City of Sturgis Water Specifications

Section W-1 Standard Specifications

W 1.1 Water main and water service details or requirements not covered in these specifications or on the plans shall follow the Sturgis MUB ordinance first, then American Water Works Association (AWWA) or South Dakota Department of Environment and Natural Resources (DENR) will govern. All state plumbing codes must be followed.

W 1.2 Unless otherwise noted in specific contract documents, contract terms will be based on the EJCDC C-700 of the Standard General Conditions of the Construction Contract Copyright 2007.

W 1.3 New water lines should have water lines that can be traced.

W 1.3 The city has first right of refusal for water line items that can be salvaged.

Section W-2 Contractor Expectations

W 2.1 The Contractor must be licensed with the city and South Dakota. The installer must be present during inspection and provide their name when signing the inspection form.

W 2.2 The contractor shall guarantee all work for a period equal to 2 years, beginning upon a letter of substantial completion by the City. The contractor is responsible for all compaction and settling within the ROW for the warranty period including curb, gutter and the roadway.

W 2.3 The contractor will furnish all equipment, materials, supplies and appurtenances, provide all construction equipment and tools; and perform all necessary project labor and supervision according to specifications and all laws. All material shall be new.

W 2.4 The contractor will coordinate the progress of the work, including coordination between subcontractors, suppliers, and City to facilitate completion of the work.

W 2.5 The contractor is responsible for identifying and locating water mains and services. The contractor should anticipate that some uncertainty may exist with respect to the exact size, type and location of underground elements of the existing utility systems. Reasonable amounts of exploratory digging should be anticipated by the contractor, and no special or extra payment will be made for effort needed to locate buried utility items.

W 2.6 The contractor shall allow for safe access by City staff. The water department will perform water taps up to 2” after a safe hole is provided by the licensed contractor. Taps larger than 2 inches are required to be completed by a licensed contractor. The city will inspect the pressure test, and all materials before the service line can be buried. All taps are “live” or a “wet” tap.

W 2.7 Use of the site: The contractor shall confine his area of operations to the space within the boundaries of the easements, property lines, and work limits shown on the plans. Do not disturb portions of the site beyond the areas in which the work is indicated. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on site

W 2.8 The contractor shall be held responsible for unnecessary damage to all the existing facilities. Care shall be used to avoid injury to property.

W 2.9 It shall be the responsibility of the contractor to comply with local road restrictions All traffic control shall meet the most current MUTCD (Manual on Uniform Traffic Control Devices).

W 2.10 The contractor shall meet OSHA standards to protect, shore, brace, support, and maintain underground pipes, conduits, drains and other underground construction uncovered or otherwise affected by construction operations.

W 2.11 The contractor shall restore to their original condition roadways, driveway, utilities, fences, landscaping and other surface features affected by construction operations. No payment will be made for such restoration unless called for in the bid schedule.

W 2.12 The contractor shall conduct operations to minimize adverse impact on city water service. Service Interruptions shall meet the requirements of W 8.2.1.

W 2.13 The contractor will provide portable toilets for personnel and maintain facilities as required by law.

W 2.14 The contractor shall provide satisfactory weathertight storage on-site for protection of materials and products prior to their incorporation into the work according to manufacturer's recommendations.

W 2.15 The contractor shall install and maintain all temporary utilities, structures, construction aids, fences, barriers, and similar items of a temporary nature necessary for the execution and security of the work. The contractor shall remove temporary facilities at the completion of the work.

W 2.16 If groundwater is encountered, appropriate groundwater dewatering techniques may be required, and that dewatering activities shall comply with applicable DENR Permit requirements.

W 2.17 Water Department inspections are required before any line is buried. Failure to have the required inspections can result in fines or revocation of the contractor's license.

Section W-3 Survey

W 3.1 The contractor will be responsible for the accurate construction of all work to the lines, grades and elevations shown on the drawings.

W 3.2 The Engineer or Water Superintendent shall be promptly notified of any discrepancies discovered during layout work.

Section W-4 Water mains and appurtenances for exterior underground installation

W 4.1 Pipe for potable water service shall bear the National Sanitation Foundation Seal.

W 4.2 Pipe shall be clearly marked with pipe size, class, type, test pressure and manufacturer's name.

W 4.3 Reference standards are AWWA C-900 PVC pressure pipe and Unibell Plastic Pipe Association “Recommended Standards for Installation of PVC Pressure Pipe.”

W 4.4 All shop drawings and product data (including valves, fittings, etc.) shall be reviewed by the city before allowed onto the site. If resubmission is required, the Contractor shall make the necessary corrections and resubmit. Resubmitted data must clearly show changes. The review will not relieve the Contractor’s responsibility to furnish materials and products in compliance with the Contract Documents.

