

PART-II WATER UTILITY

01010 WATER LINE DESIGN CRITERIA

1.0 MINIMUM DESIGN CRITERIA

1.1 GENERAL

- A. All water distribution and transmission systems will comply with these Standards and Specifications for water main and service lines. Additional criteria may be required by the Town.
- B. Use only those materials included in these specifications.

1.2 DESIGN PARAMETERS

	SINGLE FAMILY	MULTI FAMILY	COMMERCIAL/ INDUSTRIAL
MINIMUM FIRE FLOW	*	*	*
MAX MAIN DESIGN PRESSURE (Ord. #2008-16)	150 p.s.i.	150 p.s.i.	150 p.s.i.
MIN. MAIN DESIGN PRESSURE	45 p.s.i.	45 p.s.i.	45 p.s.i.
RESIDUAL P.S.I. DURING FIRE FLOW	40 p.s.i.	40 p.s.i.	40 p.s.i.

THE MAXIMUM LENGTH OF A DEAD END LINE SHALL NOT BE GREATER THAN 600 FEET.

- * Design flow and line size for fire protection purposes must be reviewed and approved by the Chaffee County Fire District or other fire jurisdiction having the authority for the area to be served.

1.3 PIPE SIZES

- A. Minimum main line size shall be eight (8) (Ord. #2008-16)inch. For pipe sizes larger than twelve (12) inches, the Town will determine the Specifications.
- B. All mains shall be looped, unless approved otherwise in writing by the Town.

1.4 SERVICE LINES

- A. Each structure and each subdivided lot shall be served by a separate service line. Shared service lines may be allowed, upon board approval, in planned unit developments. In the event of subsequent subdivision of the property, each building shall have its own water service line. (Ord.#2002-28)

	<u>Single Family</u>	<u>Duplex</u>	<u>4-plex</u>	<u>5+Multi Family</u>
Water	¾"	1"	1-½"	Town Review
Sewer	4"	4"	6"	Town Review

- B. Service lines shall be of a size which is adequate to supply the requirements of the property being served. The minimum size allowable for a service line shall be ¾ inch. The requirements of the property being served shall be defined by peak demand, as calculated in the A.W.W.A. Manual of Water Supply Practices, entitled "Sizing Water Service Lines and Meters". Service lines ¾" through 2" shall be Type K Copper Tubing conforming to ASTM B-88 and ASTM B-251, or High Density Polyethylene Tubing, SDR 9, 200 psi pressure rating, meeting the requirements of ASTM 2737 and AWWA C901 with Copper Tube Size outside diameter. For either material, brass compression fittings shall be used. Stainless steel inserts shall be used with HDPE fittings. (Ord. #2006-6)
- C. When installing new water mains, the Developer must install service lines, corporation stop, valve boxes, curb stops, curb box with rod, and meter box to each property along the new water main per Town of Poncha Springs standards and specifications. The saddle will be AY McDonald Model 3805 all bronze or equivalent. Curb boxes shall comply with Section 02641 2.6, and curb stops shall comply with Section 02641 2.4. Service pipe from corporation stop to curb stop, curb stop to meter box, meter box to residence will be AWWA 901-02 H.D.P.E. (SDR-7 I.D. controlled 200 P.S.I.) performance pipe PE 4710 or equivalent (see Section 01010, 1.4,B.) #14 PE coated solid copper tracer wire is required on all services (see Section 02621, 3.2,F.) Meter boxes for ¾" and 1" meters will be single-meter 18" Mueller/McCullough, **Ford, or AY McDonald (Ord.#2009-8)** thermal-coil, with 2" insulation plug, cast iron locking lid with 2" reader plug (Figure 6). A double meter box may be used for common ownership, i.e. apartments, etc. with written permission of Public Works Director. See Figure 7 for typical meter pit for 1 ½" and 2" meters.

The property owner is responsible for installing the water service line from the meter box to the structure. (Figure 5). From the time of service activation, the homeowner will assume full responsibility for any repairs from the end of service line at curb stop to the structure and the Town will assume responsibility from the curb stop box including valve to the water main. (Figure 5) The meter will be purchased by the property owner from the town and will be maintained by the town.

Pressure reducing valves (prv) shall be installed if the static pressure at the water main is in excess of 80 P.S.I. The prv shall be installed in the building prior to any connection to a fixture or appliance and shall be in accordance with the Chaffee County adopted plumbing code. (Ordinance #2008-16)

- D. Meter pits located beneath asphalt, concrete, or in driveways (Ord. #2007-6) shall be constructed from standard precast concrete 4' diameter (Ord. #2007-6) manhole sections. Meter pits located with landscaped areas shall be constructed of bituminous fibers.

1.5 DEPTH

- A. All water lines including hydrant leads and water services shall have at least four and one half (4.5) feet of ground cover from the top of the pipe to the finished ground surface.
- B. **All water meter pits must be set with the bottom of the pit at a minimum depth of 60 inches (five feet). (Ord. #2009-8)**
- C. **To ensure proper operation of all valves, any water or sewer line over six (6) feet deep will require an extension of the valve to allow a standard key to properly reach and operate the valve. (Ord. #2009-8)**

1.6 ALIGNMENT

- A. All water mains shall be laid, within the R.O.W, eight (8) feet from the roadway centerline.(Ord. 2007-3) Deflections in the alignment shall be made using fittings. Water and sewer lines shall be installed with a minimum ten (10) foot horizontal separation.

1.7 GRADE

- A. All pipe shall be laid and maintained to the design specified lines and grades. Fittings, valves, and hydrants shall be at the required locations with joints centered, and all valve and hydrant stems plumb. No deviation shall be made from the required line or grade except with the written consent of the Town. All pipe shall be laid to the depth shown on the contract drawings or as directed by the Town in writing. The depth shall be measured from the established street grade or finished surface level to the top of the pipe barrel.
- B. Air and vacuum valves are required at high points on water lines 12 inches and larger. Town may require air and vacuum valves on smaller lines if in their opinion they are necessary.

1.8 FUTURE CONNECTIONS

- A. Water mains must be extended to the far edge of the property to be serviced, or to the edge of the platted subdivision. (Ord. #2007-16) When future main extensions are possible, the main which can be extended must be valved such that only one valve will have to be closed when the main is extended. The valve must be restrained so that when the one valve is closed and the line to be extended is exposed, the valve will remain safely in place. Restraint may be made by the use of a swivel or flange joint or lengths of pipe installed on the extension side of the valve designed by a professional engineer to develop sufficient restraint from the soil resistance.

