DESIGN AND CONSTRUCTION STANDARDS

WATER DISTRIBUTION SYSTEMS
DIVISION 60

JOINT BASE ELMENDORF RICHARDSON
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WATER DISTRIBUTION SYSTEM - JBER DIVISION 60

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SECTION 60.01 GENERAL

Article 1.1 Scope of Work

The Work covered by these Specifications consists of providing all plant, labor, equipment, supplies, material, transportation, handling and storage, and performing all operations necessary to complete new construction, modification, and/or repair of water distribution facilities operated by Doyon Utilities LLC on Joint Base Elmendorf Richardson, hereafter referred to as JBER.

All Division 60 work shall be in accordance with the Plans, Special Provisions, Standard Details, and these Specifications.

Article 1.2 Safety

The Contractor is solely responsible for all safety and safety compliance. Safety includes, but is not limited to: worker and jobsite safety, safety of Doyon Utilities employees and agents, other JBER personnel and property, and the general public, safety of the fish, game, and the environment, and water system and other utility safety.

Water system safety includes, but is not limited to, avoidance of cross-connections between potable water systems and contamination sources, proper flushing, disinfection, and biological testing, and use of only non-toxic chemicals and materials in water systems.

Article 1.3 Applicable Standards

The latest revisions of the following standards of the American Society of Testing and Materials (ASTM), the American Water Works Association (AWWA), the International Code Council (ICC), and the National Sanitation Foundation (NSF) are hereby made a part of these Specifications.

ASTM A126	Gray Iron Castings for Valves, Flanges and Pipe Fittings
ASTM B88	Seamless Copper Water Tubing
ASTM B828	Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings
ASTM D3035	Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter
ASTM D3261	Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
ASTM D3350	Polyethylene Plastic Pipe and Fittings Materials
ASTM F2620	Heat Fusion Joining of Polyethylene Pipe and Fittings
AWWA A100	Water Wells
AWWA C104	Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water

AWWA C105	Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids
AWWA C110	Ductile-Iron and Gray-Iron Fittings
AWWA C111	Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
AWWA C115	Flanged Ductile-Iron Pipe with Threaded Flanges
AWWA C151	Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids
AWWA C502	Dry-Barrel Fire Hydrants
AWWA C504	Rubber-Seated Butterfly Valves
AWWA C509	Resilient-Seated Gate Valves for Water Supply Service
AWWA C515	Reduced-Wall Resilient-Seated Gate Valves for Water Supply Service
AWWA C550	Protective Epoxy Interior Coatings for Valves and Hydrants
AWWA C600	Installation of Ductile-Iron Water Mains and Their Appurtenances
AWWA C651	Disinfecting Water Mains
AWWA C652	Disinfection of Water Storage Facilities
AWWA C800	Underground Service Line Valves and Fittings
AWWA C906	Standard for Polyethylene (PE) Pressure Pipe and Fittings, 4 In. Through 63 In., for Water Distribution and Transmission
ICC IPC	International Plumbing Code, latest edition adopted by MOA and current local amendments
NSF Standard 60	Drinking Water System Chemicals – Health Effects
NSF Standard 61	Drinking Water System Components – Health Effects

Article 1.4 Inspection, Notices, and Official Communications

All work activities covered under this section, including but not limited to traffic maintenance, storm water pollution prevention, construction, hot tapping, water shutdowns, water line open bore flushing, hydrant flushing, water line pressure testing, hydrant pressure testing, disinfection, sampling and bacteriological testing, continuity testing, temporary water system work, pipe abandonment in place, well abandonment, and punch list work, are subject to inspection and acceptance by Doyon Utilities LLC. Work completed without inspection by Doyon Utilities' Authorized Representative shall be subject to rejection.

The Contractor shall schedule water line hot tapping, open bore flushing, hydrant flushing, water line pressure testing, hydrant pressure testing, disinfection, sampling and bacteriological testing, continuity testing, temporary water system work, pipe abandonment in place, well abandonment, and similar activities to occur on non-holiday weekdays during normal working hours of 7 AM to 4 PM to facilitate inspection by Doyon Utilities' Authorized Representative.

Written notice of traffic lane closures and water shutdowns shall be provided to Doyon Utilities LLC and the JBER Fire Department by the Contractor at least fourteen (14) calendar days in advance.

Written notice of traffic lane closures shall be provided to the JBER Police Department by the Contractor at least fourteen (14) calendar days in advance.

Written notice requesting fire hydrant extension shall be provided to Doyon Utilities LLC by the Contractor at least seven (7) calendar days in advance.

Written notice of traffic maintenance (excluding lane closure work), storm water pollution prevention, construction, hot tapping, water line open bore flushing, hydrant flushing, water line pressure testing, hydrant pressure testing, disinfection, sampling and bacteriological testing, continuity testing, temporary water system work, pipe abandonment in place, well abandonment, and punch list work, and similar activities requiring inspection shall be provided to Doyon Utilities LLC by the Contractor at least five (5) calendar days prior to beginning any of these operations. Failure to provide the required notice shall be grounds for issuance of a stop-work order and/or complete rejection of the work.

For water shutdowns, water line open bore flushing, temporary water supply, and similar activities affecting water system customers, first written notice of these activities, acceptable to Doyon Utilities' Authorized Representative, shall be provided by the Contractor to all affected customers at least seven (7) calendar days prior to beginning any of these activities. A second written notice of these activities, acceptable to Doyon Utilities' Authorized Representative, shall be provided by the Contractor to all affected customers at least 24-hours prior to beginning any of these activities.

To be considered official and binding, all communication from and to Doyon Utilities LLC shall be in writing.

Article 1.5 Utility Locations and Excavation Permit Requirements

Prior to any excavation, the Contractor shall place a telephone, fax, or on-line locate request with Alaska Digline Inc. (Anchorage telephone - 278-3121 or 811, statewide telephone - 1-800-478-3121, statewide fax – 1-907-278-0696, on-line – http://www.akonecall.com/). Documentation of the Alaska Digline request shall be provided to Doyon Utilities' Authorized Representative. The Contractor shall coordinate with utility company locator personnel to locate all existing utilities before digging.

In addition to obtaining utility locations through Alaska Digline Inc., the Contractor obtain an excavation permit signed by all appropriate JBER departments, and provide a copy of the fully executed excavation permit to Doyon Utilities' Authorized Representative. A minimum of fourteen (14) calendar shall be allowed by the Contractor for complete processing of an excavation permit. The Contractor shall comply with all requirements of the fully executed excavation permit.

Article 1.6 Hot Work Permit Requirements

For any activity producing open flames, or heat or sparks sufficient to cause combustion, the Contractor obtain a hot work permit signed by the JBER Fire Department, and provide a copy of the fully executed hot work permit to Doyon Utilities' Authorized Representative. A minimum of fourteen (14) calendar days shall be allowed by the Contractor for complete processing of a hot work permit. The Contractor shall comply with all requirements of the fully executed hot work permit.

Article 1.7 Water Shutdown Scheduling and Duration

Scheduling and durations of water shutdowns shall be subject to acceptance by Doyon Utilities' Authorized Representative. No water shutdown shall exceed 6 hours in duration in any 24-hour period. Residential water shutdowns shall be started and completed on non-holiday weekdays between the hours of 9 AM to 3 PM. Non-residential water shutdowns shall be started and completed on days and during hours determined by Doyon Utilities' Authorized Representative to minimize adverse consequences on JBER operations.

Article 1.8 Submittals

The Contractor shall provide paper submittals or electronic submittals, at the option of Doyon Utilities' Authorized Representative, for review and acceptance by Doyon Utilities. Duplicate paper submittals shall be supplied in the quantities requested by Doyon Utilities' Authorized Representative. Submittals shall clearly document compliance with Contract requirements to the satisfaction of Doyon Utilities' Authorized Representative. Any materials ordered and/or work done in advance of written acceptance of submittals by Doyon Utilities' Authorized Representative is subject to rejection.

Submittals for Doyon Utilities review and acceptance are required for the following items.

1. All permanent materials.
2. Alaska Digline utility locates request documentation.
3. Fully executed excavation permit(s).
4. Fully executed hot work permit(s)
5. Hot tap supervisor resume.
6. Temporary water system materials, construction, equipment, Contractor contact person and alternate 24-hour phone numbers, water customers' "Permissions to Enter", bacteriological test reports, and ADEC approvals.
7. Work Site Traffic Supervisor certification and resume.
8. Traffic Control Plans.

Permanent material submittals shall be provided to Doyon Utilities' Authorized Representative at least thirty (30) calendar days prior to ordering of materials. Other submittals listed above shall be provided to Doyon Utilities' Authorized Representative at least fourteen (14) calendar days prior to the activity covered by the submittal.

Doyon Utilities' Authorized Representative reserves the right to request additional submittals for other Contractor procedures and personnel qualifications.

Article 1.9 Permanent Materials Furnished by Doyon Utilities and by Contractor

Doyon Utilities may furnish some permanent materials on some projects. When Doyon Utilities does furnish permanent material, a list of these Doyon Utilities'-provided permanent materials, and locations where these Doyon Utilities'-provided materials shall be received by the Contractor, will be provided with the Request for Proposal and/or the Contract. The Contractor shall perform a complete take-off of all permanent materials required for the project. The Contractor shall furnish any and all permanent materials not supplied by Doyon Utilities, in order to complete the Project in accordance with the Plans, Standard Details, Special Provisions, and/or these Specifications.

The Contractor shall be responsible for receiving, inspecting, and inventorying Doyon Utilities'-provided materials at locations specified in the Bidding Documents, notifying Doyon Utilities Authorized Representative of damage, shortages, etc, loading as required, delivery to the jobsite, and unloading at the jobsite. Materials damaged during transportation to the jobsite and/or unloading at the jobsite shall be replaced at Contractor expense.

Any surplus Doyon Utilities'-provided materials not used on a project shall remain the property of Doyon Utilities, and shall be delivered by the Contractor to the Doyon Utilities storage yard and carefully off-loaded and stored on Contractor-provided wooden pallets or other suitable dunnage.

Article 1.10 Other Division Requirements

Except as specifically stated otherwise in the various Sections of this Division 60, the following other Divisions and Sections of these Standard Specifications are incorporated by reference into all Sections of Division 60:

1. Earthwork and Related Activities

   The Contractor shall provide storm water pollution prevention plans and Best Management Practices in accordance with Division 20 – Standard Construction Specifications for Earthwork.

   The Contractor shall clear, grub, and strip to the limits shown on the Plans or as directed by Doyon Utilities' Authorized Representative in accordance with Division 20.

   The Contractor shall remove existing Portland cement concrete sidewalk, apron, curb and gutter, and/or concrete similar structures, and asphalt pavement in accordance with Division 20.

   The Contractor shall provide all excavation, bedding, classified fill and backfill, backfilling, compaction, and incidentals as necessary to install water lines and appurtenances in accordance with Division 20.

   The Contractor shall provide casing pipe and carrier pipe as required in accordance with Division 20.

   The Contractor shall provide board insulation in accordance with Division 20.

   The Contractor shall dispose of excess and unsuitable material as required in accordance with Division 20.

   The Contractor shall provide leveling course as required in accordance with Division 20.

2. Surface Restoration

   The Contractor shall provide 3,500-psi design strength Portland cement concrete, if required for surface restoration, in accordance with Division 30 - Standard Construction Specifications for Portland Cement Concrete.

   The Contractor shall provide Class E asphalt pavement, if required for surface restoration, in accordance with Division 40 - Standard Construction Specifications for Asphalt Surfacing.

   The Contractor shall provide topsoil and hydroseeding, if required for surface restoration, in accordance with Division 75 - Standard Construction Specifications for Landscaping Improvements.

3. Traffic Maintenance

The Contractor shall provide all traffic maintenance in accordance with the Division 70 - Standard Construction Specifications, Miscellaneous**,** and the Manual of Uniform Traffic Control Devices, latest edition adopted by State of Alaska, and current local amendments. The Contractor is solely responsible to provide all traffic maintenance for vehicular, non-motorized, and pedestrian traffic. For any operations involving disruption of normal traffic flow, the Contractor shall provide Traffic Control Plans for review and acceptance by Doyon Utilities' Authorized Representative. Traffic Control Plans shall be provided at least fourteen (14) calendar days prior to beginning any operations involving disruption of normal traffic flow. Acceptance of Traffic Control Plans by Doyon Utilities' Authorized Representative is required prior to any operations involving disruption of normal traffic flow.

4. As-Built Drawings

The Contractor shall maintain as-built drawings in accordance with Division 65 - Standard Construction Specifications for JBER Construction Surveys. The as-built drawings shall be up-dated weekly by the Contractor to the satisfaction of Doyon Utilities' Authorized Representative. As-built drawings shall include;

1. GPS coordinates and bottom-of-pipe elevations for all new water line connections to existing water lines, dead ends, stub-outs, horizontal and vertical bends, tees and crosses, grade breaks, points of curvature and tangency, and at even 50-foot and 100- foot stations in horizontal curves.
2. GPS coordinates and elevations for relocated water lines.
3. GPS coordinates for plugged main tees where fire hydrant assemblies have been removed.
4. GPS coordinates on replaced, reset and adjusted valve boxes and adjusted key boxes.
5. GPS coordinates, elevations, and total installed thickness for underground board insulation.
6. GPS coordinates, elevations, and sizes for all pipe abandoned in place.
7. GPS coordinates for abandoned wells.
8. Other locations called out in these Specifications or in Division 65, or requested by Doyon Utilities' Authorized Representative.

GPS coordinates shall be to the accuracy specified in the Request for Proposal and/or Contract.

SECTION 60.02 WATER LINES

Article 2.1 General

The work under this Section includes construction of ductile iron and HDPE water mains, ductile iron fire hydrant assembly piping legs, fire lines, and water services, and copper water services and permanent vent assemblies, including pipe or tubing, fittings, thrust restraints, bolting materials, continuity straps and test leads, flushing, testing, disinfection, and incidentals.

A fire line is a water line that originates at a water main or at the valve downstream of a fire hydrant tee, and has the primary purpose of providing building interior fire protection. No connections, other than those for additional fire protection, will be allowed on the fire line outside of a served building. Domestic water obtained from a fire line shall be connected and metered inside the served building.

Refer to Section 60.01 for additional general requirements.

Article 2.2 Material

A. General

The use of pipe, tubing, or other components containing asbestos, lead, or other materials not conforming to NSF Standard 61 and/or chemicals not conforming to NSF Standard 60 shall be prohibited.

B. Line Types, Sizes, and Materials

Water mains shall be minimum 8-inch nominal diameter and shall be constructed of ductile iron or HDPE pipe.

Fire hydrant assembly piping legs shall be 6-inch nominal diameter for single pumper hydrants and 8-inch nominal diameter for double pumper hydrants, and shall be constructed of ductile iron pipe.

Fire lines shall be of the diameters shown on the Plans and shall be constructed of ductile iron pipe.

Water services of 3-inch nominal diameter and larger shall be constructed of ductile iron pipe.

Water services of 1-inch to 2-inch nominal diameter shall be constructed of copper tubing. Water services shall not be smaller than 1-inch nominal diameter.

Water main permanent vent assemblies shall be 1-inch nominal diameter and shall be constructed of copper tubing.

C. Ductile Iron Pipe, Fittings, Gaskets, Thrust Restraints, and Bolting Materials

Ductile iron pipe shall conform to the requirements of AWWA C151, Class 52, with cement mortar lining conforming to the requirements of AWWA C104.

Fittings shall be a minimum of 250 pounds pressure rating, mechanical joint, cement lined, either cast iron or ductile iron. All fittings shall conform to the requirements of AWWA C110. Rubber gasket joints for ductile iron pipe and fittings shall conform to the requirements of AWWA C111.

Mechanical joint restraints shall be "EBAA Iron MEGALUG®" or "Romac Industries RomaGrip" mechanical joint restraining glands, or Doyon Utilities' Authorized Representative accepted equal. Push-on joint restraints shall be "U.S. Pipe Field LOK®" gaskets or Doyon Utilities' Authorized Representative accepted equal.

All mechanical joint T-bolts and nuts supplied with fittings and appurtenances shall conform to ASTM A242 weathering steel. All T-bolts and nuts shall be factory-coated with a blue fluoropolymer coating for corrosion resistance.

D. Polyethylene Encasement

Polyethylene encasement for ductile iron piping shall meet the requirements of Section 60.06 – Polyethylene Encasement.

E. Ductile Iron Pipe Continuity Straps and Continuity Test Leads

Continuity straps and continuity test leads shall be stranded #2 AWG copper wire with HMWPE insulation suitable for direct burial.

F. Exothermic Weld Materials

Exothermic weld materials shall be "Erico Cadweld" or Doyon Utilities' Authorized Representative accepted equal. Weld shot size shall be per manufacturer's recommendations for the Class 52 ductile iron pipe and stranded #2 AWG copper wire.

G. High Density Polyethylene Pipe and Fittings

High density polyethylene pipe (HDPE) and fittings shall be manufactured in accordance with AWWA C906. HDPE shall be manufactured from PE4710 polyethylene compounds that meet or exceed ASTM D3350 Cell Classification 445574. All HDPE pipe and fittings shall be certified and marked for potable water service in accordance with NSF Standard 61. HDPE pipe and fitting material compound shall contain color and ultraviolet (UV) stabilizer meeting or exceeding the requirements of Code C per ASTM D3350. All fittings shall have pressure class ratings not less than the pressure class rating of the pipe to which they are joined. HDPE pipe and fittings shall be SDR11 or heavier wall.

H. Trace Wire and Trace Wire Accessories for HDPE Pipe

Trace wire shall be #12 solid copper wire with HMWPE insulation. Trace wire splice connectors shall be copper compression type, "Thomas & Betts C-Tap, Color Key Red" or Doyon Utilities' Authorized Representative accepted equal. Insulation for splices shall be 125-mil by 3 ½-inch by 4 ½-inch "3M Vinyl Mastic Pad 2200", or Doyon Utilities' Authorized Representative accepted equal.

I. Transitions from Ductile Iron to HDPE Pipe

Transitions between ductile iron and HDPE pipe shall be made using flange sets.

J. Underground Flanges and Bolting Materials

All flange dimensions shall conform to ASNI 16.5 Class 150.

Ductile iron pipe shall be flanged with restrained flange coupling adapters, ductile iron ASTM A563, Grade 65-45-12, fusion bonded epoxy coated and lined in conformance with NFS Standard 61, ANSI 16.5B Class 150 flange drilling, "Romac RFCA" or Doyon Utilities' Authorized Representative accepted equal.

HDPE pipe shall be flanged with standard HDPE flange adapters and ductile iron back-up rings.

Rubber flange gaskets shall conform to the requirements of AWWA C111.

Except as noted below, flange bolts shall be ASTM A307B heavy hexagonal, and nuts shall be ASTM A563A heavy hexagonal.

At flanged outlets for future piping connections, flange bolts and nuts shall be Type 304 stainless steel heavy hexagonal.

All flange bolt diameters shall be 1/8-inch smaller than flange bolt hole diameters. All flange bolts shall be of sufficient length that, when a bolt-up is complete, each bolt extends completely through and at least 1/8-inch beyond the nut, all around. If stud bolts are used for flange bolt-up, the same length criteria shall apply to each end of each stud bolt.

K. Underground Gate and Butterfly Valves and Appurtenances

All underground gate valves, underground butterfly valves, valve boxes, indicator posts, and appurtenances shall meet the requirements of Section 60.03 - Underground Valves.

L. Copper Tubing

Copper tubing shall be soft drawn ASTM B88 seamless Type K.

M. Corporation Stops

Corporation stops shall be 85-5-5-5 ASTM B62 brass, full port ball type, 300 PSI cold water working pressure, threaded end by flare copper end. One-inch corporation stops shall be furnished with flare nuts with integral wire connectors for connection of Number 2 thaw wire to the corporation stop.

N. Curb Stops

Curb stops shall be 85-5-5-5 ASTM B62 brass, full port ball type, 300 PSI cold water working pressure, flare copper both ends. Curb stops shall be designed so that the tubing downstream of the curb stop can drain back through the curb stop when the curb stop is closed.

O. Service Saddles

Service saddles for connection of corporation stops to 24-inch or smaller nominal diameter ductile iron water mains shall be ductile iron with double alloy straps, nitrile O-ring gasket, and female threaded connection, "Mueller DB2A" or Doyon Utilities' Authorized Representative accepted equal.

