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***TITLE 9. MPTN UTILITY STANDARDS*****CHAPTER 1. EARTHWORK****§ 1. Earth, Excavation, Backfill and Fill**

## a. Separation of Surface Materials

The contractor shall remove only as much of any existing pavement as is necessary for the prosecution of the work.

## b. Width of Trench

Pipe trenches shall be made as narrow as practicable and shall not be widened by scraping or loosening materials from the sides. Every effort shall be made to keep the sides of the trenches firm and undisturbed until backfilling has been completed and consolidated.

Trenches shall be excavated with approximately vertical sides between the elevation of the center of the pipe and an elevation 1 foot above the top of the pipe.

## c. Trench Excavation

Where pipe is to be laid in gravel bedding, the trench may be excavated by machinery to, or just below, the designated subgrade, provided that the material remaining at the bottom of the trench is no more than slightly disturbed.

## d. Unauthorized Excavation

If the bottom of any excavation is taken out beyond the limits indicated or prescribed, the resulting void shall be backfilled with thoroughly compacted, screened gravel, if the excavation was for a pipeline, or with concrete, if the excavation was for a masonry structure.

## e. Excavation Near Existing Structures

Attention is directed to the fact that there are pipes, drains, and other utilities in certain location.

As the excavation approaches pipes, conduits, or other underground structures, digging by machinery shall be discontinued and the excavation shall be done by means of hand tools. Such manual excavation when incidental to normal excavation shall be included in the work to be done under items involving normal excavation.

Where determination of the exact location of pipe or other underground structures is necessary for doing the work properly, the Contractor may be required to excavate test pits to determine such locations.

## f. Elimination of Unsuitable Material

If material unsuitable for foundation is found at or below the grade to which excavation would normally be carried, the Contractor shall remove such material to the required width and depth and replace it with thoroughly compacted, screened gravel or concrete as directed.

## g. Sheet piling and Shoring

The Contractor shall be responsible for supporting and maintaining excavations required hereunder, even to the extent of sheeting or shoring the sides and ends of excavations with the timber or steel sheet piling. The requirements of sheeting or shoring or the addition of supports shall not relieve the Contractor of his responsibility for their sufficiency.

All timbering shall be removed except that for the purpose of preventing injury to the piping or other structures, to other property or persons.

h. Removal of Water

Until final acceptance of the work, the Contractor shall pump out or otherwise remove and dispose of as fast as it may collect, any water, sewage or any other liquids which may be found or may accumulate in the excavations, regardless of whether it be water or liquid wastes from his own contract or from any existing conduits, works, or surface runoff.

There shall be upon the work at all times during the construction proper and approved machinery of sufficient capacity (including spare units kept ready for immediate use in case of breakdowns) to meet the maximum requirements for the removal of the water or other liquids and their disposal in such a manner as not to withdraw sand or cement from the concrete and so as not to interfere with the proper laying of pipe and/or masonry or the prosecution of work under this or other contract nor endanger existing structures.

i. Protection to Existing Structures, Vegetation

All existing walks, pipes, conduits, poles, wires, fences, stairways, curbing, property line markers, walls, buildings and other structures which do not require to be changed in location, shall be carefully supported and protected from injury by the Contractor and, in case of injury, they shall be restored by him without compensation thereof, to as good condition as that in which they were found.

j. Backfilling Trenches

As soon as practicable after the pipes have been laid or the structures have been built and are structurally adequate to support the loads, including construction loads to which they will be subjected, the backfilling shall be started and thereafter it shall proceed until completion.

- (1) Zone Around Pipe: The space between the pipe and bottom side of the trench shall be packed full by hand shovel with sand. In placing the material, care shall be taken that stones do not strike the pipe. The backfill under the pipe shall be thoroughly compacted using curved tamping bars. Sand backfill at the sides and up to the top of the pipe shall be compacted using approved hand tampers. Sand backfill up to a level of 1 foot above the top of the pipe shall be placed in 6-inch layers, leveled along the length and width of the trench, and thoroughly compacted using approved tampers. No sand shall be placed above the top of the pipe until sand under and at the sides of the pipe has been compacted. Care shall be taken in the use of mechanical or other tampers not to injure or move the pipe or cause the pipe to be supported unevenly.
- (2) Materials: The nature of the materials will govern both their acceptability for backfill and the methods best suited for their placement and compaction in the backfill. In general, material used for backfilling trenches and excavations around structures shall be suitable material which was removed in the course of making the construction excavations.

No stone or rock fragment larger than 12 inches in greatest dimension shall be placed in the backfill nor shall large masses of backfill material be dropped into the trench in such a manner as to endanger the pipeline. If necessary, a timber grillage shall be used to break the fall of material dropped from a height of more than 5 feet. Pieces of bituminous pavement shall be excluded from the backfill unless their use is expressly permitted, in which case they shall be broken up as directed.

- (3) Remainder of Trench: The remainder of the trench above the zone around the pipe shall be compacted by tamping, as directed or approved in accordance with the nature of the material.
- (4) Tamping: Compaction shall be accomplished by tamping or, under appropriate circumstances, rolling. The material shall be deposited and spread in uniform, parallel layers not exceeding 8 inches thick before compaction. Before the next layer is placed, each layer shall be tamped as required so as to obtain a thoroughly compacted mass. If necessary, the Contractor shall furnish and use an adequate number of power driven tampers, each weighing at least 20 lbs., for this purpose. Care shall be taken that the material close to the bank, as well as in all other portions of the trench, is thoroughly compacted. When the trench width and the depth to which backfill has been placed are sufficient to make it feasible, and it can be done effectively and without damage to the pipe, backfill may, on approval, be compacted by the use of suitable rollers, tractors, or similar powered equipment instead of by tamping. For compaction by tamping (or rolling), the rate at which backfilling material is deposited in the trench shall not exceed that permitted by the facilities for its spreading, leveling, and compacting as furnished by the Contractor.

If necessary to ensure proper compaction by tamping (or rolling), the material shall first be wet by sprinkling. However, no compaction by tamping (or rolling) shall be done when the material is too wet either from rain or too great an application of water to be compacted properly; at such times the work shall be suspended until the previously placed and new materials have dried out sufficiently to permit proper compacting, or such other precautions shall be taken as may be necessary to obtain proper compaction.

- (5) Miscellaneous Requirements: Whatever method of compacting backfill is used, care shall be taken that stones and lumps shall not become nested and that all voids between stones shall be completely filled with fine material. Only approved quantities of stones and rock fragments shall be used in the backfill. The Contractor shall, as part of the work done under the items involving earth excavation and rock excavation as appropriate, furnish and place all other necessary backfill material.

k. Fill and Backfill Under Structures and Highways

All fill and backfill under structures and pavements adjacent to structures shall be compacted bank-run gravel containing not more than 5 percent material passing a 200 sieve. The entire backfill shall be compacted to 95 percent of maximum density at optimum moisture as determined by Method D of A.S.T.M. D1557-78 Standard Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-lb. (4.54kg) Rammer and 18-inch (457) Drop.

l. Disposal of Materials

Any excavated materials not required or not suitable for backfilling shall be removed from the site of the work and disposed of by the Contractor at his own expense.

## § 2. Rock Excavation

a. Work Included

The Contractor shall excavate within the lines and grades as shown or required and shall satisfactorily dispose of any rock, boulders, or existing concrete, stone or masonry which may be encountered in the work.

The word "rock" shall mean boulders and pieces of masonry or concrete exceeding one cubic yard in volume, or solid ledge rock which, in the opinion of the Engineer, requires for

its removal, drilling and blasting or wedging, or sledging, or barring, or breaking up with a power operated tool. No soft or disintegrated rock which can be removed with a hand pick or power operated excavator or shovel; no loose, shaken or previously blasted rock or broken stone in rock fillings or elsewhere; and no rock, exterior to the minimum limits allowed, which may fall into the excavation will be measured or allowed.

b. **Blasting and Explosives**

Where blasting is necessary, it shall be done in accordance with all ordinances and other pertinent regulations relative to the storing and handling of explosives and the firing of blasts. Such ordinances, regulations and orders shall not, however, relieve the Contractor of any responsibility for damages caused by him or his employees.

**§ 3. Sand and Gravel**

a. **Sand**

- (1) Sand shall be the fine granular material naturally produced by the disintegration of rock and shall be sufficiently free of organic material, mica, loam, clay and other deleterious substances. In no case shall sand containing lumps of frozen materials be used.
- (2) Gradation of Sand: In case visual inspection of the sand indicates that it is too coarse, the following gradation shall determine its acceptability:

Sieve Size	Percentage Passing Sieves
3/8"	100
#4	95-100
#8	65-90
#16	45-75
#30	30-50
#50	10-22
#100	2-8
#200	3

b. **Bank-Run Gravel**

- (1) General: The Contractor shall furnish, place, and compact bank-run gravel as indicated on the drawings or directed and as herein specified.
- (2) Gravel: Bank-run gravel shall be granular material well graded from fine to coarse with a maximum size of 3 inches obtained from approved natural deposits and unprocessed except for the removal of unacceptable materials and stones larger than the maximum size permitted. It shall not contain vegetation, masses of roots, or individual roots more than 18 inches long or more than 1/2 inch in diameter. It shall be substantially free from loam and other organic matter, clay, and other fine or harmful substances.
- (3) Placing and Compacting: The bank-run gravel shall be spread in layers of uniform thickness not exceeding 8 inches before compaction and moistened or allowed to dry as directed. Then it shall be thoroughly compacted by means of suitable power-driven tampers or other power-driven equipment.

**§ 4. Concrete**

## a. Work Included

The Contractor shall furnish all labor, materials, tools and equipment necessary to construct the concrete work. This will include thrust blocks at pipe bends and tees in trenches, and for all miscellaneous concrete work ordered in the field to meet field conditions.

## b. Materials

- (1) All materials are to be carefully selected so as to be free of deleterious amounts of acid, alkali and organic material. If these materials are stored at the job, they shall be placed where no foreign materials will be introduced and no deterioration of the cement will take place. Latest revisions of A.S.T.M. Specifications are to be followed.
- (2) Portland Cement shall conform to A.S.T.M. C150-85a.
- (3) Aggregate shall conform to A.S.T.M. C33-86.
- (4) Reinforcing bars shall conform to A.S.T.M. A615-85 or A.S.T.M. A617-84, Grade 40.

## c. Concrete Quality

Concrete shall have a minimum ultimate 28 days compressive strength of 3000 lbs. per square inch using a maximum water content of 6 gallons per bag of cement. The aggregate shall be proportioned to give a dense concrete of this required strength using a maximum aggregate size of  $\frac{3}{4}$  inches.

Concrete for pavement replacement shall conform to the requirements of the State of Connecticut, Department of Transportation.

## d. Mixing and Placing

- (1) Concrete shall be mixed until there is a uniform distribution of the materials and shall be discharged completely before the mixer is recharged.
- (2) For job-mixed concrete, the mixer shall be rotated at a speed recommended by the manufacturer, and mixing shall be continued for at least one minute after all material are in the mixer.
- (3) Ready-mixed concrete shall be mixed and delivered in accordance with the requirements set forth in the standard specifications for Ready-Mixed Concrete A.S.T.M. C94-86a.
- (4) Provisions shall be made for maintaining concrete in a moist condition for at least 5 days after placement. Concrete shall be protected against wash by ground water in ditches.
- (5) Adequate equipment shall be provided for protecting the concrete from freezing. No frozen material or materials containing ice shall be used. No dependence shall be placed on salt or other chemicals for the prevention of freezing.
- (6) Admixtures shall be in conformance with the recommendations and requirements of Form 816 and shall be approved by the Engineer prior to use.



## CHAPTER 2. WATER TRANSMISSION AND DISTRIBUTION

### SubChapter 2.1. Water Main Design Requirements

The Mashantucket Pequot Tribal Utilities Department is a Connecticut recognized Public Water System

The following State of Connecticut Department of Health, Water Supplies Section standards have therefore been adopted.

(Rev. 26MAR14)

#### § 1. Materials

##### a. Restricted Materials

- (1) Installation of Vinyl-Lined Pipe Restricted - No contractor or employee may install any vinyl-lined pipe containing tetrachloroethylene or other solvents deemed toxic by the Commissioner of Public Health in any water supply system of the Mashantucket Tribal Nation.
- (2) Installation of Asbestos Cement Pipe Restricted - No contractor or employee may install any asbestos cement pipe in any water supply system of the Mashantucket Tribal Nation.
- (3) Restriction on Use of Lead Solder in Potable Water Systems - No solder containing more than 0.2 per cent lead shall be used in making joints and fittings in any public or private potable water system of the Mashantucket Tribal Nation..

##### b. Material

- (1) Metallic and non-metallic materials may be used to construct component parts of a water system including, but not limited to , conduits, pipes, couplings, caulking material, protective linings and coatings, services, valves, hydrants, pumps, tanks and reservoirs; provided:
  - (a) The materials shall have a reasonable useful service life;
  - (b) The material shall be capable of withstanding the internal and external forces to which it may be subjected while in service;
  - (c) The material shall not cause the water to become impure, unwholesome, nonpotable or unhealthful;
  - (d) Materials and equipment shall be designed and selected with factors of safety included and installed as to mitigate corrosion, electrolysis and deterioration. When the possibility of a near future interconnection with another utility exists, some components such as pressure tanks and compressors may be designed for limited service life;
  - (e) Use of non-metallic pipe shall require a suitable tracer wire for pipe location;
  - (f) No material shall be allowed which does not meet standards established by the AWWA or other comparable standards;
- (2) Specification for material, equipment, and testing shall be in accordance with all applicable AWWA standards, the specified water utility which will eventually own the system, and the requirements of the Department of Health Services. Such Specifications shall include the following:
  - (a) Proper protection shall be given to metal surfaces by paints or other protective coatings;

- (b) All paints, liners or coatings proposed for use in a water supply system that will come in contact with the potable water must be approved by the Department of Health Services. Following final curing, disinfection and dissipation of the chlorine residual, water samples must be collected and tested in accordance with Section 19-13-B102 of the Regulation of Connecticut State Agencies.
  - (c) Cathodic protection, when required, must be designed and installed by competent technically qualified personnel.
  - (3) Upon completion of the construction of the community water supply system, the well(s), storage tank(s), and appurtenances must be disinfected, in accordance with procedures established by the Department of Health Services;
  - (4) Prior to acceptance and use, the design engineer shall supervise appropriate pressure testing of all piping and tanks for leakage to assure specified standards are met.
- c. Standards, Materials Selections
- Pipe, fittings, valves and fire hydrants shall conform to the latest standards issued by the Mashantucket Pequot Tribal Utility Department (MPTN Utilities), AWWA, and/or NSF, if such standards exist. In the absence of such standards, material meeting applicable Product Standards and acceptable to the MPTN Utilities Department may be selected. Special attention shall be given to selecting pipe material which will protect against both internal and external pipe corrosion. Pipes and pipe fittings containing more than 8% lead shall not be used. All products shall comply with ANSI/NSF standards
- d. Permeation of System by Organic Compounds
- Where distribution systems are installed in areas of groundwater contaminated by organic compounds:
- (1) pipe and joint materials which are not subject to permeation of the organic compounds shall be used.
  - (2) non-permeable materials shall be used for all portions of the system including water main, service connections and hydrant leads.
- e. Used Materials
- Water mains which have been used previously for conveying potable water may be reused provided they meet the above standards and have been restored practically to their original condition.
- f. Joints
- Packing and jointing material used in the joints of pipe shall meet the standards of the AWWA and the Department. Pipe having mechanical joints or slip-on joints with rubber gaskets is preferred. Lead-tip gaskets shall not be used. Repairs to lead-joint pipe shall be made using alternative methods.

