutter to ensure square (90°) and clean cuts, and join pipes immediately or cap ends of pipe to seal from contaminants.

D. Meter Setter to be secured properly to avoid twisting or leaning of meter.

E. Tracer wire to be secured to meter setter with stainless steel clamp.

3.02 FIELD QUALITY CONTROL

A. Filling, Testing and Balancing: Tests of public water utility systems shall comply with authorities having jurisdiction, and, where required, shall be witnessed by the building official.

END OF SECTION