Service saddles for connection of corporation stops to 12-inch or smaller nominal diameter HDPE water mains shall be ductile iron saddle body, with two each 2-inch wide Type 304 stainless steel straps, Type 304 stainless steel bolting materials including spring washers, NBR gasket, and "CC" female threaded connection, "Romac 202-NH" or Doyon Utilities' Authorized Representative accepted equal.

P. Key Boxes

Key boxes, with non-removable operating rods, shall be "Mueller 10306" or Doyon Utilities' Authorized Representative approved equal.

Q. Thaw Wire for Copper Tubing

Thaw wire shall be stranded Number 2 AWG copper wire with HMWPE insulation suitable for direct burial.

R. Detectable Underground Warning Tape

Detectable underground warning tape shall be 5-mil by 6-inch wide aluminum backed blue tape with the words "Caution Buried Water Line Below". Detectable underground warning tape shall be "Seton" or Doyon Utilities' Authorized Representative accepted equal.

Article 2.3 Construction

A. Materials Delivery, Handling, and Temporary Storage

Pipe and appurtenances shall be handled in such a manner to ensure delivery to the trench in a sound, undamaged condition. Particular care shall be taken not to damage the pipe, pipe coating, or lining. Before installation, the pipe and appurtenances shall be examined for defects and/or damage by the Doyon Utilities' Authorized Representative.

On-site storage of pipe and other materials shall be to the satisfaction of Doyon Utilities' Authorized Representative to avoid inconvenience and/or potential safety hazards.

Rubber gaskets shall be protected from freezing temperatures or direct sunlight.

B. Removal and Off-Site Disposal of Contaminated Soil

Unless the contamination was caused by Contractor's operation, discovery of contaminated material will be treated as a changed condition. The Contractor shall remove and dispose of all contaminated soils encountered within the trench area. Contaminated soils shall not be re-used as fill material anywhere on JBER, but shall be disposed of at a disposal location directed by Doyon Utilities' Authorized Representative.

C. Minimum Depth of Cover on Water Lines

All water mains, fire hydrant assembly piping, fire lines, water services, and permanent vent assemblies shall be constructed with a minimum of 10-feet of earth cover from proposed finished grade.

Minimum 10-foot depths for water services shall be maintained to 5-feet horizontal inside of building footings.

D. Installation of Water Mains, Fire Hydrant Assembly Piping, Fire Lines, and Ductile Iron Water Services

Installation shall be in accordance with the requirements of AWWA C600. The interior of the pipe and accessories shall be thoroughly cleaned of foreign matter prior to installation.

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

All ductile iron pipe, fittings, valves, valve boxes, indicator posts, and hydrants shall be encased in one layer of polyethylene encasement in accordance with Section 60.06 - Polyethylene Encasement.

Pipe and appurtenances shall be carefully lowered into the trench by means of fabric slings, wire rope chokers, rope tag lines, and other suitable lifting and rigging gear. Pipe placement, including on-site handling, installing in the trench, and backfilling, shall be done to the satisfaction of Doyon Utilities' Authorized Representative to prevent damage to the pipe as well as ductile iron pipe cement lining and polyethylene encasement.

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 *w*ork 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 pipe or fittings.

All adjustments to line and grade shall be done by removing undisturbed earth as required or filling with suitable compacted gravel or bedding material under the pipe, but not by forcing the pipe down or blocking or wedging the pipe up.

All ductile iron pipe joints shall conform to the requirements of AWWA C600.

Ductile iron pipe thrust joint restraint components shall be installed in strict accordance with manufacturers' recommended procedures and to the satisfaction of Doyon Utilities' Authorized Representative. Thrust restraint systems shall be installed where the pipeline terminates or changes alignment, utilizing a tee, cross, bend, or similar fitting. A minimum of 72-feet of piping shall be completely restrained on both piping legs all bends, on both piping legs at tees and crosses with two piping legs and where piping turns 90^{o}, on branch legs at tees and crosses, and at all piping dead ends. Piping stub-outs shorter than 72-feet shall be completely restrained including connections to mains.

Use of thrust blocks shall only be allowed when transitioning from existing unrestrained piping to new piping or at other locations where specifically shown on the Plans or directed by Doyon Utilities' Authorized Representative.

Transitions between ductile iron and HDPE pipe shall be made using ANSI 16.5 Class 150 flange sets.

At flanged outlets for future piping connections, flange bolts and nuts shall be Type 304 stainless steel heavy hexagonal.

All HDPE pipe joint butt fusion shall conform to ASTM F2620 and the pipe manufacturer's recommendations for proper equipment and procedures. The HDPR pipe supplier shall supply a qualified representative acceptable to Doyon Utilities' Authorized Representative to instruct the Contractor's personnel on butt fusion, and to witness the first twenty butt fusion joints.

All HDPE pipe shall be spiral wrapped with #12 tracer wire. Six-inch nominal diameter and larger HDPE pipe shall receive two spiral wraps of #12 tracer wire. Full spiral wrap lengths shall not exceed 2-feet. Splices in tracer wire shall be insulated with mastic pads, and mastic pads shall be secured with vinyl electrical tape. All splice details shall be to the satisfaction of Doyon Utilities' Authorized Representative. At intervals on HDPE water mains not to exceed 500-feet in length, trace wire leads shall be brought to the surface. Trace wire lead sets shall be located so that the entire HDPE main can be located. Trace wire leads shall extend from the pipe to 3-feet minimum above finished grade and shall be permanently housed in valve boxes or in valve box top sections to provide accessibility for future use. The Contractor shall demonstrate continuity of all trace wires to the satisfaction of Doyon Utilities' Authorized Representative.

Permanent vent assemblies shall be provided at all water line high points to remove air prior to water line hydrostatic testing. Installation of permanent vent assemblies is described later in Article 2.3.G below.

At a sufficient distance, prior to encountering a known obstacle or tie-in to an existing pipe, the Contractor shall expose and verify the exact location of the obstacle or tie-in point so that proper alignment and/or grade may be determined and any required adjustments can be made.

All ductile iron pipe water line tie-in locations, methods, and fit-ups shall be subject to Doyon Utilities' Authorized Representative acceptance. Tie-ins must be made in either straight runs of water line or where the water line horizontal alignment deflects 90 degrees. If a tie-in is to be made between two straight segments of water line on the same alignment, the tie-in shall be made using a push-on joint or a single mechanical joint if possible, or using a mechanical joint "long sleeve" as shown in the Standard Details. If a tie-in is to be made between two perpendicular segments of new water line, the tie-in shall be made using a single 90 degree bend, a single tee, or a single cross. Tie-ins at bends less than 90 degrees shall not be permitted. Tie-ins using non-restrained couplings shall not be permitted. Both water line sections at a tie-in shall be restrained using thrust restraint components specified above.

When making a tie-in to an in-service water line, a "bell hole" type sump shall be excavated at the tie-in location. Water accumulating in the sump at a tie-in shall be pumped down or otherwise removed so that the water level in the sump is at all times at least two feet below the invert level of the tie-in.

If tie-in components will not be subjected to disinfection after completion of the tie-in, the interior surfaces of new and existing pipe, fittings, and/or valves shall be thoroughly cleaned of all dirt and debris and thoroughly swabbed with a strong chlorine solution just prior to assembly of the tie-in, all to the satisfaction of Doyon Utilities' Authorized Representative.

Pipe ends left for future connections shall be plugged, capped, or blind flanged, and restrained as specified above. The Contractor shall install a new vertical 4-inch by 4-inch pressure treated wood post directly over the end of pipe. In non-traffic areas, the 4-inch by 4-inch pressure treated wood post shall extend at least one foot above finished grade, shall be painted blue, and shall be permanently fitted with 3-inch diameter red plastic reflectors on all four sides. In vehicular and/or pedestrian traffic areas, the 4-inch by 4-inch pressure treated wood post shall be cut off at a depth below grade as directed by Doyon Utilities' Authorized Representative.

Where pipe or other component structural integrity, mechanical integrity, coating, lining, and/or polyethylene encasement is/are damaged as determined by Doyon Utilities' Authorized Representative, the damaged pipe or component shall be replaced if directed by Doyon Utilities' Authorized Representative, or repaired if acceptable to Doyon Utilities' Authorized Representative. All leakage repair methods and materials must be accepted by Doyon Utilities' Authorized Representative in advance. Use of repair clamps and similar devices shall not be permitted. Replacement or repair shall be at the Contractor's expense.

E. Additional Requirements for Installation of Ductile Iron Water Services

If a project includes new water main and new water services connected to the new main, new water services shall be completely installed before new water main open bore flushing, pressure testing, and disinfection are completed.

Connections of ductile iron water services to new non-operational ductile iron mains shall be made with standard ductile iron mechanical joint tees in mains and ductile iron mechanical joint concentric reducers as needed in branches.

Connections of ductile iron water services to new non-operational HDPE mains shall be made with flanged HDPE branch connections and flange-by-mechanical joint underground gate valves in conformance with Section 60.03 - Underground Valves.

Connections of ductile iron water services to operational 24-inch or smaller nominal diameter ductile iron or 12-inch or smaller nominal diameter HDPE water mains shall be in accordance with Section 60.07 - Connections to Existing Water Systems.

For connections of ductile iron water services to operational HDPE main pipe larger than 12-inch nominal diameter, the Contractor shall submit a connection plan for acceptance by Doyon Utilities' Authorized Representative.

Service line isolation valves shall be installed at or as close to water mains as possible. Valves and appurtenances shall be installed in conformance with Section 60.03 – Underground Valves.

The Contractor shall install water services perpendicular to the street centerline whenever possible.

For ductile iron water services stubbed out for connection to buildings in the near term, a service line extension shall be installed to a point located 5-feet inside the building footings that is acceptable to Doyon Utilities' Authorized Representative and, at that point inside of the footings, extended upward to four feet minimum above the finished grade.

F. Installation of Copper Water Services

If a project includes new water main and new water services connected to the new main, new water services shall be completely installed before new water main open bore flushing, pressure testing, and disinfection are completed.

Water service connections to pre-existing operational water mains shall be made under line pressure in the main.

The Contractor shall install water services perpendicular to the street centerline whenever possible.

Connections of 1-inch corporation stops to 24-inch or smaller nominal diameter ductile iron main shall be made by directly tapping the water main piping. Connections of 1 ½-inch and 2-inch corporation stops to ductile iron main pipe shall be made using service saddles.

Connections of 1-inch, 1 ½-inch, and 2-inch corporation stops to 12-inch or smaller nominal diameter HDPE main pipe shall be made using service saddles. For HDPE main pipe larger than 12-inch nominal diameter, the Contractor shall submit a plan for corporation stop connections for review and acceptance by Doyon Utilities' Authorized Representative.

All underground connections in copper tubing shall be flare connections. Underground soldered connections shall not be permitted.

No unions shall be installed in the right-of-way in newly constructed copper service lines.

Curb stops and key boxes shall be installed at locations designated by Doyon Utilities' Authorized Representative. The Contractor shall install a new vertical 4-inch by 4-inch by 5-foot pressure treated wood post within one foot horizontal from the key box. The 4-inch by 4-inch pressure treated wood post shall extend one foot above finished grade, shall be painted blue, and shall be permanently fitted with 3-inch diameter red plastic reflectors on all four sides.

For copper water services stubbed out for connection to buildings in the near term, a service line extension shall be installed from the curb stop to a point located 5-feet inside the building footings that is acceptable to Doyon Utilities' Authorized Representative and, at that point inside of the footings, extended upward to one foot minimum above the finished grade.

For copper water services stubbed out for future use, a copper bleeder line with a diameter equal to the service line diameter shall be connected to the curb stop and extended 1-foot above the finished grade within one foot of the key box. The bleeder line shall be attached to the wooden post marking the key box with a copper 2-hole strap.

Bleeders or extended service line extensions shall be used for open bore flushing, disinfection, and sampling of water services for bacteriological testing. After satisfactory bacteriological testing results are obtained from new water services, bleeders and extended services shall be shall be capped above grade with flare copper caps.

G. Installation of Permanent Vent Assemblies

Permanent vent assemblies shall be installed at all high points in water lines.

All underground connections in copper tubing shall be flare connections. Underground soldered connections shall not be permitted.

Each permanent vent assembly shall include a 1-inch nominal diameter corporation stop, with a flare nut with integral #2 wire connector, installed at top dead center at the high point of the water line to be vented. A 1-inch nominal diameter copper tubing shall be connected to the corp stop, then smoothly "gooseneck" transitioned from vertical to horizontal and extended, at a depth below finished grade of 10-feet or greater, to a 1-inch nominal diameter curb stop with key box located as called out on the Plans or as directed by Doyon Utilities' Authorized Representative.

The 1-inch tubing "gooseneck" at the corp stop shall be insulated with 4-inches of board insulation 4-feet square.

The key box shall extend one foot above finished grade. A thaw wire shall extend from the corp stop, along horizontal tubing to and up the key box, with a 3-foot long tail day-lighted and wrapped around the key box.

From the curb stop, a 1-inch nominal diameter copper tubing riser shall be installed vertically to 3-feet above finished grade. The tubing shall daylight within 2-feet of the key box. A 6-inch by 6-inch by 8-feet long treated timber post shall be buried vertically, with 4-feet exposed above finished grade, adjacent to the point where the copper tubing riser day-lights.

The treated timber post shall be painted blue, and shall be permanently fitted with 3-inch diameter red plastic reflectors on all four sides.

The copper tubing riser shall attach to the treated timber with three each 1-inch copper two-hole straps. A cast copper sweat 90^{o} elbow, cast copper sweat 90^{o} street elbow, and cast copper sweat by FNPT street adapter, all 1-inch nominal diameter, shall be soldered onto the end of riser with lead-free solder, so that the riser discharges vertically downward.

H. Water Line Separation Requirements from Sanitary Sewers and Storm Drains

All water lines, including mains, fire hydrant assemblies, fire lines, services, and permanent vent assemblies, shall be constructed to meet all separation requirements of 18 AAC 80.020, or the following requirements, whichever are more stringent:

1. Water lines shall be installed at least 10-feet horizontal out-to-out from parallel sanitary sewers or storm drains (mains, sewer services, catch basin leads, etc).
2. Water line pipe at sanitary sewer or storm drain crossings shall be installed such that no water line pipe joints are located less than 9-feet horizontal from the centerline of the sanitary sewer or storm drain at the point of intersection of water/sewer or water/storm drain horizontal alignments.
3. Where water lines cross sanitary sewer or storm drain lines, the vertical separation between the water lines and sanitary sewer or storm drain lines shall be 18-inches minimum out-to-out between exterior pipe surfaces.
4. At crossings, water lines within 10-feet of sanitary sewer or storm drain line crossings, and sanitary sewer or storm drain lines exposed at water line crossings, shall all be bedded from 6-inches below to 6-inches above the line with Class B bedding material in accordance with Division 20.

I. Alignment and Grade

All water lines shall be constructed with a minimum of 10-feet of cover from finished grade.

The Contractor shall lay the pipe in the trench so that after the line is completed, the bottom of the pipe conforms accurately to the grades and alignments shown on the Plans. A maximum two-tenths foot (0.2') deviation from design elevation and alignment will be allowed. In tangent sections, the pipe shall be generally straight to visual observation as determined by Doyon Utilities' Authorized Representative.

Pipe joint deflection from a straight line or grade at any ductile iron push-on joint, as necessary to meet horizontal or vertical curve radius requirements or grade break requirements, shall not exceed two-thirds (2/3) of the manufacturer's maximum recommended deflection. If the required radius of curvature cannot be accomplished using standard pipe lengths and joint deflections of not more than two-thirds (2/3) of the manufacturer's maximum recommended deflection, then the Contractor shall furnish bends or shorter lengths of pipe to meet the specified radius or grade break while maintaining joint angular deflections within the limits allowable.

The Contractor also shall employ qualified persons for controlling alignment and grade, and shall use standard survey instruments such as transits, engineer's levels, and laser devices, all in good repair and calibration, for controlling line and grade. The Contractor shall record line and grade measurements in a standard survey field book for each installed pipe and appurtenance, and shall promptly furnish copies of notes to Doyon Utilities' Authorized Representative. Line and grade personnel, survey instruments, procedures, and survey notes shall be subject to acceptance by Doyon Utilities' Authorized Representative.

J. Installation of Continuity Straps and Test Leads on Ductile Iron Pipe

Two parallel electrical continuity straps shall be exothermically welded to all ductile iron piping on both sides of every joint to provide redundant electrical continuity paths across each joint. This requirement shall apply to mains of all diameters, fire hydrant assembly piping, fire lines, and services.

At intervals on water mains, fire lines, and other ductile iron water lines not to exceed 500-feet in length, at fire hydrants, and at piping stub-out, fire line, and water service ends, sets of two parallel electrical continuity test leads shall be installed. Test lead sets shall be located so that all ductile iron pipe can be continuity tested. Test leads shall extend from the pipe to 3-feet minimum above finished grade and shall be permanently housed in valve boxes or in valve box top sections to provide accessibility for future use.

Continuity straps and test leads shall be exothermically welded to a clean, dry, freshly ground bright metal pipe surface. Weld procedures and quality shall be subject to acceptance by Doyon Utilities' Authorized Representative. All welds and bare pipe surfaces are to be coated with coal tar pitch or other suitable coating, all to the satisfaction of Doyon Utilities' Authorized Representative.

K. Installation of Detectable Underground Warning Tape

All ductile iron, HDPE, and copper water lines shall be marked with detectable underground warning tape. The Contractor shall install detectable underground warning tape directly above and parallel to the axis of water lines with no breaks in continuity. The Contractor shall install the locator tape three feet (3') below finish grade or two feet (2') deep in the street structural section.

L. As-building

The Contractor shall obtain accurate GPS coordinates on all pipe tie-ins, bends, grade breaks, points of curvature and tangency, at even 50-foot and 100- foot stations in horizontal curves, at dead ends, stub-outs, tees and crosses, corporation stops, valve boxes, key boxes, and other locations called out in Division 65 or requested by Doyon Utilities' Authorized Representative, and record these coordinates on as-built drawings.

Horizontal pipe bends shall be monumented at finished grade with typical pipe angle markers per the Standard Details.

Article 2.4 Flushing, Testing, and Disinfection

A. Sequence of Operations

All water mains, fire hydrant assemblies, fire lines, water services, and/or permanent vent assemblies in a new system shall be completely installed and, except as necessary for open bore flushing and test copper removal, backfilled to finished grade prior to flushing, testing, and disinfection activities. Flushing, testing, disinfection, and related activities shall be completed in the following order:

1. Open bore flushing of all water mains, fire lines, water services, and permanent vent assemblies in the system.
2. Removal of ductile iron and HDPE open bore flush piping, permanent closure of ductile iron and HDPE water lines at bore flush piping attachment points, and backfilling to finished grade.
3. Fire hydrant assembly flushing (after installation of all hydrant barrel extensions).
4. Hydrostatic testing of all water mains, fire hydrant assemblies, water services, and permanent vent assemblies in the system to a minimum of 150-psi for 30 minutes with no pressure loss.
5. Hydrostatic testing of all fire lines in the system to a minimum of 200-psi for 120 minutes with no pressure loss.
6. Line pressure testing of all fire hydrants.
7. Disinfection of all water mains, fire hydrant assemblies, fire lines, water services, and permanent vent assemblies in the system.
8. Bacteriological testing of water mains, fire hydrant assemblies, fire lines, water services, and permanent vent assemblies.
9. Test copper removal and backfilling to finished grade.
10. Ductile iron water main, fire hydrant assembly piping, fire line, and water service continuity testing.
11. HDPE water main trace wire continuity testing.

Detailed flushing, testing, disinfection, and related requirements are as follows.

B. Open Bore Flushing

All newly installed water lines shall be open-bore flushed to remove any foreign matter. First, open-bore flushing shall be accomplished at each ductile iron and/or HDPE extremity on or attached to a main, including all dead ends, stub-outs, fire lines, and water services. Temporary open bore flush piping for ductile iron and HDPE water lines shall include a single full line size 45-degree bend and full line size straight piping rising out of the trench, discharging at a height of 3 to 4-feet above grade onto an 8-foot by 8-foot plywood splash pad.