## § 2. Water Main Design

### a. Minimum Size

Sources of supply, treatment, pumping, transmission and storage facilities of sufficient capacity shall be maintained to provide flows in excess of the maximum flows experienced in the community water system, and in individual service zones within integrated systems. Whenever peak period consumption interrupts water service to consumers under normal condition, conservation measures that effectively reduce consumption shall be promptly instituted for the community water supply, and a program to provide sufficient supply,

treatment, pumping, transmission, and storage capacity to meet existing and projected peak period consumption shall be implemented.

(1) Transmission and Distribution System

- (a) The distribution system shall be of adequate size and design to maintain minimum normal operation pressures. Minimum distribution pipe diameter shall be 6 inches except in cul-de-sacs where the mains are not subject to being extended or as otherwise approved by the Department of Public Utility Control.
- (b) If fire protection is to be provided, minimum distribution pipe diameter shall be 8 inches.
- (c) All mains shall be installed in the paved roadways to allow all weather access and to facilitate repairs;

(2) Diameter

The minimum size of water main for providing fire protection and serving fire hydrants shall be six-inch diameter. Larger size mains will be required if necessary to allow the withdrawal of the required fire flow while maintaining the minimum residual pressure specified in paragraph b. of this section.

(3) Small Mains for Domestic Service

The minimum size of water main in the distribution system where fire protection is not to be provided should be a minimum of three (3) inches in diameter. Any departure from minimum requirements shall be justified by hydraulic analysis and future water use, and can be considered only in special circumstances.

b. Water Pressure

- (1) All service connections shall have a water pressure at the main of at least 25 psi under normal conditions. Where pressure is normally less than 25 psi, special provisions shall be made to furnish adequate service to the user.
- (2) Normal operating pressures, including peak demand conditions in the distribution main shall be between 35 psi and 125 psi at the service connection;
- (3) Where static pressures would exceed 125 psi, pressure reducing devices shall be provided on distribution mains;

c. Dead Ends

Insofar as practicable, the distribution system shall be designed so as to avoid dead ends in the mains. Suitable right-of-way easement control shall be provided to the proposed owner and operator and his assigns to permit future such extensions. Where a dead end line is to be used, an adequately sized blow-off shall be installed at the end of the line;

- (1) In order to provide increased reliability of service and reduce head loss, dead ends shall be minimized by making appropriate tie-ins whenever practical.
- (2) Where dead-end mains occur, they shall be provided with a fire hydrant if flow and pressure are sufficient, or with an approved flushing hydrant or blow-off for flushing purposes. Flushing devices should be sized to provide flows which will give a velocity of at least 2.5 feet per second in the water main being flushed. No flushing device shall be directly connected to any sewer.

d. Fire Protection

When fire protection is to be provided, system design should be such that fire flows and facilities are in accordance with the requirements of the Factory Mutual and MPTN Fire Dept.

**§ 3. Distribution System Appurtenances**

a. Valves

- (1) Essential water supply valves shall be maintained in operating conditions.
- (2) Sufficient isolation valves shall be provided on water mains so that inconvenience to customers and sanitary hazards will be minimized during repairs and flushing. At intersections, valves shall be installed on all connecting mains.
- (3) Sufficient valves shall be provided on water mains so that inconvenience and sanitary hazards will be minimized during repairs. Valves should be located at not more than 500 foot intervals in commercial districts and at not more than one block or 800 foot intervals in other districts. Where systems serve widely scattered customers and where future development is not expected, the valve spacing should not exceed one mile.

b. Hydrants

Whenever fire protection is required the water system shall be designed and constructed in accordance with recommendations of the, MPTN Fire Dept., Factory Mutual Ins. Co., and the MPTN Utilities Department. No fire hydrants shall be permitted unless the community water system has at least 150,000 gallons of water in atmospheric storage. Hydrants should be maintained in accordance with NFPA 25 Section 4.4.2.

(1) Location and Spacing

Hydrants should be provided at each street intersection and at intermediate points between intersections as recommended by the MPTN Fire Dept. and Factory Mutual. Generally, hydrant spacing may range from 350 to 600 feet depending on the area being served.

(2) Valves and Nozzles

Fire hydrants should have a bottom valve size of at least five inches, one 4-1/2 inch pumper nozzle and two 2-1/2 inch nozzles.

(3) Hydrant Leads

The hydrant lead shall be a minimum of six inch in diameter. Auxiliary valves shall be installed in all hydrant leads.

(4) Drainage

Hydrant drains should be plugged. When the drains are plugged the barrels must be pumped dry after use during freezing weather. Where hydrant drains are not plugged, a gravel pocket or dry well shall be provided unless the natural soils will provide adequate drainage. Hydrant drains shall not be connected to or located within 10 feet of sanitary sewers or storm drains.

c. Air Release

(1) Air Relief Valves

At high points in water mains where air can accumulate, provisions shall be made to remove the air by means of air relief valves. Automatic air relief valves shall not be used in situations where flooding of the manhole or chamber may occur.

## (2) Air Relief Valve Piping

The open end of an air relief pipe from automatic valves shall be extended to at least one foot above grade and provided with a screened, down-facing elbow. The pipe from a manually operated valve should be extended to the top of the pit. Use of manual air relief valves is recommended wherever possible.

## (3) Chamber Drainage

Chambers, pits or manholes containing valves, blow-offs, meters, or other such appurtenances to a distribution system, shall not be connected directly to any storm drain or sanitary sewer, nor shall blow-offs or air relief valves be connected directly to any sewer. Such chambers or pits shall be drained to the surface of the ground where they are not subjected to flooding by surface water, or to absorption pits underground.

**§ 4. Installation of Mains**

## a. Trench Details

When installing pipe, care must be taken to keep the pipe clean. Trenches shall be kept as free of water as is possible;

When laying of pipe is interrupted overnight or for any longer period of time, the open end of the pipe shall be plugged tightly and the open trench covered with wood or steel covers;

Installation and pressure testing shall incorporate the provisions of the AWWA Standards and/or corresponding installation procedures;

A continuous and uniform bedding shall be provided in the trench for all buried pipe. Backfill material, free of detrimental substances, shall be used. That backfill material shall be tamped in layers around the pipe and to a sufficient height above the pipe to adequately support and protect the pipe. During pipe laying, stones, boulders and any other significantly detrimental materials found in the trench shall be removed for a depth of at least six inches below the bottom of the pipe;

All pipe shall be provided with a minimum earth cover of 4.5 feet. When rock blasting is necessary, ample excess depth shall be provided to allow for a suitable depth of bedding material between the pipe bottom and the rock base. Where frost can be expected to occur deeper than 4.5 feet, additional pipe cover shall be provided to suit. The mains should have adequate cover over the top of the pipe, using suitable backfill material, for protection against surface loads. For river or stream crossings where the water main may be exposed to the air, the water main shall be protected against freezing by an alternate means;

## (1) Standards

Specifications shall incorporate the provisions of the AWWA standards and/or manufacturer's recommended installation procedures.

## (2) Cover

All water mains shall be covered with sufficient earth or other insulation to prevent freezing.

## (3) Blocking

All tees, bends, plugs and hydrants shall be provided with reaction blocking, tie rods or joints designed to prevent movement.

## (4) Pressure and Leakage Testing

All types of installed pipe shall be pressure tested and leakage tested in accordance with the latest edition of AWWA Standard C600.

## (5) Disinfection

All new, cleaned or repaired water mains shall be disinfected in accordance with AWWA Standard C651. The specifications shall include detailed procedures for the adequate flushing, disinfection, and microbiological testing of all water mains. In an emergency or unusual situation, disinfection procedure shall be discussed with the Department.

## (6) External Corrosion

- (a) Provide for a system of records by which the nature and frequency of corrosion problems are recorded. On a plat map of the distribution system, show the location of each problem so that follow-up investigations and improvements can be made when a cluster of problems is identified.
- (b) If needed, perform a survey to determine the existence of facilities or installations that would provide the potential for stray, direct electric currents. Also, determine whether problems are caused by the users of water pipes as grounds for the electrical system.
- (c) In previously unexplored areas where aggressive soil conditions are suspected, or in areas where there are known aggressive soil conditions, perform analyses to determine the actual aggressiveness of the soil.
- (d) If soils are found to be aggressive, take necessary action to protect the water main, such as by encasement of the water main in polyethylene, provision of cathodic protection (in very severe instances), or using corrosion resistant water main materials.

## b. Provisions for Sanitary and Storm Sewers

- (1) Whenever possible, water and sewer lines (sanitary and storm) shall be located in separate trenches at least 10 feet apart. Where laid in the same trench, the water pipe shall be laid on a shelf at least 18 inches above the sewer pipe and at least 12 inches, but preferably 18 inches, horizontally from the side of the sewer pipe. The horizontal separating distance between a sanitary sewer manhole and a water line shall be 10 feet.
- (2) Where water and sewer lines cross, a minimum vertical distance of 18 inches shall be maintained between the water and sewer line with the sewer at the lower elevation. At crossings, pipe joints shall be spaced as far from the crossing as possible;
- (3) For force sewer lines there shall be no deviation from the 10 foot horizontal separation and the 18 inch vertical separation distances;
- (4) When it is not possible to satisfy the requirements in paragraph (17) of this subsection above one or more of the following precautions may be approved by the Department of Health Services as acceptable alternatives:
  - (a) Sleeving of the sewer;
  - (b) Concrete encasement of the sewer;
  - (c) The use of a thicker-walled sewer pipe (pressure testing will be required);
  - (d) Concrete encasement of the water pipe;
  - (e) The use of thicker-walled water pipe;
  - (f) The design engineer may also propose other precautionary measures which will be subject to review and approval;

(5) General

The following factors should be considered in providing adequate separation:

- (a) material and type of joints for water and sewer pipes,
- (b) soil conditions,
- (c) service and branch connections into the water main and sewer line,
- (d) compensating variations in the horizontal and vertical separations,
- (e) space for repair and alterations of water and sewer pipes,
- (f) off-setting of pipes around manholes.

(6) Parallel Installation

Water mains shall be laid at least 10 feet horizontally from any existing or proposed sewer/septic tank absorption field trench. The distance shall be measured edge to edge. In cases where it is not practical to maintain a ten foot separation, the MPTN Utilities Department may allow deviation on a case-by-case basis, if supported by data from the design engineer. Such deviation may allow installation of the water main closer to a sewer, provided that the water main is laid in a separate trench or on an undisturbed earth shelf located on one side of the sewer at such an elevation that the bottom of the water main is at least 18 inches above the top of the sewer.

(7) Crossings

Water mains crossing sewers shall be laid to provide a minimum vertical distance of 18 inches between the outside of the water main and the outside of the sewer. This shall be the case where the water main is either above or below the sewer with preference to the water main located above the sewer. At crossings, one full length of water pipe shall be located so both joints will be as far from the sewer as possible. Special structural support for the water and sewer pipes may be required.

(8) Exception

The MPTN Utilities Department must specifically approve any variance from the requirements of Sections D.2.b and D.2.c of this report when it is impossible to obtain the specified separation distances. Where sewers are being installed and Section D.2.b and c cannot be met, the sewer material shall be water works grade 150 psi (1.0 Mpa) pressure rated pipe or equivalent and shall be pressure tested to ensure water tightness.

(9) Force Mains

There shall be at least a 10 foot horizontal separation between water mains and sanitary sewer force mains. There shall be an 18 inch vertical separation at crossings as required in Section D.2.c of this report.

(10) Sewer Manholes

No water pipe shall pass through or come in contact with any part of a sewer manhole.

(11) Separation of Water Mains from Other Sources of Contamination

Design engineers should exercise caution when locating water mains at or near certain sites such a sewage treatment plants or industrial complexes. On site waste disposal facility including absorption field must be located and avoided. The engineer must contact the MPTN Utilities Department to establish specific design requirements for locating water mains near any source of contamination.

## c. Surface Water Crossings

- (1) For river or stream crossings where the water main may be exposed to the air, the water main shall be protected against freezing by an alternate means;
- (2) Surface water crossings, whether over or under water, present special problems. The MPTN Utilities Department should be consulted before final plans are prepared.

## d. Above-water Crossings

The pipe shall be adequately supported and anchored, protected from damage and freezing, and accessible for repair or replacement

## e. Underwater Crossings

A minimum cover of two feet shall be provided over the pipe. When crossing water courses which are greater than 15 feet in width, the following shall be provided:

- (1) the pipe shall be of special construction, having flexible, restrained or welded watertight joints,
- (2) valves shall be provided at both ends of water crossings so that the section can be isolated for testing or repair, the valves shall be easily accessible, and not subject to flooding; and the valve closest to the supply source shall be in a manhole,
- (3) Permanent taps shall be made on each side of the valve within the manhole to allow insertion of a small meter to determine leakage and for sampling purposes.

## § 5. Cross-Connection/Interconnections

## a. Cross-connections

Permissible Arrangements for Connections to Public Water Supply Lines

## (1) Definitions

- (a) "Air Gap" means the unobstructed vertical distance through the free atmosphere between the lowest opening from any pipe or outlet supplying water to a tank plumbing fixture, or other device, and the flood level rim of the receptacle. The vertical physical separation shall be at least two times the inside diameter of the water inlet pipe above the flood rim level but shall not be less than one inch
- (b) "Air Vent Type Backflow Preventer" means a device containing two independently operating check valves separated by a chamber which can automatically vent to the atmosphere if backflow occurs.
- (c) "Atmospheric Vacuum Breaker" means a mechanical device which automatically air vents a pipeline to prevent back-siphonage.
- (d) "Auxiliary Source" means (a) a water supply which is not approved for potable use such as a pond, river, open storage tank, or large swimming pool; (b) potable water which has become un-potable such as by the addition of chemicals or from contamination while the water is being stored or held in reserve.
- (e) "Double Check Valve Assembly" (DVCA) means a device which contains two independently acting check valves located between two tightly closing shut-off valves and fitted with properly located test cocks.
- (f) "Existing Fire Sprinkler System" means a sprinkler system installed prior to October 1, 1992 and not having undergone substantial renovations, alterations or additions representing more than 50% of the replacement cost of the existing system at the time of renovation, alteration or addition after July 1, 1993.