W 4.5 Pipe and accessories shall be unloaded and stored at the jobsite in a manner that will not damage pipe or fittings. The contractor is responsible for safe storage of all materials until they have been incorporated into the completed project.

Section W-5 Measurement and payment (When paid for by City)

A. Water mains:

W 5.A.1 Pipelines will be measured by the horizontal linear foot of installed pipe, including measurement through valves and fittings. Measurement will be to the nearest 0.1 foot.

W 5.A.2 Payment will be at the contract unit price per foot of pipe actually furnished and installed for the type and size installed.

W 5.A.3 Payment will be considered full compensation for the complete pipe installation, including trenching, pipe laying, backfilling, testing, disinfecting, locator wire and subsidiary work required by the plans and specifications, but not specifically described elsewhere as a separate pay item.

W 5.A.4 No separate payment will be made for removal of existing pipelines and fittings, which are to be removed as part of new pipeline installation. Where pipeline removal is required, such removal will be considered to a subsidiary obligation to pipe installation, and no separate payment for removal will be made.

W 5.A.5 When bedding is not paid for separately, bedding will be paid as incidental to the water mains.

B. Pipe fittings

W 5.B.1 Pipe fittings over 2” for water mains will be measured by the unit each for each type of fitting furnished and installed.

W 5.B.2 Pipe fittings 2” and smaller will not constitute separate pay items and shall be included in the unit price per foot of water service.

W 5.B.3 Payment will be at the contract unit price per each fitting of the respective type and size.

W 5.B.4 Payment will include full compensation for furnishing and installing the fitting and thrust blocking and/or joint restraint system.

W 5.B.5 Fittings which are not specifically called for on the plans or authorized for use by the Engineer, but which are used for the convenience of the Contractor, or due to laying methods used by the Contractor, will not be paid for by the City, but still require approval before use by the Water Department or Engineer.

C. Gate Valves and Boxes

W 5.C.1 Gate valves will be measured by the unit each for each respective size.

W 5.C.2 Payment will be at the contract unit price per each valve and valve box.

W 5.C.3 Payment will include full compensation for furnishing and installing valve box, concrete blocking, debris plug, valve box adaptor, concrete collar, and restraints when specified.

W 5.C.4 When auxiliary gate valve and box will not be paid for separately, they will be paid as part of the fire hydrant installation.

D. Standard Fire Hydrants

W 5.D.1 Furnishing and installing fire hydrants will be measured by the unit each for each respective type.

W 5.D.2 Payment will be at the contract unit price per each hydrant installation.

W 5.D.3 Payment will be full compensation for excavating, furnishing and installing the hydrant, auxiliary thrust blocking, gravel drain, back-filling and subsidiary work. The 6" PVC hydrant, pipe and bends between the auxiliary valve and hydrant, and auxiliary valves shall be included in Bid Item "Fire Hydrant w/ Aux Valve". Bends on the hydrant lead between the main and auxiliary valve along with the 6" lead are paid for separately under their corresponding bid item. Hydrant risers and bends on the pipe between the valve and the hydrant shall be absorbed into the unit cost for the fire hydrant.

E. Service Taps

W 5.E.1 Service taps with tapping saddle and corporation stop will be measured by the unit each for each respective size.

W 5.E.2 Payment will be at the contract unit price for "tapping saddle and corporation stop" for the respective size and will include full compensation for tapping the new or existing main, furnishing and installing all materials, excavation and backfill, and labor for the appropriate corporation stop fittings and service saddle of the size indicated on the drawings.

F. Curb Stops and Boxes

W 5.F.1 Curb stops and boxes will be measured by the unit each for each respective size.

W 5.F.2 Payment will be at the contract unit price per each curb stop and box and will include full compensation for furnishing and installing all materials and labor for the appropriate curb stop and box as indicated on the drawings.

G. Water service reconnections

W 5.G.1 Water service reconnections will be measured and paid for at the unit price bid for "Reconnect Water Services" up to 2" in diameter.

W 5.G.2 payment shall include compensation for all necessary fittings to connect the new service line to the existing service line.

H. Water Service Line and Conduit (2" Diameter and Smaller)

W 5.H.1 The contractor shall have the option of selecting "open cut" or "trenchless" installation on a case by case basis. The contract prices for surface repair and restoration shall apply to any changes made to the contract quantities. Payment shall be made on the quantities of work actually performed.

W 5.H.2 Water service line (Open cut installation). Payment will be at the contract unit price per linear foot measured to the nearest 0.1 foot. Payment will include full compensation for furnishing and installing all materials and labor using open cut trenching for the appropriate size of water service line piping as indicated on the drawings.