During open bore flushing, safe access acceptable to Doyon Utilities' Authorized Representative shall be provided to the point of discharge from bore flush piping. Open bore flushing shall continue until discharge is visually clear to the satisfaction of Doyon Utilities' Authorized Representative. Bore flush discharge shall be channeled and controlled by the Contractor to avoid erosion, other damage, and/or safety hazards. The Contractor shall furnish, install, and remove all open bore flush piping and splash pads. Under no circumstances will open-bore flushing through hydrants or reduced outlets be permitted. Fire hydrant auxiliary valves shall be closed during open bore flushing.

After open-bore flushing shall be completed at each ductile iron and/or HDPE extremity on or attached to a main, temporary bore flush piping shall be removed, water lines shall be permanently sealed at points of attachment of temporary bore flush piping, and bore flush locations shall be backfilled to finished grade.

After temporary ductile iron and/or HDPE bore flush piping has been removed and water lines are sealed and backfilled, then all copper water services and permanent vent assemblies shall be open bore flushed until discharge is visually clear to the satisfaction of Doyon Utilities' Authorized Representative. Copper water services shall be open bore flushed through bleeders or extended water services.

C. Fire Hydrant Flushing

After open bore flushing, after any and all required hydrant barrel extensions are installed, but prior to hydrant pressure testing, and prior to disinfection, fire hydrants shall be flushed per Section 60.04 - Fire Hydrant Assemblies.

D. Water Line Hydrostatic Testing (Except Fire Lines)

A water line hydrostatic test will be conducted on all newly constructed water mains, fire hydrant assembly piping leads, stub-outs, water services, and permanent vent assemblies, in accordance with the requirements of AWWA C600 unless hereinafter modified. The Contractor shall furnish all necessary equipment, labor, materials, and supplies necessary to complete the test to the satisfaction of Doyon Utilities' Authorized Representative. The Contractor shall suitably valve-off all connections to existing or previously-tested water lines at Contractor expense, prior to making the required hydrostatic test. Prior to testing, all air shall be expelled from all water lines that are being tested.

Before hydrostatic testing, any test coppers, temporary caps or plugs, and/or other required temporary piping as necessary to facilitate pressure testing and disinfection, shall be completely installed to the satisfaction of Doyon Utilities' Authorized Representative.

Immediately prior to a hydrostatic test, all intermediate valves, including fire hydrant assembly auxiliary valves, within the section being tested, shall be opened in the presence of Doyon Utilities' Authorized Representative. Only line pressure will be allowed on the opposite side of the end valves of the section being tested.

Test pumps for hydrostatic testing shall be attached to the water lines through test coppers. Use of fire hydrant and service connections for test pump attachment will not be allowed.

Water lines shall be hydrostatically tested at a constant pressure of one hundred fifty (150) psi minimum with no detectable pressure drop for a duration of 30 minutes. If necessary because of topography, water main profile, and test pump location, the hydrostatic test pressure shall be increased as directed by Doyon Utilities' Authorized Representative to assure that the entire water line is exposed to a test pressure of at least 150-psi. After the required test pressure has been reached, pumping will be terminated. If the pressure remains constant for 30 minutes without additional pumping, the test shall be considered satisfactory by Doyon Utilities' Authorized Representative.

Any water line leakage detected during pressure testing shall be located and repaired at Contractor expense to the satisfaction of Doyon Utilities' Authorized Representative.

At the end of a successful hydrostatic test, pressure shall be released at a water line location remote from the test pump connection to prove the integrity of the hydrostatic test.

E. Fire Line Hydrostatic Testing

Fire lines shall be hydrostatically tested separately from other water lines. Requirements for fire line pressure testing shall be similar to other water line hydrostatic testing as described in Article 2.4.C above, except that fire lines shall be tested for 120 minutes at 200-psi with no pressure drop, in accordance with the Fire Underwriter's requirements as outlined in the National Fire Codes.

F. Fire Hydrant Pressure Testing

After water line hydrostatic testing, but prior to disinfection, fire hydrants shall be pressure tested per Section 60.04 - Fire Hydrant Assemblies.

G. Disinfection

Prior to beginning the disinfection process, all intermediate main line valves, as

well as hydrant auxiliary, fire line, and water service line valves in the pipe section to be disinfected shall be opened.

Chlorine shall be used for disinfection in accordance with the most current edition of AWWA C651. Chlorine shall be in conformance with NSF Standard 60 and shall be supplied by calcium hypochlorite and water mixture. Calcium hypochlorite shall be HTH or DU Authorized Representative approved equal. Forms of chlorine for disinfection, other than calcium hypochlorite, shall be subject to acceptance of Doyon Utilities' Authorized Representative.

All chlorine solution injection shall be injected through a test copper. Under no conditions shall the chlorine solution be introduced through a fire hydrant.

Chlorine solution shall be injected at the beginning of the water line section to be disinfected, adjacent to a potable water supply connection, ensuring disinfection of the entire water line.

Potable water shall be fed slowly into the new water line by slightly opening a supply valve to allow flow from an adjacent in-service potable water line, while chlorine solution is simultaneously injected into the new water line near the potable water supply in amounts to produce a minimum dosage of at least twenty-five parts per million (25 ppm) chlorine in the new water line. Injection of the chlorine solution shall continue until the required dosage is measured at all extremities of the new water line. Immediately after the required chlorine dosage is measured at all extremities, the supply valve allowing potable water to flow from the adjacent water line shall be closed to prevent backflow of chlorine solution.

The table below is a guide for chlorinating water mains with a granular calcium hypochlorite/water solution. The Contractor shall use a dosage per one hundred feet (100') that results in a minimum chlorine solution of twenty-five parts per million (25 ppm).

Granular HTH Dosages (65% active ingredients)

Pipe Nominal Diameter	Dosage (Ounces per 100 Feet)
4"	0.34
6"	0.76
8"	1.34
10"	2.10
12"	3.02
14" & Larger	$3.02 \times D^2$ **

** Where D is the pipe nominal diameter **in feet**.

One Heaping Tablespoon ≅ 0.5 Ounce

If a chlorinating agent other than granular HTH with 65% active ingredients is used, the dosage must be adjusted proportionally. Caution shall be exercised against producing an excessive concentration of chlorine in the line.

A residual of not less than ten parts per million (10 ppm) chlorine shall be measured at all extremities of the water line after twenty-four (24) hours or more following completion of chlorine injection into the water line. This residual shall then be flushed from the line at its extremities until the measured chlorine residual at all discharge points is equal to that of the potable water supply used for chlorination.

The Contractor shall dispose of chlorination solution in a manner acceptable to Doyon Utilities' Authorized Representative. Under no circumstances shall the Contractor allow discharged chlorination solution to enter surface waters or to cause public safety or nuisance conditions.

The Contractor may submit alternate disinfection methods to Doyon Utilities' Authorized Representative for review.

H. Water Line Bacteriological Testing and Acceptance of Disinfection

Prior to acceptance of disinfection of any new water main, fire line, fire hydrant assembly, water service line, permanent water line vent, or any combination of the above, water from each extremity of that system or line shall be sampled for bacteriological testing by the Contractor and delivered to an acceptable potable water testing laboratory for testing, all in the presence of Doyon Utilities' Authorized Representative. When satisfactory bacteriological test results have been obtained for each sample, then disinfection of the system or line shall be accepted. If unsatisfactory bacteriological test results are obtained from one or more samples, disinfection shall not be accepted, and additional disinfection, sampling, and testing shall be repeated at Contractor expense until satisfactory results are obtained for all test samples.

I. Test Copper Removal

Upon written approval of Doyon Utilities' Authorized Representative, the Contractor shall remove all test coppers, permanently close and seal all associated corporation stops with copper discs and flare nuts installed in the presence of Doyon Utilities' Authorized Representative, and backfill test copper excavations to finished grade.

J. Ductile Iron Water Line Continuity Tests

Continuity tests shall not be performed until all excavation has been completed and backfilled.

A sufficient number of continuity tests shall be conducted so that all new ductile iron pipe is continuity tested.

All equipment, instruments, labor, and supplies necessary to provide and measure input and return currents shall be supplied by the Contractor.

During each continuity test, the Contractor shall maintain a circuit of at least six hundred (600) amperes DC of input current for a period of fifteen (15) minutes. Return current shall be at least ninety percent (90%) of the input circuit.

All continuity tests will be through continuity test leads. The use of water service thaw wires, fire hydrants and valve boxes as substitutes for wires will not be accepted.

K. HDPE Water Line Trace Wire Continuity Tests

The Contractor shall demonstrate continuity of all HDPE water line trace wires to the satisfaction of Doyon Utilities' Authorized Representative.

SECTION 60.03 UNDERGROUND VALVES

Article 3.1 General

The work under this Section includes providing of underground gate and butterfly valves with valve boxes and marker posts, or underground gate valves with indicator posts and bollards where required.

Refer to Section 60.01 for additional general requirements.

Article 3.2 Material

Unless specifically shown otherwise on the Plans or directed by Doyon Utilities' Authorized Representative, 12-inch and small underground valves shall be resilient seat gate valves and underground valves larger than 12-inch shall be butterfly valves.

A. Underground Gate Valves

Gate valves shall be of suitable design and construction for underground service. Gate valves shall be cast iron or ductile iron body resilient wedge type rated for 250 PSI cold water working pressure, and in full compliance with AWWA C509 or C515 and NSF Standard 61. The wedge shall be cast or ductile iron encapsulated in nitrile rubber, and shall seat equally well against flow in either direction. The stem and wedge nut shall be manganese bronze. All exposed interior and exterior surfaces of the valve body, bonnet, and stuffing box shall have a fusion bonded epoxy coating, complying with AWWA C550 and NSF Standard 61, applied electro-statically prior to valve assembly. Gate valves shall be either mechanical joint both ends, ANSI B16.5 Class 150 flanged both ends, or mechanical joint one end and ANSI B16.5 Class 150 flanged one end, as appropriate for the particular application. Gate valves shall have non-rising stems with triple O-ring seals. Gate valves shall have 2-inch square operating nuts, and shall open when the operating nuts are turned counterclockwise. Gate valves shall be American Flow Control Series 2500, Mueller 2360 Series, US Pipe Metroseal 250, or Doyon Utilities' (Doyon Utilities') Authorized Representative's accepted equal.

B. Underground Butterfly Valves

Butterfly valves shall be of the rubber-seated tight-closing type. They shall meet or exceed the performance requirements of AWWA C504 for operational pressures of 150 psi working pressure and 300 psi hydrostatic pressure.

Mechanical joint valve ends shall be per AWWA C110 and AWWA C111 of the latest revision, and "Short-Body" in accordance with the requirements of Table 2 of AWWA C504. Accessories (bolts, glands, and gaskets) shall be supplied by the valve manufacturer.

Butterfly valve actuator bolts that are exposed shall be Type 316 stainless steel with a minimum tensile strength of 75,000 PSI and shall conform to ASTM F593 and F594. All bolts shall be stamped with the grade marking on the head of the bolt, and shall be "T-316", "316", or "F593".

Valves must use full AWWA C504 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 A126 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 C504, except that no retaining fasteners or other hardware shall be permitted in the flow stream.

Valve operators shall be of the traveling nut type, sealed, gasketed, and lubricated for underground service and capable of withstanding on overload input torque of four hundred fifty (450) foot-pounds 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. Butterfly valves shall have 2-inch square operating nuts, and shall open when the operating nuts are turned counterclockwise.

For butterfly valves twenty inches (20") and less, the valve shaft shall be one piece extending full size through valve bearings, disc and shaft seal. In the event that the shaft is turned down to fit connections to the operator, the limits of AWWA C504, 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.

For butterfly valves over twenty inches (20"), 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 C504 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. Valve Boxes for Underground Valves

Valve box castings shall include a top section with lid, bottom section, and dust cup. Valve boxes shall be 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 not be 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 the workmanship shall be acceptable to Doyon Utilities’ Authorized Representative.

Cast iron soil pipe for valve box risers shall be hub-type, 5-inch nominal diameter by 10-foot laying length.

D. Indicator Posts for Underground Gate Valves on Fire Lines

Where underground fire lines enter buildings, and/or elsewhere where called out on the Plans or in the Special Provisions, or where directed by Doyon Utilities’ Authorized Representative, adjustable indicator posts shall be provided to both manually operate underground gate valves and visually indicate status of underground gate valves by displaying the words “Open” or “Shut”. Indicator posts shall be UL listed and Factory Mutual approved, counterclockwise opening, and designed for up to 900 foot-pounds of torque input. Indicator posts shall be provided with base plates that bolt onto gate valve bonnets to support the installed posts. Indicator posts shall be Mueller, American Flow Control, or Doyon Utilities’ Authorized Representative’s accepted equal.

E. Markers for Underground Valves

Valve boxes shall be marked with markers consisting of 2-inch nominal Schedule 40 by 6-feet 8-inches long galvanized steel pipe sections.

F. Bollards for Indicator Posts

Bollards shall be 4-inch nominal diameter Schedule 80 by 6-feet 8-inches long concrete filled steel pipe.

Article 3.3 Construction

A. General

Valves shall be installed where shown on the Plans or as directed by Doyon Utilities’ Authorized Representative.

All valves shall be inspected by the Contractor, including cycling from full closed to full open and back to full closed, prior to installation to ensure that all parts are in working condition. Valves interiors shall also be cleaned of all foreign matter prior to installation.

If a valve is at the end of a line, it shall be sealed with a standard mechanical joint pipe plug or cap or blind flange as appropriate prior to backfilling.

Butterfly valves shall be installed with valve operator on the side of the water main away from the centerline of the street or easement.

Valves, valve boxes, and indicator posts shall be polyethylene encased in accordance with Section 60.06 –Polyethylene Encasement.

B. Valve Boxes

Provisions shall be made to prevent soil infiltration into valve boxes. A valve shall be wrapped in burlap inside the valve box bottom section under the packing gland and wrapped again outside the valve box bottom section with three (3) layers of non-woven geotextile fabric. Geotextile fabric shall be secured with tape to the satisfaction of Doyon Utilities' Authorized Representative.

Valve box components shall be plumb and centered over the operating nut.

If the length of required soil pipe for a valve box at a particular valve location is less than 10-feet, a single 10-foot piece of new soil pipe shall be cut to length and installed at that location. If the length of required soil pipe for a valve box at a particular valve location is greater than 10-feet, then a full 10-foot length of new soil pipe and a maximum of one cut-to-fit length of new soil pipe shall be installed at that location.

Where two sections of soil pipe are required to complete a valve box, use of removable guides shall be required. Guides shall be nominal 4-inch pipe diameter to fit inside of soil pipe riser, shall couple onto valve operating nuts, and shall be of sufficient length to extend the full height of the riser plus one foot minimum, all to assure that valve boxes will be installed straight and plumb. Guides shall remain in place until valve boxes are backfilled full height.

C. Indicator Posts and Bollards

For valves with indicator posts located adjacent to a building, these valves shall be installed at a distance of at least 40-feet outside of building so that the valves can be accessed in the event of building collapse or other disaster.

Indicator posts shall be installed in strict accordance with manufacturers' recommendations.

Four pipe bollards shall be provided for each indicator post. Bollards shall be 6-feet 8-inches long, and shall extend 3-feet above finished grade. Bollards shall be set plumb at 2-feet horizontally from indicator posts, and at 90^{o} from one another when viewed from above. Bollards shall be filled with 3,500-PSI concrete, neatly domed at the top. Bollards shall be painted a color selected by Doyon Utilities' Authorized Representative and marked with full wraps of 4-inch red reflective adhesive tape. Bollard installation shall be to the satisfaction of Doyon Utilities' Authorized Representative.

If, in the opinion of Doyon Utilities' Authorized Representative, bollards at some indicator post locations are not required, the uninstalled bollards shall be delivered by the Contractor to the Doyon Utilities storage yard and carefully off-loaded and stored on Contractor-provided wooden pallets or other suitable dunnage.

D. Valve Marker Posts

Valve markers shall be painted a color selected by Doyon Utilities' Authorized Representative and marked with permanent 2-inch high black numerals showing the distance and direction to valves being marked. Markers shall be located outside of traveled ways and snow plow areas in locations acceptable to Doyon Utilities' Authorized Representative. Valve markers shall not be required where valve boxes are located in paved areas.

If, in the opinion of Doyon Utilities' Authorized Representative, valve markers at some valve locations are not required, the uninstalled markers shall be delivered by the Contractor to the Doyon Utilities storage yard and carefully off-loaded and stored on Contractor-provided wooden pallets or other suitable dunnage.

E. Valve Box Inspection, Cleaning, and Repair

The Contractor shall expose all valve boxes for pre-final and final inspection. The Contractor shall clean all debris from valve boxes and correct any other deficiencies to the satisfaction of Doyon Utilities' Authorized Representative prior to acceptance.

F. As-Builting

The Contractor shall obtain accurate GPS coordinates for all valve boxes and indicator posts and shall clearly record these coordinates on as-built drawings.

SECTION 60.04 FIRE HYDRANT ASSEMBLIES

Article 4.1 General

The work under this Section includes construction of "L-base" fire hydrant assemblies, including the single pumper or double pumper fire hydrants as shown on the Plans or directed by Doyon Utilities' Authorized Representative, main tees, piping from mains to hydrants, auxiliary gate valves, valve boxes, joint restraint at all pipe, fitting, valve, and hydrant joints, continuity straps, continuity test leads, guard posts, polyethylene encasement, flushing, testing, disinfection, and incidentals.

Refer to Section 60.01 for additional general requirements.

Article 4.2 Materials

A. Fire Hydrants

Fire hydrants shall conform to the requirements of AWWA C502 for dry barrel fire hydrants. Fire hydrants shall be Mueller Super Centurion or Doyon Utilities' Authorized Representative accepted equal.

1 All fire hydrants shall be supplied with a 5.25-inch main valve opening.

2 All single pumper hydrants shall be furnished with 6-inch standard mechanical-joint piping connections. All double pumper hydrants shall be furnished with 8-inch standard mechanical-joint piping connections.

3 Single pumper hydrants shall be furnished with two each 2.5-inch hose connections and one each 4.5-inch pumper connection.

4 Double pumper hydrants shall be furnished with one each 2.5-inch hose connection and two each 4.5-inch pumper connection s.

5 Unless otherwise required by the Contract Documents, all hydrants shall be furnished with a barrel length that will allow a minimum of 10-feet of bury.

6 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 shutoff.

7 All fire hydrants shall be furnished with a breakaway flange which 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.

8 Operating and nozzle nuts shall be pentagon shaped with 1.5-inch point to flat measurements.

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

10 All working parts shall be bronze or non-corrosive metal in accordance with the requirements of AWWA C502.

11 All hydrants shall open when the operating nuts are turned counter-clockwise.

B. Ductile Iron Pipe, Fittings, Gaskets, Thrust Restraints, and Bolting Materials

All ductile iron pipe fittings, gaskets, thrust restraints, and bolting materials shall meet the requirements of Section 60.02 - Water Lines.

C. Auxiliary Gate Valves

All gate valves and valve boxes shall meet the requirements of Section 60.03 - Underground Valves.

D. Polyethylene Encasement

Polyethylene encasement for hydrants, hydrant leg piping, auxiliary valves, and valve boxes shall meet the requirements of Section 60.06 – Polyethylene Encasement.

E. Continuity Straps and Test Leads

Continuity straps and test leads shall meet the requirements of Section 60.02 – Water Lines.

F. Exothermic Weld Materials

Exothermic weld materials shall meet the requirements of Section 60.02 – Water Lines.

G. Board Insulation

Board insulation shall meet the requirements of Division 20.

H. Guard Posts

The Contractor shall furnish four each 4-inch nominal diameter by 6-foot 8-inch long Schedule 40 steel guard posts for each hydrant installation in accordance with the Standard Details.

I. Detectable Underground Warning Tape

Detectable underground warning tape shall meet the requirements of Section 60.02 – Water Lines.

Article 4.3 Construction

A. Installation

All hydrant leg piping shall be constructed with a minimum of 10-feet of cover from finished grade.

Fire hydrant assemblies shall be constructed to meet all separation requirements of 18 AAC 80.020 from sanitary sewer and storm drain lines. These requirements are summarized in Article 2.3.H, Section 60.02 – Water Lines**.**

The Contractor shall install the hydrant assemblies in accordance with the Standard Details.