- (g) “Fire Sprinkler System” for fire protection purposes means an integrated system of underground and overhead piping designed to provide fire protection for a building or structure. The installation includes one or more automatic water supplies. The portion of the sprinkler system aboveground is a network of specially sized or hydraulically designed piping installed in a building, structure, or area generally overhead, and to which sprinklers are attached in a systematic pattern. The valve controlling each system riser is located in the sprinkler riser or its supply piping. Each sprinkler system riser includes a device for actuating an alarm when the system is in operation. The system is usually activated by heat from a fire and discharges water over the fire area.
  - (h) “Hose Bibb Vacuum Breaker” means an atmospheric vacuum breaker designed to be attached to an outlet having a hose connection thread.
  - (i) “New Fire Sprinkler System” means a sprinkler system installed after October 1, 1992 or a sprinkler system which has undergone substantial renovations, alterations or additions representing more than 50% of the replacement cost of the existing system at the time of renovation, alteration or addition after July 1, 1993.
  - (j) “Owner” means the customer of a water utility.
  - (k) “Pressure Vacuum Breaker” means a device which contains a spring loaded check valve and a spring loaded atmospheric vent which opens when the pressure approaches atmospheric. The unit shall include two tightly closing shut-off valves located at each end of the device and two test cocks properly located for testing the device.
  - (l) “Reduced Pressure Principle Backflow Preventer” (RPD) means a device containing within its structure a minimum of two independently acting, approved check valves, together with an automatically operating pressure differential relief valve located between the two check valves. The first check valve reduces the supply pressure a predetermined amount so that during normal flow and cessation of normal flow the pressure between the checks shall be less than the supply pressure. In case of leakage of either check valve, the differential relief valve, by discharging to atmosphere, shall operate to maintain the pressure between the checks less than the supply pressure. The unit shall include tightly closing shut-off valves located at each end of the device and each device shall be fitted with properly located test cocks.
  - (m) “Siamese Connection” means an inlet equipped with one or more couplings to which a fire hose can be attached and through which water can be delivered by a fire department pumper to a sprinkler system.
  - (n) “Toxic or Objectionable Substance” means any compound which could affect the public health, the pot ability or the aesthetic quality of the water.
- (2) Air Gap
- An air gap is required between all potable water lines and equipment or systems which may be subject to contamination.
- (3) Reduced Pressure Principle Backflow Preventer
- (a) A reduced pressure principle backflow preventer (RPD) is required on a line to all facilities where toxic or objectionable substances are used in addition to the required air gap, vacuum breaker or RPD on individual pieces of equipment. Where such substances are used in a specific area, and RPD on the line to that area may be used in place of the RPD on the line to the facility.

- (b) A reduced pressure principal backflow preventer (RPD) or an air gap shall be installed in the following instances:
- (i) On a line to fire sprinkler systems (including tanks) where chemicals are added or to foam firefighting systems;
  - (ii) On a line to pressurized water systems on ships;
  - (iii) On a line used to supply car wash facilities where pressure is boosted;
  - (iv) On a line to irrigation or lawn sprinkler systems where chemicals are added;
  - (v) On a line to all boiler systems where chemicals are added;
  - (vi) On a line to heat exchangers where chemicals are added;
  - (vii) On a line to solar heating systems where chemicals are added;
  - (viii) On a line to new fire sprinkler systems with any Siamese connections;
  - (ix) Effective January 1, 1999, on a line to all existing fire sprinkler systems with any siamese connections unless such systems are systems are equipped with a DCVA. The owner shall have in place either an RPD or a DCVA or an air gap on such systems. Where chemicals are added to such systems, the owner shall install an RPD pursuant to subparagraph (A) of this subdivision of the Regulations of Connecticut State Agencies.
  - (x) On a line to plating tanks or areas. No potable water use will be allowed downstream of the device pursuant to Section 19-13-B38a(e)(2) of the Regulations of Connecticut State Agencies.
- (c) A RPD or an air vent type backflow preventer or an air gap in the following instances:
- (i) Water supply lines to all boiler systems where chemicals are not added;
  - (ii) Water supply lines to carbonators for beverage machines, water conditioning systems, and commercial ice making equipment;
  - (iii) Water supply lines connected to solar heating systems where chemicals are not added and heat exchangers where chemicals are not added;
  - (iv) Water supply lines to storage tanks used for fire protection where chemicals are not added.
- (4) Vacuum Breaker.
- The owner shall install either an atmospheric vacuum breaker or a pressure vacuum breaker or an air gap in the following instances:
- (a) Irrigation or lawn sprinkler systems where chemicals are not added;
  - (b) Flush valve toilets;
  - (c) Inlets which are or may become submerged, except where an RPD is required pursuant to Sections 19-13-B38a(c)(2) of the Regulations of Connecticut State Agencies;
  - (d) Hemodialysis units;
  - (e) At marinas and docks on all hose bibbs or other outlets to which a hose may be connected.
- (5) Installation and Maintenance.
- The devices required by Section 19-13-B38a of the Regulations of Connecticut State Agencies shall be purchased, owned, installed, and maintained by the facility in compliance with the following conditions:

- (a) New devices shall conform to the revision of American Water Works Association Standard C510, C511 or the revision of the applicable standard of the American Society of Sanitary Engineering in effect at the time of building permit application.
  - (b) There shall be no connection made for potable water use downstream of an RPD and upstream of the equipment or systems subject to contamination except where the device is installed on the service line and the required air gap, vacuum breaker, or RPD is provided on all individual pieces of equipment.
  - (c) Each RPD shall be located in a room or structure that is well lighted, properly drained, and not subject to flooding. Each RPD shall be easily accessible for repair, testing, and inspection.
  - (d) Each DCVA shall be accessible for testing and inspection.
  - (e) If an RPD or DCVA cannot be removed from service for maintenance and testing during normal working hours, than a second device of the same type shall be installed in parallel so as to permit inspection and repair of either unit.
  - (f) The public water utility shall test annually each RPD, DCVA and pressure vacuum breaker and maintain records of the test. Any malfunctioning device shall be promptly restored to proper operating condition by the owner. A copy of the results shall be forwarded to the State Department of Health Services as a part of the annual cross connection survey report. All tests must be performed by a backflow preventer tester who has passed a written and laboratory examination administered by the State Department of Health Services.
  - (g) Atmospheric vacuum breakers shall be located beyond the last control valve prior to the first outlet. All vacuum breakers shall be installed at an elevation higher than any outlet according to manufacturer's instructions.
  - (h) An atmospheric vacuum breaker shall be installed so that it is not subject to backpressure or continuous operating pressure of more than twelve (12) hours duration. Where vacuum breakers are to be installed under Section 19-13-B38a(d) of the Regulations of Connecticut State Agencies and a continuous operating pressure exists, a pressure vacuum breaker shall be used.
  - (i) An atmospheric vacuum breaker shall be installed in such a fashion that it will not be subject to corrosion which will render it inoperative.
  - (j) Any time a device is required to be installed on a fire sprinkler line, the customer shall submit to the water utility written approval of the proposed installation and device from the Fire Marshal and the customer's insurance underwriter.
- (6) Protection of Distribution System

Each supplier of water to a community public water supply system shall report the following information to the state health department by March 1 of each year covering the preceding calendar year.

- (a) A list of all consumer premises where:
  - (i) A private source of water supply is known to exist.
  - (ii) Toxic or objectionable chemical or biological substances are used in water solution on public commercial or industrial premises.
  - (iii) Water pressure is raised by pumping on other than residential premises above that furnished by the supplier.
  - (iv) There is a water storage tank for other than residential use, commercial swimming pool or commercial water filter.
  - (v) There is known to be a sprinkler system for either fire protection or irrigation.

- (b) Date of last inspection of each consumer premises listed in item (a). Also the number of violation detected of the PHC Regulations relation to water distribution systems, and the status of corrections of these violation. Listings under item (a.) (B.) shall be inspected at least once each year and the remaining items shall be inspected at least once every five years.

(7) Cross-Connection

There shall be no connection between the distribution system and any pipes, pumps, hydrants, or tanks whereby unsafe water or other contaminating materials may be discharged or drawn into the system. Each water utility shall have a program conforming to state requirements to detect and eliminate cross connections.

b. Interconnections

(1) Cross-Connections Between Water Supplies Prohibited

- (a) No physical connection between the distribution system of a public potable water supply and that of any other water supply shall be permitted, unless such other water supply is of safe sanitary quality and the interconnection of both supplies is approved by the MPTN Utilities.
- (b) Effective December 31, 1989, the State Department of Health Services shall prohibit the use of double check valve assemblies except those assemblies allowed pursuant to section 19-13-B38a(c)(2)(1) of the Regulations of Connecticut State Agencies.

(2) Connections with Other Water Sources

No physical connection between piping carrying water from a public water supply and piping carrying water from any other source shall be permitted unless such other water supply is of safe, sanitary quality and the interconnection is approved by MPTN Utilities.

(3) Service Pipes

No physical connection between the distribution system of a public water supply and any non-public water supply is permitted except as provided for in Section 19-13-B37 of the Regulations of Connecticut State Agencies;

(4) Interconnections

The approval of the MPTN Utilities Department shall be obtained for interconnections between potable water supplies

c. Cooling Water

Neither steam condensate, cooling water from engineer jackets, nor water used in conjunction with heat exchange devices shall be returned to the potable water supply.

d. Water Loading Stations

Water loading stations present special problems since the fill line may be used for filling both potable water vessels and other tanks or contaminated vessels. To prevent contamination of both the public supply and potable water vessels being filled, the following principles shall be met in the design of water loading stations:

- (1) there shall be no backflow to the public water supply,
- (2) the piping arrangement shall prevent contaminant being transferred from a hauling vessel to others subsequently using the station,
- (3) hoses shall not be contaminated by contact with the ground.

**§ 6. Water Services and Plumbing**

## a. Plumbing

## (1) Service Pipes

- (a) The size, design, material, and installation of the service pipe shall conform to the reasonable requirements of the utility that will eventually own the water system; provided, however, that the minimum size of the pipe shall be not less than  $\frac{3}{4}$  inch and that the use of non-metallic pipe shall include a suitable tracer wire for pipe location;
- (b) All service pipes shall be installed below the frost line to prevent freezing;
- (c) Service pipes shall not be connected to hydrant branch lines, and they shall not cross intervening properties even with the protection of easements. If fire protection to the customer's property is required, there shall be a separate service connection and separate service pipe paralleling the domestic service pipe to the customer's place of consumption;
- (d) The service pipe shall be connected to a single-service corporation at the main, installed with a suitable gooseneck and be sufficiently flexible to prevent fracture from expansion or contraction. It shall be run perpendicular from the water main to the customer premises and be free from any tee, branch connection, irregularity or defect;
- (e) The service pipe shall be installed with a suitable shutoff valve and curb box at the property line. There shall also be a suitable shutoff valve at the interior of the premises. In the case of service pipes dedicated for fire protection, there shall be a detector check meter installed on the pipe;
- (f) No physical connection between the distribution system of a public water supply and any non-public water supply is permitted except as provided for in Section 19-13-B37 of the Regulation of Connecticut State Agencies;

## (2) Plumbing

Water services and plumbing shall conform to relevant local and/or state plumbing codes, or the applicable National Plumbing Code. Solders and flux containing more than 0.2% lead and pipe and pipe fittings containing more than 8% lead shall not be used.

## b. Service Meters

Each service connection shall be separately metered. The service line in each dwelling or office unit shall contain two ball valves and an AWWA certified meter adaptive to a remote reading device setting. The facility or leased tenant shall be responsible for providing the water meters to each customer premise at its own expense.

## SubChapter 2.2 Technical Specifications and Requirements

(Rev. 27MAR14)

### § 1. General Conditions

- (1) Water service and house sewer pipes shall be laid in separate trenches at least ten feet apart. When approved to be laid in the same trench due to warranted conditions, the water pipe shall be laid on a bench at least 18" above the top of the sewer pipe and 18" from the side of the sewer pipe.
- (2) Water main and services shall maintain a minimum of 10 ft distance from a sewer force main. Should it not be possible to maintain the 10 ft separation distance, upon approval from MPTN Utilities Dept, the force main will need to be encased in concrete in lieu of required separation distance. All water main bell joints located within the required 10 ft separation distance shall have bell repair couplings installed to provide and additional gasket at joints.
- (3) Minimum cover on water mains and services shall be 4'-6".
- (4) In general, separate utilities (each separate residential unit in a condominium) shall be separately metered and have separate water services.
- (5) Water mains should be at least 10' from any building.
- (6) Curb boxes should be at least 6' from any building.
- (7) Minimum size of any main line water main to supply a hydrant – 8".
- (8) Hydrant branch line size – 6" minimum.
- (9) Minimum size of any water service installed from the main to property line shall be 1-1/2".
- (10) Meters:
 

Exterior Meters located in meter pits shall be so located as to be accessible to the main distribution line for proper service connection. The meter pit shall be installed as to be unaffected by climatic conditions, reasonably secure from damage and in areas not subject to vehicle traffic if possible.

Interior Meters installed inside buildings shall be located as near as possible to the point where the service pipe enters the building and so as to be reasonable secure from damage and readily accessible for reading.
- (11) Water Mains:
 

In so far as practicable shall be designed to avoid dead ends. Where dead ends are necessary, hydrants or blow-offs for the purpose of flushing mains must be installed.
- (12) Remote Water Meter reading devices are required on all units.
- (13) Backflow Prevention Devices are required on all commercial service and for other potentially contaminating situations.
- (14) No backfilling of pipe shall be done until an inspection has been made by a designated representative of the Owner or MPTN Department of Utilities, and installation has been approved

### § 2. Ductile Iron Pipe and Fittings

#### a. Quality Control

- (1) Manufacturers' Recommendations:

The Contractor shall submit for approval, six (6) copies of the manufacturer's printed recommendations for the storage, protection, handling and installation of the ductile

iron pipe, pipe fittings and appurtenances, which shall be strictly adhered to by the Contractor.

(2) Certificate of Compliance:

Each shipment of pipe, pipefittings, and appurtenances, shall be accompanied by the manufacturer's notarized certificate certifying conformance with all requirements of these specifications.

b. Products

(1) General:

All materials to be incorporated into the work shall be new, purchased specifically for this contract. All material shall be made in the United States of America.

(2) Ductile Iron Pipe:

Ductile iron pipe shall be Class 52, and shall conform to AWWA specifications C150 and C151, latest revision. Ductile iron pipe shall have push-on type joints with the exception that mechanical joints shall be used at all fitting and along straight pipe sections where mechanical joint restraint is required. All pipe shall have a double bituminous seal coating on all exterior surfaces. Pipe shall be manufactured in USA by Atlantic States Cast Iron Pipe Co., or approved equal.

