

STANDARD CONSTRUCTION SPECIFICATIONS FOR
WATER SYSTEMS

DIVISION 600

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STANDARD CONSTRUCTION SPECIFICATION FOR

WATER SYSTEMS DIVISION 600

SECTION 601 GENERAL

601.1 General

This division of the Standard Construction Specifications covers the construction of all water facilities that will be supplied water by the Homer Water Utility.

601.2 Applicable Standards

The most recent revision of the following standards of the American Society for Testing and Materials (ASTM) and the American Association for State Highway and Transportation Officials (AASHTO), the American Standards Association (ASA), and the American Water Works Association (AWWA) are hereby made a part of these Specifications:

ASTM D256	Test Methods for D-C Resistance of Plastics and Electrical Insulating Materials.
ASTM D3035	Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter.
ASTM D3261	Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for PE Plastic Pipe and Tubing
ASTM D3350	Specification for Polyethylene Plastic Pipe and Fitting Materials
AWWA C-104	Cement Mortar Lining for Cast Iron and Ductile Iron Pressure Pipe Fittings.
AWWA C-105	Polyethylene Encasement for Gray and Ductile Iron Piping.
AWWA C-110	Gray Iron and Ductile Iron Fittings
AWWA C-111	Rubber Gasket Joints for Cast Iron and Ductile Iron Pressure Pipe Fittings
AWWA C-115	Flanged Cast Iron and Ductile Iron Pipe with Threaded Flanges
AWWA C-150	Thickness Design for Ductile Iron Pipe
AWWA C-151	Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand Lined Molds

AWWA C-500	Gate Valves
AWWA C-502	Dry Barrel Fire Hydrants
AWWA C-600	Installation of Cast Iron Water Mains
AWWA C-601	Disinfecting Water Mains
AWWA C-800	Threads for Underground Service Line Fittings
AWWA C-901	Standard for Polyethylene (PE) Pressure Pipe and Tubing
AWWA B-88	Standard Specifications for Copper Water Tube

601.3 Surveys

The Contractor will lay out in the field the alignment and grade for work to be done under the Contract. When once so laid out, the Contractor shall be responsible for the preservation of all line stakes, grade stakes, and hubs. In the event of their loss or destruction, the Contractor shall pay all costs for their proper replacement. Offset hubs and stakes shall be set for each fitting and grade-break on a line parallel to and at a uniform distance from the line of pipe. The Contractor shall be responsible for, and pay all costs for, the transfer of the control points from the reference hubs to such hubs or batter boards as required for the prosecution of the work. A ground line profile will be made by the Contractor.

The ground line profile refers to the elevation of the ground directly above the centerline of pipe, and the grade line refers to the elevation of the bottom of pipe, except where otherwise noted.

The Engineer will furnish the Contractor with a list of all pertinent bench marks necessary for vertical control of the work. Prior to utilizing information such as bench marks, etc., it shall be the Contractor's responsibility to verify bench marks and control points provided by the Engineer and properly reference them. The Contractor shall pay for any necessary replacement.

As-built measurement will be done by the Contractor on all fittings, grade-breaks, and utility crossings. The Contractor shall, prior to final acceptance, provide the City of Homer with record drawings and field notes.

SECTION 602 FURNISH AND INSTALL PIPE

602.1 General

The work under this section consists of the performance of all work required for the furnishing and installation of water pipe, fittings, and tie rods. The Contractor shall install them in accordance with these specifications and in conformity with the lines and grades as shown on the drawings, unless otherwise approved.

602.2 Material

a. Ductile Iron Pipe

Ductile Iron Pipe shall conform to the requirement of AWWA C-151, with cement mortar lining conforming to the requirements of AWWA C-104. Class 52 Pipe shall be used for all pipe.

Fittings shall be of a minimum two hundred fifty (250) pounds pressure rating, mechanical joint or all bell, lined or unlined, either cast iron or ductile iron, unless otherwise required by the contract documents. All fittings shall conform to the requirements of AWWA C-110. Rubber gasket joints for ductile iron pipe and fittings shall conform to the requirements of AWWA C-111.

b. Copper Service Pipe

Pipe used under this specification shall be soft-drawn, seamless, annealed copper pipe suitable for use as underground service water connections for general plumbing purposes and shall comply with the requirements of ASTM B-88 for Type K soft copper as manufactured by the American Brass Company, or equal.

c. Joint Tie Rods

Tie rods shall be threaded black iron or mild steel and shall be located symmetrically around the perimeter of the pipe, using anchoring lugs of standard manufacture for attachment where required. Tie rods shall be three-quarter inch (3/4") diameter on pipes twenty-four inches (24") and less and one inch (1") diameter on pipes thirty inches (30") and over. There shall be two (2) rods on pipes twelve inches (12") and less; four (4) each on pipes fourteen inches (14") to sixteen inches (16") inches in diameter; six (6) each on pipes eighteen inches (18") in diameter; eight (8) each on pipe twenty-two inches (22") to twenty-four inches (24") in diameter; twelve (12) each on pipes forty-two inches (42") in diameter; and fourteen (14) each on pipes forty-eight inches (48") in diameter.