All fire hydrant legs shall be installed level and in accordance with Section 60.02 - Water Lines. All mechanical and push-on joints in hydrant leg piping from hydrant main tees to hydrants shall be restrained.

Auxiliary gate valves and valve boxes shall be installed in accordance with Section 60.03 - Underground Valves.

The fire hydrant barrel shall be installed plumb.

Hydrant drain plugs shall be installed in hydrants located where the seasonal high groundwater table is at, above, or within 2-feet vertical below the hydrant base, or where directed by Doyon Utilities' Authorized Representative. Otherwise, drain plugs shall be removed.

Polyethylene encasement of piping, valves, hydrants, and valve boxes shall be installed per Section 60.06 – Polyethylene Encasement.

Joint continuity straps and test leads at fire hydrants shall be installed in accordance with Section 60.02 - Water Lines. Continuity test leads shall be installed at new fire hydrants and elsewhere as needed so that fire hydrant assemblies can be continuity tested from the main to the hydrant within test segments of 500-feet maximum length.

Board insulation for hydrant leg piping shall be installed in accordance with Division 20.

The fire hydrant auxiliary valve shall be closed during installation and remain closed during all main line open bore flushing operations. The auxiliary gate valve shall be opened for hydrant extension, hydrant flushing, water line hydrostatic pressure testing, hydrant pressure testing, and disinfection.

All fire hydrant barrel extension shall be completed by Doyon Utilities.

After installation is complete, the Contractor shall paint fire hydrants a finish color designated by Doyon Utilities' Authorized Representative.

After hydrant paint has suitably cured, the Contractor shall mark, with permanent black marker on the bonnet flange, the direction and distance to the nearest one-tenth foot (0.1') from the hydrant to the hydrant auxiliary valve box.

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

B. Hydrant Flushing

After open bore flushing and after any and all required hydrant barrel extensions are installed, but prior to hydrant pressure testing and prior to disinfection, all new fire hydrant auxiliary valves shall be opened and each new fire hydrant shall be flushed until discharge is visually clear to the satisfaction of Doyon Utilities' Authorized Representative. Fire hydrant flush discharge shall be channeled and controlled by the Contractor to avoid erosion, other damage, and/or safety hazards.

C. Hydrant Pressure Testing

After water line hydrostatic testing, but prior to disinfection and guard post installation, each hydrant shall be pressure tested at normal line pressure in the presence of Doyon Utilities' Authorized Representative. With all hydrant port caps securely in place, and with the water main pressurized to normal line pressure, the auxiliary valve and foot valve for each extended hydrant shall be opened, allowing pressurized water to fill each hydrant for a period of 10 minutes. Any detectable leakage through hydrant barrel joints during this test shall be repaired at Contractor expense to the satisfaction of Doyon Utilities' Authorized Representative. Testing shall be repeated if necessary until no leakage is detected during a 10 minute test.

D. Hydrant Guard Post Installation

Hydrant guard posts shall be installed as shown in the Standard Details. If, in the opinion of Doyon Utilities' Authorized Representative, some or all guard posts at various hydrant locations are not required, the uninstalled posts shall be delivered by the Contractor to the Doyon Utilities storage yard and carefully off-loaded and stored on Contractor-provided wooden pallets or other suitable dunnage.

E. Installation of Detectable Underground Warning Tape

All fire hydrant assembly piping shall be marked with detectable underground warning tape. The Contractor shall install detectable underground warning tape directly above and parallel to the axis of the fire hydrant assembly piping with no breaks in continuity. The Contractor shall install the locator tape three feet (3') below finish grade or two feet (2') deep in the street structural section.

F. Continuity Testing

Continuity testing of fire hydrant assemblies shall be in accordance with Section 60.02 – Water Lines.

G. As-Builting

The Contractor shall obtain accurate GPS coordinates for all fire hydrant assembly main tees, bends, and valve boxes, and shall clearly record these coordinates on record drawings.

SECTION 60.05 GALVANIC ANODES

Article 5.1 General

The work under this Section includes providing galvanic anodes for corrosion protection of ductile iron water lines.

Refer to Section 60.01 for additional general requirements.

Article 5.2 Materials

A. Anodes

Anodes utilized for typical galvanic anode system installation shall be prepackaged magnesium style anodes weighing twenty (20) pounds. Anode composition shall consist of the following;

Element	Amount (%)
Cu	0.001
Si	0.01
Zn	2.5 – 3.5
Mn	0.2 – 0.5
Ni	0.001
Al	5.5 – 6.5
Fe	0.005
All Others	0.01
Magnesium	Balance

Anodes shall be packaged in a low resistive backfill consisting of seventy-five percent (75%) gypsum, twenty percent (20%) bentonite, and five percent (5%) sodium sulfate.

Anodes shall be provided with #10 AWG stranded copper single-conductor cable with HMWPE insulation. This cable shall be rated for six hundred (600) volts and designed for direct burial applications.

B. Exothermic Weld Materials

Exothermic weld materials shall meet the requirements of Section 60.02 – Water Lines.

Thermite weld caps, to protect the exothermic welds from corrosion, shall be “Royston Handy Cap 2” or Doyon Utilities’ Authorized Representative accepted equal.

Article 5.3 Construction

Galvanic anodes shall be installed in accordance with the Standard Details and general procedures described below:

A. Anode Placement

Anodes shall be installed on the trench bottom at 12-inches to 36-inches from the side of the pipe. Anodes shall be placed on either side of the pipeline, one anode per every second pipe joint.

B. Lead Wire Connection to Pipe

The #10 AWG HMWPE lead wires shall be exothermically welded to the top dead center of the pipe in strict conformance with exothermic weld manufacturer's recommended procedures. Lead wires shall be welded to a clean, dry, freshly ground bright metal pipe surface. Weld procedures and quality shall be subject to acceptance by Doyon Utilities' Authorized Representative.

Completed welds shall be capped with thermite weld caps. Bare pipe surfaces not covered by thermite weld caps shall be coated with coal tar pitch to the satisfaction of Doyon Utilities' Authorized Representative.

C. Bedding

Anodes and lead wires shall be bedded, from 6-inches below to 12-inches above anodes and wires, in Class "B" bedding per Division 20 to avoid damage during backfilling and compaction. One foot of Class "B" bedding shall be placed over anodes and lead wires prior to compaction.

D. As-Builting

The Contractor shall obtain accurate GPS coordinates for galvanic anodes, and shall clearly record these coordinates on as-built drawings.

SECTION 60.06 POLYETHYLENE ENCASEMENT

Article 6.1 General

The work under this Section consists of providing a layer of polyethylene encasement on all ductile mains, fire lines, water services, fire hydrants, valve boxes, indicator posts, etc.

Refer to Section 60.01 for additional general requirements.

Article 6.2 Material

The polyethylene encasement material for pipe shall be 8-mils thick and conform to AWWA C105.

Article 6.3 Construction

The polyethylene encasement shall be installed in strict conformance to the methods described in the most current editions of AWWA C105 and the Ductile Iron Pipe Research Association's "A Guide for the Installation of Ductile Iron Pipe."

Bedding and backfill material around pipelines with polyethylene encasement shall be carefully placed to the satisfaction of Doyon Utilities' Authorized Representative to protect the polyethylene encasement from becoming torn, punctured or otherwise damaged during the Work. Damage to the integrity of the polyethylene encasement shall be either repaired, or the pipeline removed and the polyethylene encasement replaced, as directed by Doyon Utilities' Authorize Representative and all at Contractor expense.

SECTION 60.07 CONNECTIONS TO EXISTING WATER SYSTEMS

Article 7.1 General

The work under this Section includes connections to existing operational ductile iron or HDPE water lines by using existing plugged, capped, or blind flanged stub-outs, tees, or crosses, or by hot tapping.

Refer to Section 60.01 for additional general requirements.

Article 7.2 Material

A. Piping Materials for 3-Inch Nominal Diameter and Larger Connections to Existing Piping

Piping materials for 3-inch nominal diameter and larger connections to existing piping shall be in accordance with Section 60.02 – Water Lines.

B. Tapping Sleeve Kits for 3-Inch Nominal and Larger Branch Diameters

Tapping sleeve kits for ductile iron main sizes from 4-inch to 24-inch nominal diameter and branch sizes from 3-inch to 12-inch nominal diameter shall include a two-part full encirclement shell, an ANSI B16.5 Class 150 flanged outlet, test plug, and all necessary bolting and gasket materials for complete installation. The shell, lifter bars, armors, branch outlet, test plug, and all bolting materials shall be Type 304 stainless steel. The flange shall be ductile iron, ASTM 536-80, Grade 65-45-12. The wrap-around shell gasket and flange gasket shall be virgin SBR in compliance with NSF Standard 61. Tapping sleeve kits shall be "Romac Industries Ductile+Plus SST" or Doyon Utilities' Authorized Representative approved equal.

Tapping sleeve kits for HDPE main sizes from 4-inch to 12-inch nominal diameter and branch sizes from 3-inch to 10-inch nominal diameter shall be similar to tapping sleeve kits for ductile iron mains, but shall include stainless steel spring washers. Tapping sleeve kits shall be "Romac Industries SST-H" or Doyon Utilities' Authorized Representative approved equal.

For ductile iron and HDPE main and/or branch sizes not addressed above, and other main types than ductile iron or HDPE, tapping sleeve kits shall be as shown on the Plans, specified in the Special Provisions, or as directed by Doyon Utilities' Authorized Representative.

C. Underground Gate Valves and Appurtenances for 3-Inch Nominal Diameter and Larger Connections

Underground gate valves with valve boxes and valve markers or with indicator posts and bollards shall be as specified in Section 60.03 - Underground Valves.

Valves for hot tapping shall be flange-by-mechanical-joint or flange-by-flange as shown on the Plans or as directed by Doyon Utilities' Authorized Representative.

D. Bolting Materials

Mechanical joint tee bolts, flange bolts, and nuts shall be as specified in Section 60.02 – Water Lines.

E. Tapping Saddles for 1-Inch to 2-Inch Nominal Diameter Connections

Tapping saddles, as required for hot tapping of 1 1/2-inch and 2-inch connections to existing operational ductile iron water lines, or for hot tapping of 1-inch to 2-inch connections to existing operational HDPE water lines, shall be as specified in Section 60.02 - Water Lines.

F. Corporation Stops for 1-Inch to 2-Inch Nominal Diameter Connections

Corporation stops for hot tapping of 1-inch to 2-inch connections to existing operational ductile iron or HDPE water lines shall be as specified in Section 60.02 - Water Lines.

Article 7.3 Construction

A. Use of Existing Connection Points for 3-Inch Nominal and Larger Connections

Where possible, connections to existing water mains shall utilize existing mechanical joint or flanged stubs, tees, crosses, and or other standard outlets.

B. General Connection Requirements for 3-Inch Nominal and Larger Connections

New valves shall be installed at all new connections to existing water mains. If an existing valve is installed at a tie-in location, the existing valve shall be removed and replaced with a new valve.

Valves, valve boxes, maker posts, indicator posts, bollards, and/or other appurtenance installation details shall be as specified in Section 60.03 - Underground Valves.

C. Hot Tapping Requirements for 3-Inch Nominal and Larger Branch Diameters

Hot tapping supervisory personnel shall have a minimum of 5 years of experience in hot tapping of water mains.

The Contractor shall submit procedures and supervisory personnel resume(s) for hot tapping, for review and acceptance by Doyon Utilities' Authorized Representative. No hot tapping shall commence until Doyon Utilities' Authorized Representative written acceptance of Contractor procedures and supervisory personnel resume(s) is provided.

Hot tapping procedures that have been accepted by Doyon Utilities' Authorized Representative shall be strictly followed in the field. All hot tapping operations shall at all times be prudently conducted to ensure sanitation and uninterrupted service of "live" water lines.

Tapping saddle installations on mains shall be in strict accordance with manufacturer's recommendations and subject to acceptance by Doyon Utilities' Authorized Representative.

Hot tapping supervisory personnel shall be directly onsite at all times when hot tapping operations are in progress.

All supplies used for hot tapping shall conform to NSF Standard 61.

D. Hot Tapping Requirements, 1-Inch and 2-Inch Nominal Branch Diameters

Hot tapping equipment and procedures shall be in strict accordance with corporation stop manufacturer's recommendations.

E. Visual Inspection and Leak Repair

Any visually detectable leaks at new connections to existing water mains shall be repaired to the satisfaction of Doyon Utilities' Authorized Representative.

F. Disinfection

After a new tie-in valve is in place, and just before connecting new piping to the tie-in valve, the valve interior on the downstream side shall be thoroughly cleaned and swabbed with strong chlorine solution, all to the satisfaction of Doyon Utilities' Authorized Representative

G. As-Builting

The Contractor shall obtain accurate GPS coordinates for new connections to existing water systems, and shall clearly record these coordinates on as-built drawings.

SECTION 60.08 WATER METER ASSEMBLIES

Article 8.1 General

The work under this Section consists of construction of water meter assemblies inside military or on-base commercial building mechanical rooms or residential mechanical rooms, basements, or crawl spaces. Each meter assembly shall include the following components, listed in order of flow direction from upstream to downstream:

1. An inside connection to the water line supplying the building, which may be either a direct connection to a 2-inch nominal or smaller copper water service line, a direct connection to a 3-inch nominal or larger ductile iron water service line, or a copper or ductile iron water service branch connection tapped onto a larger fire line that supplies the building.
2. A check valve downstream of the connection to the water service or fire line.
3. A by-pass tee, with branch oriented right or left, downstream of the check valve.
4. A water meter with two each isolation valves, one on each side of the water meter, all installed downstream of the by-pass tee described above.
5. A second by-pass tee, with branch oriented right or left, installed downstream of the meter and isolation valves.
6. A branch bypass lines around the water meter, with two each 90^{o} bends and a single shut-off valve in the bypass line.
7. A cap or blind flange with gasket at the discharge end of the water meter assembly to prevent accidental discharge prior to connection of building plumbing to the water meter assembly.
8. Pipe, valve, and meter supports to the satisfaction of Doyon Utilities' Authorized Representative.
9. Incidental piping and appurtenances as necessary for a complete, workable, and code compliant system.

Meter assembly piping shall be either rigid copper tubing with sweat joints, cast copper sweat fittings, and bronze solder end valves, rigid copper tubing with press fittings and valves, or ductile iron pipe, ductile iron flanged fittings, and flanged valves.

Refer to Section 60.01 for additional general requirements.

Article 8.2 Material

A. <u>Water Meters</u>

Water meters shall be supplied by Doyon Utilities. The table below provides end connection information for water meters of various sizes:

Meter Size	End Connection Type
1”	MNPT
1-1/2” & 2”	AWWA 2-bolt elliptical flange
3” and larger	ANSI 16.5 Class 150 flange

B. Copper Tubing, Fittings, and Solder

Rigid seamless Type L copper tubing in conformance with ASTM B88 shall be used for water meter assemblies from 1-inch minimum to 2-inch maximum nominal diameter.

Cast copper sweat fittings shall conform to the requirements of ASME B16.22.

Solder, flux, and related products shall be lead free in accordance with NSF Standard 61.

Press copper fittings shall conform to the requirements of ASME B16.18 and NSF Standard 61. Press copper fittings shall “Viega ProPress Zero Lead” or Doyon Utilities’ Authorized Representative accepted equal.

C. Bronze Valves

Bronze valves shall be used for 1-inch minimum to 2-inch maximum nominal diameter water meter assemblies.

Bronze solder end gate valves shall be 200-psi minimum cold water pressure rated, Class 125, solder ends, rising stem, threaded bonnet, solid disc wedge, in compliance with MSS-SP-80 Type 2, “Stockham Figure B-109” or Doyon Utilities’ Authorized Representative accepted equal.

Bronze solder end swing check valves shall be 200-psi minimum cold water pressure rated, Class 125, solder ends, bronze disc, threaded cap, in compliance with MSS-SP-80 Type 3, “Stockham Figure B-309” or Doyon Utilities’ Authorized Representative accepted equal.

Bronze press end ball valves shall be 600-psi minimum cold water pressure rated, press ends, Type 316 stainless steel trim, metal handle, EDPM and PTFE seals, in compliance with MSS-SP-110 and NSF Standard 61, “Viega ProPress Model 2970.3”, or Doyon Utilities’ Authorized Representative accepted equal.

Bronze press end spring check valves shall be 400-psi minimum cold water pressure rated, press ends, EDPM seals, in compliance with MSS-SP-80 and NSF Standard 61, “Viega ProPress Model 2974”, or Doyon Utilities’ Authorized Representative accepted equal.

D. Ductile Iron Pipe, Fittings, Gaskets, & Bolting Materials

Ductile iron pipe and fittings shall 3-inch nominal diameter and larger water meter assemblies.

Ductile iron pipe, fittings, gaskets, and bolting materials shall be in accordance with Section 60.02 – Water Lines, except that ductile iron pipe for use with thread-on flanges shall be Class 53.

E. Iron Body Flanged Valves

Iron body valves shall be used for 3-inch nominal diameter and larger water meter assemblies.

Iron body gate valves, 3-inch nominal diameter and larger, shall be 200-psi minimum cold water pressure rated, ANSI 16.5B Class 150 flanged, rising stem, bolted bonnet, solid disc wedge, OS&Y, "Stockham Figure G-623" or Doyon Utilities' Authorized Representative accepted equal.

Iron body swing check valves, 3-inch nominal diameter and larger, shall be 200-psi minimum cold water pressure rated, ANSI 16.5B Class 150 flanged, bolted cap, with lever and weight, "Stockham Figure G-931 L&W" or Doyon Utilities' Authorized Representative accepted equal.

F. Meter Coupling Tail Pieces and AWWA 2-Bolt Elliptical Companion Flanges

Meter coupling tail pieces for 1-inch nominal diameter water meters shall be bronze, FNPT spud nut by male sweat end, with rubber gasket in conformance with NSF Standard 61.

AWWA 2-bolt elliptical companion flanges for 1 1/2-inch and 2-inch nominal diameter water meters shall be brass sweat, with rubber gasket in conformance with NSF Standard 61, and stainless steel bolting materials.

G. Piping and Valve Supports and Appurtenances

Piping support materials shall be as shown on the Plans or as directed by Doyon Utilities' Authorized Representative. Minimum piping and valve supports shall be single-leg, H-shaped, and/or inverted-L-shaped unistrut supports, including but not limited to the following hot dip galvanized components: "B-Line B-22 Channel, B232 Three Hole Corner Brackets, B280SQ Post Bases, B2015 through B2022 Pipe Clamps, B2029 through B2037 O.D. Tubing Clamps, B1999 Vibra-Cushion, B822 Plastic End Caps, HHCS ½" x 1" hex head cap screws, and N225 ½-inch Spring Nuts" or Doyon Utilities' Authorized Representative accepted equals.

Anchor bolts for connecting unistrut post bases to concrete floors shall be Type 304 stainless steel, diameter as required to match post bases, 4-inch minimum length, "Redhead" or Doyon Utilities' Authorized Representative accepted equal. Type 304

stainless steel flat washers, lock washers, and heavy hex nuts shall be provided for all anchor bolts.

Article 8.3 Construction

A. Code Compliance

All water meter assembly work shall be in accordance with the most current International Plumbing Code and all other applicable codes, and shall be done under the direct supervision of a journeyman plumber and a Mechanical Administrator, both properly licensed by the State of Alaska.

B. Water Service Line and Fire Line Flushing, Testing, and Disinfection

Water service lines and fire lines shall be open bore flushed, pressure tested, disinfected, sampled, bacteriologically tested with satisfactory results, and continuity tested prior to connection of water meter assemblies.

C. Water Meter Assembly Sizing

Where water meter assemblies connect directly to copper or ductile iron water service lines, the nominal diameter of the water meter assembly shall match the nominal diameter of the water service line. Where water meter assemblies branch connect to fire lines, the nominal diameter of the water meter assembly shall be as shown on the Plans or as directed by Doyon Utilities' Authorized Representative.

D. Water Meter Assembly Location, Construction, Supports, and Testing

Water meter assembly layout and location shall be as directed by Doyon Utilities' Authorized Representative. Water meter assemblies shall be compact, but large enough to allow for maintenance activities including but not limited to water meter removal and replacement.

Unless directed otherwise by Doyon Utilities' Authorized Representative, water meter assemblies shall be piped in the horizontal plane.