(3) Fittings:

Fittings and plugs for use with the ductile iron pipe specified shall be ductile iron, with a working pressure rating of not less than 250 psi, class 350 conforming to AWWA C153, latest revision, and shall have mechanical joints. Fittings shall be manufactured by Union, Tyler Mechanical Joint, or approved equal.

(4) Transitional Couplings:

(5) The center sleeve and end rings of couplings shall be made of ductile iron, meeting or exceeding ASTM A536. The coupling shall accommodate the entire O.D. range in the specified size by use of interchangeable color-coded end rings and gaskets.

(6) The coupling shall be made of virgin rubber compound for water use. The SBR shall meet or exceed ASTM D2000-3-BA715. The gasket shall have raised lettering and sizing and state the proper color code for the appropriate end ring.

(7) The coupling shall be equipped with stainless steel bolts, washers, and nuts, and conform to the latest edition of AWWA C111.

(8) Transition/Repair couplings shall be as manufactured by Ford Model FC2A-SH, Smith Blair Model 441, Romac Model 501, Cascade Waterworks Model CTC, or approved equal.

(9) Repair Clamp shall be as manufactured by Smith Blair Model 226 or 227, Dresser Model 360 or approved equal.

(10) Straight connections between two ductile iron pipe sections shall be made by ductile iron solid sleeves with Mega lug restraints.

(11) Joints:

(12) Push-on and mechanical type joints for pipe as specified above shall conform to AWWA C111, latest revision. Gasket material for all jointing requirements shall be styrene butadiene (SBR).

(13) Expansion Joints shall be flexible joint single ball or double ball type and shall be manufactured by EBAA Iron.

(14) Cement Mortar Lining:

Interior pipe and fitting surfaces shall be covered with a double cement-mortar continuous lining not less than 1/16" thick, of materials, and applied in accordance with AWWA/ANSI C104/A21.4, latest revision.

- (15) Storage of Materials:
- (16) Pipe and related materials shall be stored in locations and in a manner approved by the Owner Representative. The locations and manner of storage shall be as to minimize handling of the materials.
- (17) The Contractor shall, at all times, be solely responsible for the safe storage of all materials.
- (18) Testing:
- (19) Testing of ductile iron pipe shall be done in accordance with AWWA C151, latest revision.
- (20) Testing of ductile iron fittings shall be done in accordance with AWWA C153, latest revision.
- (21) Testing of jointing material shall be done in accordance with AWWA C111, latest revision.
- (22) Testing of the interior coating shall be done in accordance with AWWA C104, latest revision.
- (23) Certified test reports shall be submitted by the Pipe manufacturer.
- (24) The Owner Representative shall be notified at least ten (10) days in advance of the date and location of the testing in order to witness the tests.
- (25) The Contractor shall furnish to the Owner Representative notarized test reports by an independent testing laboratory, which show compliance of all materials furnished to the requirements specified herein. The test reports shall indicate results and methods employed.
- (26) Joint Restraint:
- (27) Restraining devices shall be used where indicated, directed or as required. Joint restraint shall be concrete thrust block and mechanical restraint joints. Mechanical joint restraint shall be manufactured by EBAA Iron, of type Mega-Lug pattern, Model 1100 for mechanical joints.
- (28) Restraining devices shall be utilized on all mains under the following conditions:
  - (i) Pipeline direction changes (tees, bends)
  - (ii) Dead end lines (caps, plugs, valves)
  - (iii) Transition pieces (reducers)
  - (iv) Thrust restraint shall be provided via restrained joint, ductile iron pipe meeting AWWA C151/A21.512 and AWWA C111/A21.11. Restrained joint pipe lengths (restrained length) shall be sufficient to restrain thrust imparted by 1½ times the anticipated working pressure but not less than 200 psi.
  - (v) Thrust restraint utilizing tie-rods shall be utilized on vertical bends from MJ Bend to MJ Bend or as directed by the Owner or specifically indicated. Tie-rod diameters shall be 2 times the diameter required to restrain the main. All rods shall be protected from corrosion with two coats of bituminous paint or epoxy.



## c. Pipe Installation

- (1) General:
- (2) All pipe shall be installed in accordance with AWWA C600, latest revision and manufacturer requirements.
- (3) All pipe and accessories shall be carefully inspected by the Contractor for defects before installation and all defective unsound or damaged materials shall be rejected.
- (4) The Owner Representative will make such additional inspections as he deems necessary and the Contractor shall furnish all necessary assistance for such inspection.
- (5) Proper implements, tools, and facilities satisfactory to the Owner Representative shall be provided by the Contractor for the proper and satisfactory execution of the work.
- (6) Pipe, accessories, and appurtenances shall be new and unused, and shall be of the types and materials specified, as indicated or as directed.
- (7) The interior of pipe and fittings shall be thoroughly cleaned of foreign matter before being lowered into the trench and shall be kept clean during laying operations.
- (8) Pipelines shall be constructed in dry trenches and shall not be laid when the conditions of the trench or the weather is unsuitable for such work.
- (9) The trench bottom and gravel bedding shall be shaped and compacted to give substantially uniform unyielding circumferential support to the lower fourth of the full length of each pipe.
- (10) Holes for the bells shall be excavated so that after placement the pipe and coupling receive uniform bearing pressure from the trench bottom.
- (11) Each pipe shall be laid to the line and grade and in such a manner as to form a close concentric joint with the adjoining pipe and to prevent sudden offsets of the flow line.
- (12) As the work progresses, the interior and exterior of the pipes and couplings shall be cleaned of all dirt and superfluous material of every description.
- (13) When required to keep interior of pipe clean, a suitable drag shall be kept in the pipe and pulled forward past each joint immediately after the jointing has been completed.
- (14) At times when work is not in progress, open ends of pipe and fittings shall be securely closed so that no trench water, earth or other substance will enter the pipe or fitting.
- (15) Any pipe that has been disturbed after lying shall be taken up and re-laid.
- (16) All materials found to be defective during the progress of the work will be rejected by the Owner Representative and the Contractor shall promptly remove such defective material from the site of the work and replace with new material at no additional expense to the Owner.
- (17) The Contractor shall be responsible for the safe storage and proper handling of all materials.
- (18) No shims or mounds of earth shall be used to raise the pipe to grade.
- (19) All pipe shall be maintained accurately to the required line and grade.
- (20) No pipe shall be covered until the Owner Representative has inspected the joints.
- (21) The pipeline shall not be used to convey trench drainage during construction.
- (22) Pipes shall be protected at all times during construction against flotation. They shall be thoroughly secured, properly supported and bedded to prevent settlement or disturbance. Compaction of bedding and backfill material shall be in strict accordance with Section 02200, EARTHWORK.
- (23) Bends, crosses, tees, caps, plugs, valves, and other appurtenances, shall be strapped and clamped where indicated and/or as directed. Steel bars, rods and plates shall be of

structural steel. Straps, bridle rods, clamps, anchors and such other parts shall be provided to the details as directed and as approved. After installation, all parts of the strapping and clamping devices shall be given two (2) heavy coats of an approved coal-tar base protective coating.

d. Jointing

- (1) No pipes shall be jointed until couplings and ends of pipe have been inspected to determine that the joint surfaces are free from any defects in materials or workmanship, and free from dirt or other foreign matter.
- (2) Pipe, pipe fittings and accessories shall be stored, installed, joined and protected by the Contractor in strict accordance with the printed recommendations of the manufacturer of the piping material, and as approved.
- (3) Field assembled joints shall be checked with a suitable gauge as recommended by the manufacturer to ensure that the rubber rings are properly located.
- (4) If inspection indicates that the rings are improperly located, the Contractor shall disassemble, and properly reinstall the pipe.
- (5) Pipe stoppers shall be installed, sealed and blocked in such a manner as to prevent any leakage and so as to withstand an internal hydrostatic pressure of not less than 5 psi.
- (6) Timber blocking shall be of adequate size and arrangement to prevent the stopper from being blown off the line.
- (7) Timber bracing shall extend back to the undisturbed end of the trench.

PIPE DEFLECTION ALLOWANCES (FULL LENGTH PIPE)

Maximum permissible deflection, in.\*

Size of Pipe	Maximum Joint Deflection in Degrees	Tyton Joint	Approx. Radius in Ft. of Curve Produced by Succession of Joints.
4"	5 <sup>0</sup>	19	205
6"	5 <sup>0</sup>	19	205
8"	5 <sup>0</sup>	19	205
10"	5 <sup>0</sup>	19	205
12"	5 <sup>0</sup>	19	205
14"	4 <sup>0</sup>	15	260
16"	4 <sup>0</sup>	15	260
20"	3 <sup>0</sup>	11	345
24"	3 <sup>0</sup>	11	345

\*Maximum permissible deflection for 18' length; maximum permissible deflections for other lengths shall be in proportion of such lengths to 18'.

e. Temporary Plugs

At all times when pipe laying is not actually in progress, the open ends of pipe shall be closed by temporary watertight plugs or by other approved means. If water is in the trench when work is resumed, the plug shall not be removed until all danger of water entering the pipe has passed. Pipelines shall not be used as conduits for trench drainage during construction.

### § 3. Valves and Appurtenances

#### a. General

##### (1) Summary

The work under this Section includes the furnishing, installation and testing of all valves, tapping sleeves, and appurtenances as indicated on the plans or as may be required by the Owner.

##### (2) Quality Assurance

##### (3) Manufacturer's Recommendations:

The Contractor shall submit for approval six (6) copies of the manufacturer's printed recommendations for the storage, protection, handling and installation of the valves, tapping sleeves and appurtenances, which shall be strictly adhered to by the Contractor.

##### (4) Certificate of Compliance:

Each shipment of valves, tapping sleeves and appurtenances shall be accompanied with the manufacturer's notarized certificate certifying conformance with the requirements of the Specifications.

##### (5) Marking

Marking of all tapping sleeves shall conform to the requirements of AWWA 110 latest revision, marking of all valves shall conform to the requirements of AWWA 509 latest revision, and marking of all shall conform to the requirements of AWWA 502, latest revision.

##### (6) Manufacturer's Representative

The Contractor shall furnish at no additional expense to the Owner, the services of the manufacturer's representative for instruction of the contractor personnel who will be installing the tapping sleeves and valves. The instruction shall include proper handling, installation and jointing, and other construction areas and shall be for such lengths of time required to fully familiarize the Contractor's personnel with proper techniques. This information shall be bound and indexed for each type of unit as herein specified.

##### (7) References

Standard Specifications when referenced to in this Section shall mean the "Standard Specifications for Roads, Bridges, and Incidental Construction" of the Connecticut Department of Transportation, 1995 Edition.

#### b. Products

##### (1) Tapping Sleeves and Tapping Valves

##### (2) All material shall be made in the United States of America.

##### (3) All tapping sleeves shall comply in all respects to AWWA Standard C-110 and the following design standards:

(i) Tapping sleeve shall be installed at the location of the existing water main as shown on the plans and details.

(ii) The tapping sleeve shall be a mechanical type joint to provide pressure - tight installation and be suitable for use with the existing pressurized pipe material. Tapping sleeves shall be manufactured by Mueller, Model H-615. Outlet flange shall be Class 125C, ANSI B16.1.

(iii) Mechanical joint tapping sleeves shall have totally confined end gaskets and be designed to withstand a minimum of 200 p.s.i. working pressure.

- (iv) Tapping valves shall comply with Section 2-3 - Gate Valves except one end shall be flanged and the other mechanical.
  - (v) Tapping Valves shall be manufactured by Mueller, Model T2360, and shall be resilient wedge type, open left for mechanical joints.
  - (vi) Tapping valves shall be provided with an oversized opening to allow the use of full size cutters.
- (4) Buried Gate Valves
  - (5) Resilient seated gate valves shall meet AWWA C-509 and be UL listed and FM approved. This valve shall be iron-body, bronze mounted, non-rising stem, 4 inch through 12 inch in diameter as shown on plans. All valves to open left. All valves to be mechanical joint.
  - (6) Sizes 4 inch through 12 inch shall be suitable for 200-psig maximum working pressure and 400-psig-test pressure. Size 16 inch shall be suitable for 200-psig maximum working pressure.
  - (7) Valve shall have a minimum of two O-ring stem seals.
  - (8) Bonnet and gland bolts and nuts shall be stainless steel for corrosion resistance.
  - (9) The interior and exterior of valves shall be fully epoxy coated 8 mils thick.
    - (a) Gate valves shall be as manufactured by Mueller, Model A2360 or approved equal.
  - (10) Butterfly Valves
  - (11) Buried butterfly valves shall be iron-body, ductile iron valve discs with rubber seats offset from the valves shaft in order to provide complete 360<sup>o</sup> seating having mechanical, flanged or bell-and-spigot ends necessary to match connecting pipe. The valves shall be suitable for 150 psi working pressure for 12" to 24" sizes and shall conform to the AWWA Standard for Rubber-Seated Butterfly Valves, Designations C504-94 insofar as applicable. Valves shall be made by the Mueller Company, Decatur, Illinois or approved equal.
  - (12) They shall, in addition, meet the following requirements:
  - (13) Valve body seating surface shall be Stainless Steel, ASTM A276, Type 304. The mating seat shall be natural rubber bonded to an 18-8 stainless steel seat retaining ring and shall be mounted on the disc. The rubber seat mounted on the disc shall be field adjustable and field replaceable.
  - (14) Valve shafts shall be Stainless Steel, ASTM A276, Type 304 of the stub shaft design. The shafts and disc shall be connected by means of an O-ring sealed taper pin, held in place by self-locking nuts. The disc shall be held in the center of the valve by factory set thrust collars. Shaft seals shall be of the O-ring type in removable bronze cartridge.
  - (15) Operators shall be of the traveling-nut type with readily adjustable end stops without disassembly of operator or use of machine tools. Operators shall be field replaceable.
  - (16) All valves furnished shall open left.
  - (17) Above Ground Blow-Off Valve
  - (18) Blow-Off valves shall be non-freezing, self-draining type.
  - (19) Blow-Off valves shall be furnished with a 4" MJ inlet, a non-turning operating rod, and shall open to the left.
  - (20) All of the working parts shall be of bronze-to-bronze design, and be serviceable from above ground with no digging.
  - (21) Units shall operate with a standard 2" gate valve wrench.
  - (22) When open, valve shall be 100% unobstructed and drain hole shall be covered.