d. High Density Polyethylene Pipe

The pipe and fitting material shall have a cell classification of 345434C or better in accordance with ASTM D3350. In addition, the material must exceed 1000 hours when

tested in accordance with the ASTM F1248, the Ring Environmental Stress Crack Resistance Test with fewer than 50 percent (50%) failures. The extruded pipe shall have impact strengths greater than three feet pounds per inch (3 ft.# / inch), in accordance with the ASTM D256 Izod Impact Test. The material shall be listed by the NSF (National Sanitation Foundation) for potable water service **and be indicated as such on the pipe.**

Butt fusion of the pipe and fittings shall be performed in accordance with the pipe manufacturer's recommendations as to equipment and technique. The fusion operation shall be performed by an individual who has demonstrated the ability to fuse polyethylene pipe in the manner recommended by the pipe supplier. **The individual performing the fusing procedure must hold a current certification for fusing HDPE as stated in Title 49.1 DOT Certification.**

Bolts for flanged connections will meet the minimum standard ASTM A307A unless otherwise noted.

All HDPE mainline shall be installed with No. 6 bare copper locate trace wire. Trace wire will be secured to the top of the pipe with tape or other approved method at minimum ten foot intervals.

e. Material Limitations

Copper, ductile iron, and HDPE are the only pipe materials allowed on water service connections or extensions. HDPE is only approved for services 2" and larger. Galvanized pipe shall not be allowed in underground water systems.

602.3 Construction

a. Trench Excavation and Backfill

The Contractor shall provide all trench excavation and backfill and compaction necessary to install pipe in accordance with *Division 200 Standard Construction Specifications for Earthwork, Section 207 Trench Excavation and Backfill* of these specifications.

Caution tape clearly indicating water will be installed two feet (2') and centered on the pipe.

b. Materials Delivery

Pipe and appurtenances shall be handled in such a manner as to insure delivery to the trench in a sound, undamaged condition. Particular care shall be taken to not damage the pipe, pipe coating or lining. Before installation, the pipe and appurtenances shall be examined by the Engineer for defects.

The pipe shall not be strung out along the shoulders of the road for long distances if it causes inconvenience to the public. The amount of pipe strung at the job site shall be at the discretion of the Engineer.

Rubber gaskets shall be stored in a cool, dark place to prevent damage from the direct rays of the sun.

c. Installation

Installation shall be in accordance with the requirements of AWWA C-600. The interior of the pipe and accessories shall be thoroughly cleaned of foreign matter before being lowered into the trench. The pipe shall be kept plugged during the laying operation to keep the interior clean.

Pipe and appurtenances shall be carefully lowered into the trench by means of derrick, ropes, belt slings, or other suitable equipment. Under no circumstances shall any of the pipe or appurtenances be dropped or dumped into the trench. Care shall be taken to avoid abrasion of the pipe coating. Poles used as levers or skids shall be of wood and shall have broad, flat faces to prevent damage to the pipe and coating.

The trench bottom shall be graded to provide uniform support for the pipe barrel. Water shall be kept out of the trench by pumping, if necessary, until the jointing is completed. When work is not in progress, open ends of the pipe, fittings, and valves shall be securely plugged so that no trench water, earth or other substances will enter the pipes or fittings. Where any part of the coating or lining is damaged, the repair shall be made by the Contractor at his expense and in a manner satisfactory to the Engineer. At a sufficient distance, prior to encountering a known obstacle or connection into an existing pipe, the Contractor shall expose and verify the exact location of the obstacle or pipe so that proper alignment and/or grade may be determined before the pipe sections are laid in the trench and backfilled. The connections shall be made by using special parts and/or fittings to suit actual conditions. All connections made under pressure shall be witnessed by City of Homer Public Works personnel.

Pipe ends left for future connections shall be plugged, or capped, and anchored as shown on the drawings or as directed by the Engineer. The end of the pipe shall be marked by means of a two by four (2" x 4") extending from the face of the pipe to two feet (2') above finish grade. The 2" x 4" marker shall be painted white and stenciled with the word "Water" in black two inch (2") high letters. A minimum ½"x 2" piece of rebar shall be driven alongside the 2x4 and flush with the finished grade.

Cutting of pipe shall be done in a neat and workmanlike manner without damage to the pipe.

Concrete thrust blocks and mechanical restraints of the type shown on the standard details shall be installed where the pipe line terminates or changes alignment, utilizing a tee, cross, bend or similar fitting. Either poured-in-place or pre-cast thrust blocks are

acceptable if the minimum base area is sufficient as shown in the standard details. Concrete for the thrust blocks shall be Class C-6 as described in *Division 300 Standard Construction Specifications for Portland Cement Concrete, Section 300.1 General, 301.6 Mix Requirements for Classes of Concrete* of these specifications.