1.9 VALVING

- A. Mainline valve placement.
 - 1. Place valves not more than 18 inches from any fitting.
 - 2. In line tee connections shall not have less than two valves, except hydrant tees.
 - 3. In line cross connections shall not have less than three valves.
- B. Valves shall be the same size as the line for which they serve.
- C. Valves will be placed on lines of (12) twelve inch or smaller diameter no more than (500) five hundred feet apart. Each fire hydrant shall have a hydrant valve.
- D. For lines larger than 12" the valve location and spacing will be determined by the Town.
- E. The valving of the mainlines between hydrants must be accomplished to prevent more than one hydrant from being out of service in the event of a mainline break or shutdown.

1.10 BLOW OFF VALVE ASSEMBLY

- A. In all installations where the main will be permanently dead-ended, such as a cul-de-sac, a fire hydrant shall be installed. Where the main will be temporarily dead-ended, for example the boundary of a subdivision filing, a fire hydrant, which can serve additionally as a blow-off, is located at the main's temporary end. All plugs and caps unless otherwise specified, shall be provided with a concrete thrust block, or thrust shall be restrained by attaching suitable metal tie rods or clamps as specified. The blow-off shall be installed at a right angle to the main.

1.11 FIRE HYDRANT LOCATION

- A. The Developer shall provide fire hydrants which conform to the requirements of these Specifications. Fire hydrant location and spacing shall be determined by the Fire

Chief or the Town. As minimum general requirements, the number of fire hydrants, their location and spacing shall be as follows:

1. Residential Areas - 500 feet between hydrants starting at street intersections.
2. Multiple Dwellings - 500 feet between hydrants and not more than 400 feet to rear of premise.
3. Commercial, Industrial, Storage - 500 feet between hydrants and not more than 350 feet to any other part of building.
4. No fire hydrant line shall be connected to less than a six (6) inch water main or to a "dead end" water main unless the hydrant can deliver 1250 G.P.M. with a 20 P.S.I. residual, or specifically approved by the Town.

1.12 FIRE LINES & FIRE HYDRANT LINES

- A. A fire hydrant line shall extend from the hydrant tee on the water main to the fire hydrant.
- B. If allowed, private fire service main for use on an internal fire suppression system shall extend from the valve on the main to the base of the riser flange in the building.
- C. Plans for the installation of the above mentioned fire suppression lines must be submitted to the Town for approval and must be stamped by a Professional Engineer.
- D. The owner of any nonpublic fire service main or fire hydrant line is responsible for maintenance of that line from the valve and valve box on the Town main to and including the hydrant. Valves on newly constructed fire lines will be located on the tee at the main and they shall open left.
- E. Fire service lines and fire hydrant lines shall be separate from each other and all other service connections.
- F. The use of any private fire service main to supply more than one lot is not allowed.
- G. Private fire hydrants shall meet the requirements of the Town and the Chaffee County Fire Department.

* * * END OF SECTION * * *

01656
DISINFECTION OF DOMESTIC WATER LINES

1.0 GENERAL

1.1 DESCRIPTION

- A. This section covers disinfection of potable water lines. Contractor is responsible for disinfection and testing of water lines.

1.2 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Exercise extreme care in handling of hypochlorites as they may be dangerous to health.
- B. Standard: Forewords to both AWWA B-300 and AWWA C651.

2.0 PRODUCTS

2.1 MATERIALS

- A. Hypochlorites: Reference AWWA B300.

3.0 EXECUTION

3.1 GENERAL

- A. The Contractor shall flush and satisfactorily disinfect new water lines prior to placing them in service, in accordance with AWWA C651.
- B. Heavy particulates generally will contain bacteria, and will prevent even very high concentrations of chlorine from contacting and killing such organisms. It is therefore essential that procedures be observed to assure that a water main and its appurtenances are thoroughly clean for the final disinfection by chlorination.
- C. If dirt enters the pipe that, in the opinion of the Town, will not be removed by the flushing operation, the interior of the pipe shall be cleaned by mechanical means and then shall be swabbed with a 1 percent hypochlorite disinfection solution. Cleaning with the use of a pig, swab, or "go-devil" should be undertaken only when such operation will not force mud or debris into pipe joint spaces.
- D. The Town shall operate existing valves to prevent the disinfectant solution from flowing back into the line supplying the water or into adjacent parts of the in-service distribution system.

- E. If it is not possible to keep the pipe and fittings dry during installation, every effort shall be made to assure that any of the water that may enter the pipe joint spaces contains an available chlorine concentration of approximately 25 mg/l. This may be accomplished by adding calcium hypochlorite granules to each length of pipe before it is lowered into a wet trench.
- F. If the main is flooded during construction, it shall be cleared of the flood water by draining and by flushing with potable water until clean. The section exposed to the flood water shall then be filled with a chlorinated potable water which at the end of a 24-hour holding period will have a free chlorine residual of not less than 25 mg/l. The chlorinated water may then be drained or flushed from the main. After construction is completed, the main shall be disinfected using the continuous feed or slug method.
- G. Operate valves and other appurtenances while the lines are filled with heavily chlorinated water.
- H. Do not fill the pipe at a velocity greater than 6 fps.

3.2 PRELIMINARY FLUSHING

- A. Flush pipelines at a minimum velocity of 2.5 ft./sec., in order to remove foreign material prior to disinfection.
 - 1. Do not use preliminary flushing with the tablet method of disinfection.

3.3 METHODS

- A. Disinfection by chlorination of the pipe shall be performed prior to acceptance by the Town. The chlorinating agent and method of application shall be approved by the Town in accordance with A.W.W.A. C-651. The Town has the authority to restrict the method of disinfection on a case by case basis.
- B. The chlorinated water shall be retained in the main for at least 24 hours, during which time all valves and hydrants in the section treated shall be operated in order to disinfect the appurtenances. At the end of this 24-hour period, the treated water in all portions of the main shall have a residual of not less than 10 mg/l free chlorine.
- C. Chlorine tablets are not to be used for disinfection, only granular methods.

3.4 FINAL FLUSHING.

- A. Clearing the Main of Heavily Chlorinated Water.
 - 1. After the applicable retention period, the heavily chlorinated water shall be flushed from the main until chlorine measurement show that the concentration in the water leaving the main is no higher than that generally prevailing in the system.

B. Disposing of Heavily Chlorinated Water.

1. The environment to which the chlorinated water is to be discharged shall be inspected and if there is any question that the chlorinated discharge will cause damage to the environment, then a reducing agent shall be applied to the water to be wasted to neutralize thoroughly the chlorine residual remaining in the water. Where necessary, federal, state, and local regulatory agencies should be contacted to determine special provisions for the disposal of heavily chlorinated water.
2. Chlorine residual of water being disposed will be neutralized by treating with one of the following chemicals:

Pounds of Chemicals Required to Neutralize Various Residual Chlorine Concentrations in 100,000 Gallons of Water.