- (23) The outlet shall be 4" FIP with plug and extend a minimum of 12" above the ground.
- (24) The Blow-Off valve shall be a Model # 7500 manufactured by Kupferle Foundry Co., St Louis, MO, or an approved equal.
- (25) Straight and Transition Pipe Couplings
- (26) The center sleeve and end rings of couplings shall be made of ductile iron, meeting or exceeding ASTM A536. The coupling shall accommodate the entire O.D. range in the specified size by use of interchangeable color-coded end rings and gaskets.
- (27) The coupling shall be made of virgin rubber compound for water use. The SBR shall meet or exceed ASTM D2000-3-BA715. The gasket shall have raised lettering and sizing and state the proper color code for the appropriate end ring.
- (28) The coupling shall be equipped with stainless steel bolts, washers, and nuts, and conform to the latest edition of AWWA C111.
- (29) Straight couplings shall be as manufactured by Ford Model FC1-SH, Smith Blair Model 441, Romac Model 501, Cascade Waterworks Model CDC, or approved equal.
- (30) Transition/Repair couplings shall be as manufactured by Smith Blair Model 441, or approved equal.
- (31) Repair Clamp shall be as manufactured by Smith Blair Model 226 or 227 or approved equal.
- (32) Straight connections between two ductile iron pipe sections shall be made by ductile iron solid sleeves.
- (33) Valve Boxes and Covers
- (34) Cast iron valve boxes shall be two-piece adjustable style, slip type, as manufactured by Tyler, Bibby, or equal. Barrel inside diameter shall be 4½ inches with 26-inch top section and 48 inch bottom section lengths adjusted to finish grade.
- (35) Covers shall be cast iron, 5¼ inch, with the word "WATER" and a direction to open arrow imprinted thereon. The boxes and covers shall be compatible with the valves to which they attach.
- (36) An approved operating key shall be provided to the Owner.
- (37) Joint Restraint
- (38) Restraining devices shall be used where indicated, directed or as required. Joint restraint shall be concrete thrust block and mechanical joint restraint. Mechanical joint restraint shall be manufactured by EBAA Iron, of type Mega-Lug pattern, Model 1100 for mechanical joints.
  - (i) Restraining devices shall be utilized on all mains under the following conditions:
  - (ii) Pipeline direction changes (tees, bends)
  - (iii) Dead end lines (caps, plugs, valves)
  - (iv) Transition pieces (reducers)
  - (v) Thrust restraint shall be provided via restrained joint, ductile iron pipe meeting AWWA C151/A21.512 and AWWA C111/A21.11. Restrained joint pipe lengths (restrained length) shall be sufficient to restrain thrust imparted by 1½ times the anticipated working pressure but not less than 200 psi.
  - (vi) Thrust restraint utilizing tie-rods shall be utilized on vertical bends from MJ Bend to MJ Bend or as directed by the Owner or specifically indicated. Tie-rod diameters shall be 2 times the diameter required to restrain the main. All rods shall be protected from corrosion with two coats of bituminous paint or epoxy.

- (39) Indicator Post
- (40) Indicator post and valve shall be Underwriter's Laboratories, Inc. (UL) listed and Factory Mutual Research (FM) approved.
- (41) Indicator post shall be equipped with an angle-type operating wrench, which shall be locked to the post thus preventing unauthorized valve operation.
- (42) Indicator post and valve shall be the two-piece type manufactured by US Pipe or approved equal.
- (43) Indicator posts shall be supplied on all buried gate valves for full operation of opening and closing of valves.
- (44) Targets shall be set in the indicator posts to indicate "open" and "shut" position and shall be in full view.
- (45) Provide stem and coupling of adequate length for valve operation, along with adjustable setting box and base with a flange having sufficient bearing area to prevent under settlement. The lower base shall be designed to enclose the operating nut and stuffing box of the valve and fit over the valve bonnet.
- (46) Fire Hydrants

All fire hydrants shall comply in all respects to AWWA C-502 and the following design standards:
- (47) Fire hydrants shall be of the compression type, closing with the line pressure.
- (48) The depths of bury shall be 5 feet minimum to top flange of hydrant boot. Hydrant extensions, which may be required, shall be manufactured by the same manufacturer of the hydrants being installed.
- (49) Hydrant shall be furnished with a sealed reservoir located in the bonnet so that all threaded and bearing surfaces are lubricated each time the hydrant is operated.
- (50) Hydrant shall be equipped with "O" ring packing. Each nozzle cap shall be provided with a Buna-N rubble washer.
- (51) A bronze or rustproof steel nut and check nut shall be provided to hold the main hydrant valve on its stem.
- (52) Hydrant shall be equipped with two 2-½ inch hose nozzles, and one 4-½ inch steamer nozzle; three way, National Standard Threads with 1-½ inch pentagonal nuts.
- (53) Each hydrant shall be able to deliver 500 gallons per minute through its two 2-½ inch hose nozzles when opened together with a loss of not more than 2 psi through hydrant.
- (54) Hydrant shall have at least two (2) bronze or copper lined drain outlets. The shoe of the hydrant shall be 6 inch mechanical joint D-150, suitable for use either with centrifugally cast pipe or Class D Pit Cast Pipe. Lugs will be case on either side shoe, securely anchoring the hydrant. Hydrants shall be furnished with a breakable feature that will break cleanly upon impact. This shall consist of a 2-part breakable safety flange with a breakable stem coupling. Hydrant nozzles must be able to be rotated to any position without disassembly of ground-line flange.
- (55) Hydrants shall open to the LEFT and shall have a direction-to open arrow with the work "OPEN" imprinted on the hydrant.
- (56) Hydrants shall be post type.
- (57) Hydrants shall be so arranged that the direction of outlets may be turned 90 degrees without interference with the drip mechanism or obstructing the discharge from any outlet.

- (58) Hydrants shall be furnished with caps, double galvanized steel hose cap chain, galvanized steel pumper hose cap chain, a galvanized steel chain holder and any other hooks and/or appurtenances required for proper use.
- (59) All hydrants shall be equipped with a 6" gate valve in accordance with Section 2-3 above, and be fully restrained as shown on the drawings. Restrained joints shall be by Megalug Thrust Restraint Wedge manufactured and sold by EBAA Iron Sales Inc.
- (60) Hydrants shall be Mueller No. A423 5-1/4" valve opening Centorion 250 which opens left.
- (61) Hydrant shall be sand blasted to SSPC/SP-6, primed with phenolic urethane compatible coating 5 mils thick, and finish coated red The boot coating shall be fuse-bonded epoxy or thermal set epoxy for interior and exterior - holiday free with minimum 8 mils thickness meeting or exceeding AWWA C550.
- (62) For every 4 hydrants installed the following shall be provided to the Owner (If less than 4 hydrants are installed, at least one completed set of the following shall be provided):
  - (i) One (1)-traffic repair kit,
  - (ii) One (1) full set of "O" - rings and gaskets,
  - (iii) One (1) set of drain valve facings,
  - (iv) One (1) hydrant valve removal wrench, and
  - (v) One (1) hydrant-operating wrench.

All parts shall be properly labeled and housed in a carton with part numbers clearly indicated.

c. Installation

- (1) General
  - (a) All tapping sleeves, valves and accessories shall be carefully inspected by the contractor for defects before installation and all defective, unsound or damaged materials shall be rejected.
  - (b) The Owner's Representative will make such additional inspections as he deems necessary and the Contractor shall furnish all necessary assistance for such inspection.
  - (c) Proper implements, tools and facilities satisfactory to the Owner's Representative shall be provided by the Contractor for the proper and satisfactory execution of the work.
  - (d) Tapping sleeves, valves and appurtenances shall be new and unused and shall be of the types and materials specified as indicated or as directed.
  - (e) The interior of tapping sleeves and valves shall be thoroughly cleaned of foreign matter before being lowered into the trench and shall be kept clean during laying operation.
  - (f) Tapping sleeves and valves shall be constructed in dry trenches and shall not be laid when the conditions of the trench or the weather is unsuitable for such work.
  - (g) Tapping sleeves, valves and couplings shall be laid to the line and grade in such a manner as to form a close concentric joint with the adjoining pipe and to prevent sudden offsets of the flow line.
  - (h) At times when work is not in progress, open ends of tapping sleeves and valves shall be securely closed so that no trench water, earth or other substances will enter.

- (i) Any tapping sleeves or valves that have been disturbed after laying shall be taken up and relayed.
  - (j) All materials found to be defective during the progress of the work will be rejected by the Owner's Representative and the Contractor shall promptly remove such defective material from the site of the work and replace with new material at no additional expense to the Owner.
  - (k) The Contractor shall be responsible for the safe storage and proper handling of all materials.
  - (l) No shims or mounds of earth shall be used to raise the equipment to grade.
  - (m) No tapping sleeve, valve or appurtenance shall be covered until the joints have been inspected.
  - (n) Installed materials shall be protected at all times during construction against flotation; they shall be thoroughly secured, properly supported and bedded to prevent settlement or disturbance.
  - (o) Tapping sleeves shall be installed where indicated or as directed by the Owner's Representative and shall be installed according to the manufacturer's recommended procedures.
  - (p) Valves and joint restraints shall be installed where indicated or as directed by the Owner's Representative and shall be installed according to the manufacturer's recommended procedures.
  - (q) Setting Valves and Valve Boxes
  - (r) Valves shall be set in the pipelines as directed. Blocking or supports of a permanent nature shall be placed under each valve to ensure against settlement.
  - (s) Each valve shall be tightly closed before being placed in the line and shall remain so until the joints on each side are completely tightened.
  - (t) Valve boxes shall be set for all valves. They shall be carefully fitted together and to the valve and securely held during backfilling. They shall be centered over the valve-operating nut. The bedding material around them shall be thoroughly tamped in place and the box cover set to the finished grade.
- (2) Testing
- (a) All materials shall be tested for tightness as soon after installation as possible in accordance with Section 02675.
  - (b) All materials found to be defective during testing shall be replaced with new and approved material at no additional expense to the Owner.
  - (c) Test Report and Certificates
  - (d) In addition to other requirements specified herein, the Contractor shall furnish to the Owner Representative notarized test reports and methods of test by an approved independent testing laboratory to show compliance of all materials furnished under this section of the Specifications with all the requirements herein.
  - (e) Each shipment of tapping sleeves, valves, shall be accompanied by the manufacturer's notarized certificate of conformance certifying that materials to be furnished under these items meet all requirements herein.
  - (f) All testing of materials furnished under this section of the Specifications shall be provided by the Contractor at no additional expense to the Owner.
  - (g) Corporation Stops and Fittings



- (3) Corporation Stops
- (a) The inlet thread shall be AWWA taper “cc” threads and conform to AWWA 800 latest revision. The outlet thread shall conform to CTS and accessories required for a compression type connection suitable for use with polyethylene service tubing as specified herein. Design to withstand a minimum of 200-psi pressure.
  - (b) Corporation stops shall be Mueller Style No. H-15008. For the purposes of system standardization, no substitution will be allowed.
  - (c) Fittings - Brass:  
 Compression Fitting: Materials shall meet standard AWWA C-800 for brass fittings. The fittings and adapters shall be furnished with CTS Type for connections to polyethylene service tubing. Fitting design to withstand a minimum of 200-psi pressure and shall be as manufactured by Mueller. For the purposes of system standardization, no substitution will be allowed. The fittings shall Mueller H-15403
- (4) Curb Stops  
 Curb stops to meet the following requirements:
- (a) Valve to open left.
  - (b) T-head which aligns with the port that provides a quick identification of valve position.
  - (c) Valves shall be of bronze, meeting AWWA C-800.
  - (d) Design of valve shall be for a minimum hydrostatic test pressure of 200-psi pressure.
  - (e) Connections shall be CTS Type connections couplings for suitable use with polyethylene service pipe (tubing) material being installed and existing polyethylene tubing services.
  - (f) Curb stop shall be non-draining type.
  - (g) Curb stops shall be Mueller ball type B25209. For the purposes of system standardization, no substitution will be allowed.
- (5) Curb Boxes
- (a) Curb boxes shall be 2½-inch 94E Buffalo box slide type, and manufactured by Tyler, Bibby, or approved equivalent. The construction shall provide adjustment for varying grade levels and provide allowance for settlement or frost heave. Extension range shall be 40” to 60”. The boxes shall completely cover the curb stop. "Water" shall be clearly cast on the cover and have a brass pentagonal bolt.
  - (b) The box and cover shall be coated inside and out with a tar base enamel.
- (6) Water Service Piping (Tubing)  
 EndoPure POLYETHYLENE TUBING
- (i) Water service piping shall be EndoPure Polyethylene as manufactured by Endot Industries, Inc. or approved equal. EndoPure Polyethylene tubing shall be copper tube size (CTS) and have a working pressure of 200 psi.
  - (ii) EndoPure Polyethylene shall meet the applicable standards of ASTM D1248, ASTM D3350, ASTM D2239, and NSF-14 and shall meet the minimum values in the following table:

<b>PHYSICAL PROPERTY REQUIREMENTS</b>		
EndoPure Polyethylene		
<b>Property</b>	<b>Test Method</b>	<b>Requirement</b>
Cell Classification	ASTM D3350	345444A
Density	ASTM D1505	0.944 g/cc
Melt Index	ASTM D1238	>15.0 g/10 min
Tensile Strength	ASTM D638	>3,300 psi
Elongation	ASTM D638	>800%
Hydrostatic Design Basis	ASTM D2837	1,600 psi @23°C
Flexural Modulus	ASTM D790	12,000 psi
Brittleness Temperature	ASTM D746	< -180 °F
Environmental Stress Crack Resistance	ASTM D1693	>5,000 hours

- (7) Installation of Water Service Lines
- (a) Water service lines or branches shall be installed in accordance with the detail attached to this specification.
  - (b) For service branch installations, it is anticipated that the Contractor will use the conventional open-trench method, or he may choose any method of installing the water service piping, as approved by the Owner's Representative.
  - (c) Corporation stops shall be directly tapped into the water main and the polyethylene service piping (tubing) of the size specified shall run from the corporation stop to the curb stop.
  - (d) Corporation stops shall be installed as near the horizontal diameter as possible. The length of travel of the tap should be so established that when the stop is inserted and tightened with a 14-inch wrench, not more than one to three threads will be exposed on the outside. When a wet tapping machine is used, the corporation cock shall be inserted with the machine while it is still in place. Stops shall be tightened only sufficiently to give watertightness and care must be constantly exercised not to overtighten them.
  - (e) The Contractor shall install straight couplings to existing water mains of the sizes required in the locations designated by the Owner's Representative in the field. The Contractor shall utilize the manufacturer's recommended installation procedures while performing the work. Care shall be taken to ensure a watertight connection.
  - (f) Curb stops will, in most cases, be installed to beyond the roadway alignment and beyond the sidewalk on sides of the road that have a sidewalk, as shown on the drawing details. The Contractor shall install the curb stops and boxes in a workmanlike manner as described herein and as directed by the Owner's Representative and shall place clean compacted sand around and below the curb stop.
  - (g) Curb stops shall be furnished with a tailpiece, and end plug, which will be removed during future connection to the service stop.
  - (h) The boxes shall be set in a true vertical position and if they are within the limits of the roadway or within limits where the plowing of snow will take place in the winter, the tops of the boxes shall be set about 1/2 inch below the top of the finished

grade. In locations where these boxes are not likely to be disturbed, the tops shall be set flush with the adjoining ground.