For water meter assemblies piped in the horizontal plane, all gate valves in a water meter assembly shall be installed so that operating wheels are directly above the valves that they operate.

Caps or blind flanges with gaskets shall be installed at the discharge ends of all water meter assemblies to avoid accidental discharge prior to connection of building potable water plumbing to the water meter assembly.

All copper sweat joint soldering shall be in conformance with ASTM B828 and the International Plumbing Code.

All press joints shall be in conformance with the International Plumbing Code.

Typical direct connections of water meter assemblies to copper water services shall be made by installing a cast copper sweat fitting or press fitting, usually a 90° long turn elbow (to transition from vertical water service piping to horizontal water meter assembly piping), onto the copper water service line, followed by properly supported Type L copper tubing with cast copper sweat or press fittings as necessary to connect to the water meter assembly in the location designated by Doyon Utilities' Authorized Representative.

Typical direct connections of water meter assemblies to ductile iron water services shall be made by installing a restrained flange coupling adapter on vertical ductile iron water service pipe, followed by a flanged ductile iron 90° elbow (to transition from vertical water service piping to horizontal water meter assembly piping), followed by properly supported flanged straight spool pieces and fittings as necessary to connect to the water meter assembly in the location designated by Doyon Utilities' Authorized Representative.

Typical branch connections of 2-inch nominal diameter and smaller water meter assemblies to ductile iron fire water lines shall be made by installing a restrained flange coupling adapter on vertical ductile iron fire line, followed by a flanged tee with branch horizontal and with a blind flange and gasket installed on the top flange of the tee. A FNPT concentric tapped blind flange shall be installed on the branch outlet of the flanged tee. The FNPT blind flange tap shall match the nominal diameter of the water meter assembly. A cast copper MNPT-by-female sweat or press union shall be threaded into the blind flange tap. From the union, properly supported Type L copper tubing with cast copper sweat or press fittings shall be installed as necessary to connect to the water meter assembly in the location designated by Doyon Utilities' Authorized Representative.

Typical branch connections of 3-inch nominal diameter and larger water meter assemblies to ductile iron fire lines shall be made by installing a restrained flange coupling adapter on the vertical ductile iron fire line, followed by a flanged straight or reducing tee with branch horizontal, and with a blind flange and gasket installed on the top flange of the straight or reducing tee. Properly supported flanged straight spool pieces, flanged bend fittings, and if required, one flanged concentric reducer, shall be installed as necessary downstream of the fire line straight or reducing tee branch to connect to the water meter assembly in the location designated by Doyon Utilities' Authorized Representative.

Piping, valve, and meter supports shall be as shown on the Plans, or shall be unistrut single leg or H-shaped double leg floor support assemblies, and/or unistrut inverted-L-shaped floor/wall support assemblies, or shall be of other types proposed by the Contractor, all of sufficient quantity and spacing to securely support meters, piping, valves, and all to the satisfaction of Doyon Utilities' Authorized Representative. Steel fabricated supports for piping, valve, and meters shall be anchor bolted to floors and/or walls.

All completed water meter assemblies shall be visually inspected for leaks. Any leaks shall be repaired at Contractor expense.

E. Water Meter Assembly Electrical Continuity

All water meter assemblies shall be constructed so that electrical continuity is provided from interior building piping across the water meter assembly to the water service line or fire line serving the building. If required for continuity, electrical jumpers shall be installed to the satisfaction of Doyon Utilities' Authorized Representative.

SECTION 60.09 WATER STORAGE TANKS

Article 9.1 General

The work under this Section addresses construction of water storage tanks.

Refer to Section 60.01 for additional general requirements.

Article 9.2 Material

Materials for water storage tanks shall be as shown on the Plans and/or as specified in the Special Provisions.

Article 9.3 Construction

Water storage tanks shall be constructed in accordance with the Plans and the Special Provisions.

SECTION 60.10 BOOSTER STATIONS

Article 10.1 General

The work under this Section addresses construction of booster stations.

Refer to Section 60.01 for additional general requirements.

Article 10.2 Material

Materials for booster stations shall be as shown on the Plans and/or as specified in the Special Provisions.

Article 10.3 Construction

Booster stations shall be constructed in accordance with the Plans and the Special Provisions.

SECTION 60.11 PRESSURE REDUCING STATIONS

Article 11.1 General

The work under this Section addresses construction of pressure reducing stations.

Refer to Section 60.01 for additional general requirements.

Article 11.2 Material

Materials for pressure reducing stations shall be as shown on the Plans and/or as specified in the Special Provisions.

Article 11.3 Construction

Pressure reducing stations shall be constructed in accordance with the Plans and the Special Provisions.

SECTION 60.12 TEMPORARY WATER SYSTEMS

Article 12.1 General

The work under this Section includes design, construction, installation, operation, maintenance, and removal of temporary water mains and services to all current customers in an area impacted by water system construction and associated water outages longer than 6-hours.

Exact methods for providing temporary water service shall be the responsibility of the Contractor. Surface piping, trailer mounted supply systems, or other systems may all be considered as long as these systems comply with ADEC regulations and requirements specified herein.

At least 14-days prior to beginning work on any temporary water system, the Contractor shall submit a written plan to Doyon Utilities' Authorized Representative and the State of Alaska, Department of Environmental Conservation (ADEC) for review and acceptance. The plan must include a detailed description of the proposed system, drawings showing the proposed temporary supply, mains, and water services to each existing water customer presently served by Doyon Utilities and affected by a proposed shutdown of longer than 6-hours, proposed maintenance and operation procedures, written and fully executed "Permission to Enter" agreements from the proper authorities regarding access and water supply to the various buildings proposed for temporary water service, and the names and phone numbers of a contact person and at least one alternate who shall be available on call on a 24-hour basis for repair and/or maintenance of the temporary water system.

A copy of ADEC written acceptance of temporary water system plans shall be provided to Doyon Utilities' Authorized Representative.

In the event that the Contractor fails to repair and/or maintain the temporary system and Doyon Utilities is required to perform repairs and/or maintenance, said repairs and/or maintenance shall be at Contractor expense.

Refer to Section 60.01 for additional general requirements.

Article 12.2 Material

Temporary main pipe shall be a minimum of 3-inches nominal diameter and temporary service piping shall be a minimum of 3/4-inches nominal diameter. Temporary water mains and services shall be constructed from one or more of the following materials: polyvinyl chloride (PVC), high-density polyethylene (HDPE), copper, ductile iron, or galvanized steel. All materials shall be in conformance with NSF Standard 61.

Article 12.3 Construction

A. Permission and Notifications

Prior to constructing temporary water services, the Contractor shall secure a signed "Permission to Enter" from proper authority responsible for each building to be supplied by the temporary water system. Such permission shall hold Doyon Utilities and its agents harmless for any claims resulting from damage or harm sustained due to the Contractor's operation.

Doyon Utilities' Authorized Representative shall be notified five (5) calendar days prior to the beginning of construction of any temporary water system. Doyon Utilities' Authorized Representative shall be present to inspect the disinfection process and sampling of temporary water services.

First written notice of temporary water supply, acceptable to Doyon Utilities' Authorized Representative, shall be provided by the Contractor to all affected customers at least seven (7) calendar days prior to actually placing customers on temporary water supply. A second written notice of temporary water supply, acceptable to Doyon Utilities' Authorized Representative, shall be provided by the Contractor to all affected customers at least 24-hours prior to actually placing customers on temporary water supply.

B. Use of Fire Hydrants

Fire hydrants may be used as a water source for a temporary water system. The Contractor will be required to obtain a hydrant permit from Doyon Utilities and will be required to meet all permit conditions. (Winter use of a hydrant shall required special permission from Doyon Utilities.) In addition, the Contractor shall provide a gate valve assembly at the fire hydrant as a shutoff valve for the temporary water system, and shall furnish and install a backflow prevention device and water meter at the fire hydrant. The Contractor shall be responsible for any damage to the hydrant and shall repair such damage at no cost to Doyon Utilities.

C. Temporary System Requirements

Temporary water service shall be supplied to each water system customer that is served by Doyon Utilities and that is affected by a water supply shutdown of greater than 6-hours.

The following minimum criteria shall be used for service to each water system customer:

1. Forty (40) psi minimum to 100-psi maximum static delivery pressure measured at the connection to a water system customer.

2. A minimum of 5-gallons per minute flow at the above delivery pressure measured at the connection to the structure. Some water system customers may require higher water flows.
3. Potable water system and water quality shall conform to 18 AAC 80 Alaska Drinking Water Standards.
4. All services to water system customers shall be valved to allow individual control of service to each water system customer.

Prior to disinfection, all temporary water system mains and service lines shall be open bore flushed to the satisfaction of Doyon Utilities' Authorized Representative.

All temporary water service equipment and piping shall be disinfected per, AWWA C652 and AWWA C651. All bacteriological samples shall be taken at all connection points to the temporary system and shall be tested by a testing laboratory certified by the State of Alaska. Satisfactory bacteriological test results shall be obtained prior to connecting to any water system customer. All temporary water service equipment and piping shall be re-disinfected and re-tested with satisfactory results each and every time the equipment and/or piping is disconnected and then connected to another water system customer. Copies of all bacteriological test reports, satisfactory or not, shall be provided to Doyon Utilities' Authorized Representative as soon as possible after results are made available from the testing laboratory.

D. Isolation from Permanent Water System

Following the successful connection to the temporary water system, and just prior to turning temporary water on to a water system customer, that customer's existing permanent water service key box or shutoff valve shall be closed to prevent back-feeding of water from the temporary system through the permanent service connection to the main.

E. Plumbing Modifications

If supply of temporary water necessitates plumbing modifications in a water customer's building, this work shall be in accordance with the most current International Plumbing Code and all other applicable codes, and shall be done under the direct supervision of a journeyman plumber and a Mechanical Administrator, both properly licensed by the State of Alaska.

SECTION 60.13 RELOCATION OF DUCTILE IRON OR HDPE WATER LINES

Article 13.1 General

The work under this Section includes rerouting of new ductile iron or HDPE water lines to avoid previously unknown obstructions, or relocation of existing ductile iron or HDPE water lines to avoid conflict with new utilities. All relocations shall acceptable to Doyon Utilities' Authorized Representative.

Refer to Section 60.01 for additional general requirements.

Article 13.2 Material

A. Piping Materials

Water line piping materials shall conform to the requirements of Section 60.02 – Water Lines.

B. Board Insulation

Board insulation shall conform to the requirements of Division 20.

C. Detectable Underground Warning Tape

Detectable underground warning tape shall conform to the requirements of Section 60.02 – Water Lines.

Article 13.3 Construction

Where water lines are relocated to avoid conflict with sanitary sewer or storm drain lines, relocated water lines shall be constructed to meet all separation requirements of 18 AAC 80.020 from sanitary sewer and storm drain lines. These requirements are summarized in Article 2.3.H, Section 60.02 – Water Lines.

The Contractor may employ the following methods for relocating a water line:

1. For new ductile iron water lines only, deflection of push-on joints on either side of an obstruction as necessary to allow the water line to pass under, over, or beside the obstruction, providing the deflection at any joint does not exceed two-thirds of the pipe manufacturer's recommended maximum deflection.
2. For new HDPE water lines only, deflection of pipe as necessary to allow the water line to pass under, over, or beside the obstruction, providing the radius of HDPE pipe curvature is greater than the pipe manufacturer's recommended minimum radius of curvature.

3. For new or existing water lines, reroute ductile iron water lines using four each 22 ½-degree or 11 ¼-degree bends with straight piping as necessary, or reroute HDPE water lines using four each 30-degree bends with straight piping as necessary. All ductile iron water line bends shall be restrained.

Relocated water lines shall have a minimum of 10-feet of earth cover from finished grade.

All permanent high points created by water line relocations shall be permanently vented per Section 60.02 - Water Lines.

If the clearance between the relocated water line and the storm drain or sanitary sewer is less than 3-feet, at least 4-inches (a minimum of two each 2-inch by 4-foot by 8-foot sheets) of board insulation board shall be installed between the water line and storm drain or sanitary sewer in accordance with Division 20.

Existing water lines shall be disinfected according to AWWA C651 prior to being place back into service.

All ductile iron pipe and fittings shall be encased in one layer of polyethylene encasement in accordance with Section 60.09 – Polyethylene Encasement.

All relocated water line shall be marked with detectable underground warning tape. The Contractor shall install detectable underground warning tape directly above and parallel to the axis of the relocated water line with no breaks in continuity. The Contractor shall install the locator tape three feet (3’) below finish grade or two feet (2’) deep in the street structural section.

The Contractor shall obtain accurate GPS coordinates and elevations for relocated water lines, and shall clearly record these coordinates and elevation data on as-built drawings.

Any horizontal pipe bends in relocated water lines shall be marked at finished grade with typical pipe angle markers per the Standard Details.

SECTION 60.14 RELOCATION OF COPPER WATER SERVICES

Article 14.1 General

The work under this Section includes relocating existing copper water services to provide the required separation from new sanitary sewers or storm drains.

Refer to Section 60.01 for additional general requirements.

Article 14.2 Material

A. Tubing Materials

Copper tubing materials shall conform to the requirements of Section 60.02 –Water Lines.

B. Board Insulation

Board insulation shall conform to the requirements of Division 20.

C. Detectable Underground Warning Tape

Detectable underground warning tape conforms to the requirements of Section 60.02 – Water Lines.

Article 14.3 Construction

Where water services are relocated to provide the required separation from new sanitary sewer or storm drain lines, relocated water services shall be constructed to meet all separation requirements of 18 AAC 80.020 from sanitary sewer and storm drain lines. These requirements are summarized in Article 2.3.H, Section 60.02 – Water Lines.

The Contractor shall excavate the water service connection on either side of the sanitary sewer or storm drain to a sufficient distance to relocate the water service such that the conflict will be eliminated. In no case will the length of relocation of the water service exceed 50-feet.

Relocated copper water services shall have a minimum of 10-feet of earth cover from finished grade.

If the clearance between the relocated water service and the storm drain or sanitary sewer is less than 3-feet, at least 4-inches (a minimum of two each 2-inch by 4-foot by 8-foot sheets) of board insulation board shall be installed between the water service and storm drain or sanitary sewer in accordance with Division 20.

If existing copper water services are separated for any reason, they shall be disinfected according to AWWA C651 prior to being place back into service.

All relocated water service shall be marked with detectable underground warning tape. The Contractor shall install detectable underground warning tape directly above and parallel to the axis of the relocated water service with no breaks in continuity. The Contractor shall install the locator tape three feet (3') below finish grade or two feet (2') deep in the street structural section.

The Contractor shall obtain accurate GPS coordinates and as-built elevation data for relocated water services, and shall clearly record these coordinates and this elevation data on as-built drawings.

SECTION 60.15 REMOVAL AND SALVAGING OF EXISTING FIRE HYDRANT ASSEMBLIES

Article 15.1 General

The work under this Section includes removing and salvaging existing fire hydrant assemblies, disposing of unusable components, and delivering usable components to Doyon Utilities' storage yard.

Refer to Section 60.01 for additional general requirements.

Article 15.2 Material

Piping, gasketing, and bolting materials used in this Work shall conform to the requirements of Section 60.02 – Water Lines.

Article 15.3 Construction

The Contractor shall excavate and remove the fire hydrant assemblies identified on the Plans or directed by Doyon Utilities' Authorized Representative for removal.

Hydrant assemblies shall be carefully excavated and removed in their entirety from the hydrant to the main tee.

Existing water mains shall be disinfected at hydrant assembly removal locations per AWWA C651.

The Contractor shall install a standard mechanical joint plugs or blind flanges as appropriate at the branch connections on the main tees after hydrant removal. Plugs or blind flanges shall be visually inspected for leakage at line pressure prior to backfilling, and any visually detectable leakage shall be repaired to the satisfaction of Doyon Utilities' Authorized Representative.

Hydrant assembly components to be salvaged include the hydrant itself, hydrant leg piping, the auxiliary gate valve, and components of the valve box. Upon inspection of the salvaged hydrant assembly components, Doyon Utilities' Authorized Representative may determine that some of the components are not reusable. These non-reusable items shall be loaded and transported by the Contractor to a disposal site as directed by Doyon Utilities' Authorized Representative. Usable items shall become property of Doyon Utilities and shall be delivered by the Contractor to the Doyon Utilities storage yard and carefully off-loaded and stored on Contractor-provided wooden pallets or other suitable dunnage.

The Contractor shall obtain accurate GPS coordinates on plugged or blind flanged hydrant tees, and shall clearly record these coordinates on as-built drawings.

SECTION 60.16 REPLACEMENT, RESETTING, OR ADJUSTMENT OF VALVE BOXES

Article 16.1 General

The work under this Section includes replacement, resetting, or adjustment of valve boxes for existing water main, fire hydrant auxiliary, fire line, and/or water service valves as follows:

1. Full replacement requires complete removal and disposal of an existing valve box to the valve, followed by installation of a valve box bottom section, burlap and geotextile fabric, soil pipe riser, new valve box top section, lid, and dust pan.
2. Resetting requires partial removal and disposal of an existing valve box to a level acceptable to Doyon Utilities' Authorized Representative, followed by installation of a new soil pipe riser as required, valve box top section, lid, and dust pan.
3. Top section replacement requires complete removal and disposal of an existing valve box top section, followed by installation of a new valve box top section, lid, and dust pan.
4. Adjustment requires temporary removal of an existing valve box top section and appurtenances, addition of new soil pipe riser or shortening of existing soil pipe riser, and resetting of the existing valve box top section at a new elevation.

Refer to Section 60.01 for additional general requirements.

Article 16.2 Material

All materials used in the replacement, resetting, or adjustment of valve boxes shall meet the requirements of Section 60.03 – Underground Valves, and the Standard Details.

Article 16.3 Construction

All valve box replacement, resetting, and adjustment shall be installed in strict accordance with Section 60.03 - Underground Valves, and the Standard Details.

All components of a replaced or reset section of valve box shall be new and undamaged. Damaged components of existing valve boxes to be adjusted shall be replaced with new at Contractor expense.

Replacement, reset, and/or adjusted valve boxes shall be polyethylene encased per Section 60.09 – Polyethylene Encasement.

For valve box replacements, resetting, or adjustments, the valve box top section shall be set as follows: ½-inch below finished grade in concrete sidewalk, asphalt pavement, and similar hard surface areas, flush with the surface in vegetated areas, and 6-inches below finished grade in gravel surfaced areas.

In new concrete sidewalk, new asphalt pavement, or new other hard surfaced areas, the Contractor shall complete all valve box replacements, resetting, or adjustments to finish grade prior to placement of new finished surfacing.

During valve box replacement, resetting, or adjustment, care shall be used to ensure that soil or other foreign matter does not enter valve boxes. If replaced, reset, or adjusted valve boxes require cleaning as determined by Doyon Utilities' Authorized Representative, these valve boxes shall be cleaned to the satisfaction of Doyon Utilities' Authorized Representative at Contractor expense.

The Contractor shall obtain accurate GPS coordinates on replaced, reset and adjusted valve boxes, and shall clearly record these coordinates on as-built drawings.

SECTION 60.17 ADJUSTMENTS OF KEY BOXES

Article 17.1 General

The work under this Section includes adjusting existing key boxes to finished height and/or finished grade. All broken and/or missing key box components shall be replaced with new materials.

Refer to Section 60.01 for additional general requirements.

Article 17.2 Material

All materials used in the key box adjustment shall conform to the requirements defined in Section 60.02 - Water Lines, and the Standard Details.

Article 17.3 Construction

Key boxes to be adjusted shall be shown on the Plans or as directed by Doyon Utilities' Authorized Representative. Unless directed otherwise by the Plans, Specifications, Standard Details, or by Doyon Utilities' Authorized Representative, adjusted key boxes shall be flush with the final ground surface. Adjusted key boxes shall be set to the proper grade and shall be readily accessible for operation of the curb stop.

Lowering of key boxes shall be done by cutting as required and re-threading of the key box with new MNPT threads. Raising of key boxes shall be done by adding a threaded coupling and threaded pipe extension of the length required. Only NPT threaded joints shall be allowed. Non-threaded "quick-connect" style connections assembled with set screws shall not be allowed.