Residual Chlorine Concentration mg/l	Sulfur Dioxide SO ₂	Sodium Bisulfite NaHSO ₃	Sodium Sulfite Na ₂ SO ₃	Sodium Thiosulfate Na ₂ S ₂ O ₃ 5H ₂ O
1	0.8	1.2	1.4	1.2
2	1.7	2.5	2.9	2.4
10	8.3	12.5	14.6	12.0
50	41.7	62.6	73.0	60.0

3.5 REPETITION OF PROCEDURE

- A. If the initial disinfection, or subsequent disinfections, fail to produce satisfactory samples, the main shall be refushed and resampled. If the samples are still not satisfactory, the main shall be rechlorinated by the continuous-feed or the slug method of chlorination until satisfactory results are obtained.
- B. If the residual is less than 10 milligrams per liter the water lines shall be rechlorinated by the continuous-feed or slug method of chlorination and retested.

* * * END OF SECTION * * *

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01666
TESTING PIPING SYSTEM

1.0 GENERAL

1.1 DESCRIPTION

- A. This section covers hydrostatic testing of water lines.

2.0 PRODUCTS

- A. Section not used.

3.0 EXECUTION

3.1 GENERAL

- A. Once the pipeline has been backfilled, filled and disinfected, a pressure test shall be conducted.
1. The contractor shall provide all equipment and personnel to perform the hydrostatic test.
 - a. Test equipment shall be able to maintain a continuous internal pipe pressure of 150 psi and accurately measure leakage from the pipe over a 12 hour, minimum test period.
 - b. The maximum allowable pressure gauge increment shall be 5 psi.
 - c. A water meter shall be used to measure the amount of water used in pressurizing the system.
 2. The Town shall witness tests.
- B. Testing shall not occur until at least 7 days have elapsed since the last concrete thrust restraint was cast.
1. A minimum of 72 hours shall elapse if high-early - strength cement is used.
- C. Unless prior permission is given by the Town, the hydrostatic pressure test shall be performed against all valves within the new piping system.
- D. Pipe shall remain filled with water for a minimum of 24 hours prior to the hydrostatic pressure test.
- E. Prior to the tests inspect valves within the test section to make sure they are fully open.
1. Hydrants: Test with the hydrant main valve closed and the hydrant tee/auxiliary valve open.

3.2 PRESSURE TEST

- A. "Leakage" is the quantity of water that must be added to the pipeline to maintain a pressure of within 5 psi of the specified test pressure after the air has been expelled and the pipe has been filled with water.
- B. Test pressure.
 - 1. Test pressure shall be 150 psi at the lowest elevation of the test section.
 - 2. A residual pressure of within 5 psi of the test pressure shall be maintained for a minimum of 2 hours.
- C. The maximum allowable leakage for each test section is determined by the

$$L = \frac{SxDx\sqrt{P}}{133,200}$$

following formula and table:

Where: L = maximum allowable leakage, in gallons per hour.

S = length of pipeline tested, in feet.

D = nominal pipe diameter, in inches.

P = average test pressure during the leakage test, in psi (gauge).

- 1. Reference AWWA C600.
- D. Testing and Leakage.
 - 1. When filling the pipeline, it shall be filled at a rate which will not cause surges nor will it exceed the rate at which the air can be released.
 - 2. All air in the line shall be properly purged. Where blowoffs or hydrants are not available or effective in purging air from the line, the Town shall require a tap to purge the line. The location and the size of the tap shall be at the Town's discretion.
 - 3. Unless prior written permission is given by the Town, a test section shall not be any longer than length of pipe between adjacent line valves.
 - 4. There will be no additional leakage allowance for valves.
 - 5. Testing through fire hydrants shall not be allowed.
- E. Do not test against Town's existing valves. Provide temporary watertight plugs and temporary thrust restraint until tests pass. After system passes acceptable testing remove plugs and thrust restraint and connect to existing valve with cut-in sleeve or solid sleeve.

3.3 PASSING

- A. If the tests disclose leakage greater than that specified, the defective materials and joints shall be located and repaired.
 - 1. The tests shall be repeated until the leakage is less than the maximum allowed.
- B. With the exception of obvious leaks, passing of the pressure test shall be on the basis of maximum allowable leakage per section tested.
 - 1. No leakage is allowed through the bonnet of any valve or appurtenance. Any valve or appurtenance that leaks will be removed and replaced.
- C. If the pipeline under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size.
- D. All visible leaks shall be repaired regardless of maximum allowable leakage.

* * * END OF SECTION * * *

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TRENCHING, BACKFILLING AND COMPACTING

1.0 GENERAL

1.1 DESCRIPTION

- A. This section covers excavation and trenching, including drainage, preparation of subgrades, pipe bedding, backfilling, compacting, and finish grading for underground pipelines and appurtenances.

1.2 QUALITY ASSURANCE

- A. "CDOT" refers to Colorado Department of Transportation designations in their "Standard Specifications for Road and Bridge Construction."
1. When CDOT is referenced herein, Sections 100 through 109 and measurement and payment provisions will not apply.

1.3 JOB CONDITIONS

- A. Right-of-Way.
1. In developed areas haul and stockpile excess material or erect suitable bulkheads to prevent deposition of excavated material where right-of-way or easements are not adequate to stockpile all excavated material without depositing it on private property.
- B. Blasting.
1. Blasting is not permitted within the jurisdiction of the Town.
- C. Drainage and Groundwater.
1. Maintain excavations and trenches free from water during construction.
 2. Remove water encountered in the trench to the extent necessary to provide a firm subgrade, to permit joints to be made in the dry, and to prevent the entrance of water into the pipeline.
 3. Divert surface runoff and use sumps, gravel blankets, well points, drain lines or other means necessary to accomplish the above.
 4. Maintain the excavation or trench free from water until the structure, or pipe to be installed therein, is completed to the extent that no damage from hydrostatic pressure, flotation, or other cause will result.
 5. Uncontaminated groundwater shall be prevented from entering into previously constructed pipe.
Groundwater contaminated by sanitary waste shall be discharged into the sanitary sewer.
 6. The pipe under construction shall not be used for dewatering.

- D. Sequencing.
 - 1. Perform pipeline installation within 50 linear feet of trench excavation.
 - 2. Perform trench backfill within 50 linear feet of pipe installation.
 - 3. Perform clean-up within 200 linear feet of trench excavation.
 - 4. Where excavation is a hazard to automotive or pedestrian traffic, the amount of open trench and the time duration of that opening is to be minimized.
 - 5. Maintain access to private residence and businesses.
- E. Underground Obstructions.
 - 1. Contractor is responsible for the location and verification of all underground utilities and obstructions.
 - 2. Maintain, protect and support by shoring, bracing or other means existing utilities, appurtenances and structures.
 - 3. Take such protective measures as the utilities may direct where protection, alternations or moving of the utilities is required.
- F. Weather.
 - 1. Do not backfill or construct fills or embankments during freezing weather.
 - 2. Do not place backfill, fill or embankment on frozen surfaces.
 - 3. Do not place frozen materials, snow or ice in backfill, fill or embankments.
 - 4. Do not deposit, tamp, roll or otherwise mechanically compact backfill in water.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Storage.
 - 1. Provide adequate and orderly storage of excavated material adjacent to Work.
 - 2. Pile suitable material for backfilling in an orderly manner a sufficient distance from banks or trench or excavation to avoid overloading and to prevent slides or cave-ins.
 - 3. Do not stockpile excavated materials against existing structures, Work, or appurtenances.
 - 4. Excess excavated material will not remain on job site for more than one (1) month.