If the Contractor elects to use poured-in-place thrust blocks, all pipe and fittings exposed to concrete will be double wrapped with four (4) mil polyethylene film prior to placement of the concrete.

d. Alignment and Grade

The pipe shall be so laid in the trench that after the line is completed, the bottom of the pipe conforms accurately to the grades and alignment given by the Engineer. A maximum two-tenths foot ($2/10'$) deviation from design elevations and alignment will be allowed. The pipe shall be generally straight to visual observation as determined by the Engineer.

Both line and grade shall be checked and recorded in a field book for each piece of pipe and appurtenances laid. The Contractor shall have instruments such as a transit and level for transferring alignment and grades from offset hubs. He shall also have in his employ a person who is qualified to use such instruments and who shall have the responsibility of placing and maintaining such construction guides. The Contractor will furnish to the Engineer a copy of the surveyor's notes for the newly installed pipe and appurtenances.

The practice of placing backfill over a section of pipe to provide a platform for instruments shall be subject to the approval of the Engineer and shall be accomplished in accordance with *Division 200 Standard Construction Specifications for Earthwork, Section 207 Trench Excavation and Backfill, 207.3 Construction*, of these specifications. The Contractor shall provide true, correct, and certified record drawings of the survey notes, to the Engineer.

All Adjustments to line and grade shall be done by scraping away or filling the earth under the body of the pipe and not by blocking or wedging up. Deflections from a straight line or grade, as required by vertical curves, horizontal curves, or offsets, shall not exceed the manufacturer's recommendations for the type of pipe being installed.

If the alignment requires deflection in excess of the above limitations, the Contractor shall furnish special bends to provide angular deflections within the limits allowable. Short radius curves and closures shall be formed by shorter lengths of pipe, bevels, or fabricated special segments.

e. Jointing of Metal Pipe

The Contractor has the option of using either mechanical or push-on joints. All joints shall conform to the requirements of AWWA C-600.

The Contractor will be required to use mechanical joints on all hydrant leads. The Engineer has the option of checking any or all mechanical joints to assure proper torque as specified by the manufacturer.

Whenever flange connections are shown on the drawings, called for in the specifications, or required in the work, the flange and fittings shall conform to the requirements of AWWA C-110 for 250 pound pressure ratings.

602.4 Flushing and Testing

Prior to any tests performed, all newly installed water facilities, including fire lines, shall be open bore flushed. The Contractor, at his option, shall perform the disinfection and hydrostatic tests in any order of sequence. The Contractor is made aware, that in the event the disinfection has been performed and repairs are made on the system in order to pass the hydrostatic test, all previous tests, including open bore flushing, shall be declared void and shall be repeated to the satisfaction of the Engineer.

a. Flushing

All newly installed water facilities shall be “open bore” flushed to remove any foreign matter. “Open bore” flushing shall be accomplished prior to hydrostatic testing and disinfection at each extremity of the main, including all stub-outs and dead ends. The Contractor shall furnish, install, and remove all fittings and pipes necessary to perform the flushing, at no additional cost to the City of Homer. Under no circumstances will open bore flushing through hydrants or reduced outlets be permitted. The use of reducers will not be allowed.

It will be the contractor’s responsibility to notify the Engineer and the City of Homer’s Public Works Department forty-eight (48) hours in advance of any flushing operations. All flushing of newly constructed mains will be done between the hours of 8:00 a.m. and 4:00 p.m. weekdays, unless otherwise authorized by the City of Homer. Any and all overtime costs incurred by the Public Works Department will be charged to the Contractor. The City of Homer will not be responsible for any flushing costs caused by the Contractor’s negligence through faulty workmanship, or erosion from the flushing waters.

b. Hydrostatic Testing

All mains shall be chlorinated, flushed, and pressure tested by the Contractor before service connections are made.

A hydrostatic test will be conducted on all newly constructed water mains, fire hydrant leads, and stub-outs, after “open bore” flushing, in the presence of City of Homer representatives in accordance with the requirements of AWWA C-600 unless hereinafter modified. The Contractor, at his option, can either use a pressure test or a leakage test.

The Contractor shall furnish all necessary assistance, equipment, labor, materials, and supplies necessary to complete the test to the satisfaction of the Engineer. The Contractor shall suitably valve-off or plug the outlet to the existing or previously tested water main at his expense, prior to making the required hydrostatic test. Prior to testing, all air shall be expelled from the pipe. If permanent air vents are not located at all high points, the contractor shall, at his expense, install corporation cocks at such points so the air can be expelled as the line is slowly filled with water.

All main valves, fire hydrant auxiliary valves, fire hydrant main valves, and plugs shall be tested. All intermediate valves within the section being tested will be closed and reopened as directed by the Engineer during the actual test. Only static pressure will be allowed on the opposite side of the end valves of the section being tested.