W 5.H.3 Water service line (Trenchless Installation) Payment will be made at the contract unit price per linear foot measured to the 0.1 foot. Payment will include full compensation for furnishing and installing all materials and labor via trenchless methods for the appropriate size of water service line piping as indicated on the drawings.

W 5.I.1 Abandon Valve/ Piping. Gate valves and piping to be abandoned will not be measured. Payment for abandonment work shall be absorbed into the project or to the item to which it relates.

W 5.J.1 Remove Curb Stop and Box: Removal of existing curb stop and box will not be paid for, but shall be absorbed into the project or to the item to which it relates.

W 5.K.1 Remove Fire Hydrant: Removal of existing fire hydrants shall also include removal of auxiliary valves where applicable and will be paid for at the contract unit price per each. Payment will include full compensation for excavation and backfilling, plugging existing pipe connection and disposing of the removed piping components.

W 5.L1 Tracer Wire Access Box: Measurement will not be made and will be incidental to the Contract bid item per each for "Fire Hydrant and Auxiliary Valve". Payment shall include full compensation for all labor, materials and work necessary to complete tracer wire access box.

W 5.M.1 Meter pits will be measured and paid at the unit price per each.
Payment will include full compensation for all equipment, labor and materials necessary for furnishing and installing the meter pit and required interior components, all fittings for connection for the meter, the remote readout post, and the meter pit concrete collar.

On new service lines, the contractor will purchase a tap from the city. City will provide meters, saddles, and corporations for installation and will complete installation of remote readout wiring and configuration. Service lines larger than 1 inch will need additional time to order and receive all parts. The Meter must be installed before any tees in the water line. A backflow preventer is required to be installed before any tees in the line. A pressure reducing valve is required to be installed before the meter is the water pressure is 80 pounds or higher. Meters must be placed in a place which can be accessed easily. If the Water Superintendent deems the meter is not accessible, the Contractor must move it to an accessible location at their expense.

Section W-6 Products

W 6.1 Distribution System Pipe shall be Polyvinyl Chloride (PVC) pressure pipe conforming to AWWA C-900, Class 150, SDR 18.

Joints: Push-on integral bell and rubber ring gaskets, ASTM D3139 and F-477.
Exterior Coating: None
Interior Lining: None
Gaskets: Vulcanized Rubber
Manufacturer: Certain Teed ”Fluid-Tite,” JM Eagle or approved equal
Installation procedures shall conform to AWWA C-605

W 6.2 Ductile Iron Fittings shall be Ductile iron, compact type, ANSI/AWWA C-111/A21.11
Interior and Exterior Coating: All internal and external ferrous surfaces shall be coated with a 6-mil fusion -bonded epoxy coating applied electrostatically and, at a minimum shall meet the requirements of AWWA C116. The epoxy coating shall be applied to all fittings. Cement-lined interiors are acceptable.
Gaskets: vulcanized rubber, non-tipped ANSI/AWWA C-111/A21.11
Bolts for mechanical joints and restraints shall be corrosion resistant type high strength, low-alloy steel w/ ceramic filled, baked on fluorocarbon resin, ANSI/AWWA C-111/A21/11

W 6.3 Joint restraint systems:
PVC pipe to DI Fittings with mechanical joint fittings: EBBA 200 PV, Uniflange Series 1500 or approved equal.
DI pipe to DI fittings with mechanical joint fittings: EBBA Megalug Series 1100, 1100 SD, Uniflange Series 1400 or approved equal.
PVC pipe to PVC pipe, push on fittings: EBBA 2500, Uniflange Series 1390 or approved equal.
DI pipe to DI pipe with push-on fittings: EBBA 1100 HD, Uniflange Series 1450 or approved equal.
All fittings shall be equipped with restraints and be suitably provided with concrete thrust blocks poured against the fittings and undisturbed earth. The concrete shall be so placed that the pipe and joints will be accessible for repair. Thrust blocks shall be applied at all hydrants, crosses, tees, plugs, caps and vertical bends per the table provided in the plans.

W 6.4 Transition Sleeve couplings:
Comply with ANSI/AWWA C219

Ductile iron or stainless steel construction
Ductile iron shall be epoxy coated.
Bolts and nuts shall be stainless steel.
Ford FCI-ESH Romac Style 501, or equal

W 6.5 Tapping Sleeves:
Ductile iron or stainless steel construction, 200 psi rating
Branch end shall be flanged.
Stainless steel tapping sleeves shall be provided with stainless steel bolts and nuts.
Ductile iron sleeves shall be epoxy coated.

W 6.6 Service Line Piping: Minimum line size is 1 inch.
1 inch lines must be type "K" copper or SIDR-7 Poly with inserts and brass compression fittings.
1 ½ " and 2" service lines must be SIDR-7 Poly inserts and brass compression fittings. No copper is allowed on service lines bigger than 1".