1.5 MAINTENANCE AND CORRECTION

- A. Scarify surface, reshape, and compact to required density completed or partially completed areas of work disturbed by subsequent construction operations or by adverse weather.
- B. Maintain and correct backfill, fill and embankment settlement and make necessary repairs to pavement structures, seeding and sodding which may be damaged as a result of settlement for period of one (1) year after Substantial Completion and acceptance of the Work.

2.0 MATERIALS

2.1 GENERAL

- A. All material shall be free from frozen matter, stumps, roots, brush, other organic matter, cinders or other corrosive material, debris, broken asphalt and concrete, and any other material that is not suitable in the opinion of the Town.
- B. If job excavated material is not sufficient or suitable, suitable material shall be imported. All imported material shall have a liquid limit not greater than 30 and a plasticity index not greater than 6.

2.2 STABILIZATION MATERIAL

- A. Top 6 inches of pipe subgrade - If the existing soil in the trench bottom is judged to be unsuitable the top 6-inches of the pipe subgrade shall be removed and replaced with a stabilization material.

- 1. Stabilization material is crusher-run rock, conforming to ASTM D448, size #357.

<u>SIZE</u>	<u>PERCENT PASSING</u>
2 ½"	100
2"	95-100
1"	35-70
½"	10-30
#4	0-5

- B. Geotextile: CDOT, Section 712.08, Class A Table 712-2.
- C. Subgrade below top 6 inches - Same as top 6 inches except that broken concrete and rock may be included in sizes permitting compaction as specified without discernible voids.

2.3 BEDDING MATERIALS

- A. Definition: Materials placed from the subgrade to an elevation 12 inches above the top of pipe, including service lines.
- B. Granular material.
 - 1. Angular crushed rock, conforming to CDOT #67.

<u>SIZE</u>	<u>PERCENT PASSING</u>
1"	100
¾"	90-100
⅜"	20-55
#4	0-10
#8	0-5
Class #6 Road Base	90-100 (Ord. 2005-16)
Bedding Sand	90-100 (Ord. 2005-16)

2. Or, well-graded angular crushed rock: 95% passing a one (1) inch sieve and not more than 5% passing a No. 4 sieve.
- C. Concrete.
1. Compressive strength: 4000 psi at 28 days minimum.
 2. Class A concrete, reference Colorado Department of Transportation, Division of Highways, State of Colorado "Standard Specifications for Road and Bridge Construction" section 601. Sections 100 through 109 and measurement and payment provisions shall not apply.
- D. Barrier material.
1. Soil Classification.
 - a. GC - clayey gravels, gravel-sand-clay mixtures.
 - b. SC - clayey sands, sand-clay mixtures.
 - c. CL - inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, clean clays.
 - d. Material shall not be lumpy or hard but shall be finely divided, suitable, and free from stones.
- E. Bedding material for service lines less than four (4) inches in diameter shall be sands or silts and clays meeting the Unified Soil Classification types ML or CL. Material shall not be lumpy or hard but shall be finely divided, suitable, and free from stones greater than ½ inch in its largest dimension.

2.4 TRENCH BACKFILL MATERIAL

- A. Trench backfill material shall be placed from a point 12-inches above the pipe to 6-inches below the ground surface, to bottom of topsoil layer, or to the bottom of the pavement subgrade, whichever is applicable.
- B. Trench backfill material shall be soil free from any rocks or stones which are larger than 12-inches, in any dimension.
 1. Rocks or stones which are larger than 3-inches, in any dimension, shall not be placed within one foot of pavement subgrade, or within one foot of the finished surface of unpaved areas.
 2. Material shall not be lumpy or hard but shall be finely divided.

3.0 EXECUTION

3.1 PREPARATION

- A. Topsoiling. Remove a minimum of 6 inches of topsoil and stockpile topsoil away from areas to be disturbed by construction. Keep topsoil segregated from non-organic excavation materials and debris.
- B.

3.2 TRENCHING

- A. Excavate trenches by open cut methods, except where boring or tunneling is indicated in the Contract Documents, required by jurisdictional agencies or desired by Contractor to avoid removal of obstructions.
- B. Do not use mechanical equipment in locations where its operation would cause damage to trees, buildings, culverts, or other property, utilities, or structures above or below ground. In all such locations, hand excavating methods shall be used.
- C. Use mechanical equipment so designed and operated that the rough trench excavation bottom elevation can be controlled with uniform trench widths and vertical sidewalls from an elevation one foot above the top of the installed pipe to the bottom of the trench, and trench alignment sufficiently accurate to permit pipe to be aligned properly between the pipe and sidewalls of the trench. Do not undercut the trench sidewall to obtain clearance.
- D. Excavation in rock.
 - 1. Over excavate a minimum of six inches below the bottom of the pipe.
 - 2. Backfill with Granular Material.
- E. Preparation of Trench Bottom.
 - 1. Grade trench bottoms uniformly to provide clearance for each section of pipe.
 - 2. Remove loose materials, water and foreign objects.
 - 3. Provide firm subgrade suitable for application of bedding material.
 - 4. Wherever unstable material is encountered in the bottom of the trench, over-excavate such material to a depth suitable for construction of a stable subgrade. Backfill overdepth with Stabilization Material and compact. A layer of geotextile fabric shall be placed between the stabilization material and the bedding material.
- F. Stockpiling Excavated Materials.
 - 1. Pile suitable material for backfilling in an orderly manner a sufficient distance from banks of the trench to avoid overloading and to prevent slides or cave-ins.
 - 2. Remove and dispose of excess excavated materials not suitable or not required for backfilling.
 - 3. Do not stockpile excavated material against existing structures or appurtenances.
 - 4. Excess excavated material will not remain on job site for more than one (1) month.
- G. Limiting Trench Widths
 - 1. Trenches shall be excavated to a width necessary to provide a 12-inch minimum working space between the pipe and the trench walls for proper pipe installation, joining, and bedding.
 - 2. The maximum trench width at an elevation 12 inches above the top of the installed pipe, shall be 2 barrel diameters of the pipe or 32 inches whichever is greater.

- a. If the width of the trench, 12 inches above the top of the installed pipe, exceeds the maximum allowable trench width special pipe bedding shall be provided, as required by soil loading conditions and as determined by the Town.