All hydrostatic testing will be performed through test copper. Use of fire hydrant and service connections for testing will not be allowed.

The hydrostatic pressure shall be one hundred pounds per square inch (100 psi) greater than static line pressure but not less than one hundred fifty pounds per square inch (150 psi) any place within the system being tested. The duration of each hydrostatic pressure test for ductile iron pipe shall be thirty (30) minutes. After the required test pressure has been reached, the pumping will be terminated. If the pressure remains constant for thirty (30) minutes without the aid of a pump, that section of line will not be subject to any future hydrostatic test.

If a hydrostatic pressure test fails on any section, the Contractor has the option to perform a leakage test on that section. The Contractor shall furnish all necessary assistance equipment, labor, tools, materials, and supplies necessary to conduct the test.

Leakage for a newly installed main is determined by the following formula:

$$L = \frac{0.5 \cdot N \cdot D \cdot (P)}{7400}$$

L = Allowable leakage in gallons per hour.

N = Summation of mechanical and push on joints in lengths of pipe tested.

D = Diameter of pipe in inches.

P = Test pressure in pounds per square inch.

The duration of each leakage test shall be two (2) hours, and during the test, the main shall be subjected to the constant test pressure as defined above. The test pump shall be valved to ensure that constant test pressure is maintained throughout the test and all excess water returned to the supply tank.

If the pressure decreases below the required test pressure during the two (2) hour period, the preceding portion of that test will be declared void. Cracked or defective pipes,

gaskets, mechanical joints, fittings, valves, or hydrants discovered as a consequence of the hydrostatic tests shall be removed and replaced with sound material at the Contractor's expense. The test shall then be repeated until the results are satisfactory.

Pressure testing of HDPE piping shall be in accordance with the manufacturer's recommendations.

c. Disinfection

Chlorine shall be used for disinfection. Chlorine shall be applied by one (1) of the following methods:

1. Liquid chlorine gas-water mixture
2. Direct chlorine gas feed
3. Calcium hypochlorite and water mixture

Calcium hypochlorite shall be comparable to commercial products known as HTH, Perchloren or Machochlor.

The chlorinating agent shall be applied at the beginning of the section adjacent to the feeder connection, insuring treatment of the entire line. Water shall be fed slowly into the new line with chlorine applied in amounts to produce a dosage of forty to fifty parts per million (40 to 50 ppm). Application of the chlorine solution shall continue until the required dosage is evident at all extremities of the newly laid line.

Chlorine gas-water mixture shall be applied by means of a solution feed chlorinating device. Chlorine gas shall be fed directly from a chlorine cylinder equipped with a suitable device for regulating the rate of flow and the effective diffusion of gas within the pipe. Calcium hypochlorite shall be injected or pumped into the water main. During the chlorination process, all intermediate valves and accessories shall be operated. Valves shall be manipulated so that the strong chlorine solution in the line being treated will not flow back into the line supplying the water. Hydrostatic testing of a water line containing the chlorine mixture will not be allowed.

A residual of not less than ten parts per million (10 ppm) chlorine shall be produced in all parts of the water main and retained for a minimum period of twenty-four (24) hours. After which, this residual shall be flushed from the line at its extremities until the replacement water tests are equal chemically and bacteriologically to those of the permanent source of supply. In no instance shall a water main be chlorinated before "open bore" flushing.

CHLORINATION

<u>Pipe Diameter</u>	<u>Dosage (oz.) per 100 Feet</u>
4"	.60 oz
6"	1.35 oz
8"	2.75 oz
10"	4.30 oz
12"	6.19 oz
16"	11.00 oz
20"	17.00 oz

The above table is to be used as a guide for chlorinating mains by the calcium hypochlorite and water mixture method. The given dosage per one hundred feet (100') results in a chlorine solution of forty to fifty parts per million (40 to 50 ppm).

This dosage takes into account that Contractors more frequently used granular HTM or HTH, which is sixty-five percent (65%) pure. If another chlorinating agent is used, the dosage must be adjusted. Concentrations in excess of 100 ppm will result in rejection of the disinfection test, immediate flushing of the line, and the injection of a new mixture of chlorine solution.

d. Test and Air Vent Copper Pipe Removal

After completion of testing, all test and air vent copper pipe shall be removed and the corporation stop closed at the main, in the presence of the Engineer.

602.5 Method of Measurement

Measurement for furnishing and installing water main shall be per linear foot of horizontal distance of the various sizes as set forth in the Bid Schedule. Measurement will be from station to station as staked in the field and as shown on the drawings, except where the grade exceeds twenty-five percent (25%), in which case measurement will be by actual pipe length.

602.6 Basis of Payment

Fittings and appurtenances as shown on the drawings or not specifically identified for payment under a separate pay item but required for normal completion of water main installation, will be considered incidental and shall be included in the linear foot cost of the water main. Trench excavation, and compaction shall be incidental to the Bid Item provided in this item of work. Imported backfill shall be paid under the appropriate pay item or by letter of agreement.