- (i) Care shall be exercised in the placing and laying of polyethylene service tubing to be sure that the pipe (tubing) does not have kinks or sharp bends and to assure against it being in contact with sharp stones or ledge which would cause damage to the pipe. At least 12-inches of clean compacted sand shall be placed adjacent to, below and above the water service tubing and no stone shall be placed over the pipe until the depth of backfill above the latter is in excess of 1-ft.
- (j) All new water services shall have a minimum cover of four and one-half feet, as measured from finished grade; throughout the installation from the water main to the curb stop.

#### § 4. Backflow Protection

- (1) MPTN Product Standard
 

Reduced Pressure Backflow Preventers (RPZ) shall be installed at all water service entry points to Tribal Government, Commercial, and Enterprise facilities. MPTN Utilities product standard is Watts RPZ model 909.
- (2) Installation Requirements
  - (a) The installation for the potable water service shall consist of a primary and a secondary backflow device with isolation valves for each of the devices. The backflow devices shall be tested by certified backflow tester utilizing test equipment with a current test certification prior to activation of the water service. The fire suppression service shall utilize a double check valve assembly for fire services that do not utilize chemical additives. The model of the backflow prevention device shall be subject to the approval of MPTN Fire Dept. and Factory Mutual. If chemicals are utilized in the fire suppression system a RPZ backflow device shall be installed.
  - (b) RPZ Backflow Prevention Devices shall be also installed at the water service entrance points of vendor outlets and restaurants that utilize water for public use and consumption to include but not limited to food service, bars and nightclubs. All other backflow devices shall be required and installed as per the current adopted International Plumbing Code. All point of water service entry backflow devices shall be installed in a well-lit area no more than 6 feet from ground level and easily accessible without need of a ladder or confined space entry. See schematic drawing detail on Page 9 of Appendix I for typical installation.

#### § 5. Water Meters

- (1) MPTN Product Standard
 

MPTN Utilities product standard is Hersey. Meters shall be equipped with a translator pulse capability, measure in cubic feet, and capable of measuring water flow (+ ) or (-) 1% accuracy during high flow and low flow conditions. The design engineer and contractor shall submit the product data of the proposed meter along with high and low flow conditions for review and approval by the Utilities Department.
- (2) Installation Requirements
  - (a) All Commercial, Tribal Government, and Enterprise meter installations shall include bypass piping and isolation valves to allow meter removal without interruption to the water service. Meters installed inside the customer's building shall be located as

near as possible to the point where the service pipe enters the building and at a point reasonably secure from injury and readily accessible for reading and testing.

- (b) Meters shall be installed in a easily accessible area no higher than 5 feet above floor level and located as near as possible to the water service entrance. If the meter is installed in a locked closet a remote reader shall be installed so the meter can be easily read outside of the closet or in an accessible hallway. Under no conditions shall a meter be installed in the overhead ceiling. Installation of a meter in a meter pit outside of the building will not be allowable with prior approval from the MPTN Utilities Dept. See schematic drawing detail Page 9 of Appendix I for typical installation.

## § 6. Pressure and Leakage Tests

The pipelines shall be given combined pressure and leakage tests in sections of approved length in accordance with the AWWA Standard Specification (C600-93). The pressure test shall be conducted at 200 PSI for a period of 2 hours and shall be performed by a certified third party testing laboratory, the contractor shall be responsible for all costs of third party to perform pressure testing, chlorination, flushing, and bacterial sampling.

- (1) The scheduling of pressure and leakage test shall be as directed by the MPTN Utilities Department.
- (2) Subject to approval, and provided that the tests are made within a reasonable time considering the progress of the project as a whole and the need to put the section into service, the Contractor may make the tests when he desires.
- (3) The Contractor shall furnish and install suitable temporary testing plugs or caps for the pipeline; all necessary pumps, pipe connections and other similar equipment; and all labor required, all without additional compensation. The contractor shall furnish a water meter and a pressure gauge which the Contractor shall install in such a manner that all water entering the section under test will be measured and the pressure in the section indicated.
- (4) Pipelines in excavation or encased in the concrete shall be tested prior to the backfilling of the excavation or placing of the concrete.
- (5) Unless it has already been done, the section of pipe to be tested shall be filled with water of approved quality, and all air shall be expelled from the pipe. If hydrants or blow-offs are not available at high points for releasing air, the Contractor shall provide all blow offs necessary, make the necessary excavations and do the necessary backfilling and make the necessary taps at such points and shall plug said holes after completion of the test.
- (6) The section under test shall be maintained full of water for a period of 24 hours prior to the combined pressure and leakage test being applied.
- (7) The pressure and leakage test shall consist of first raising the water pressure (based on the elevation of the lowest point of the section under test and corrected to the gauge location) to a pressure in pounds per square inch numerically equal to the pressure rating of the pipe. While maintaining this pressure, the Contractor shall make a leakage test by metering the flow of water into the pipe. If the average leakage during a two-hour period exceeds a rate of 10 gallons per inch of diameter per 24 hours per mile of pipeline, the section shall be considered as having failed the test. All joints within chambers and all flanged joints shall have no visible leakage. No caulking of compound joints with lead or other foreign material will be allowed. Compound joints which drip slightly will, in general, be satisfactory, but no joints from which water continues to run or squirt in an active manner will be accepted.

- (8) If the section shall fail to pass the pressure test or the leakage test, or both, the Contractor shall do everything necessary to locate, uncover and repair and replace the defective pipe, fitting or joint, all at his own expense and without extension of time for completion of the work. Additional tests and repairs shall be made until the section passes the specified tests.

**§ 7. Disinfecting and Flushing**

- (1) After a section of the main has been tested and found acceptable, it shall be flushed thoroughly by MPTN Utilities and the Contractor. Upon completion of flushing operations, the approved 3<sup>rd</sup> Party testing agency hired by the Contractor shall disinfect the main with a solution consisting of 50 ppm of chlorine (which shall be retained in the main for at least 24 hours) in accordance with the AWWA Standard Specifications for Disinfecting Water Mains C651-92, Sections 1 to 9, inclusive.
- (2) Before the bypass pipes and service connections are put into use, the approved 3<sup>rd</sup> Party testing agency hired by Contractor shall disinfect the piping with a solution consisting of 50 ppm of chlorine, which shall be retained in the pipe for at least 8 hours. Disinfection shall be in accordance with the above mentioned AWWA Specifications insofar as applicable.
- (3) Following disinfection, all treated water shall be de-chlorinated and thoroughly flushed from the main to a drainage area approved by the Office of Natural Resources.
- (4) For all work involved, the Contractor shall furnish all equipment, material, and labor required for the testing, flushing, and chlorination. The Contractor shall also furnish means for disposal of the water used in disinfecting and flushing the main. The water shall be wasted in such a manner as to eliminate possibility of damage to roadways, adjacent property and contamination of water supply.
- (5) After disinfection and flushing but prior to placing the water main in active service a water sample representative of the new construction shall be collected in accordance with the most current version of AWWA Standard C651 by a certified testing laboratory . Samples shall be analyzed, at a minimum, for total coliform bacteria, total and free chlorine residual, and physical parameters. Test results, with the exception of chlorine, shall meet the water quality standards shown I Table 1 prior to placing the water main into service.

**TABLE 1 Water Quality Standards**

Parameter	Standard
Total coliform Bacteria	0 or absent (must use membrane filter (MF) technique unless HPC testing is conducted in which case the presence -absence technique may be substituted for the MF technique
Color	< 15 CU
Turbidity	< 5 NTU
Odor	< 2
pH	RANGE 6.4 - 10

## CHAPTER 3. SANITARY SEWER SYSTEM

### SubChapter 3.1. Technical Specifications and Requirements

#### § 1. Manholes

##### a. General

The Contractor shall furnish all materials and shall construct all the manholes required including the frames, covers, and steps.

##### b. Description

- (1) Manholes shall conform in shape, size, dimensions, materials, and other respects to the details indicated on the detail drawing specifications (see Appendix I), or as approved by MPTN Utilities.
- (2) Manholes may have cast in place concrete bases and may be precast units. Invert channels may be formed in the concrete of the base or may be formed of brick and mortar upon the base.
- (3) Manhole barrels and domes shall be precast concrete sections. The top 8 in. shall be built of brick or concrete grading rings to permit adjustment of the frame to meet the street surface. The inverts shall conform accurately to the size of the adjoining pipes. Side inverts shall be curved and main inverts (where direction changes) shall be laid out in smooth curves of the longest possible radius which is tangent to the centerlines of adjoining sewers.

##### c. Precast Concrete Selections

- (1) Precast concrete sections shall conform to the A.S.T.M. Standard Specifications for Precast Reinforced Concrete Manhole Sections, Designation C478-85a, with the following exceptions and additional requirements:
- (2) The barrel shall not be less than 5 in. thick.
- (3) Type II cement shall be used except as otherwise approved.
- (4) Joints between sections shall be made with round (O-ring) rubber gaskets with a shiftable groove on the spigot ends and shall conform to the A.S.T.M. Standard Specifications for Joints for Circular Concrete sewer and Culvert Pipe, Using Rubber Gaskets, Designation C443-85a.
- (5) Manhole sections shall contain manhole steps accurately positioned and embedded in the concrete when the section is cast.
- (6) Sections shall be cured by subjecting them to thoroughly saturated steam at a temperature between 100 and 130 deg. F. for a period of not less than 12 hours or, when necessary, for such additional time as may be needed to enable the section to meet the strength requirements.
- (7) The joint for the pipe at the base section shall consist of a Lock Joint flexible sleeve (imbedded in the wall of the base section) and a stainless steel strap to provide a water tight seal and allow a flexible joint. (Or Approved Equal)
- (8) No more than two lift holes may be cast or drilled in each section.
- (9) The date of the manufacture and the name or trademark of the manufacturer shall be clearly marked on the inside of the barrel.
- (10) Acceptance of the sections will be on the basis of material tests and inspections of the completed product.
- (11) Cones shall be precast sections of the eccentric type.

- (12) If precast concrete sections are used, the tops of the bases shall be suitably shaped by means of accurate bell-ring forms to receive the barrel sections.
- d. Setting Precast Manhole Selections
    - (1) Precast-reinforced concrete manhole sections shall be set so as to be vertical and with sections and steps in true alignment.
    - (2) Rubber gaskets shall be installed in all joints in accordance with the manufacturer's recommendations.
    - (3) All holes in the sections used for their handling shall be thoroughly plugged with rubber plugs made specifically for this purpose or with mortar. The mortar shall be one part cement to 2 parts sand, mixed slightly damp to the touch (just short of "balling"), hammered into the holes until it is dense and an excess of past appears on the surface, and then finished smooth and flush with the adjoining surfaces.
  - e. Brick
    - (1) The brick shall be sound, hard, and uniformly burned brick, regular and uniform in shape and size, of compact texture, and satisfactory to the Engineer. Brick shall comply with the A.S.T.M. Standard Specification for Sewer Brick and Manhole Brick (made from Clay or Shale) Designation C32-73 (Reapproved 1984) for Grade SS, hard brick, except that the mean of five tests for absorption shall not exceed eight percent by weight.
    - (2) Rejected brick shall be immediately removed from the work.
  - f. Mortar for Brickwork
    - (1) The mortar shall be composed of portland cement, hydrated lime, and sand, in which the volume of sand shall not exceed three times the sum of the volumes of cement and lime. The proportions of cement and lime shall be as directed and may vary from 1: ¼ for dense, hard-burned brick to 1:¾ for softer brick. In general, mortar for Grade SS brick shall be mixed in the proportions of 1: ½:4-1/2.
    - (2) Cement shall be Type II portland cement as specified for concrete masonry.
  - g. Laying Brickwork

Only clean bricks shall be used in brickwork for manholes. The brick shall be moistened by suitable means, as directed, until they are neither so dry as to absorb water from the mortar nor so wet as to be slippery when laid. Each brick shall be laid in a full bed and joint of mortar without requiring subsequent grouting, flushing, or filling, and shall be thoroughly bonded as directed.
  - h. Coating

The exterior surfaces of all manholes shall be given two coats of bituminous waterproofing material. The material shall be Minwax Fibrous Coat made by Minwax Co., New York, N.Y.; Tremco 121 Foundation Coating made by Tremco Mfg. Co., Cleveland, Ohio; Inertol No. 7 made by the Inertol Co., Inc., Newark, N.J.; or approved equal product. The waterproofing material shall be applied by brush or spray and in accordance with the instructions of the manufacturer. Time shall be allowed between coats to permit sufficient drying so that the application of the second coat has no effect on the first coat.
  - i. Manhole Frames and Covers
    - (1) The Contractor shall furnish all cast-iron manhole frames and covers.
    - (2) The cast-iron frames and covers shall be Pattern No. 1009 manufactured by the Campbell Foundry Co., Harrison, N.J., or approved equal product.

- (3) The frames and covers shall be set by the Contractor to conform accurately to the grade of the finished pavement, or existing ground surface.
  - (4) The castings shall be of good quality, strong, tough, even-grained cast iron, smooth, free from scale, lumps, blisters, sandholes, and defects of every nature which would render them unfit for the service for which they are intended. Contact surfaces of covers and frame seats shall be machined to prevent rocking of covers. (4-5/8" vent holes min).
  - (5) All castings shall be thoroughly cleaned and subject to a careful hammer inspection.
  - (6) Castings shall be at least Class 30 conforming to the A.S.T.M. Standard Specification for Gray Iron Castings, Designation A48-83.
  - (7) Before being shipped from the foundry, castings shall be given one coat of coal-tar-pitch varnish, applied in a satisfactory manner so as to make a smooth coating, tough, tenacious, and not brittle or with any tendency to scale off.
- j. Setting Manhole Frames and Covers
- (1) Manhole frames shall be set with the tops conforming accurately to the grade of the pavement or finished ground surface or as indicated on the drawings or directed. Frames shall be set concentric with the top of the masonry and in a full bed of mortar so that the space between the top of the manhole masonry and the bottom flange of the frame shall be completely filled and made watertight. A thick ring of mortar extending to the outer edge of the masonry shall be placed around and on top of the bottom flange. The mortar shall be smoothly finished and have a slight slope to shed water away from the frame.
  - (2) Manhole covers shall be left in place in the frames on completion of other work at the manholes.
- k. Stubs in Manholes
- Stubs placed as specified and indicated on the drawings shall extend into the manhole with sufficient clearance to allow a standard joint to be made.
- l. Manhole Steps
- Unless otherwise indicated, manhole steps shall be of aluminum. Aluminum manhole steps for precast concrete sections shall be Stock No. 12653B made by Aluminum Company of America and Allegheny Foundry Co., or Stock No. F-14-2B made by New Jersey Aluminum Co., or an approved equal product. Before the steps are built into the masonry and after thorough cleaning, those parts of aluminum steps which will be embedded shall be given a protective coating of an approved, heavy-bodied, bituminous material. The cleaning shall be done by suitable means with suitable cleaning agents to ensure that the surfaces to be coated are free from all foreign matter such as dirt, oil, and grease. The steps shall be thoroughly rinsed and dried before the coating is applied and the coating shall have become thoroughly dry before the steps are built into the masonry.
- m. Leakage Testing for Manholes
- (1) After completion of manhole construction, wall sealing, or rehabilitation, but prior to backfilling, test manholes for water tightness using hydrostatic or vacuum testing procedures.