3.3 PIPE BEDDING

- A. Bedding classes: Place pipe bedding in accordance with the details shown on the Drawings. Provide higher class bedding where unexpected trench conditions are encountered.
- B. Placement and Compaction.
 1. Distribute and grade bedding material to provide uniform and continuous support beneath the pipe at all points between bells and pipe joints.
 2. Deposit bedding material and compact uniformly and simultaneously on each side of the pipe to prevent lateral displacement.
 3. Compact granular bedding material by vibrating, slicing with a shovel, or bent tee-bar.
- C. Ground Water Barriers.
 1. To impede passage of water through bedding material, construct a ground water barrier the full trench width, approximately 4 feet long, and from the bottom of all Granular Material to top of Granular Material.
 2. Space:
 - a. Approximately 10 feet downstream of each manhole for sanitary sewers and storm drains.
 - b. Every 400 feet on water lines and force main.
 - c. Place a ground water barrier 20 feet downstream of the edge of all drainage ways, streams and water courses.
- D. Over Depth Excavation.
 1. Restore over excavated subgrades to proper elevation with Stabilization Material or Granular Material.

3.4 BACKFILLING AND COMPACTION

- A. Backfill trench promptly after completion of pipe bedding.
- B. Deposit backfill material in uniform layers not exceeding eight inches in uncompacted thickness. Increased layer thickness may be acceptable provided it is demonstrated that the specified compacted density will be obtained.
- C. Use methods and equipment appropriate for the backfill material. Do not use equipment or methods that will transmit damaging shocks to the pipe.
 1. Do not perform compaction by jetting or water settling.

- D. Import material for trench backfill if compaction can not be obtained with job excavated material, when specifically required by these Contract Documents, or required by jurisdictional authorities.
- E. Rock and bedrock encountered in the excavation shall be separated from other excavated material and disposed of by Contractor.
- F. Topsoiling - Replace topsoil after construction and grading to the depth of stripping over all areas disturbed by construction operations and which will not receive other surface treatment.
- G. Obtaining a site for disposal of excavated rock and bedrock material, excess excavated materials, and material not suitable for backfilling is the responsibility of Contractor. If excavated materials are disposed on private property, written permission shall be obtained from the property owner and a copy given to Town.

3.5 FIELD QUALITY

- A. Field Compaction Control.
 - 1. Field tests will be conducted to determine compliance of compaction methods with specified density in accordance with:
 - a. ASTM D2922 (AASHTO T238) - Tests for Density of Soil and Soil - Aggregate In-Place by Nuclear Methods, or
 - b. ASTM D1556 (AASHTO T191) - Tests for Density of Soil In-Place by the Sand Cone Method, or
 - c. ASTM D2167 (AASHTO T205) - Tests for Density of Soil In-Place by Rubber-Balloon Method.
- B. Compaction shall be to the following minimum densities, reference ASTM D698 or AASHTO T99 unless otherwise indicated.
 - 1. Subgrade under footings or foundations: 100%
 - 2. Barrier material: 95%
 - 3. Pipe bedding.
 - a. Compacted granular material: 80% (ASTM D4253, D4254)
 - b. Barrier material: 95%
 - 4. Trench backfill.
 - a. Within right of way and under areas of permanent surface improvements: 95%
 - b. Under footings, foundations or structures: 95%.
 - c. Seeded areas: 88%.
 - d. All other locations: 95%.
 - e. Do not compact topsoil.
 - 5. Where granular materials are used in lieu of cohesive soils reduce the above percentages by 15% to arrive at the relative density and ASTM D4253 and D4254 shall apply.
- C. Moisture Content.
 - 1. All compacted backfill shall be within 2% (+/-) of the optimum moisture content of the soil as determined by ASTM D698.

2. Water shall be added to the material, or the material shall be harrowed, disced, bladed, or otherwise worked to insure a uniform moisture content, as specified.

3.6 COMPACTION TEST FAILURE

- A. If the required state of compaction is not obtained, it shall be the responsibility of the Contractor to recompact the material to the required state of compaction. In cases where there is a failure to achieve the required state of compaction, the Town may require that the backfill be removed and recompacted or replaced.
- B. A hydrostatic retest shall be required on water lines after recompaction if the hydrostatic testing had been performed prior to recompaction.
 1. Testing shall be performed between valves on both sides of area of recompaction.
- C. A retest of wastewater lines testing shall be required after recompaction if the testing has been performed prior to recompaction.
 1. Testing shall be performed between manholes on both sides of area of recompaction.

* * * END OF SECTION * * *

02621
PLASTIC PRESSURE PIPE

1.0 GENERAL

1.1 DESCRIPTION

- A. This section covers the furnishing and installation of plastic pressure pipe and fittings.

2.0 PRODUCTS

2.1 MATERIALS

- A. PVC Pressure Pipe (4 inch through 12 inches).
1. Conformance: AWWA C-900.
 2. O.D. Base: Cast Iron equivalent.
 3. Pressure Class: 150 psi, 18 DR.(Minimum)
 4. Joints: Bell ends with elastomeric gaskets. Solvent cement joints are strictly prohibited.
- B. Fittings: Ductile Iron.
1. Standard: AWWA C-104, C-110, C-111, or C-153.
 2. Lining: Cement mortar, standard thickness.
 3. Pressure rating: 250 psi.
 4. Connections: mechanical joint unless specified otherwise indicated.
 - a. Tee-head bolts and nuts: high strength, low alloy steel "Cor Ten", "Usalloy", or equal.
- C. Tracer wire.
1. Copper: #14 stranded, water-tight insulation for direct bury.

3.0 EXECUTION

3.1 INSPECTION

- A. Examine the pipe and fittings for cracks, dents, abrasions or other flaws prior to installation. Mark defective pipe and remove from the site.

3.2 INSTALLATION

- A. Install pipe in accordance with Section 02713, "Water Distribution and Transmission System."
- B. Cutting the pipe.
1. Cut the pipe square with saws or pipe cutters designed specifically for the material.
 2. Bevel the end in accordance with the manufacturer's recommendations.
 3. Locate a depth mark with a marker or crayon to assure the spigot end is inserted to the recommended depth.

4. Remove burrs and wipe off all dust from the jointing surfaces.
- C. Gasketed joints.
 1. Remove all dirt and foreign material from the spigot, gasket and gasket groove.
 2. Apply lubricant furnished by the pipe manufacturer.
 3. Insert the spigot to the depth recommended by manufacturer.
 4. Do not disturb previously completed joints during jointing operations.
- D. Do not bend pipe on any radius. Joints may be deflected if manufacturer's written literature allows, but bending of pipe is not allowed.
- E. Joints of all pipe in the trench shall be completed before work is stopped. If water accumulates in the trench, the plugs shall remain in place until the trench is dry.
- F. Tracer wire.
 1. Tape to top centerline pipe every 5 feet with tape such that wire remains in place during embedding of pipe.
 2. Bring up along and tape to valve boxes. Drill hole in boxes below base of lid. Run wire through hole. Two (2) feet of wire shall be coiled inside each box.
 3. Wire may be spliced with plastic ties. Totally enclose in waterproof Permatex. Double wrap in Protecto-Wrap.
 4. Attach one pound sacrificial anodes to tracer wire every 500 feet.
 5. Testing.
 - a. Pass current through wire and demonstrate that wire is capable of locating the pipe.
 - b. If wire will not pass current, locate break in circuit and test until tracer wire works in accordance with its intended use.