Payment shall be made under the following units:

<u>ITEM</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
602	Furnish and Install Water Main	Linear Foot

SECTION 603 FURNISH AND INSTALL VALVES

603.1 General

The work covered by these specifications consists of the performance of all work required for furnishing and installing valves, including valve boxes and marker posts.

603.2 Material

a. Gate Valves

Gate valves shall be iron body, fully bronze mounted, resilient wedge, parallel seat valves as manufactured in accordance with the requirements of AWWA C-500, Gate Valves for Ordinary Water Works Service. All valves shall be non-rising stem type with an O-ring seal and a two inch (2") square operating nut, and shall open counter clockwise. Valves shall have mechanical joint or flanged ends as specified.

b. Butterfly Valves

Butterfly valves shall be of the rubber-seated tight-closing type. They shall meet or exceed the performance requirements of AWWA C-504 for operational pressure of one hundred fifty pounds per square inch (150 psi) working pressure and three hundred pounds per square inch (300 psi) hydrostatic pressure.

Mechanical joint valve ends shall be as per AWWA Specification C-110 and C-111 of the latest revision, and "Short-Body" in accordance with the requirements of Table II of AWWA C-504. Accessories (bolts, glands and gaskets) shall be supplied by the valve manufacturer.

Valves must use full AWWA C-504 Class 150 B valve shaft diameter and full Class 150 B underground service operator torque rating throughout entire travel to provide capability for operation in emergency service.

Valve body shall be high strength cast iron ASTM C-126 Class B. For valves with the rubber seat mounted on the disc, the mating surface in the body shall be 304 or 316 steel. For valves containing the rubber seat in the body, the method of seat retention shall be in accordance with the requirements of AWWA C-504-80, except that no retaining fasteners or other hardware shall be permitted in the flow streams.

Valve operators, unless otherwise required by the contract documents, shall be of the traveling nut type, sealed, gasketed, and lubricated for underground service and capable of withstanding an overload input torque of 450 ft/lbs at full open or closed position without damage to the valve or valve operator. The number of turns to operate the valve shall be a minimum of two (2) turns per inch of valve diameter for ninety degrees (90°)

of closure travel at a maximum pull of eighty (80) pounds. All valves shall open counter clockwise and be equipped with two inch (2") square AWWA operating nut.

- Butterfly valves twenty inches (20") and less: In the event that the shaft is turned down to fit connections to the operator, the limits of AWWA C 504-80, Section 3.3.2 shall be strictly observed. Carbon steel shafts, if used, shall have 304 or 316 stainless steel journals with static seals to isolate the interior of the disc and the shaft from the water.

- Butterfly valves over twenty inches: The valve shaft shall be of two piece stub shaft type, made of 18-8 Type 304 stainless steel. Valve bearings and shaft seals for valves of all sizes shall meet the requirements of AWWA C 504 Section 3.6 and 3.7 respectively, with the following additional requirements:

1. Sleeve bearings shall have a maximum coefficient of friction of 0.1.
2. For underground service, packing shall be pressure energized chevron or O-ring type, not requiring adjustment and suitable for permanent duty.

c. Pressure Reducing Valves

Pressure reducing valves shall be supplied as directed in the contract documents.

d. Air Relief Valves

Air relief valves shall be supplied as directed in the contract documents.

e. Valve Boxes

Valve boxes shall be cast iron of sliding, adjustable height type with round or oval bottom hood sections to fit over the top of the valve. The top section shall be recessed to receive a close fitting "eared" lid with the word "WATER" cast into it. Internal diameter of the smallest section shall be not less than five inches (5"). Minimum thickness of the metal shall not be less than five-sixteenth inch (5/16"). Castings shall be smooth and workmanship shall be first class. Valve boxes shall be provided with dust covers.

Valve boxes shall be of sufficient length for the pipe cover depth on the profile drawings and in accordance with the standard details, of these specifications.

Valve boxes shall be supplied with valve operator extension rods such that the maximum depth from the ground surface to the operator nut does not exceed three (3) feet.

f. Markers

Valve boxes shall be marked with markers consisting of two and one-half inch (2-1/2") O. D. galvanized steel pipe sections, seven feet (7') in length, with three feet (3') buried in the ground. Markers shall be shop painted "Caterpillar Yellow" and painted with stenciled two inch (2") black numerals, showing the appropriate references. Markers shall be located on the nearest property line, due north, south, east or west of the valve at a maximum distance of fifty feet (50') unless otherwise directed by the Engineer. Markers shall carry the notation:

VB (feet) (direction)

When valve boxes are located in a paved area, the valve marker posts are not required. The Contractor's surveyor shall provide a minimum of two swing ties from prominent nearby physical features to each valve box located in paved areas.