Section W-7 Pipe Accessories

W 7.1 Gate valves:
Iron body resilient seated solid wedge, non-rising stem per AWWA C-509 and C-515 with a 250-psi pressure rating, Mueller R/S, American Flow Control, Waterous or Engineer approved equal.
Mechanical joint ends per ANSI/AWWA C-111/A21.11
Wrench nuts per AWWA C-500
Valves shall be internally coated per AWWA C-550 with fusion bonded epoxy coating.
Gate valves used as tapping valves or auxiliary gate valves mounted directly to hydrant shoes shall meet the requirements of this specification, but shall have one mechanical joint end and one flanged end (ANSI B.16.1)
Bonnet bolts and nuts shall be series 300 stainless steel.
Valve Boxes shall be straight and operate without binding.

W 7.2 Standard Fire Hydrants:
AWWA C-502 "American Darling, Waterous WB-67 or "Mueller Co. A-423 ".
Size: 5 ¼" main valve, 2 ½" hose nozzles and 1- 4" pumper nozzle, National Standard threads.
Inlet connection: 6" mechanical joint standard.
Bury Depth: 6 foot minimum; provide bury depth required by pipe grades and ground surface elevations shown on plans. Provide hydrant extensions as required.

W 7.3 Valve Boxes:
Cast iron, screw type extension sleeve, 5 ¼" diameter with 3/16" casting thickness, (Heavy Duty) adjustable to the heights indicated on the drawings using extension pieces. The top piece shall be at least 24" in length.
Furnish with drop lids marked "water". Provide Tyler, or East Jordan Iron Works.
Valve adaptor: Furnish and install valve adaptor to stabilize valve box and prevent setting or shifting of the box. The adaptor shall match the type and size of valve installed.

W 7.A.1.0 Service Line valves and Fittings:
W 7.A.1.1 Copper splicing couplings shall be brass compression type such as Ford, Mueller 110 conductive compression. Soldered joints shall not be used for service lines installed underground.
W 7.A.1.2 General: Service line valves and fitting shall meet AWWA C-800. All castings shall be 85/5/5/5 copper alloy. No insta tites, shark bites or plastic fittings are allowed.
W 7.A.1.3 Curb Stop Valves can only be operated by Sturgis Water Department: Curb stops shall be of bronze construction conforming to AWWA C800 and rated at least 300 psi. Curb stops shall have Minneapolis pattern for threaded connection to curb boxes and shall only turn 90 degrees. (Mueller Mark II Oriseal, Ford B44 Series)
W 7.A.1.4 Curb Boxes: Curb boxes shall be Minneapolis Pattern, Type PL head with pentagon head plug, 1 ¼" upper section. Ford, and Mueller are acceptable manufacturers.
W 7.A.1.5 Corporation Stops: shall have tapered pipe thread by compression type connections. (Ford FB1000 Series, Mueller 300 Series).
W 7.A.1.6 Tapping Saddles: Service saddles for 1" through 2" service pipe shall be ductile iron front with 304 stainless steel band (double band) tap, nuts and 4 bolts and shall provide full-circumferential support of the pipe. Saddles shall be minimum 5 inches wide for 4 inch and larger pipe. Saddles must be torqued to manufacturer specifications. Outlet taps shall be stainless steel with FIPT connections sized as required. Saddles shall have Tapered Buna-N ASTM D2000 rubber gasket, Ford FC202, Mueller DR2S Series, or Romac 202N. There should be 2 feet minimum between taps, bell joints and tees.

W 7.B.1 Tracer Wire Access Box:
Locate wire terminal box suitable for burial (1/4" – ½" below surface) with a 2 ½ " locking cast iron top with a standard pentagonal head. The box shall include integral stainless wire terminals in the lid with a 12" ABS bottom section. The access box shall have 12 inches of excess wire in it. Tracer wire access box shall be manufactured by Valvco, Bingham & Taylor Corp.

W 7.C.1 Meter Pits: require Water Department approval before ordering and may be a McDonald 795 series or 95 series adjustable kit, or may be a rigid PVC 18" x 72" meter pit (Mueller/Hunt Thermal-Coil Meter Box) with standard coil pit setter, aluminum bottom, full port handle ball valve, cascading angle dual check valve, 1" coil, and 1" MIP in/out, 4" insulating foam disc, standard lid frame with 4 inch concrete collar (see plate 8-8), and 18" cast iron side locking lid with pit radio receptacle and with the words "water meter" marked on the lid. See Section W-5 section M. Posts for remotes may be allowed at the discretion of the water department.