3.3 TAPPING

1. Tapping of P.V.C. up to and including two (2) inch shall be done only with approved tapping saddles.
2. Taps larger than two (2) inches in size shall be made only with approved tapping saddles, sleeves, or fittings as determined by the Town and shall be stainless steel only.

* * * END OF SECTION * * *

02641 VALVES

1.0 GENERAL

1.1 DESCRIPTION

- A. This section covers valves, valve operators, valve boxes, and appurtenances used for water distribution and transmission system.

1.2 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Take precautions so as not to damage materials during delivery or storage.
- B. Store valves off the ground and away from materials that could contaminate potable water systems.
- C. Take precautions to keep joints and internal parts clean.

2.0 PRODUCTS

2.1 GENERAL

- A. Direction of opening: open counterclockwise (left)
- B. Operating nut: 2 inch square
- C. Markings
 - 1. Paint nuts red.
 - 2. Mark centering ring with directional arrow indicating direction for opening of valve.
 - a. Fabricate directional arrow permanently into centering ring.
- D. Valves shall be capable of satisfactory operation with flow in either direction.
- E. Generally, valves 12 inches and smaller in diameter shall be gate valves. Town may require butterfly valves at certain locations.

2.2 GATE VALVES

- A. Conformance: AWWA C509
 - 1. Type: resilient seat
 - 2. Coating: epoxy coated interior
 - 3. Stem seals: two O-ring seals in accordance with Section 4.8 of AWWA C509.
 - 4. Ends: mechanical joint.
 - 5. Hydrant valve ends: flanged by swivel.

2.3 CORPORATION STOPS

- A. For use with Air Release and Vacuum Valves, only.
- B. Corporation stops shall conform to AWWA C800, except must be capable of operating at a working pressure of 150 psi.
 - 1. Corporation stops shall be construction of brass.
 - 2. Corporation stop inlet threads shall be "cc" or "cs" type.
 - 3. Corporation stop outlet threads shall conform to AWWA C800-89.
- C. Manufacturers:
 - 1. Ford
 - 2. There will be no substitutes allowed.

2.4 CURB STOPS

- A. Curb stops shall be Ford ¾" B44-33-G or equal, approved by Town.
(Ord. #2005-16)

2.5 AIR RELIEF/VACUUM RELIEF VALVES

- A. Materials and Construction
 - 1. Type: integral type assembly which functions both as an air release and vacuum valve.
 - 2. Rating: working pressure of 50 psi min. and a hydrostatic test pressure of 250 psi.
 - 3. Size: as determined by Design Engineer subject to Town approval.
 - 4. Connections:
 - a. Inlet: threaded.
 - b. Outlet: threaded, protect to minimize entry of debris and dirt.
 - 5. Body: cast iron or ductile iron.
 - 6. Working parts and seats: brass, stainless steel, or non-corroding material.
 - 7. Float: non-corroding, high resilience, stainless steel.
 - 8. Watertight at 150 psi.
- B. Acceptable Manufacturers.
 - 1. Crispin Universal Air Valve, by Multiplex Manufacturing.
 - 2. Apco Combination Air Release Valve, by Valve and Primer Corporation.
 - 3. CAV Combination Air Release and Vacuum Valve, G.A. Industries Inc.
 - 4. or equal.

2.6 VALVE BOXES

- A. Cast iron or ductile iron 5 1/4 inch screw type box, including fire hydrant valves.
 - 1. Capable of future adjustment for overlays.
 - 2. Manufacture: Tyler, 6860 series #6 base and 6860 series box.
 - 1. Furnish with suitable cast iron bases and covers.

3.0 EXECUTION

3.1 GENERAL

- A. Valves and valve boxes shall be examined for cracks, dents, abrasions, and other flaws prior to installation.
 - 1. Mark and remove defective valves and valve boxes from the site.

3.2 VALVES

- A. Join valves in the same manner used to join fittings.
- B. Install with operating nut perpendicular to pipe.
- C. Support the joined valve in place on compacted granular material.
- D. Mount butterfly valve operators to south or west of the valve.

3.3 VALVE BOXES

- A. Install on all buried valves.
- B. Install so that no stress is transmitted to valve.
- C. Set plumb and directly over the nut.
- D. Set top of box 1/4 inch below the finished surface on paved surfaces, six inches below finished grade in gravel surfacing, and at grade in other locations.
- E. Carefully compact soil around barrel with hand equipment, to prevent misalignment and settling of the backfill.

3.4 AIR RELEASE AND VACUUM VALVES

- A. Install at all high points in line. Distances between successive air release valves or successive vacuum valves shall not exceed 1/4 mile.

3.5 OPERATION

- A. Operation of valves shall be only by the Town after Substantial Completion.

* * * END OF SECTION * * *

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02644
FIRE HYDRANTS

1.0 GENERAL

1.1 DESCRIPTION

- A. This Section covers dry-barrel fire hydrants.

1.2 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Fire hydrants shall be handled, stored, and protected in such a manner as to prevent damage to materials, coatings, and finishes.
- B. Fittings and joints shall be kept free from dirt, oil and grease.

2.0 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable manufacturers.
1. Mueller
 2. Watrous
 2. No Substitutes

2.2 MATERIALS AND CONSTRUCTION

- A. Type: dry barrel with break away flange designed for a working pressure of 150 psi, minimum.
- B. Outlet size: 1 - 4 ½ inch pumper nozzle and 2 - 2 ½ inch hose nozzles.
- C. Outlet threads: National Standard
- D. Main valve size: 5 1/4 inch.
- E. Shoe inlets: 6 inches with mechanical joint fitting
- F. Bury: 5 feet
- G. Operation: open left (counter clockwise)
- H. Color: red
- I. Operating nut: pentagonal
- J. The auxiliary gate valve on the hydrant lateral shall be a 6-inch resilient seat gate valve with a valve box, reference Section 02641.

- K. The hydrant tee on the main line shall be a swivel tee.

2.3 HYDRANT GRAVEL

- A. Hydrant gravel shall be well graded crushed stone or gravel, conforming to ASTM-D448, #67 (also CDOT #67) as listed below:

<u>SIZE</u>	<u>PERCENT PASSING</u>
1"	100
3/4"	90 - 100
3/8"	20 - 55
#4	0 - 10
#8	0 - 5

- B. Or well graded 3/4" angular rock.