- (2) Plug influent and effluent lines, including service lines, with suitably-sized pneumatic or mechanical plugs.
  - (a) Ensure plugs are properly rated for pressures required for test; follow manufacturer's safety and installation recommendations.
  - (b) Place plugs minimum of 6 inches outside of manhole walls. Brace inverts to backfilled.
- (3) Vacuum testing:
  - (a) Install vacuum tester head assembly at top access point of manhole and adjust for proper seal on straight top section of manhole structure. Following manufacturer's instructions and safety precautions, inflate sealing element to recommended maximum inflation pressure; do not over-inflate.
  - (b) Evacuate manhole with vacuum pump to 10 inches mercury (Hg), disconnect pump, and monitor vacuum for time period specified in Table below, locate leaks, complete repairs necessary to seal manhole and repeat test procedure until satisfactory results are obtained.
- (4) Perform hydrostatic exfiltration testing as follows:
  - (a) Seal wastewater lines coming into manhole with internal pipe plug. Then fill manhole with water and maintain it full for at least one hour.
  - (b) The maximum leakage for hydrostatic testing shall be 0.025 gallons per foot diameter per foot of manhole depth per hour.
  - (c) If water loss exceeds amount tabulated above, locate leaks, complete repairs necessary to seal manhole and repeat test procedure until satisfactory results are obtained.

MINIMUM TESTING TIMES FOR SANITARY MANHOLES  
LOW PRESSURE AIR TEST

DEPTH IN FEET	TIME IN SECONDS BY PIPE DIAMETER		
	48"	60"	72"
4	10	13	16
8	20	26	32
12	30	39	48
16	40	52	64
20	50	65	80
24	60	78	96

**§ 2. Polyvinyl Chloride Sanitary Gravity Sewer**

a. General

The Contractor shall furnish, lay, joint and test the polyvinyl chloride sanitary sewer pipe, fittings and appurtenances.

b. Pipe and Fittings

- (1) Polyvinyl chloride sanitary sewer pipe shall be composed of clean, virgin class 12454-B PVC compounds according to ASTM Standard Specifications, Designation D3034-85A. All pipe and fittings shall be SDR 35 heavy wall pipe having bell and spigot with

rubber ring joints as manufactured by Johns-Manville, Certainteed, or approved equal product.

- (2) Joints for the pipe shall be of the integral bell type, consisting of an integral wall section with a solid cross section rubber ring securely set in place to prevent dislocation of the ring.
- (3) The pipe shall be furnished in standard 20 foot and 12.5 foot laying lengths.
- (4) Minimum pipe stiffness at 5% deflection shall be 46 PSI for all sizes when tested in accordance with ASTM D2412-77, Standard Test Method for External Loading Properties of Plastic Pipe by Parellel-Plate Loading.

c. Handling and Cutting Pipe

- (1) The Contractor's attention is directed to the fact that polyvinyl chloride pipe and fittings used with the pipe are comparatively brittle. Care shall be taken in handling and laying pipe and fittings to avoid damaging the pipe and fittings.
- (2) Any fittings showing a crack, and any fitting or pipe which has received a severe blow that may have caused an incipient fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work.
- (3) Polyvinyl chloride pipe shall be cut by means of a hand saw, "metal inserted" abrasive wheels, or by plastic tubing cutters with blades, not rollers, doing the cutting. All cut ends shall be examined for possible cracks caused by cutting. All burrs from both the inside and outside of the pipe must be removed with a knife, file or reamer prior to jointing the pipe.

d. Jointing Pipe and Fittings

- (1) Polyvinyl chloride sanitary sewer pipe and fittings shall be jointed in accordance with the latest detailed instructions of the manufacturer.
- (2) The Contractor shall furnish coupling pullers for jointing the pipe. Gasket-feeler gauges shall be available for use by the pipe layer and the Engineer for checking the position of the rubber gaskets in the completed joint.

e. Low Pressure Air Tests

- (1) Tests shall be conducted on all sewers as soon after installation and partial backfill has been completed in a manner and sequence as approved by the Engineer.
- (2) Equipment shall be Cherne Air-Loc Equipment as manufactured by Cherne Industrial, Inc., Edina, Minnesota, or an approved equal. Equipment shall meet the following minimum requirements:
- (3) Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe to be tested.
- (4) Pneumatic plugs shall be able to resist internal test pressures without requiring external bracing or blocking.
- (5) All air used shall pass through a single control panel.
- (6) Three individual hoses shall be used for the following connections:
  - (i) From control panel to pneumatic plugs for inflations.
  - (ii) From control panel to sealed line for introducing the low pressure air.
  - (iii) From sealed line to control panel for continually monitoring the air pressure rise in the sealed line.

- (7) Procedures
- (8) All pneumatic plugs shall be seal tested before being used in the actual test installation. One length of pipe shall be laid on the ground and sealed at both ends with the pneumatic plugs to be used in the testing. Air shall be introduced into the plugs to 25 psig. The sealed pipe shall be pressurized to 10 psig. The plugs shall hold against the 10 psig pressure without bracing and without movement of the plug.
- (9) After a manhole to manhole reach of pipe has been backfilled and cleaned, and the pneumatic plugs are checked by the above procedure, the plugs shall be placed in the line at each manhole and inflated to 25 psig. Low pressure air shall be introduced into the sealed line until the internal air pressure reaches 4 psig greater than the average back pressure of any groundwater that may be over the pipe. At least two minutes shall be allowed for the air pressure to stabilize.
- (10) After the stabilization period (3.5 psig minimum pressure in the pipe), the air hose from the control panel to the air supply shall be disconnected. The portion of the line being tested shall be termed "Acceptable" if the time required in minutes for the pressure to decrease from 3.5 to 2.5 psig (greater than the average back pressure of any groundwater that may be over the pipe) shall not be less than the time shown for the given diameters in the following table.
- (11) Test Criteria

Pipe Diameter In Inches	Minutes (Minimum)
4	2.0
6	3.0
8	4.0
10	5.0
12	5.5
15	7.5
18	8.5
21	10.0
24	11.5

Groundwater pressure shall be determined by measuring the average height of the groundwater table in feet above the invert of the section of pipe being tested. The height in feet shall be divided by 2.3 to determine the pounds of pressure that shall be added to all test pressures. For example, if the average height of groundwater over the pipe invert is 11.5 feet, the pressure to be added would be 5 psig (11.5 divided by 2.3 = 5.0) Therefore, the starting pressure of 3.5 psig would be increased to 8.5 psig and the drop in pressure should fall to no less than 7.5 psig instead of 2.5 psig. The allowable drop of one pound and the time start would remain unchanged. All sections of pipe that fail to meet the criteria of the test shall be rejected and the Contractor shall determine the source of leakage and repair or replace defective work in a manner satisfactory to the City, and retest until the test criteria are satisfied.

### § 3. Polyvinyl Chloride Low Pressure Sewer Pipe

#### a. General

The Contractor shall furnish, lay, joint and test the polyvinyl chloride low pressure sewer pipe, fittings and appurtenances.

#### b. Pipe and Fittings

- (1) Polyvinyl chloride low pressure sewer pipe and fittings shall be Schedule 40, solvent weld pressure pipe conforming to ASTM Standard Specifications, Designation D2241084 and D1784-81 and shall be of the sizes as indicated on the drawings. The pipe and fittings shall be as manufactured by Johns-Manville, Certaineed, or approved equal product.
- (2) Fittings for solvent weld pressure pipe shall have a pressure rating not less than that of the pipe and be fully compatible with the pipe supplied without alteration.
- (3) Joints for the pipe shall be solvent weld, polyvinyl chloride joints and shall be made in accordance with the manufacturer's recommendations or as directed by the Engineer.
- (4) The pipe shall be furnished in standard 20 foot laying lengths.
- (5) All fittings and bends a required shall be backed up with class B concrete thrust blocks as indicated on the drawings or as directed by the Engineer.

#### c. Handling and Cutting Pipe

- (1) The Contractor's attention is directed to the fact that polyvinyl chloride pipe and fittings used with the pipe are comparatively brittle. Care shall be taken in handling and laying pipe and fittings to avoid damaging the pipe and fittings.
- (2) Any fittings showing a crack, and any fitting or pipe which has received a severe blow that may have caused an incipient fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work.
- (3) Polyvinyl chloride pipe shall be cut by means of a hand saw, "metal-inserted" abrasive wheels, or by plastic tubing cutters with blades, not rollers, doing the cutting. All cut ends shall be examined for possible cracks caused by cutting. All burrs from both the inside and outside of the pipe must be removed with a knife, file or reamer prior to jointing the pipe.

#### d. Jointing Pipe and Fittings

Polyvinyl chloride low pressure sewer pipe and fittings shall be jointed using solvent weld, polyvinyl chloride joints in accordance with the latest detailed instructions of the manufacturer.

#### e. Installing Pipe and Fitting

- (1) No defective pipe or fittings shall be installed. Any piece discovered to be defective after having been laid shall be removed and replaced with a sound piece.
- (2) Each pipe and fitting shall be cleared of all debris, dirt, etc., before being installed and shall be kept clean until accepted in the completed work.
- (3) Each length of pipe shall be shoved home against the pipe previously laid and held securely in position. Joints shall not be "pulled" or "cramped" without approval of the Engineer.
- (4) Before any joint is made, the pipe shall be checked to assure that a close joint with the next adjoining pipe has been maintained and that the inverts are matched and conform to the required grade. The pipe shall not be driven down to the required grade by striking it.

- (5) Pipe or fittings shall not be left permanently supported on saddles or blocking, but shall be firmly supported by screened gravel or sand as indicated on the drawings.
- (6) The screened gravel or sand shall be thoroughly compacted under the pipe so as to obtain a substantial unyielding bed shaped as indicated on the drawings. After each pipe has been properly bedded, enough screened gravel or sand shall be placed between the pipe and the sides of the trench, and thoroughly compacted, to hold the pipe in correct alignment. Holes provided for jointing shall be filled and compacted and then screened gravel or sand shall be placed and compacted to complete the bedding as indicated on the drawings.
- (7) Adjacent to structure walls, the pipe shall be provided with a concrete cradle as indicated on the details. Class B Concrete shall be used, or if the Contractor prefers, Class A concrete for the structure base may be extended to the cradles.
- (8) The Contractor shall take all necessary precautions to prevent flotation of the pipe in the trench.
- (9) Hydrated lime shall be Type S conforming to the ASTM Standard Specifications for Hydrated Lime for Masonry Purposes, Designation C207-79 (Reapproved 1984).
- (10) The sand shall comply with the specifications for "Fine Aggregate" for concrete masonry except that all of the sand shall pass a No. 8 sieve.
- (11) Temporary Plugs  
When pipe laying is not in progress, the open ends of the pipe shall be closed with temporary watertight plugs. If water is in the trench when work is resumed, the plug shall not be removed until all danger of water entering the pipe is eliminated.
- (12) Pipelines shall not be used as conductors for trench drainage during construction.
- (13) Leakage tests shall be conducted by maintaining the pipe under a pressure, as measured at the point of lowest elevation, of 50 pounds per square inch for at least 2 hours. Care should be taken to expel all air from the pipes when filling with water. The quantity of water measured to maintain the test pressure shall not exceed 0.009 gallons per inch of diameter per 24 hours per joint. If the leakage exceeds this rate, the Contractor must repair, replace or relay sections of pipe and repeat the tests until satisfactory to the Engineer.

#### § 4. Curb Valves and Appurtenances

##### a. General

The Contractor shall furnish all curb valves and appurtenances as indicated on the drawings and as herein specified.

##### b. Curb Valves and Appurtenances

- (1) Curb valves shall be Mueller Oriseal Model H-10291 or be approved equal.
- (2) Cast iron valve box including lid and plug, footpiece and stationary rod shall be Mueller Model H-10386 or an approved equal. The work "sewer" shall be cast on the cover. The length of the valve box shall be as necessary to suit the ground elevation.

**CHAPTER 4.**  
**STANDARDS FOR GAS METER & GAS SERVICE INSTALLATIONS**

**§ 1. General**

Following are requirements for the installation of gas meters for residential, commercial and industrial applications. Some requirements are specific to residential meters only and are identified as such. Every specific requirement may not be addressed in these standards, however MPTN Utilities retains the right to require changes in installation as required by code or other safety related conditions.

**§ 2. Gas Meter Location**

a. Residential gas meters may be only installed within 15 feet of either front outside or inside corners of the house unless otherwise approved by the Superintendent of Gas Distribution. This will assure a safe approach to the gas meter and eliminate most conflicts with fences, decks, patios, etc. (See Figure A in Appendix III, page 1:)

b. Any Potential Ignition Sources such as: electric meters, air conditioners, etc., may not be located within 3 feet in all directions of any regulator or relief vents regardless of meter set type and design. (See Figure B in Appendix III, page 2)

c. All gas meters must be located in a readily accessible location and in an area that protects the gas meter from damage such as: Vehicles, water, ice, falling objects, etc.  
(Note: Gas Meters will not be allowed to be installed behind any fenced area, under decks, in ceilings, or surrounded by any structure or enclosure that may prohibit 24 hour access.)

d. Meter sets will not be allowed to be installed in the following locations:

- (1) Under or in front of operable windows used for egress or any other building openings and doors.
- (2) Under or in front of building and appliance vents or other air intakes.

e. MPTN Utilities shall have the right to refuse installation of Gas Meter/Service if the desired location does not meet approval of the Director of Utilities.