W 7.D.1 Miscellaneous Accessories:
Pipe lubricant: Per pipe manufacturer's recommendations.
Concrete for thrust blocking: 28 day compressive strength of 3000 psi (min)
Locator wire shall be solid soft drawn copper AWG #12 with a blue coating.
Insulation shall be low density, high molecular weight polyethylene insulation suitable for direct bury applications with a minimum 3/64" thickness.

Any splices in the tracer wire must be done using silicone nuts or grease packs. When hooking a poly service line to a pvc main, the tracer wire from the service line must be spliced to the water main tracer wire.
Tie rods: Steel, ASTM 307, galvanized, minimum 5/8" diameter.
Polyethylene encasement: ANSI A21.5, seamless tube, black ASTM D1248, Type 1, Class C, Grade G-1, 8-mil thickness.

Concrete for thrust Blocks: Cement Content- 610 lbs. per cubic yard (min): Maximum coarse aggregate of 1". Maximum slump of 6" admixtures for air entraining; minimum compressive strength of 3,000 psi at 28 days.

W 7.E.0 Execution

W 7.E.1 Alignment and Grade

Lay water main to lines and grades established and indicated on the plans. If grade is not indicated, provide cover depth shown, but not less than 6'0" unless directed otherwise by the Engineer.

If unforeseen obstructions are encountered during the progress of the work and interfere with the proposed vertical or horizontal alignment of the pipeline, the Engineer will alter the plans and order a deviation in line, and/ or grade, or may arrange for the removal or relocation of the obstruction. If pipe grades are established on the plans, the contractor will not deviate from plan line or grade without Engineer's approval.
The contractor shall provide 6'0" cover over all mains and services.

W 7.E.2.0 Installation

W 7.E.2.1 Cutting Pipe: Cut pipe neatly without damage to pipe. Cut smooth, straight, and at right angles to the pipe axis using saw or abrasive wheel. Dress and bevel end of cut pipe to remove roughness and sharp corners.
W 7.E.2.2 Cleaning: Thoroughly clean pipe and fittings of foreign matter before installation. Keep pipe and fittings clean until piping system placed into service.
W 7.E.2.3 Clean joint contact surfaces immediately prior to jointing.
W 7.E.2.4 Trenching: See Sturgis Standard Plate 11-3.

W 7.E.3.0 Jointing and Laying Pipe:
W 7.E.3.1 Lay pipe with bell ends facing in the direction of laying.
W 7.E.3.2 Comply with pipe manufacturer's recommended laying and joining instructions, and with Unibell Standards, unless specifically required otherwise by these specifications.
W 7.E.3.3 Mechanical Joints should be torqued to manufacturer's recommendations. Do not over tighten joints; if an effective seal is not obtained, disassemble joint, clean thoroughly, and reassemble. Where tie rods are used for restraining joints, align holes carefully to permit installation of harness bolts.

W 7.E.3.4 Push-on Joints. Clean and lubricate joint surfaces immediately before completing the joint. Bevel the spigot ends of field cut piping.
W 7.E.3.5 Mechanical Sleeve Type Couplings. Cut pipe ends clean square and smooth. Leave a space not a less than ¼" or more than 1" between pipe ends.
W 7.E.3.6 Polyethylene Encasement: For fittings and joint restraining devices, which are not epoxy coated, the encasement shall be 8-mil thickness sheet polyethylene meeting AWWA C-105. Joint tape for encasement shall be 3M Scotchwrap 50, or equal.

W 7.E.4.0 Anchorage
W 7.E.4.1 Thrust restraint shall be completed in accordance with ANSI/AWWA C605-94/5.7, ANSI/AWWA 907-91 and AWWA Manual M23 or must current edition of these standards and should adhere to the manufacturer's recommendations.
W 7.E.4.2 Provide a complete system of reaction blocking and mechanical restraint to prevent pipe movement caused by internal pressure.
W 7.E.4.3 Provide concrete thrust blocking and restraining system at tees, crosses, bends deflecting 11 ¼ degree or more, plugs, caps, and similar locations whether specifically indicated on the drawings or not.
W 7.E.4.4 Concrete thrust blocking shall be concrete when a joint is mechanically restrained. Blocking shall extend from the fitting to solid undisturbed earth, and shall be installed such that the joints are not covered by concrete.
W 7.E.4.5 Provide polyethylene encasement completely over the fitting to protect the bolts from concrete. The minimum thickness of concrete between the fitting and the soil bearing area shall be 6".

W 7.E.5.0 Placing Hydrants and Auxiliary valves

W 7.E.5.1 Fire hydrants shall be installed in accordance with ANSI/AWWA C600-93/3.7, AWWA Manual M17 or most current edition and the recommendations of the manufacturer, and must be torqued to manufacturer's specifications. See Plate 8-1.