Where key boxes are located in traffic areas such as concrete sidewalk, asphalt pavement, or gravel surfacing, the adjusted key box shall be set 12-inches below grade in a new valve box top section with "Water" cover. The valve box top shall be set below finished grade as follows: ½-inch in concrete sidewalk, asphalt pavement, and similar hard surface areas, and 6-inches below grade in gravel surface areas.

In new concrete sidewalk, new asphalt pavement, or new other hard surfaced areas, the Contractor shall adjust all key boxes to finish grade prior to placement of new finished surfacing.

The Contractor shall obtain accurate GPS coordinates on adjusted key boxes, and shall clearly record these coordinates on as-built drawings.

SECTION 60.18 ABANDONMENT OF PIPE IN PLACE

Article 18.1 General

The work under this Section includes abandonment of existing pipe in place. Where shown on the Plans, authorized in the Special Provisions, or directed by Doyon Utilities' Authorized Representative, the Contractor shall abandon an existing pipeline in place in accordance with the requirements of this Section.

Abandonment of existing pipe in place shall only be allowed if specifically called out on the Plans, authorized in the Special Provisions, or directed by Doyon Utilities' Authorized Representative. Otherwise, existing pipe that is taken out of service in the course of a Doyon Utilities project must be removed and disposed of offsite at a location directed by Doyon Utilities' Authorized Representative.

Refer to Section 60.01 for additional general requirements.

Article 18.2 Material

A. Pumpable Grout Mix

The Contractor shall provide a pumpable grout mix composed of water, sand, cement, and admixtures.

B. Pipe Caps and Restraints

Pipe caps and restraints shall meet the requirements of Section 60.02 – Water Lines.

Article 18.3 Construction

Wherever existing pipe is to be abandoned in place, the Contractor shall empty the line of all water, cap or plug ends of the line, restrain or thrust block pipe ends as necessary to prevent pipe joint separation, and fill the pipe full of pumpable grout, all to the satisfaction of Doyon Utilities' Authorized Representative.

The Contractor shall demonstrate to Doyon Utilities' Authorized Representative that the entire pipe to be abandoned has been filled with pumpable grout prior to backfilling of pipe ends.

In the event that exposed pipe to be abandoned is damaged such that it is not fit for abandonment in place as determined by Doyon Utilities' Authorized Representative, then the Contractor shall excavate to undamaged pipe acceptable to Doyon Utilities' Authorized Representative, neatly cut off and remove the damaged pipe, and begin abandon-in-place operations there. Damaged pipe that cannot be abandoned in place shall be removed and disposed of at a location directed by Doyon Utilities' Authorized Representative.

The Contractor shall obtain accurate GPS coordinates and elevations on the ends of abandoned pipe, and shall clearly record these coordinates, elevations, and abandoned pipe sizes on as-built drawings.

SECTION 60.19 ABANDONMENT OF WATER WELLS

Article 19.1 General

The work under this Section includes abandonment of existing water wells as described in this Section.

Refer to Section 60.01 for additional general requirements.

Article 19.2 Material

A. Pea Gravel

Pea gravel for backfilling of wells shall be free of organics or other deleterious substances, and shall meet the following gradation requirements:

U.S. Standard Sieve	Cumulative % Passing by Weight
1/2”	100
3/8”	85 - 100
#4	10 - 30
#8	0 - 10
#16	0 - 5
#200	0 - 3

B. Bentonite Chips

Bentonite chips shall be 3/8-inch to 3/4-inch in size and shall be in conformance with NSF Standard 60.

C. Concrete

Portland cement concrete shall meet the requirements of Division 30 with a 3,500-psi design strength.

Article 19.3 Construction

The Contractor shall use the following procedure when abandoning the wells:

A. Carefully remove the existing well pump and appurtenances to avoid damage. Upon inspection of the salvaged well pump and appurtenances, Doyon Utilities’ Authorized Representative may determine that some of the components are not reusable. These non-reusable items shall be loaded and transported by the Contractor to a disposal site as directed by Doyon Utilities’ Authorized Representative.

Usable items shall become property of Doyon Utilities and shall be delivered by the Contractor to the Doyon Utilities storage yard and carefully off-loaded and stored on Contractor-provided wooden pallets or other suitable dunnage.

B. Verify the depths from the top of the well casing to the bottom of the well, and to the static water table surface in the well casing, in the presence of and to the satisfaction of Doyon Utilities' Authorized Representative.

C. Backfill the well casing to 5-feet above static water table surface with disinfected pea gravel. Pea gravel shall be disinfected by mixing it in a 25-ppm chlorine/water solution in a cement mixer for at least 5 minutes prior to the backfilling operation. Carefully hand place disinfected pea gravel in the well casing to the satisfaction of Doyon Utilities' Authorized Representative to avoid bridging. Verify the top elevation of disinfected pea gravel to Doyon Utilities' Authorized Representative.

D. Backfill the well casing above disinfected pea gravel for a minimum column height of 15-feet with bentonite chips. Carefully hand place chips in the well casing to the satisfaction of Doyon Utilities' Authorized Representative to avoid bridging. Verify the top elevation of bentonite chips to Doyon Utilities' Authorized Representative. After chips have been placed, absence of bridging has demonstrated, and top elevation of bentonite chips has been verified, slowly pour potable water down the well casing to hydrate the bentonite. Allow the bentonite plug to hydrate for 24 hours before continuing well abandonment. Use the table below as a guide for placement of a minimum 15-foot plug of bentonite chips in well casings of various diameters.

Well Diameter	Pounds of Chips	Gallons of Water
6"	250	25
8"	400	40
10"	600	60
12"	850	85

E. Backfill the well casing from above the bentonite plug to a point fifteen feet (15') below finished grade with pea gravel. Disinfection of this pea gravel is not required in this zone. Verify the top elevation of pea gravel to Doyon Utilities' Authorized Representative.

F. Temporarily cap the well casing, excavate the area adjacent to the top of the well to a depth of 6-feet below finished grade, and cut the casing at a depth of 5-feet below finished grade.

G. Backfill the remaining 10-feet of well casing with tremied concrete.

H. Seal weld a ¼-inch thick steel plate on top of the well casing to ensure that the top of the well casing is sealed.

I. Obtain accurate GPS coordinates on the abandoned well casing, and shall clearly record these coordinates on as-built drawings.

J. Pour a concrete encasement around the top of the sealed well casing to preclude the downward migration of water around the outside of the casing. Prior to forming and pouring concrete, remove any loose subgrade material around the well casing. The encasement shall extend horizontally a minimum 2-foot radius from the center of the well casing all around, and vertically from 12-inches minimum below to 6-inches minimum above the top of the sealed well casing.

K. After concrete has cured for 36-hours, strip forms and carefully backfill the remainder of the excavation to finished grade.

The Contractor may employ an alternate method of abandoning the wells that conforms to the requirements of AWWA A100 and is acceptable to Doyon Utilities' Authorized Representative. In the event the Contractor elects to obtain approval to employ an alternate method, he/she shall first prepare written procedures for alternate well abandonment, secure the approval of the ADEC for these alternate procedures, and then submit alternate procedures with written ADEC approval to Doyon Utilities' Authorized Representative for acceptance. The alternate procedures shall clearly describe in detail the abandonment method the Contractor wishes to employ including references to applicable sections of AWWA A100.

SECTION 60.20 WATER DISTRIBUTION SYSTEM STANDARD DETAILS

Detail	Description
60-1	MJ Cap and Plug
60-2	Thrust Block
60-3	Typical Valve Box
60-4	Single Pumper "L" Base Fire Hydrant Assembly
60-5	Double Pumper "L" Base Fire Hydrant Assembly
60-6	Fire Hydrant Guard Posts
60-7	Water Service Connect – 1"
60-8	Water Service Connect – 1-1/2" and 2"
60-10	Connecting Ductile Iron Pipe to Ductile Iron Pipe
60-11	Typical Pipe Angle Marker
60-13	Anode Detail
60-14	Adjust Service Key Box

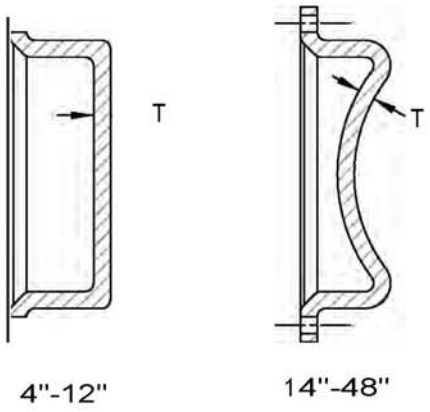
In the event of a conflict between JBER Standard Specifications and the attached 2009 Municipality of Anchorage Standard Details, JBER Standard Specifications shall govern.

All section number references on the attached 2009 Municipality of Anchorage Standard Details shall be disregarded.

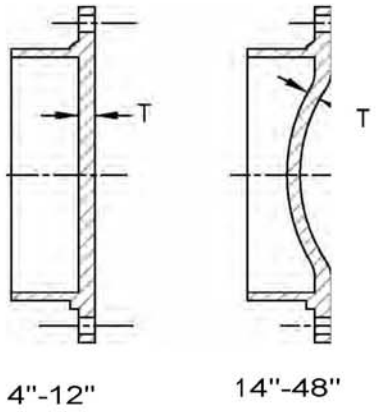
The word "ENGINEER" and similar wording on the attached 2009 Municipality of Anchorage Standard Details shall refer to Doyon Utilities' Authorized Representative.

The words "AWWU", ""MOA", and similar wording on the attached 2009 Municipality of Anchorage Standard Details shall refer to Doyon Utilities.

Any references to payment or pay limits on the attached 2009 Municipality of Anchorage Standard Details shall be disregarded.



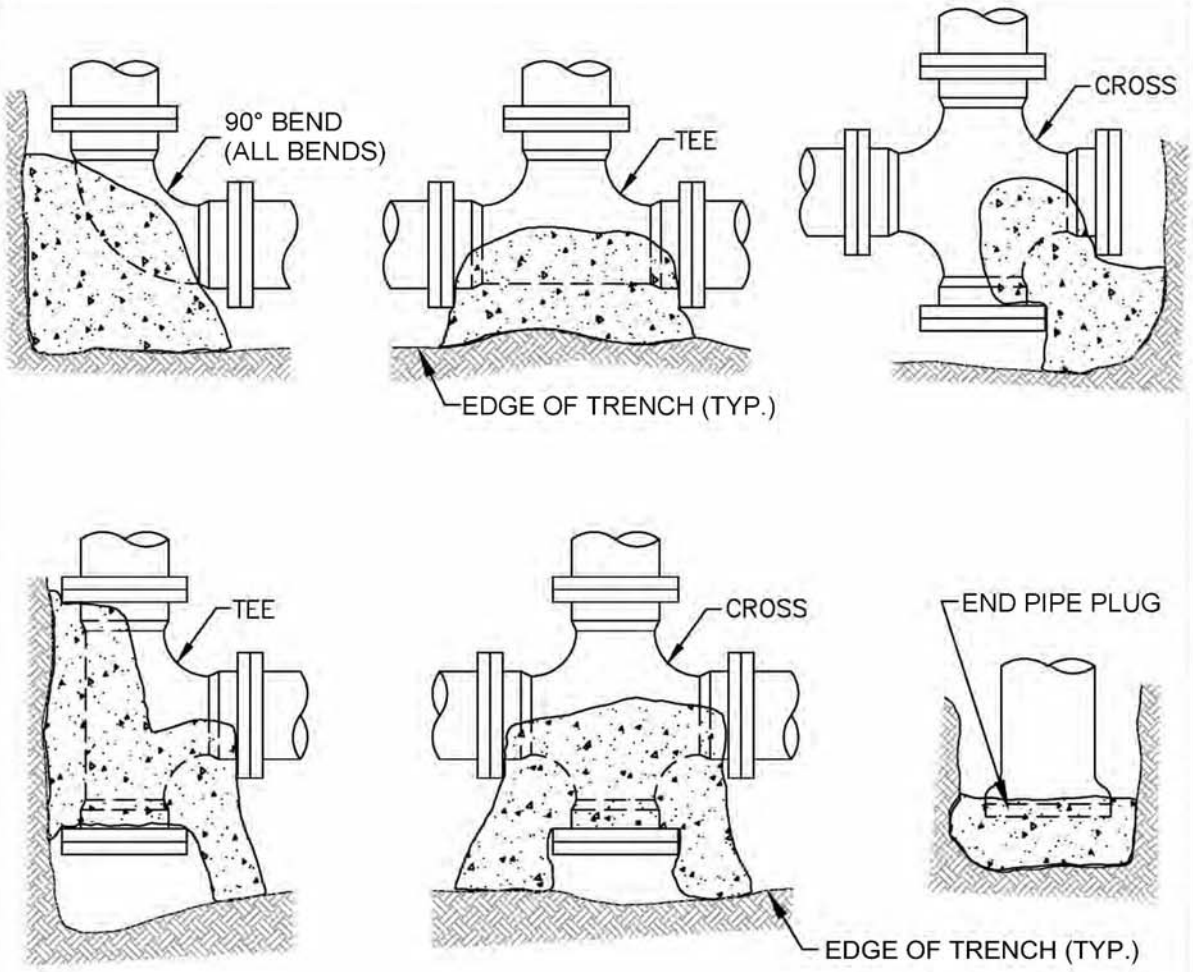
MJ CAP



MJ PLUG

NOTES:
1. MECHANICAL JOINT RESTRAINT EBAA IRON MEGALUG® OR EQUAL.
2. COST OF THIS FITTING TO BE INCLUDED IN BID PRICE OF PIPE.
3. T = THICKNESS PER AWWA C110 STANDARDS.

MUNICIPALITY OF ANCHORAGE	SCALE: NTS APPROVED: REVISED: 12/09	MJ CAP AND PLUG	SECTION # 60.02 DETAIL # 60-1

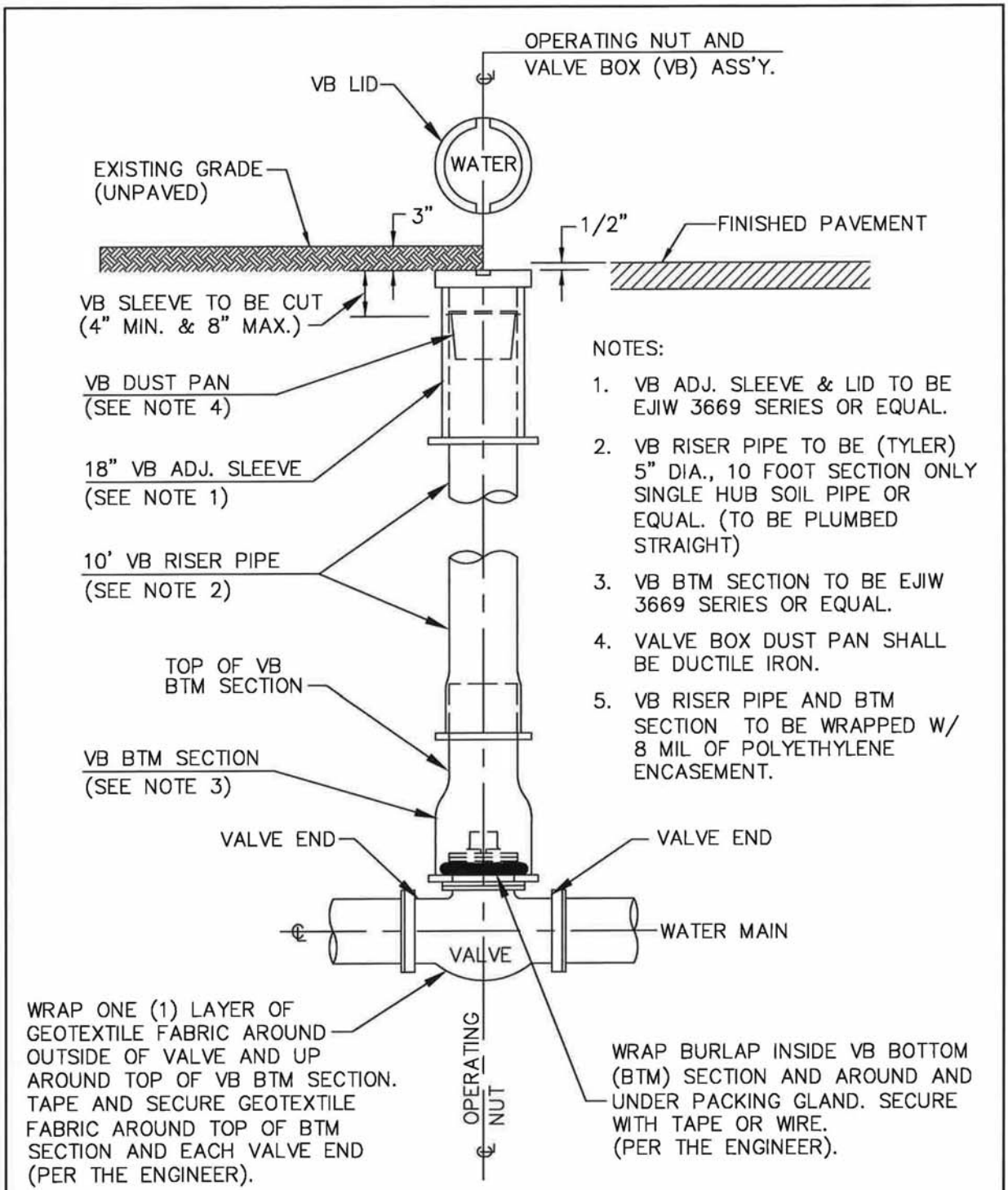


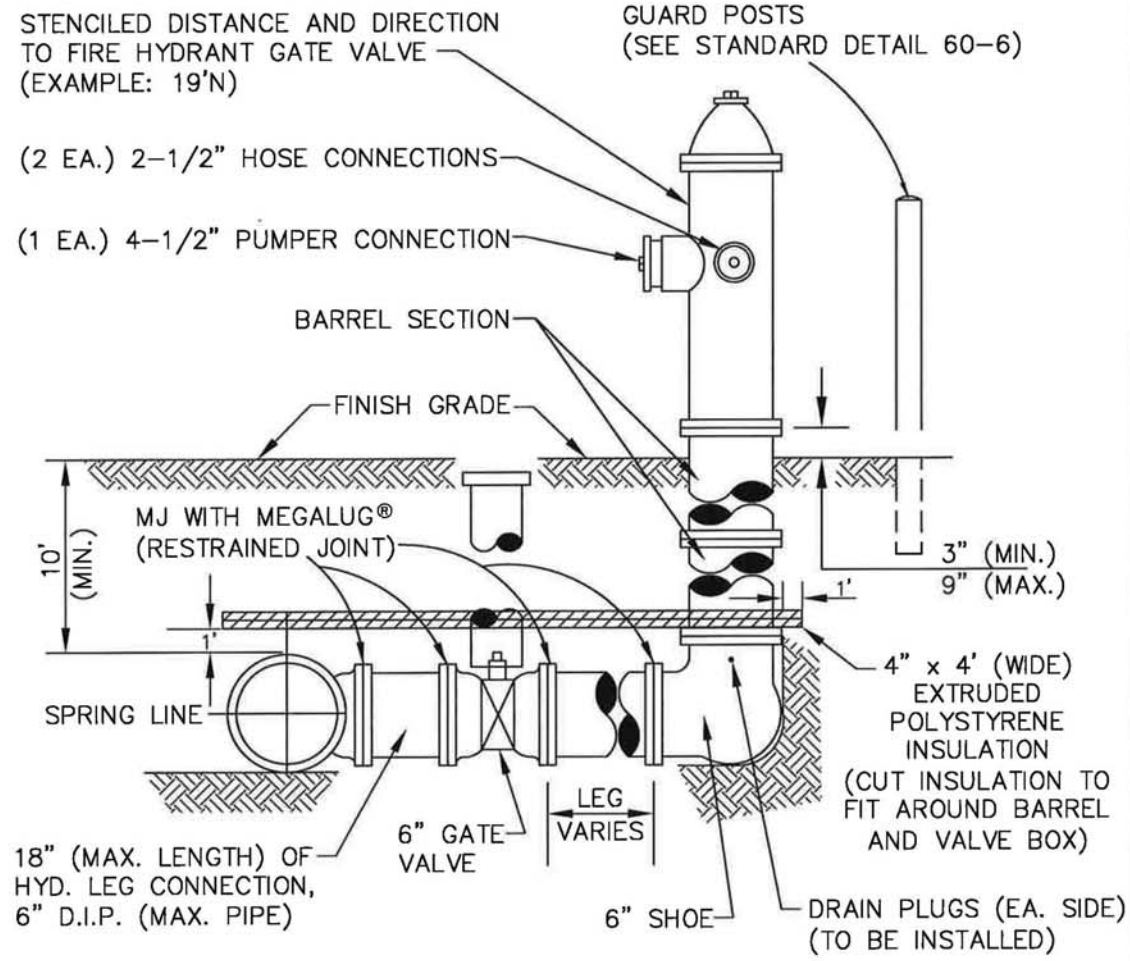
MINIMUM BASE AREA SQUARE FEET				
PIPE SIZE	PLUG	90' BEND	45° BEND	22 1/2° BEND
6"	2.0	2.0	1	1
8"	2.5	2.5	1.5	1.5
10"	4.5	4.5	2.5	2.5
12"	6	6	3.5	3.5
14"	8	8	4.5	4.5
16"	10.5	10.5	6	6
24"	24	24	13	13

NOTES:

1. MINIMUM THICKNESS OF PRE-CAST CONCRETE THRUST BLOCKS SHALL BE 6-INCH OR PER THE CONTRACT SPECIFICATIONS, AND IN CONFORMANCE WITH DIVISION 30.
2. THRUST BLOCK MAY NOT BE USED IN LIEU OF THRUST RESTRAINT.
3. THRUST BLOCK CAST AGAINST UNDISTURBED SOIL (HATCH).