603.3 Construction

The Contractor shall provide all trench excavation, backfill, and compaction necessary to install valves in accordance with *Division 200 Standard Construction Specifications for Earthwork, Section 207 Trench Excavation and Backfill* of these specifications.

Valves and valve boxes shall be installed where shown on the drawings. On fire line installations, a valve shall be placed outside the building so that all fire hydrants will remain in service in the event water service to the building must be shut off for any reason.

Valves shall have the interiors cleaned of all foreign matter before installation. If the valve is at the end of the line, it shall be plugged prior to back-filling. The valve shall be inspected by the Engineer in the open and closed positions to insure that all parts are in working condition.

In areas where running sand is encountered, provisions shall be made to restrict the sand from entering the bottom section of the valve box.

The Contractor shall expose all valve boxes for pre-final and final inspection. After final inspection of the valves located in unpaved areas, florescent surveying flagging shall be placed directly over the valve box lid and covered with gravel to facilitate location in the future.

603.4 Method of Measurement

The quantity to be paid for shall be the actual number of valves of each class and size (including valve boxes and marker posts) furnished, installed, and accepted.

603.5 **Basis of Payment**

Payment shall include full payment for all work described in *Section 603*. Trench excavation and compaction shall be considered incidental to bid items as provided in this section. Imported gravel backfill will be paid under the appropriate pay item or by letter of agreement.

Payment shall be made under the following units:

<u>ITEM</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
603	Furnish and Install Gate Valve, Valve Box and Marker	Each
	Furnish and Install Butterfly Valve, Valve Box and Marker	Each
	Furnish and Install Pressure Reducing Valve – All Required	Each Each
	Furnish and Install Air Relief Valve All Required	Each

SECTION 604 FURNISH AND INSTALL FIRE HYDRANTS

604.1 General

The work covered by these specifications consists of the performance of all work required for the furnishing and installation of “L-Base” Fire Hydrant Assemblies, including the fire hydrant leg pipe, auxiliary gate valve, valve box, tie back rods, guard rails and fire hydrants.

604.2 Materials

a. Fire Hydrants

Fire hydrants shall conform to the requirements of AWWA C-502 for Dry Barrel Fire Hydrants. Fire hydrants shall be American Darling B-62-B; to include, without limitation, the following:

1. All fire hydrants shall be supplied with a five and one-fourth inch (5-1/4”) main valve opening.
2. All connections shall be mechanical joint unless otherwise indicated in the contract documents.
3. Single pumper hydrants shall be furnished with two and one-half inch (2-1/2”) hose connections and one (1) four and one-half inch (4-1/2”) pumper connection.
4. Unless otherwise required by the contract documents, all hydrants shall be furnished with a barrel length that will allow seven foot (7’) bury.
5. The main valves shall be of the compression type, where water pressure holds the main valve closed permitting easy maintenance or repair of the entire barrel assembly from above the ground without the need of a water shut-off.
6. All fire hydrants shall be furnished with a breakaway flange of the type that allows both barrel and stem to break clean upon impact from any angle. Traffic flange design must be such that repair and replacement can be accomplished above ground.
7. Painting and coating shall be in accordance with cited AWWA Specifications. After installation, the hydrant section from the traffic flange to the top of the operating nut shall be painted “Caterpillar Yellow.”
8. Operating and nozzle nuts shall be pentagon shaped with one and one-half inch (1-1/2”) point to flat measurement.

9. Hose nozzle threading shall be in conformance with NFPA #194 for National (American) Standard Fire Hose Coupling Screw Threads.

10. All working parts shall be bronze or noncorrosive metal in accordance with the requirements of AWWA C-502.

11. All hydrants shall be left hand opening (counter clockwise).

12. All hydrants shall have drain outlets at the base of the barrel. **Brass manufacturer plugs must be installed prior to installation.**

b. Gate Valve and Valve box

All gate valves and valve boxes shall be furnished and installed in accordance with *Section 603, Furnish and Install Valves*, of this division.

c. Tie Rods / Mechanical Restraints

Tie rods are not approved for new construction. The use of tie-rods requires approval from the Engineer. If used, all tie rods must be three-fourths inch (3/4") O. D. black iron or mild steel.

Megalug series 1100 mechanical joint restraints shall be used on all mechanical joints.

d. Guard Posts

The Contractor shall install guard posts at each hydrant installation in accordance with the standard details of these specifications. If, in the opinion of the Engineer, the guard posts are not to be installed, they shall be delivered to the City of Homer Public Works Shop. Measurement and payment for guard posts shall be incidental to the Bid Item, *Furnish and Install Fire Hydrant Assembly*.

604.3 Construction

The Contractor shall provide all trench excavation, and compaction necessary to install the fire hydrant assembly in accordance with *Division 200 Standard Construction Specifications for Earthwork, Section 207 Trench Excavation and Backfill* of these specifications. Imported backfill shall be paid under the appropriate pay item or by letter of agreement.