W 7.E.5.2 Hydrants auxiliary gate valves and boxes shall be placed in a vertical position (plumb) at the locations indicated on the plans.

W 7.E.5.3 Excavate an area not less than 18" square and 18" deep below the base of each hydrant and fill this excavation with ¾" to 1" clean rock or gravel before placing the hydrant. After the hydrant is placed, construct a concrete thrust block between the back of the hydrant and the firm undisturbed earth at the back of the hydrant excavation. See Plate 8-1.

W 7.E.5.4 Place an additional quantity of clean rock or gravel at the base of the hydrant to completely cover the base of the hydrant to a depth of at least 6" above the barrel drain ports.

W 7.E.5.5 Place the hydrant auxiliary gate valve in the position indicated on the plans and torqued to manufacturer's recommendations.

W 7.E.5.6 Set the hydrant with the bury line at the finished ground surface. Contractor hall refer to plans for finish grade elevations which vary from existing ground elevations. Provide hydrant extension if required. Hydrant must be clean after installation. The water department will require re-painting at their discretion.

W 7.E.6.0 Placing Valves and Valve Boxes.

W 7.E.6.1 Valves shall be placed on a precast concrete block, with a thickness of at least 6" and a surface area of at least 8" x 18" and centered at the valve center.

W 7.E.6.2 Valves and boxes shall be placed in a vertical position, with the top of the valve box ¼" or ½" below the pavement in paved areas. See Standard Plate 8-6.

W 7.E.6.3 Where the plans indicate that the future grade at the valve location will be higher or lower than the surface elevation at the time of valve installation, the contractor shall provide the correct combination of extension pieces such that the elevation of the valve box can be adjusted to the future finish grade without replacing the valve box.

W 7.E.6.4 Install valve adaptor and debris cap on each valve and box.

W 7.E.6.5 All valve boxes must have a debris plug installed.

W 7.E.7.0 Locator Wire

W 7.E.7.1 Locator wire shall be 12 gauge solid blue, not stranded Tracer wire must run from the main to the meter inside the foundation. If there is an existing curb box in the sidewalk, the new trace wire access box must be placed adjacent to the sidewalk with a 18" x 18" of cement and 4" deep.

W 7.E.7.2 The trace wire must be hooked up to a trace wire access box, installed at the surface next to the curb box, at the edge of the ROW in the sidewalk. If there is no sidewalk, and at the curb box and trace wire access box are not in concrete or asphalt, a cement square 18" x 18" and 4" thick must be poured at the edge of the ROW. The concrete must be flush with the finished grade, and the top of the curb box and trace wire box being ¼" to ½" below the top of pavement. Lay locator wire along with the pipe near the top of the pipe embedment zone, taking care not to damage the wire during backfilling.

W 7.E.7.3 Bring the locator wire to the surface of the tracer wire access box, curb boxes and hydrants. Provide a minimum of 1 foot of slack in the wire as required. Any splices completed on the trace wire must be made using silicone nuts or grease packs. Cement must be kept out of the top of the boxes. Any cement remaining will be required to be removed before the water will be turned on.

W 7.E.8.0 Meter pits: Install per manufacturer recommendations and the standard details provided in the plans.

Section W-8 Water Main Replacement

W 8.1.1 Removal of Exiting Water Mains

Unless indicated otherwise on the plans, the Contractor shall not remove existing water main pipe and fittings as part of the Contract work.
Contractor shall lawfully dispose of removed materials.
Pipe profiles of existing pipes shown on the plans are shown to illustrate assumed pipe depths and grades and to show potential conflicts with other utilities. The actual depth of existing pipelines may vary from the profiles shown on the drawings, and the Contractor shall comply with the requirements of this specification to provide the necessary frost protection.
Existing valves shall be abandoned when called for on the drawings. The valves shall be placed in the closed position, box removed and hole backfilled.

W 8.2.1 Temporary Water Service

Prior to commencing any water main replacement work, the Contractor shall provide for temporary water service to any residences or business where the water main service will be discontinued for 8 hours or more. Temporary water main plugs required for construction sequencing will be the responsibility of the Contractor and no payment will be made.
Acceptable temporary service shall consist of safe and reliable piping with a capacity sufficient for normal needs.
The Contractor is responsible for all temporary piping and service equipment needed to provide temporary water service, and for maintaining the temporary equipment in a serviceable condition.
The Contractor is responsible for investigating the conditions for temporary service in advance construction, and for having the needed fitting and connection devices at the jobsite.