3.0 EXECUTION

3.1 INSTALLATION

- A. Set plumb with nozzles parallel with, or at right angles to, the curb, with the pumper nozzle facing the curb, or as directed by Town.
- B. Set traffic flange 3 inches above finished grade.
- C. Hydrants shall be fully closed or fully opened. Do NOT operate hydrants in partially open mode.
- D. Provide offset staking for both vertical and horizontal control of placement.
- E. The joining of laterals, valves, and hydrants shall be handled in the same manner as pipe.
1. The hydrant shall be set to the elevation staked, to insure that the bury line is at the final grade.
- F. The hydrant shall be supported on a minimum of 18 inches of compacted hydrant gravel.
1. The hydrant shall be supported with a concrete block.
- G. A concrete thrust block, with a minimum bearing surface area as shown on the Drawings, shall be placed behind the hydrant shoe.
1. A sheet of 8 mil polyethylene film shall be placed between hydrant shoe and concrete thrust block.
 2. Care shall be taken when placing thrust blocks so that hydrant drain holes remain free of obstructions.

- I. After pouring the thrust block, hydrant gravel shall be placed to a depth of 12" above the hydrant shoe.
 - 1. Hydrant drain holes shall remain free of obstructions.
- J. After installation of the hydrant is complete, the oil/ grease reservoir shall be checked to insure that it is full.
 - 1. If it is necessary to fill the reservoir, it shall be filled with the oil/grease which is specified by the hydrant manufacturer.
- K. Dependent upon the soil conditions and the length of the hydrant run, the fittings and pipe lengths may require rodding as determined by the Town.
- L. Cover hydrants with acceptable locking hydrant covers after installation until acceptance by Town.

3.2 LOCATION

- A. Hydrants shall be located at least one (1) foot outside of the property line and shall conform to one of the following conditions.
- B. When placed behind the curb, the hydrant barrel shall be set so that no portion of the pumper or hose nozzle cap will be less than twenty-four (24) inches nor more than thirty (30) inches horizontal distance from the gutter face of the curb.
- C. When set in the lawn space between the curb and the sidewalk, or between the sidewalk and the property line, no portion of the hydrant or nozzle cap shall be within six (6) inches of the sidewalk, or no greater than eighteen (18) inches from the sidewalk.
- D. There shall not be a post, fence, vehicle, growth, trash, storage, or other material within 3 feet of a fire hydrant, except as otherwise approved by the Chaffee County Fire District.
 - 1. The ground surrounding the fire hydrant shall slope away from the hydrant at a minimum grade of 2%.

* * * END OF SECTION * * *

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WATER DISTRIBUTION AND TRANSMISSION SYSTEM

1.0 GENERAL

1.1 DESCRIPTION

- A. This section covers the installation of water distribution and transmission lines.

1.2 QUALITY ASSURANCE

- A. Do not deviate from alignment more than 0.5 feet.
- B. Do not deviate from grade so as to cause a reverse slope in any one pipe section between vertical points of intersections shown on the Drawings.
1. Measure at the pipe invert for grade, not at the top of pipe.
- C. Conform to the regulations for installation of the Colorado Department of Health, and the Water Quality Control Commission.

1.3 JOB CONDITIONS

- A. Precautions shall be taken to protect the interiors of pipes, fittings, and valves against contamination.
- B. Pipe delivered for construction shall be strung so as to minimize entrance of foreign material.
- C. All openings in the pipeline shall be closed with watertight plugs when pipe laying is stopped at the close of a day's work or for other reasons, such as rest breaks or meal periods.
- D. Do not place debris, tools, clothing, or other material in the pipe.
- E. Use effective measures to prevent uplifting or floating of the pipeline prior to completion of backfilling operations.
- F. Do not install pipe under the following conditions:
1. When the trench contains water.
 2. When weather conditions are unsuitable.
 - a. Temperature is less than -5 degrees Fahrenheit.
 - b. Snowing.
 - c. Raining.
 - d. High winds.
 3. When the trench bottom is unstable.

- G. Protect pipe and appurtenances against dropping and damage.
 - 1. Do not use pipe and appurtenances if they are damaged.

2.0 PRODUCTS

2.1 CORROSION PROTECTION

- A. Protecto wrap tape, #200 or 200A.

2.2 PIPE

- A. Ductile iron pipe: reference Section 02615.
- B. Polyvinyl chloride pipe: reference Section 02621.

2.3 VALVES

- A. Reference Section 02641.

2.4 HYDRANTS

- A. Reference Section 02644.

2.5 COUPLINGS

- A. Reference Section 02615.

2.6 METERS AND METER PITS

- A. All water meters shall be SRII TR/PL. (Ord. #2004-1)
- B. ~~Meter pits for lines up to 1 ¼" shall be Mid States Plastics or equivalent, modified polyethylene material, minimum 36" in length~~ **All water meter pits should follow guidelines specified in Part II, Section 010101, subsection 1.4, Service Lines or reference Figure 6. Any service line over 1 ¼" shall have a concrete meter pit, reference Figure 7.**

2.7 CONCRETE

- A. Class A concrete, reference Colorado Department of Transportation, Division of Highways, State of Colorado "Standard Specifications for Road and Bridge Construction" section 601. Sections 100 through 109 and measurement and payment provisions shall not apply.

2.8 MECHANICAL JOINTS

- A. Megalug connections shall be made at all mechanical joints.

3.0 EXECUTION

3.1 PREPARATION

- A. Perform trenching, backfilling and compacting in accordance with Section 02221.

3.2 INSPECTION

- A. Confirm pipe barrel and fittings are free of dirt or other foreign objects prior to installation.
- B. Inspect pipe and fittings for cracks, dents, abrasions or other flaws prior to installation.
- C. Damaged pipe, fitting, linings or coatings shall be rejected.
 - 1. Mark defective pipe and store on site at a separate location away from the work until after acceptance of the piping system at which time it shall be removed from the site.
- D. Operational Inspection:
 - 1. At the completion of the project and in the presence of the Town, the Contractor shall operate all valves, hydrants, and water services to ascertain that the entire facility is in good working order; that all valve boxes are centered and valves are opened; that all hydrants operate and drain properly; that all curb boxes are plumb centered; and that water is available at all curb stops.

3.3 CONNECTIONS TO EXISTING SYSTEM

- A. When connecting to the existing water system. Valves on the existing system shall be operated by the Town ONLY. The Contractor provide at least forty-eight (48) hours notification prior to needing any valve operated, except in the case of emergencies.
- B. At locations where connections to existing water mains are to be installed, the Contractor shall locate the existing mains both vertically and horizontally and verify their exact size and material in advance of the time scheduled for making the connections.
 - 1. Prior to connecting to existing water mains, the Contractor shall have all men, materials, and equipment ready to connect the fitting to the existing main, so as to keep the shutoff time to a minimum.
 - 2. Town will examine the existing pipe or appurtenance and specify any necessary adjustments in line, grade, or connection requirements to accomplish the connection.
 - 3. Use effective measures to prevent contamination to existing water lines.