MUNICIPALITY OF ANCHORAGE	SCALE: NTS APPROVED: REVISED: 12/09	THRUST BLOCK	SECTION # 60.02 DETAIL # 60-2

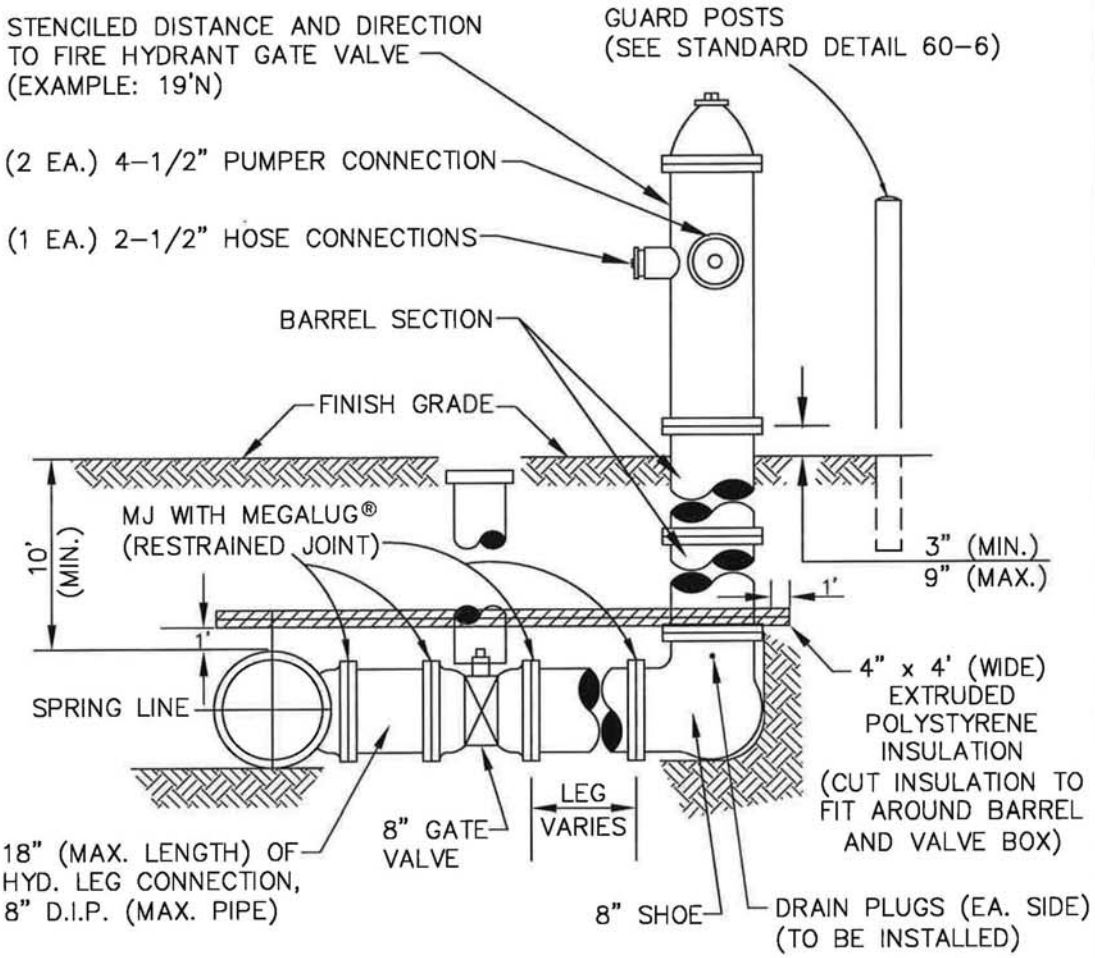

OPERATING NUT AND
VALVE BOX (VB) ASS'Y.
VB LID
WATER
EXISTING GRADE
(UNPAVED)
3"
1/2"
FINISHED PAVEMENT
VB SLEEVE TO BE CUT
(4" MIN. & 8" MAX.)
VB DUST PAN
(SEE NOTE 4)
18" VB ADJ. SLEEVE
(SEE NOTE 1)
10' VB RISER PIPE
(SEE NOTE 2)
TOP OF VB
BTM SECTION
VB BTM SECTION
(SEE NOTE 3)
VALVE END
VALVE END
WATER MAIN
VALVE
OPERATING
NUT
WRAP ONE (1) LAYER OF
GEOTEXTILE FABRIC AROUND
OUTSIDE OF VALVE AND UP
AROUND TOP OF VB BTM SECTION.
TAPE AND SECURE GEOTEXTILE
FABRIC AROUND TOP OF BTM
SECTION AND EACH VALVE END
(PER THE ENGINEER).
WRAP BURLAP INSIDE VB BOTTOM
(BTM) SECTION AND AROUND AND
UNDER PACKING GLAND. SECURE
WITH TAPE OR WIRE.
(PER THE ENGINEER).
NOTES:
1. VB ADJ. SLEEVE & LID TO BE EJIW 3669 SERIES OR EQUAL.
2. VB RISER PIPE TO BE (TYLER) 5" DIA., 10 FOOT SECTION ONLY SINGLE HUB SOIL PIPE OR EQUAL. (TO BE PLUMBED STRAIGHT)
3. VB BTM SECTION TO BE EJIW 3669 SERIES OR EQUAL.
4. VALVE BOX DUST PAN SHALL BE DUCTILE IRON.
5. VB RISER PIPE AND BTM SECTION TO BE WRAPPED W/ 8 MIL OF POLYETHYLENE ENCASEMENT.
MUNICIPALITY
OF ANCHORAGE
SCALE: NTS
APPROVED:
REVISED: 10/08
TYPICAL VALVE BOX
SECTION # 60.03
DETAIL # 60–3



NOTES:

1. HYDRANT BARREL SHALL BE INSTALLED PLUMB AND THE LEG SHALL BE LEVEL.
2. DRAIN PLUGS TO BE PROVIDED BY CONTRACTOR.
3. ALL HYDRANTS SHALL BE PAINTED CATERPILLAR YELLOW.
4. HYDRANT GATE VALVE BOX TO BE INSTALLED ACCORDING TO DETAIL FOR TYPICAL VALVE BOX.
5. ALL PIPE AND FITTINGS FROM THE MAIN TO THE HYDRANT SHOE SHALL BE RESTRAINED BY USE OF MEGALUG® AND/OR FIELD LOK® GASKETS OR EQUAL.
6. ALL BACKFILL MATERIAL AROUND HYDRANT BARREL SHALL BE NFS.

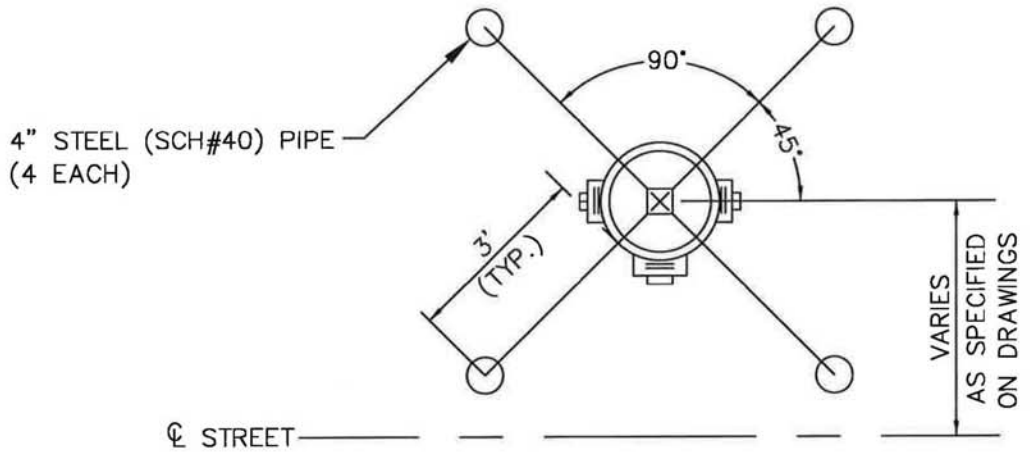
MUNICIPALITY OF ANCHORAGE	SCALE: NTS APPROVED: REVISED: 10/07	**SINGLE PUMPER 'L' BASE FIRE HYDRANT ASSEMBLY**	SECTION # 60.04 DETAIL # 60–4

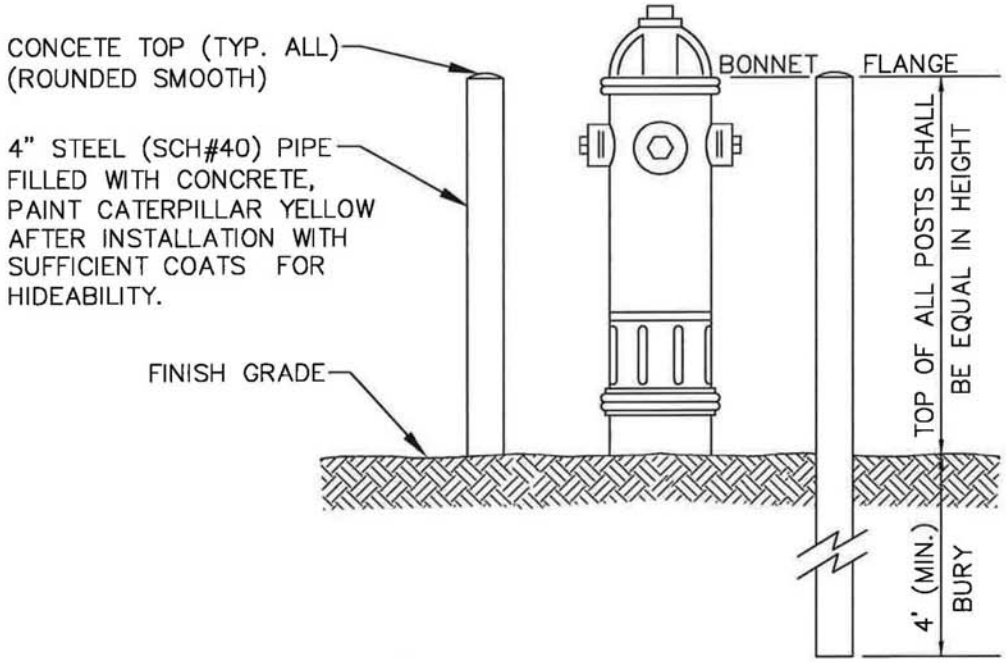


NOTES:

1. HYDRANT BARREL SHALL BE INSTALLED PLUMB AND THE LEG SHALL BE LEVEL.
2. DRAIN PLUGS TO BE PROVIDED BY CONTRACTOR.
3. ALL HYDRANTS SHALL BE PAINTED CATERPILLAR YELLOW.
4. HYDRANT GATE VALVE BOX TO BE INSTALLED ACCORDING TO DETAIL FOR TYPICAL VALVE BOX.
5. ALL PIPE AND FITTINGS FROM THE MAIN TO THE HYDRANT SHOE SHALL BE RESTRAINED BY USE OF MEGALUG® AND/OR FIELD LOK® GASKETS OR EQUAL.
6. ALL BACKFILL MATERIAL AROUND HYDRANT BARREL SHALL BE NFS.

MUNICIPALITY OF ANCHORAGE	SCALE: NTS APPROVED: REVISED: 10/08	**DOUBLE PUMPER "L" BASE FIRE HYDRANT ASSEMBLY**	SECTION # 60.04 DETAIL # 60–5

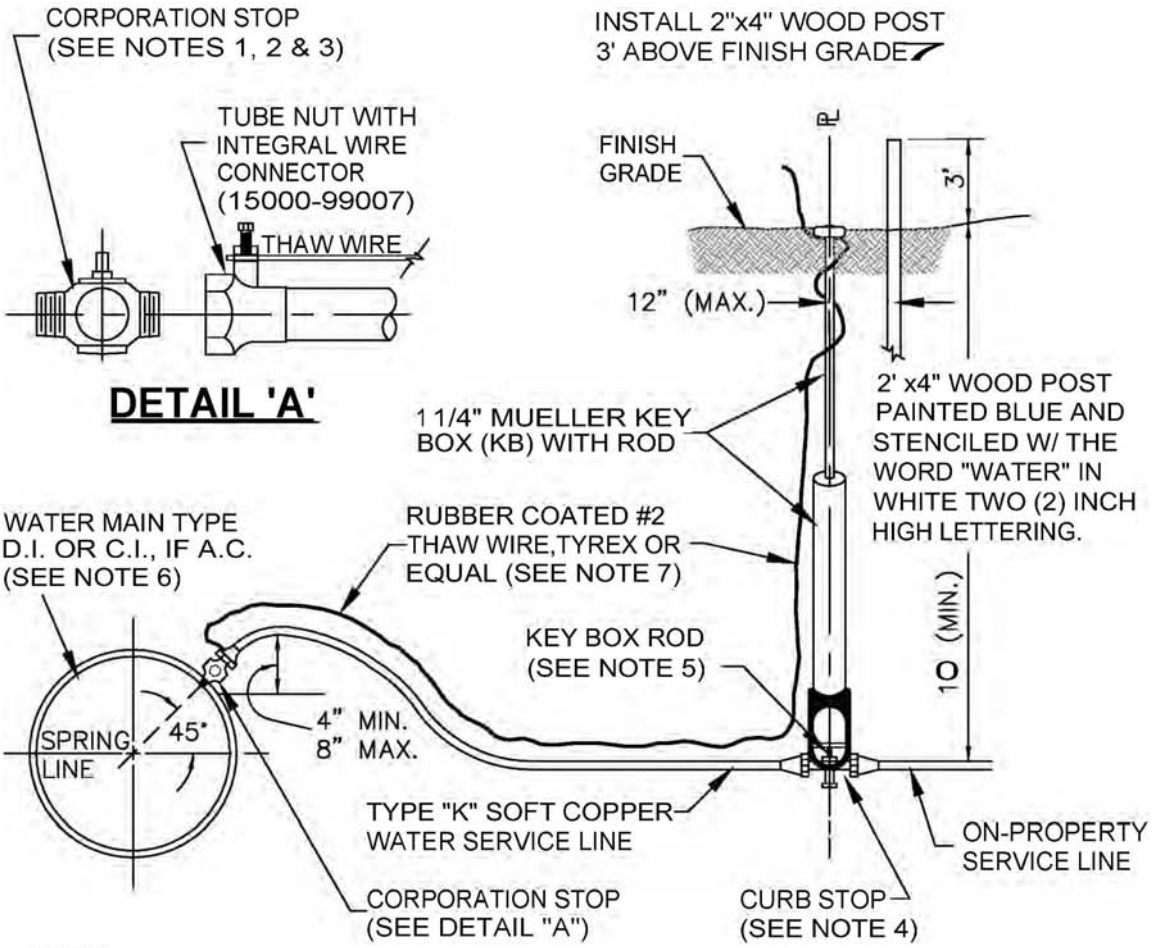




NOTES:

1. GUARD POSTS WILL BE FURNISHED & INSTALLED BY THE CONTRACTOR AND APPROVED BY THE ENGINEER.
2. GUARD POSTS SHALL BE INSTALLED PLUMB AND LOCATED TO ALLOW UNRESTRICTED ACCESS TO PUMPER AND HOSE CONNECTIONS.
3. GUARD POSTS NOT INSTALLED SHALL BE DELIVERED TO AWWU OPERATIONS DIVISION (PER THE ENGINEER).

MUNICIPALITY OF ANCHORAGE	SCALE: NTS APPROVED: REVISED: 10/08	FIRE HYDRANT GUARD POSTS	SECTION # 60.04 DETAIL # 60–6

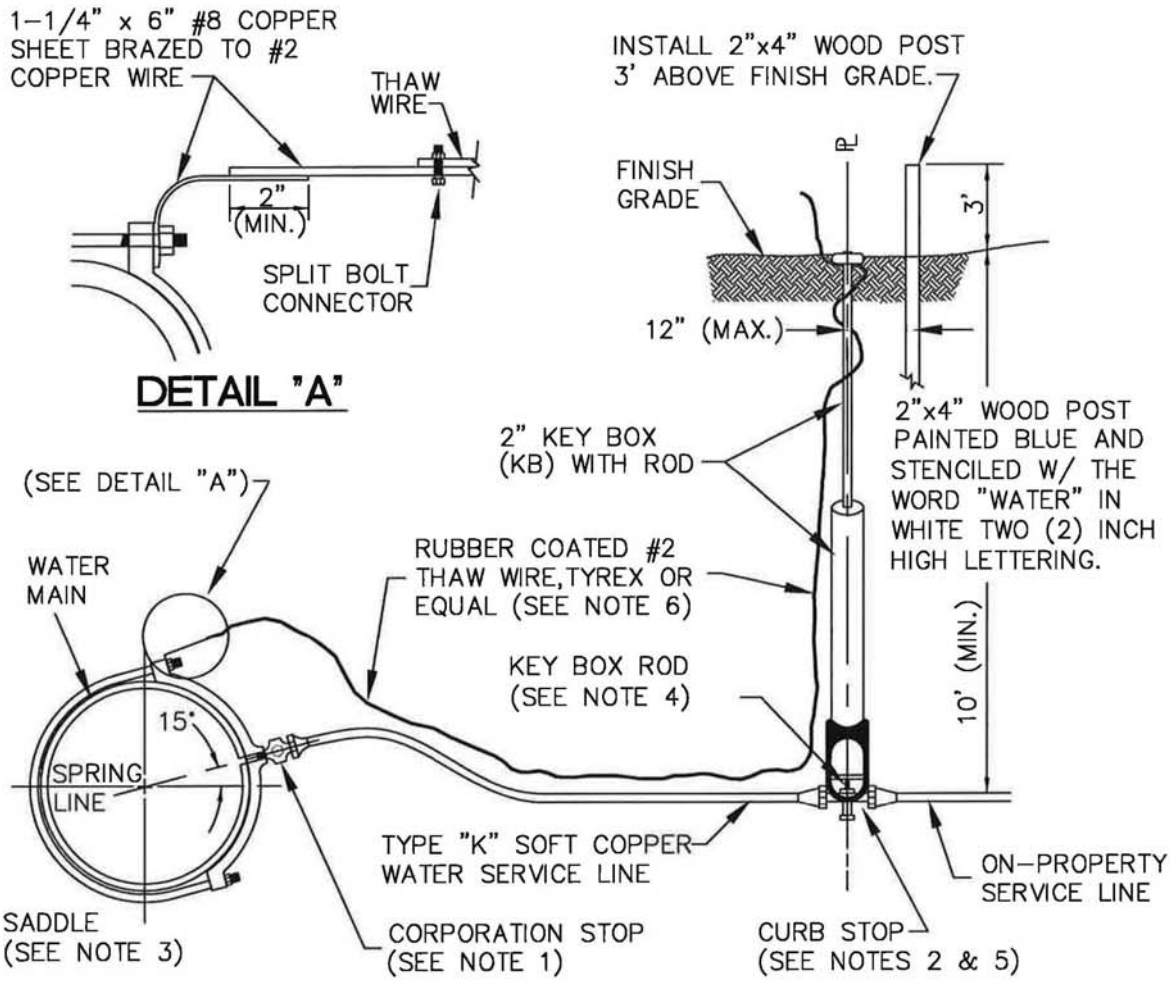


NOTES:

1. USE MUELLER CORPORATION STOP NO.15050 OR EQUAL FOR STEEL PIPE.
2. USE MUELLER CORPORATION STOP NO.10016 OR EQUAL FOR WOOD STAVE PIPE.
3. USE MUELLER 1-INCH CORPORATION STOP NO.15000 OR EQUAL FOR DUCTILE PIPE.
4. USE MUELLER CURB STOP NO. H-15214 OR EQUAL FOR COPPER TO COPPER CONNECTIONS.
5. KB ROD TO BE ATTACHED TO CURB STOP WITH 9/64" X 4" BRASS COTTER PIN, NO SUBSTITUTIONS (MANUFACTURERS COTTER PIN SHALL NOT BE USED).
6. STAINLESS STEEL WRAP AROUND SERVICE SADDLE SHALL BE USED ON ALL A.C, PIPE. C.I.P. AND D.I.P. MAY BE DIRECT TAPPED.
7. THAW WIRE TO BE PLACED PARALLEL TO THE SERVICE LINE AND SHALL NOT COME IN CONTACT WITH THE SERVICE LINE AT ANY LOCATION.