W 8.3.1 Service Interruption

The Contractor shall provide not less than 24 hours (City prefers 48 hours) advance written notification to affected property owners when service interruption is anticipated.
Service interruption, when needed, shall be limited to between the hours of 7 AM and 5 PM Monday through Friday, unless special arrangements with the affected owner have been made in advance. Some businesses may need more notice or different working hours.

No weekend service or Holiday interruptions are permitted without special arrangements with Water Department.

W 8.4.1 Restoring Service
Do not reconnect exiting services to new mains until mains are satisfactorily tested and disinfected. A minimum of 2 Bacterial tests results are required to be submitted to the Water Department. Cooperate with property owners to minimize service interruption time and to assure that services are properly flushed and operating properly.

Section W-9 Testing

W 9.1.1 The Contractor shall coordinate all flushing, pressure, leak or bacterial testing with the Water Department. No testing shall be completed without the Water Department being present.

W 9.2.1 The City Water department must receive **ALL** test results directly from the testing company. The City will not allow waterlines to be serviced until test results are received that meet requirements.

W 9.3.1 Tests and inspections shall be in accordance with AWWA or recognized industry standards.

W 9.4.1 Where the results of any test fail, then such repeat tests necessary to achieve contract requirements shall be made by the Contractor at their expense.

W 9.5.1 Reports and Test certificates can be scanned and uploaded to the project permit file.

W 9.6.1 Any additional tests required may be ordered by the City to settle disagreements with the Contractor regarding quality of the work done. If the work is defective, the Contractor shall pay all cost of the extra test, and correct the work. If the work is satisfactory, then the city shall pay for the tests.

Section W-10 Disinfection of Water Main

W 10.1 Before being placed into service, each portion of water main shall be disinfected by introduction of chlorine solution in the mains. If tabs are used, the glue must be RTV approved.

W 10.2 After completion of pressure testing, mains shall be flushed to remove dirt or other debris.

W 10.3 Pipeline disinfection shall comply with the requirements of AWWA C-651.

W 10.4 Chlorine solution shall be prepared using sodium hypochlorite or calcium hypochlorite conforming to AWWA B-300, and introduced into the piping in an approved manner (tabs) to achieve a uniform dosage of 50 ppm in the piping system.

W 10.5 The disinfecting solution shall be allowed to stand in the pipe for a period not exceeding 5 days or less than 24 hours, during which time all valves and hydrants shall NOT be operated.

W 10.6 At the end of 24 hours, the treated water shall not contain less than 25 ppm of available chlorine in all parts of the system.

W 10.7 The system shall be flushed with clean water to reduce the residual chlorine to approximately 0.5 – 0.8 ppm. During the flushing period, each hydrant shall be operated to insure complete flushing.

W 10.8 Disposal of chlorinated water shall be performed in a manner which will not endanger aquatic life in adjacent watercourses in accordance with DENR rules. Neutralization of chlorinated water by approved means will be required.

W 10.9 At the completion of the disinfection and flushing period, the Contractor shall collect two consecutive samples at least 24 hours apart for bacteriological testing at each hydrant location, or at other approved tap locations, and shall submit these samples to an approved testing laboratory. Test results for each of the two samples must indicate the absence of bacteria before water mains are placed into service. Tests must be sent to the City.

W 10.10 The contractor shall not proceed with disinfection until a disinfection plan has been submitted to the City and approved.

Section W-11 Pressure Testing

W 11.1 Hydrostatic testing must be completed in accordance with ANSI/AWWA C605-94/Section 7.3 (PVC pipe) or most current edition for every section of water main between successive valves or other closures. 2 gauges with 2 lb increments must be provided for the test.

W 11.2 Each section shall be tested by applying a hydrostatic pressure of 150 psi as measured by a gauge at the lowest hydrant. On a new subdivision or a long service line, the contractor should submit a testing plan for review by the Water Department.

W 11.3 Lines shall be filled slowly (velocity less than 2 fps) and all air completely expelled from pipes prior to pressure testing.

W 11.4 Allowable leakage shall be calculated using the following formula. Leakage tests shall be for a duration of 2 hours or more.

$L = (NDP^{1/2})/7400$

L= allowable leakage in gallon per hour
N = number of joints in the length of pipeline tested
D = nominal diameter of pipe in inches
P = average test pressure during the leakage test, in pounds per square inch (gauge)

Example leakage calculation:
Max L (8”) = 0.65 gallons per hour per 1,000 linear feet at 150 psi.
Max L (6”) = 0.49 gallons per hour per 1,000 linear feet at 150 psi.

The above described tests shall be made under the observation of the Water Department. The Contractor shall provide at least 24 hours notice prior to testing. The Contractor shall correct and/or replace any faulty material or workmanship at his expense to the satisfaction of the Water Superintendent. Tests shall be repeated after any replacements have been made.