4. Swab the interior of new pipe, fittings, and valves installed in existing pipelines with a solution of 1 percent (10,000 ppm) chlorine solution prior to installation.
 5. Only Town shall operate existing valves, hydrants, and other control units.
 6. A soon as possible after making the connections, the Contractor shall flush the connection so as to prevent contamination of the existing facilities. The Contractor shall take every precaution necessary to prevent dirt or debris from entering the main.
- C. The Town is not responsible for the water tightness of its valves on existing facilities. If existing valves leak, the Town shall assist in reducing the influx of water, but the Contractor must use methods at his own disposal to dewater the trench and complete any required testing and disinfection of the water line.
- D. All connections shall be valved to separate new construction from the existing system. Valves shall be kept closed until acceptance of the new system.
- E. The connection is subject to approval by the Town. Under NO circumstances shall a non-disinfected main be connected to an existing disinfected main.

3.4 PIPE INSTALLATION

- A. Pipe Laying.
1. Lay pipe with the bells pointing in the direction the Work is progressing.
 2. Take effective measures to prevent opening of joints during bedding and backfilling operations.
 3. Complete the joint in accordance with the applicable pipe material specification and adjust the pipe to the correct line and grade as each length of pipe is placed in the trench.
 - a. Make adjustments in line and grade by scraping away or filling pipe bedding under the entire length of the pipe, except at bells, and not by wedging, blocking, or mounding up the pipe or bells.
 4. Secure the pipe in place with the specified bedding tamped under and around the pipe except at the joints.
 - a. Do not disturb the pipe after the jointing has been completed.
 5. Install the pipeline so that a positive or negative grade is maintained between high and low points.
 6. Provide a minimum depth cover from finished grade to top of pipe of 4.5 feet.
- B. Separation of water, sanitary sewer (Including services and laterals)
1. Parallel installations: Water mains shall be laid at least 10 feet horizontally from existing and proposed sanitary sewers. The distance shall be measured edge to edge.
 2. Crossings: Water main and sanitary sewer crossings. Water mains crossing sanitary sewers and sanitary sewers crossing water mains shall be laid to provide a minimum vertical distance of 18 inches between the outside of the

water main and the outside of the sanitary sewer. The crossing shall be constructed such that the water main is above the sanitary sewer.

3. **Special Conditions**

- a. When it is impossible to obtain proper horizontal and vertical separation as stipulated above, and whenever the water main crosses under a sanitary sewer the crossing pipe shall be constructed of ductile iron or PVC pressure pipe and the pipe shall be a minimum of 18 feet long. It shall be located such that both ends of the pipe will be as far from the crossing as possible. The sewer shall remain pressure class until the minimum horizontal conditions above are met. The Town may require that both water and sewer be pressure tested to assure water tightness. Special structural support for the water and sewer pipes may be required.
- b. Pressure pipe shall be the same size or larger than the non-pressure pipe. Use watertight transition couplings where sewers cross water mains and the sewer outside diameters are different than the pressure pipe outside diameters. The pressure pipe shall be larger than the non-pressure where the outside diameters are different. Transition couplings must be acceptable to the Town.
- c. The Town may allow concrete encasement in lieu of the above at the option of the Town.
 - 1) All joints of the sewer which are located within 10 feet on both sides of the water line shall be encased in reinforced concrete. Encasement must be acceptable to the Town.
 - 2) Provide suitable backfill or other structural protection to prevent settlement or failure of the higher pipe.

3.5 THRUST RESTRAINT

- A. Concrete thrust blocks shall be designed for the internal pipe pressure, surge pressure and the soil bearing capacity. (The concrete shall have a minimum 28 day compressive strength of 3000 p.s.i.) Forms for thrust blocks may be required.
 1. Provide concrete thrust blocks for preventing pipe movement at hydrants, tees, and bends installed in piping and called for on the Drawings.
 - a. Tie concrete blocks to fittings, by 2 "U" shaped No. 5 rebar.
 - 1) Bend ends of rebar 90 degrees out, length 3 inches.
 - 2) Rebar embedment: one-half pipe O.D. - plus 6 inches.
 2. Extend concrete to solid undisturbed earth. Construct so joints and drain holes are clear and accessible.
 3. For size of thrust blocks see Drawings.
 4. Concrete to be separated from fittings, and hydrants by 8 mil polyethylene film. No concrete shall be poured directly on or over fittings to be blocked.
 5. Excavate thrust block bearing into undisturbed soil.
 6. Clean out loose soil and carefully shape to provide uniform bearing surfaces of the proper area.
 7. Notify Town 24 hours prior to concrete placement.
 8. Install thrust blocks so bottom is flat and sides are vertical.
 9. Form to provide access to fittings, and hydrants.

- B. Joint Restraints
 - 1. Provide joint restraints and restrained joint pipe in all areas required by the Town.
 - 2. Joint restraints shall be in addition to thrust blocks.

3.6 INSTALLATION OF PIPELINE APPURTENANCES

- A. Install valves, hydrants and other equipment appurtenant to the water lines at the locations shown on the Drawings or as designated by Town to accommodate field conditions.
 - 1. Record measurements of the actual location of appurtenant equipment prior to backfill and record for the As-Built Drawings.
- B. Plug and restrain plug to pipeline in dead end water lines.
 - 1. Close valves on all dead-end water lines after testing and Substantial Completion of the water line.
 - 2. Use mechanical joint pipe and plug.

3.7 PROTECTION OF METAL SURFACES

- A. Protect supplied material by one of the following methods including coatings that have been damaged:
 - 1. Polyethylene encasement, reference Section 02615.
 - 2. Apply two coats of coal tar paint to ferrous metal rods, rebar, clamps, bolts, nuts and other accessories which are subject to submergence or contact with earth or fill material, and are not encased in concrete.
 - a. Apply first coat of coal tar paint to a dry, clean surface.
 - b. Allow first coat of coal tar paint to dry before the second coat is applied.
 - 3. Protect ferrous metal rods, rebar, clamps, bolts, nuts and other accessories which are subject to submergence or contact with earth or fill material, and not encased in concrete with one coat of coal tar paint and double wrap with Protecto Wrap.

3.8 DISSIMILAR MATERIALS

- A. Whenever it is necessary to join materials of dissimilar metals, an approved insulated joint shall be installed. The Contractor shall conduct a resistivity test across the joint. If the resistance test fails, the insulated joint shall be removed and repaired. The joint shall then be reinstalled and retested. This procedure shall continue until a successful test result is obtained.

* * * END OF SECTION * * *