The Contractor shall install the hydrant assemblies in accordance with the standard details of these specifications.

All fire hydrant legs shall be installed level. The fire hydrant barrel shall be installed plumb. Any adjustments to the fire hydrant traffic flange on a city of Homer Contract shall be made by the Contractor at no cost to the City of Homer.

Hydrants installed, but not available for use, shall be covered with burlap and securely tied.

In lieu of valve box markers for the auxiliary gate valves, the Contractor shall paint in two inch (2") black lettered stencils, the direction and distances, to the nearest one-tenth foot (1/10'), the distance to the valve box on the face of the fire hydrant directly below the bonnet flange.

604.4 Method of Measurement

The method of measurement to furnish and install fire hydrants shall be as follows:

a. Single Pumper Fire Hydrants

Fire hydrants, complete with, six inch (6") leg to main, six inch (6") auxiliary gate valve and valve box, and guard post installation shall be paid for as a unit as set forth in the Bid Schedule. The price shall include full compensation for furnishing and installing single pumper hydrants as shown in the standard details of these specifications.

604.5 Basis of Payment

Shall include full payment for all work described in *Section 604*.

Payment shall be made under the following units:

<u>ITEM</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
604	Furnish and Install Fire Hydrant Assembly (Single Pumper)	Each

SECTION 606 WATER SERVICE LINES

606.1 General

The work under this section consists of performing all operations necessary for excavation, backfill, and compaction required for water service connections and all other miscellaneous items as specified in this section. The Contractor shall make the actual connection, lay the service line and thaw wire, and set the key box. All mains shall be chlorinated, flushed, and pressure tested by the Contractor before service connections are made.

606.2 Material

a. Pipe

Ductile iron pipe Class 52, HDPE, or soft drawn seamless copper, Type K, shall be used for all service lines. All services 1 ½" and smaller shall be constructed of Type K copper.

b. Corporation Stop, Curb Stop, Curb Box

- Corporation stops shall be flare type, brass only. Mueller brand only is accepted.
- Curb stops shall be flare type, brass only. Mueller brand only is accepted.
- Iron pipe thread corporation stops and curb stops will be used for HDPE service lines. Poly Cam HDPE/IP fittings shall be used for connection of the HDPE to the service valves.
- Curb boxes must be furnished with stationary operating rods. Mueller brand only is accepted.

The curb box shall provide a clear and unobstructed access to a valve or curb stop to enable the City of Homer operation of the valve or curb stop. Key boxes or valve boxes shall be of an acceptable construction as outlined in the standard specifications, *Section 603.3, Furnish and Install Valves, Article 603.2*, materials and standard details.

606.3 Construction

a. Excavation and Backfill

The Contractor shall provide all excavation, backfill, and compaction necessary to install water source lines in accordance with *Division 200, Standard Construction Specifications for Earthwork, Section 207, Trench Excavation and Backfill* of these specifications.

b. Service Connection

A corporation stop or main valve shall be installed at a point in the service line as close to the main water supply as possible. There shall be line pressure in the main at all times connections are being made. All service lines one and one half inches (1 1/2") and smaller shall be constructed of seamless, soft drawn, Type K copper. All two inch (2") service connections shall be made of HDPE. Services larger than 2" shall be of ductile iron or HDPE as shown on the plans. All ductile iron pipe installations shall be flushed, hydrostatic tested, and disinfected as outlined in *Section 602, Furnish and Install Pipe* of this division.

The Contractor shall make the connection to the City of Homer's main water supply in a manner consistent with the standard specifications and standard details. A water service shall not cross property lines or adjoining lots, unless shown otherwise on the plans. The key box shall be installed no closer than five feet (5') from adjoining property lines. The connections shall be inspected by the Engineer or appointed representative at the time the connection is made or the excavation be exposed in its entirety for his inspection.

A water service connection will not have more than one (1) union every one hundred feet (100').

c. Excavation

Excavation for service connections shall be unclassified and the Contractor shall excavate whatever substances are encountered to the depth required for the connections. Depth for water service connections will be a minimum of seven feet (7') below proposed finished grade. The seven foot (7') depth below finished grade shall be maintained five feet (5') past the footings, before the depth shall be less than less than seven feet (7'). Variations in depth from the depth stated above will not be grounds for additional payment. It shall be the Contractor's responsibility to familiarize himself with depth of water mains for the project. The portion of the right-of-way that extends from the main to the key box (curb stop) will be excavated in such a manner that will allow the service connection to be installed horizontally (no slope). The Contractor shall excavate for water connections in such a manner that the excavation is ninety degrees (90°) to the street line, whenever possible. The ditch shall be long enough to allow the key box to be set at the property line.

Trenches shall be of sufficient width at the bottom to allow for laying of the particular service (minimum width will be two and one-half feet (2-1/2') for single services). Excavation of all fill materials to virgin ground is required to provide safety for workmen utilizing the trench.