All necessary pumps, appliances, gauges and labor for the test shall be furnished by the Contractor at their own expense.
Replace all defective fitting pipe or other accessories with new material. The use of repair clamps or sleeves to repair defective material will not be permitted.

Section W-12 Separation of Water Main and Sewers

W 12.1.0 Horizontal separation:

W 12.1.1 Sewers shall be laid at least 10' horizontally from any existing or proposed water main. The distance shall be measured edge to edge.

W 12.1.2 In cases where it is not practical to maintain a 10 foot separation, the SDDENR may allow deviation on a case-by-case basis, if supported by data from the design engineer. Such deviation may allow installation of the sewer closer to a water main, provided that the water main is in a separate trench or in an undisturbed earth encased with flowable fill cement.

W 12.1.3 If it impossible to obtain proper horizontal separation as described above, both the water main and sewer shall be constructed of slip-on or mechanical joint pipe complying with public water design standards of the SDDENR and be pressure tested to 150 psi to assure water tightness before backfilling.

W 12.2.0 Vertical Separation

W 12.2.1 Sewers Crossing Under Water Mains

The sewer shall be laid to provide a minimum of 18" from the top of the sewer to the bottom of the water main.
The crossing shall be arranged so the sewer joints will be equidistant and as far as possible from the water main, and encasing them in concrete.

W 12.2.2 Sewers Crossing Over Water Mains

Either the water main or the sewer main must be encased in concrete that extends 10 feet on both sides of the crossing, measure perpendicular to the water main. The carrier pipe shall be PVC, ABS, or HDPE, and the ends sealed with a rubber gasket or boot.

W 12.3.0 Special Conditions: When it is impossible to obtain the proper horizontal and vertical separation, one of the following methods shall be specified,

W 12.3.1 Water Pipe. The sewer shall be designed and constructed equal to water pipe and shall be pressure tested at 150 psi prior to backfilling to assure water tightness; or

W 12.3.2 Carrier Pipe. Either the water main or the sewer main may be encased in a watertight carrier pipe that extends 10 feet on both sides of the crossing, measured perpendicular to the water main. The carrier pipe shall be PVC, ABS, or HDPE and the ends sealed with a rubber restraining gasket and spacers to hold the pipe from breaking or pulling apart..

Section W-13 Separation of Water Services and Sewer Services

W 13.1 Horizontal and Vertical Separation
Building sewers and water services lines to buildings may be installed to meet State plumbing code requirements when water lines are installed with continuous non-jointed material.

W 13.2 Building sewers and water service lines shall not run in the same trench in the ROW. Outside public ROW, building sewers and water service lines shall not run in the same trench unless all state rules of separation and materials must be used.

W 13.3 Water service pipes crossing sewer piping constructed of clay or materials which are not approved for use within a building shall be laid a minimum of twelve inches above that sewer pipe.

Section W-14 Trench

W 14 See Standard plate 11-3. All trenching shall meet OSHA and AWWA standards. Bedding is required. The water line must be a minimum of 6 feet deep until it is inside the foundation.

Section W-15 Trenchless Service Line Installation

W 15.1.1 Protection of Roadbed and Pavement. No excavation for access pits will be permitted within 3 feet of the pavement edge or curb of any highway unless shown otherwise on the plans.

W 15.1.0 The sides of the pits shall be supported by sheetpiling or shoring placed in such a manner as to prevent any movement or slippage of earth during the excavation and boring operations.

W 15.1.1 The Contractor shall work in close cooperation with City and utilities to insure the protection of their property and traffic.

W 15.2 Trenchless Boring Pits

W 15.2.1 The boring pit shall be excavated on one side of the right of way under which the pipe is to be installed. The pits shall be excavated within the existing right of way and meet all OSHA guidelines.

W 15.2.2 Shielding of the working face with steel plate may be necessary to prevent voids or caving.

W 15.2.3 Pits shall be maintained in a dewatered condition during the construction period.

W 15.3.1 Trenchless procedure: The water service shall be installed and pulled through the void prepared by a pneumatic boring or directional drilling device. The void for the water service shall not be enlarged to cause surface depressions or failures. The Contractor shall repair any settling or surface problems at no cost to the City for a minimum of a two year period.

W 15.4.1 Line and Grade. The completed service shall be true to plan line and grade to a tolerance of 0.5 feet maximum with a minimum 7.5 foot of cover under street pavement unless the Engineer specifically approves deviation of a greater amount from the plan grade. If the Contractor is unable to maintain this tolerance, he shall bear the full responsibility for corrective work and/or redesign and relocation.

W 15.5.1 Underground Utilities. The Contractor bears full responsibility for any change to underground utilities and for pothole locations.