MUNICIPALITY OF ANCHORAGE	SCALE: NTS APPROVED: REVISED: 12/09	WATER SERVICE CONNECT 1	SECTION # 60.06 DETAIL # 60-7

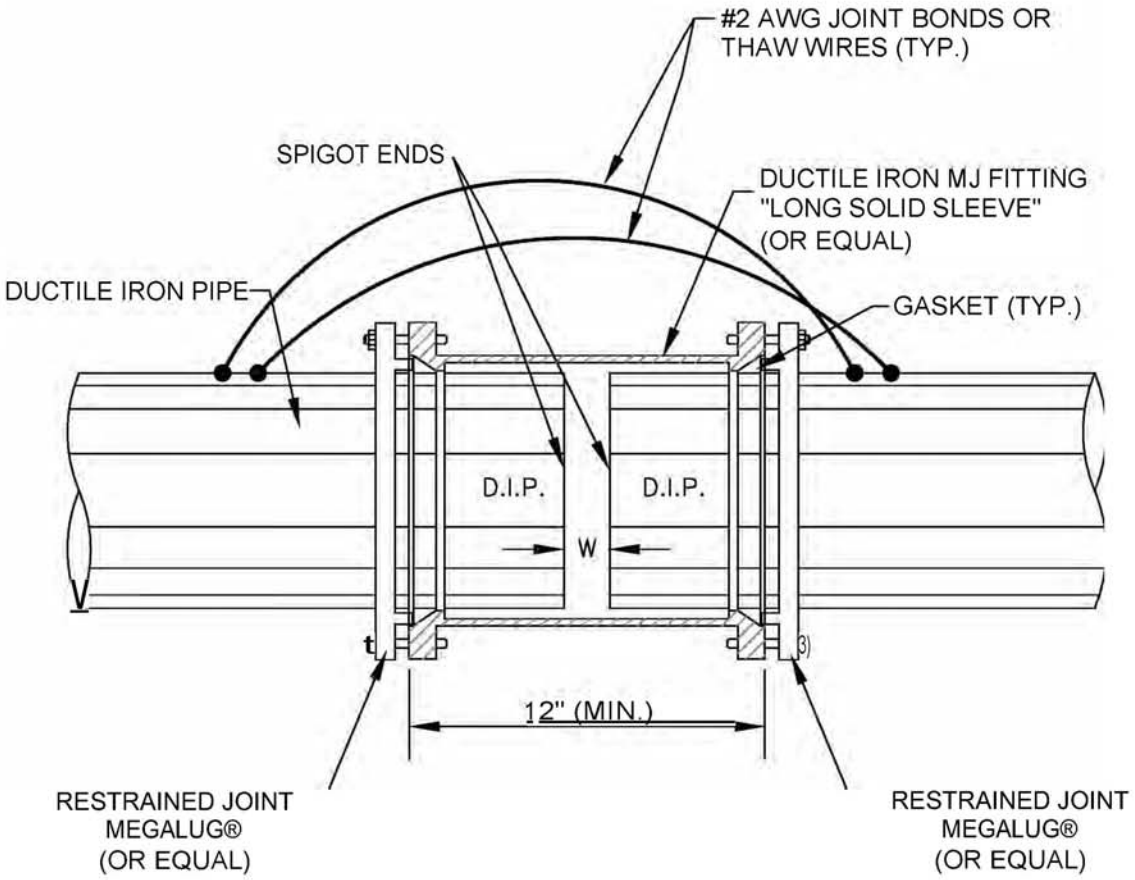
REVISION 12/09 MODIFIED NOTE 6



NOTES:

1. USE MUELLER CORPORATION STOP NO. 15025 OR EQUAL.
2. USE MUELLER CURB STOP NO. H15184 ORISEAL OR EQUAL FOR COPPER TO IRON CONNECTIONS.
3. WRAP AROUND STAINLESS STEEL SERVCE SADDLE SHALL BE USED ON ALL PIPE.
4. KB ROD TO BE ATTACHED TO CURB STOP WITH 9/64 X 4" BRASS COTTER PIN, NO SUBSTITUTIONS (MANUFACTURERS COTTER PIN SHALL NOT BE USED).
5. USE MUELLER CURB STOP NO. H15214 ORISEAL OR EQUAL.
6. THAW WIRE TO BE PLACED PARALLEL TO THE SERVICE LINE AND SHALL NOT COME IN CONTACT WITH THE SERVICE LINE AT ANY LOCATION.

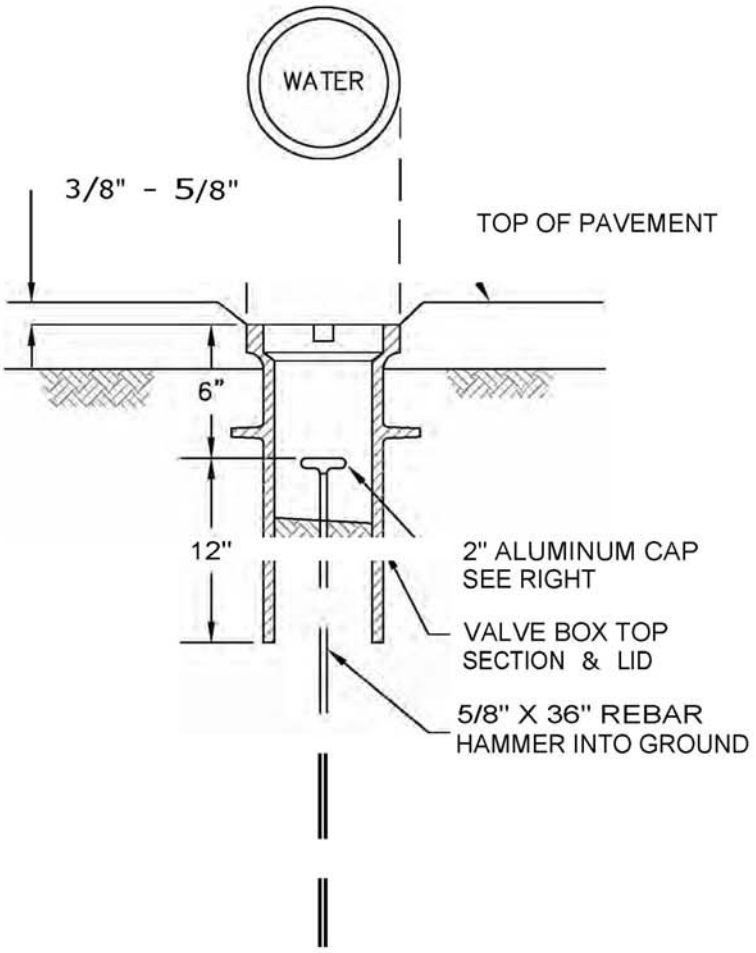
MUNICIPALITY OF ANCHORAGE	SCALE: NTS APPROVED: REVISED: 10/07	**WATER SERVICE CONNECT 1-1/2" AND 2"**	SECTION # 60.06 DETAIL # 60–8

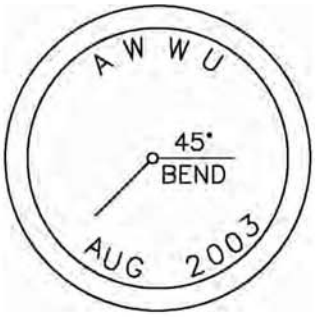


NOTES:

1. MECHANICAL JOINT (MJ) LONG SOLID SLEEVE SHALL BE USED TO CONNECT SAME SIZE (O.D.) DUCTILE IRON PIPE (D.I.P.) TO D.I.P. ONLY.
2. SEE MANUFACTURERS RECOMENDATIONS FOR DIMENSION "W"
3. ALL D.I.P. FITTINGS SHALL CONFORM TO THE REQUIREMENTS OF AWWA C110/ANSI A21.10 (SEE SECTION 60.02 - FURNISH AND INSTALL PIPE)

MUNICIPALITY OF ANCHORAGE	SCALE: NTS APPROVED: REVISED: 10/07	**CONNECTING DUCTILE IRON PIPE TO DUCTILE IRON PIPE**	SECTION # 60.02 DETAIL # 60-10

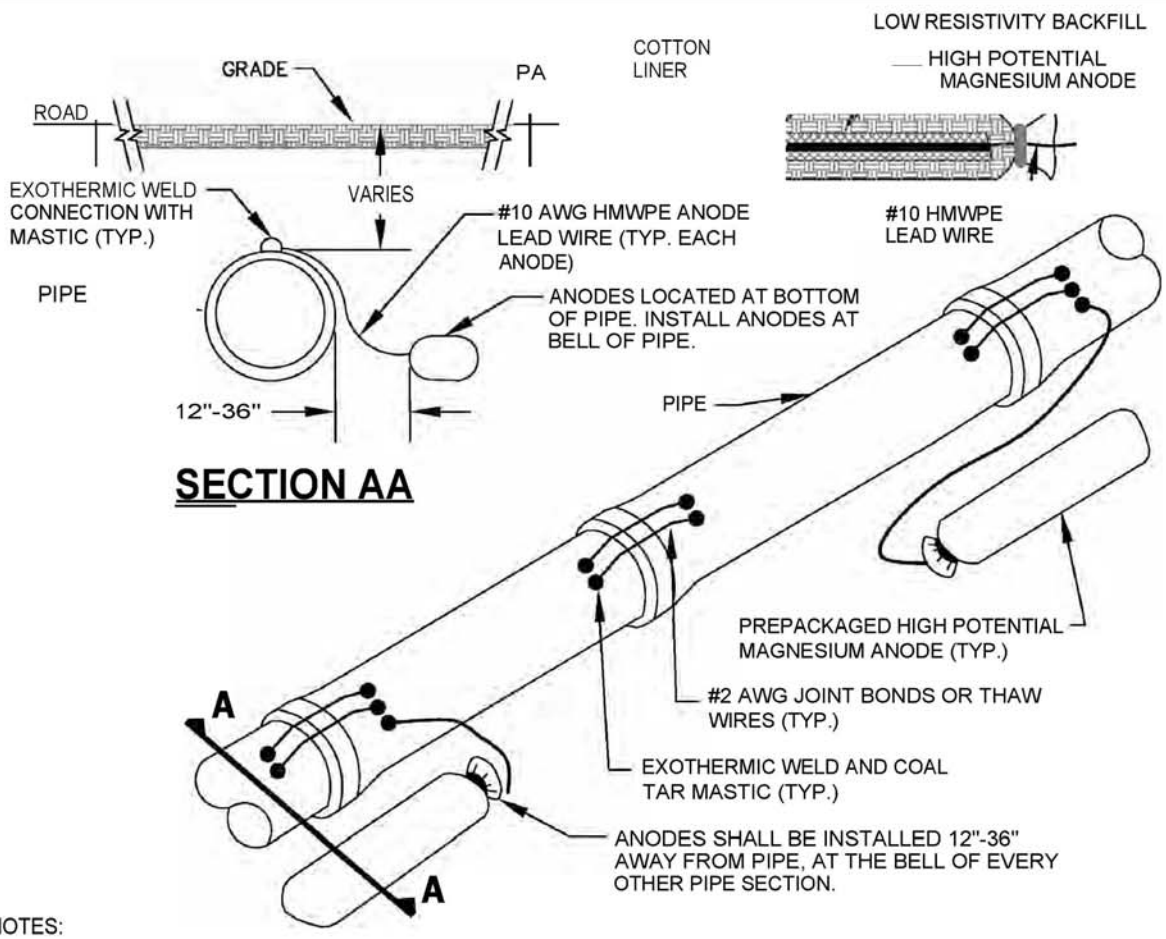




2" ALUMINUM CAP

NOTE: BEND SHOWN ON ALUMINUM CAP SHALL MATCH ACTUAL INSTALLED WATER MAIN BEND.

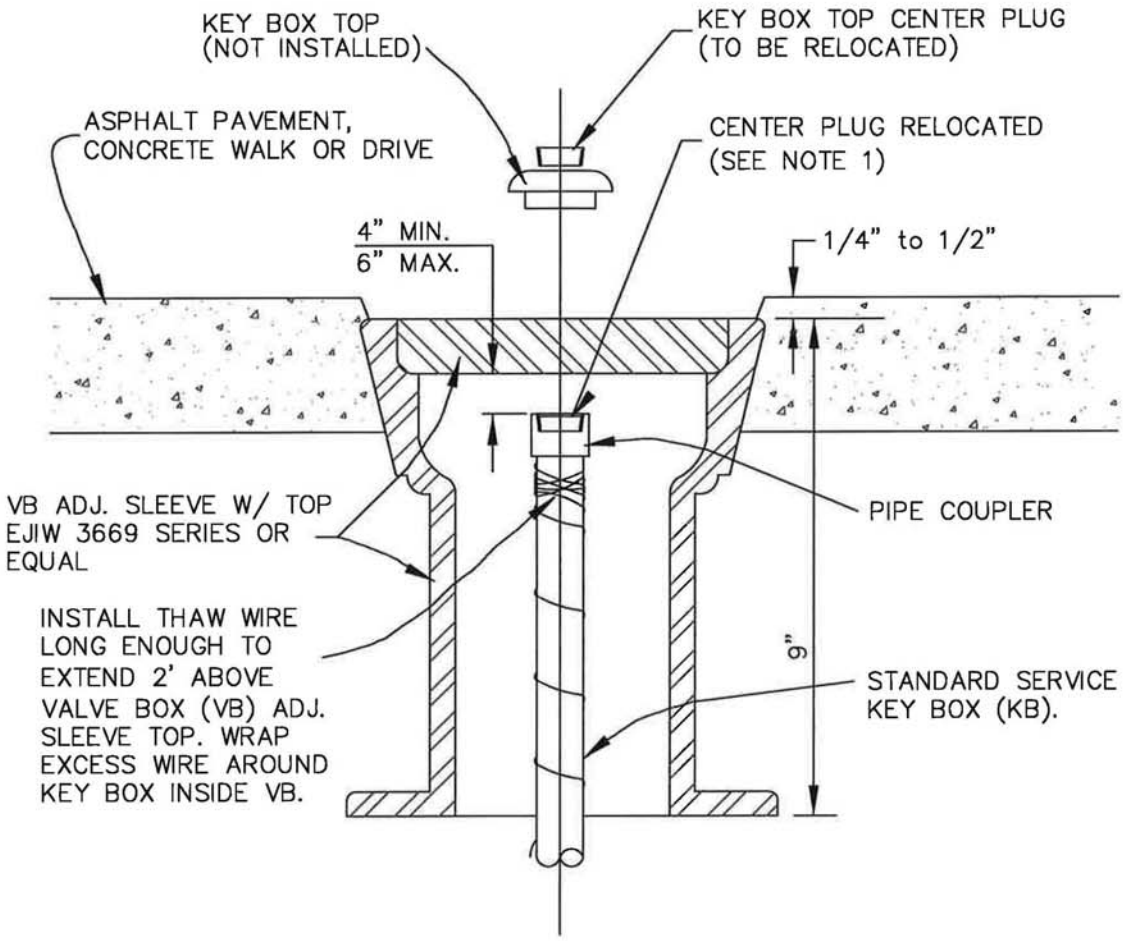
MUNICIPALITY OF ANCHORAGE	SCALE: NTS APPROVED: REVISED: 10/07	**TYPICAL PIPE ANGLE MARKER**	SECTION # 60.02 DETAIL # 60-11



NOTES:

1. HIGH POTENTIAL MAGNESIUM ANODES SHALL BE PREPACKAGED IN A CLOTH BAG WITH A BACKFILL MIXTURE OF 75% GYPSUM, 20% BENTONITE AND 5% SODIUM SULFATE. THE ANODES SHALL HAVE A 20 lb. BARE WEIGHT AND APPROXIMATELY 70 lb. PACKAGED WEIGHT.
2. ANODES SHALL BE INSTALLED ON EVERY OTHER JOINT OF PIPE (A MAXIMUM OF 36 FEET OF BURIED PIPE BETWEEN ANODES). AN ANODE IS REQUIRED ON THE FIRST AND LAST JOINT OF PIPE.
3. CONTRACTOR SHALL PROVIDE COORDINATES OR PIPE STATIONING FOR EACH ANODE INSTALLED.
4. TWO #2 AWG THAW WIRES ARE REQUIRED FOR PIPE SIZES LESS THAN 12". TWO #2 AWG JOINT BOND WIRES ARE REQUIRED FOR PIPE SIZES 12" AND LARGER, WHEN ANODE INSTALLATIONS ARE REQUIRED.
5. ALL CABLES SHALL BE SINGLE CONDUCTOR, STRANDED COPPER, WITH TYPE HMWPE INSULATION RATED FOR 600 VOLTS.
6. SPLIT—BOLT CONNECTIONS SHALL NOT BE ALLOWED ON ANY UNDERGROUND CONDUCTORS. IF SPLICES ARE REQUIRED, COMPRESSION CONNECTIONS (BURNDY OR APPROVED EQUAL) SHALL BE USED. COMPRESSION CONNECTIONS SHALL BE SEALED WITH A HEAT SHRINK SLEEVE RATED FOR BELOW GRADE USE.
7. EXOTHERMIC WELDS SHALL BE MADE IN STRICT ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS (NOTE: COPPER CONDUCTOR SLEEVES ARE REQUIRED FOR #10 WIRE BY SOME MANUFACTURERS). THE EXOTHERMIC WELD AREA SHALL BE COATED WITH COAL TAR MASTIC.
8. AT FIRE HYDRANT LOCATIONS, INSTALL ONE ANODE (12"-36" AWAY FROM THE PIPE) AT THE MIDPOINT BET1NEEN THE TEE FROM THE MAIN LINE PIPE AND THE HYDRANT SHOE.

MUNICIPALITY OF ANCHORAGE	SCALE: NTS APPROVED: REVISED: 11/08	ANODE DETAIL	SECTION # 60.19 DETAIL # 60-13



NOTES:

1. REMOVE KEY BOX TOP AND INSTALL PIPE COUPLING ON STANDARD KEY BOX, REMOVE CENTER PLUG FROM KEY BOX TOP AND INSTALL INTO TOP OF PIPE COUPLER.
2. TYPICAL INSTALLATION WHEN KEY BOX FALLS WITHIN ASPHALT PAVEMENT, CONCRETE WALK OR DRIVEWAY.
3. TO BE INSTALLED AND APPROVED BY THE ENGINEER.
4. ALL BACKFILL MATERIAL AROUND VALVE BOX SHALL BE NFS AND COMPACTED TO 95% MAX. DENSITY.

MUNICIPALITY OF ANCHORAGE	SCALE: NTS APPROVED: REVISED: 11/08	**ADJUST SERVICE KEY BOX**	SECTION # 60.19 DETAIL # 60–14