The Contractor shall expose the mains to be tapped for distances of four feet (4') in length. Excavation on both sides of the pipe shall be carried to the bottom of the pipe. Excess excavation below the required level shall be backfilled and compacted with sand or gravel at the Contractor's expense as directed by the Engineer.

No water service shall be installed within a horizontal distance of ten feet (10') from a sewer service.

The Contractor shall be responsible for, and shall bear the expenses incurred, in the event that a main should be damaged during excavation or back-filling. The City of Homer's Public Works Department will be notified immediately of any damage and will provide oversight of the repair. The City of Homer Public Works Department will provide personnel for operation of all gate valves and may provide personnel and/or equipment necessary for the repair. The Contractor shall bear the cost of all materials, labor and other expenses incurred by the City.

All on-property installations shall be constructed to the same standard as off-property installations.

d. Backfill

Trench backfill shall commence only after the water service lines and appurtenances have been properly completed and inspected. The backfill material, free from large clods or stones, shall be placed by the Contractor in conformance with the codes and regulations of the City of Homer. Backfill shall be placed and compacted in conformance with *Section 207 Trench Excavation and Backfill*, of these specifications.

The Contractor shall exercise due care in back-filling to keep the service box and thaw wire vertical and in place. In the event the service box or thaw wire is displaced, the Contractor will be required to excavate and restore the service box and thaw wire to the proper position. Any work necessary to restore the service box and thaw wire to the proper position will be performed at the Contractor's expense.

Backfill shall not be placed in frozen trenches.

A plastic or rubber coated #2 copper thaw wire shall be attached to the corporation stop on three-fourth inch (3/4") and one inch (1") corporation stops by an approved method. On one and one-half inch (1-1/2") and two inch (2") connections, the thaw wire shall be attached to the saddle on the main.

e. Hydrostatic Testing

All 3/4" through 2" water service lines, fittings, and connections will be inspected for leaks under system pressure prior to backfilling. All water service lines larger than 2" shall undergo the requirements for Flushing, Hydrostatic Testing, and Disinfection as specified in *Section 602.4* of these specifications.

606.4 Method of Measurement

Trench excavation, compaction, and service line installation for water service connections shall be measured as completed units. Imported gravel backfill will be paid under the appropriate pay item or by letter of agreement.

606.5 **Basis of Payment**

Fittings and appurtenances as shown on the drawings or not specifically identified for payment under a separate pay item but required for normal completion of water service line installation, will be considered incidental.

Payment shall be made under the following unit:

<u>ITEM</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
606	Water Service Connection	Each

SECTION 607 ADJUST VALVE BOX

607.1 General

This item consists of furnishing all labor, equipment and materials necessary to adjust existing mainline valve boxes to finish grade as shown on the plans and in accordance with the applicable standard details of these specifications.

607.2 Materials

All materials used in the adjustment of mainline valve boxes shall conform to the requirements for mainline valve boxes as outlined in *Section 603 Furnish and Install Valves*.

607.3 Construction

All valve box adjustments will be accomplished as directed by the Engineer. Any damage to a mainline valve or valve box resulting from construction under this item shall be repaired or the damaged portion replaced at the Contractor's expense.

Valve operator extension rods shall be installed whenever the depth to the valve operating nut exceeds 36 inches. The costs of furnishing and installing the extension rods shall be considered incidental to *Item 607*.

607.4 Method of Measurement

Mainline valve box adjustments will be measured per unit, complete in place.

607.5 Basis of Payment

Basis of payment for this item shall be in accordance with *Section 10.07*, and shall include full payment for all work described in this section and all work outlined on the applicable standard details of these specifications, unless otherwise noted.

Payment will be made under:

<u>ITEM</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
607	Adjust Valve Box to Finish Grade	Each

SECTION 608

POLYETHYLENE ENCASEMENT

608.1 **General**

The work under this section consists of providing all operations pertaining to the furnishing and installation of one layer of polyethylene encasement on all ductile iron pipe, if required in the plans and specifications.

608.2 **Material**

The polyethylene encasement material for pipe shall be 8 mils thick and conform to the most current edition of AWWA C105/ ANSI A21.5.

608.3 **Construction**

The polyethylene encasement shall be installed in strict conformance to the methods described in the most current editions of AWWA C105/ ANSI A21.5 and the Ductile Iron Pipe Research Association’s “Installation Guide for Ductile Iron Pipe.”

608.4 **Method of Measurement**

Measurement on all sizes of polyethylene encasement for pipe shall be the same as the measurement of the pipe installed.

608.5 **Basis of Payment**

Payment for this item shall be in accordance with *Section 10.07*, and shall be full payment for the work described in this section.

Payment will be made under:

<u>ITEM</u>	<u>DESCRIPTION</u>	<u>PAY UNIT</u>
608	Polyethylene Encasement	Linear Foot