**§ 3. Typical Residential Meter Set Standard (See Figure B, page 2 of Appendix III)**

a. Typical residential meters are as follows:

- (1) Normal residential meter capacity is: 500 scfh (standard cubic feet per hour- based upon 2"wc differential across the meter).
- (2) Normal delivery pressure to the customer is: 7" w.c. (water column) or 1/4 psi.
- (3) Other customer requirements for capacity and/or pressure must be requested at the time of completing an "Application for Gas Service". (Meter, service and other appurtenances may require upgrading in order to meet customer load demand.)

b. The gas service, meter, regulator, meter valve, and fabricated meter set shall be designed and installed by a MPTN Utilities approved vendors who are NGA Certified, and shall remain property of the MPTN Utilities Department.

c. MPTN Utilities standard for Residential Gas Meters is Elster American Diaphragm Meter class AC-250, MAOP 5 psi, odometer index, UV protective index cover, meter bar, measures in ccf.

d. Distance from centerline of the service riser to the outlet union (customer connection point), is 20 inches for a residential meter set.

e. Normal gas service piping from the main to the residential customer meter set is typically 3/4 inch or 1 inch Polyethylene (see 1a. above). A #12 coated copper wire is buried along with the plastic service terminating at the riser allowing electrical locating of the service line.

#### § 4. Commercial / Industrial Meter Sets

a. Commercial / Industrial meter sets may vary in design and configuration because of increased flow and pressure requirements. Flow requirements may vary from 600 scfh to over 100,000 scfh. Customer requirements for delivery pressure may vary from 7" w.c. (.25 psi) to distribution pressure (40-60 psi).

b. Large capacity commercial / industrial sets shall be fabricated using welded and flanged fittings. MPTN Gas Meter standard is Itron Dattus, temperature and pressure compensated, which reads in ccf. Meter bypass is required to allow meter change out without customer interruption.

c. Isolation and Gas Service valves shall be ball or plug type valves, butterfly valves are not allowed.

d. Fluid filled gauges shall be installed on the inlet pipe and outlet piping of regulators. Regulator pressure setting shall be indicated on both the primary and secondary regulators.

e. Isolation to protect corrosion shall be installed at the point of connection to the customers gas piping

f. Above Ground gas piping and apertures shall be primed and painted. MPTN Utilities paint standard is as follows:

- (1) Primer – B58W00610-Macropoxy 646 Fast Cure Epoxy Part A (tinted to match finish color)
- (2) Finish: B65Y00337-Hi-Solids Polyurethane Gloss (Part S) Safety Yellow

g. MPTN Utilities Regulator standard is Actaris, consisting of primary and secondary regulators with proper isolation to allow change out or maintenance of the regulators without interruption to customer service.

h. The customer's engineer or architect shall provide specific pressure and flow requirements in order to design and build the correct gas meter set.

i. The leased vendor, facility, or Project requesting gas service shall be responsible for the cost of design, 3<sup>rd</sup> party review, inspection, materials, painting of above ground piping, and installation of the meter/regulator set.

#### § 5. Customer Piping Requirements

a. Customer-owned Piping: Is all piping, either above or below ground that is located after the outlet connection of the meter; or in the case of fabricated meter sets, the first connection point (which may be a union, flange or coupling) that is located after the fabricated section of the meter setting.

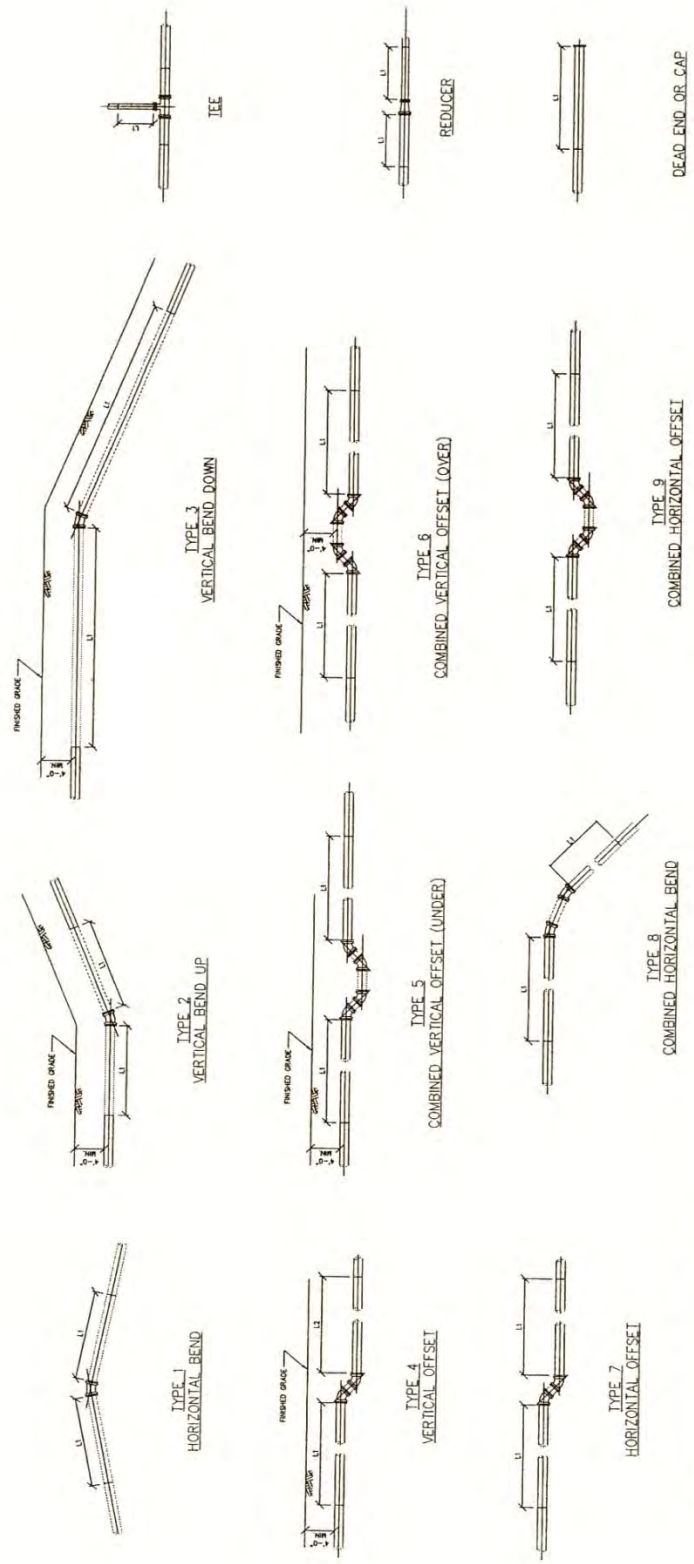
b. MPTN Utilities does not provide maintenance on Customer-owned gas piping; which includes: repairs on piping and appliances (if needed), locating for excavation and periodic inspection for leaks and corrosion.

- c. The final tie-in of the gas line to the outlet (customer) side of the meter is the Customer and must be made by a qualified installer who shall adhere to the guidelines set forth in the latest edition of the American National Standard "National Fuel Gas Code", also identified by National Fire Protection Association #54 and ANSI Z223.1. [Ref. VOM Ord. 8-2-10 (B)]
- d. Customer piping connected to the meter set must be black iron. Corrugated Stainless Steel Tubing (CSST) is not allowed for use as piping system at meter connection.
- e. Customer piping that will be operated at a pressure of 10 psi or more, must be welded.
- f. Installation will not be considered complete until a pressure test of all piping and appurtenances conducted in the presence of a MPTN Building Code Inspector. (labor, materials, and equipment to be furnished by the contractor)
- g. MPTN Utilities shall have the right and option to demand changes, removal, or replacement of any pipe, fixture, or apparatus which is considered to be faulty, inadequate, or hazardous, provided, however, that this provision shall not obligate the MPTN Utilities in any way or manner. MPTN Utilities shall have the right to refuse or discontinue gas service without notice to its customers if MPTN Utilities finds any apparatus or appliance in operation which would be detrimental or hazardous to the efficient operation of the existing facilities.
- h. Temporary service (e.g. for construction) is not permitted in residential construction. All piping, appliance valves and vent piping must be in place before a final pressure test will be allowed and final connection to the meter set is made.
- i. Customer-owned yard lines (e.g.: yard lights, gas grills, pool heaters, etc.); Shall be installed by use of standard installation procedures as outlined in the "National Fuel Gas Code", also identified by National Fire Protection Association #54 and ANSI Z223.1.
- j. Polyethylene gas pipe
  - (1) must be only used in a below-ground application (installed with #12 copper trace wire).
  - (2) All connections must be made below-ground, PE pipe cannot terminate aboveground.



**APPENDIX I:**  
**WATER TRANSMISSION AND DISTRIBUTION**  
**STANDARD DRAWING DETAILS**

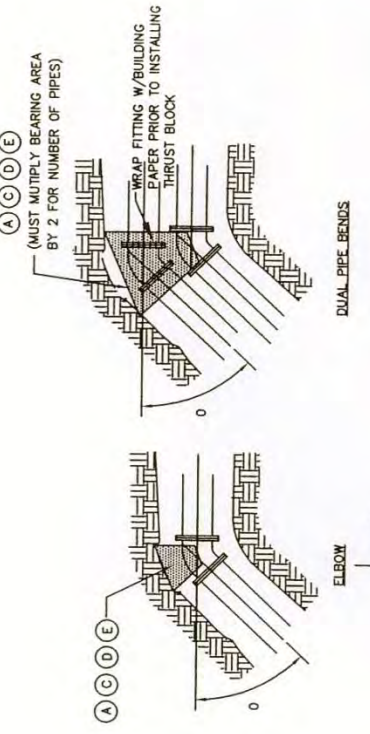
# MINIMUM PIPE RESTRAINTS



MINIMUM RESTRAINED LENGTH OF PIPE FOR EACH SIDE OF FITTING (FEET)  
12" DI WATER MAINS (TEST PRESSURE 200 PSI)

DIAMETER (in)	ANGLE OF BEND (DEGREES)	TYPE 1 & 2		TYPE 3		TYPE 4		TYPE 5		TYPE 6, 7, 8, & 9		TEE	
		BARE	LI	LI	L2	BARE	LI	L2	BARE	LI	BARE	LI	BARE
6" TO 12"	11.25	4	11	22	8	22	8	22	8	8	8	8	8
6" TO 12"	22.5	8	22	45	16	45	16	45	16	16	16	16	16
6" TO 12"	45	16	46	93	33	93	33	93	33	33	33	33	33
6" TO 12"	90	39	112	112	112	112	112	112	112	112	112	112	112
16x12	TEE	-	-	-	-	-	-	-	-	-	-	-	61
16x16	TEE	-	-	-	-	-	-	-	-	-	-	-	142
16x12	TEE	-	-	-	-	-	-	-	-	-	-	-	110

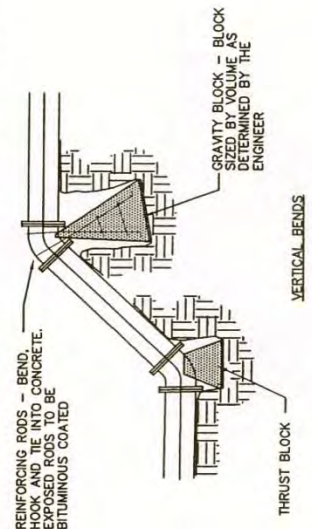
ALL FITTINGS MECHANICALLY RESTRAINED USING MEGALUGS (EBAA SERIES 1100 OR APPROVED EQUAL), WHEN THE MINIMUM REQUIRED RESTRAINED LENGTH EXCEEDS THE LENGTH TO THE NEXT JOINT, USE RESTRAINED PUSH ON JOINT PIPE AS SPECIFIED (EBAA SERIES 1700 OR APPROVED EQUAL)



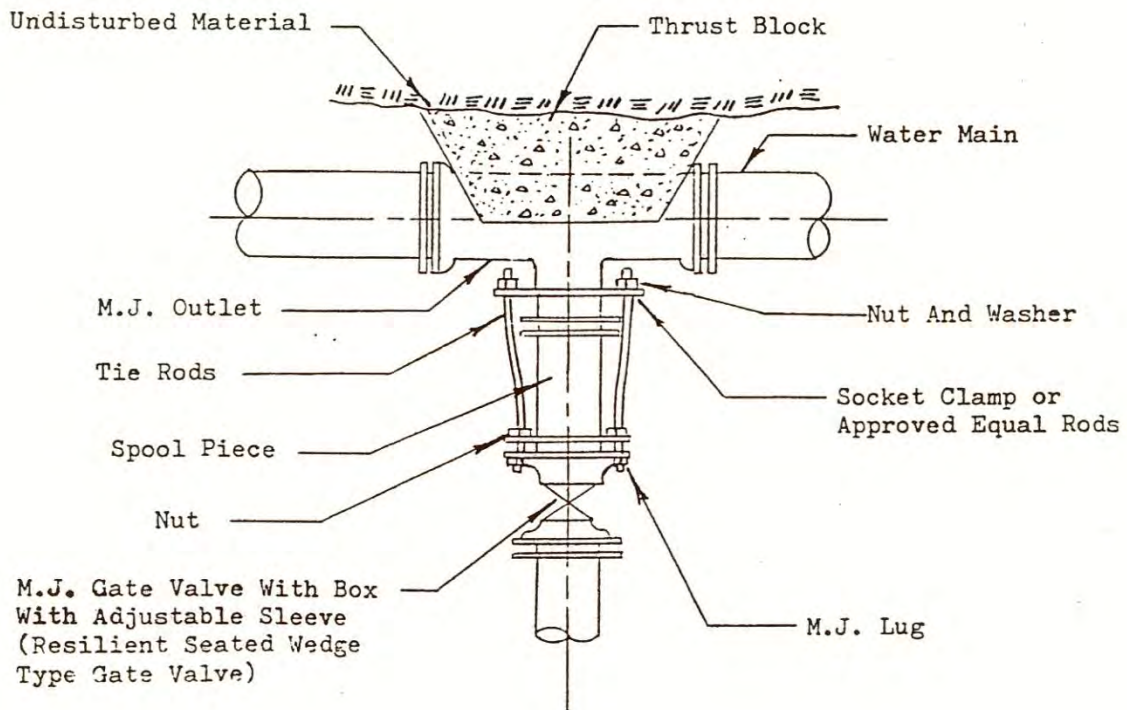
REACTION TYPE	PIPE SIZE											
	4"	6"	8"	10"	12"	14"	16"	18"	20"	24"	30"	36"
A 90° ELBOW	0.9	2.2	3.9	5.6	8.6	10.9	15.4	18.0	24.1	34.6	41.9	53.8
B 180° TEE	0.7	1.6	2.8	4.2	6.1	8.4	10.9	13.9	17.0	24.5	38.1	54.7
C 45° ELBOW	0.5	1.2	2.1	3.0	4.7	5.9	8.3	9.7	13.0	18.8	28.1	41.9
D 22° ELBOW	0.3	0.6	1.1	1.5	2.4	3.0	4.3	5.0	6.6	9.6	14.9	21.4
E 11° ELBOW	0.1	0.3	0.5	0.8	1.2	1.5	2.1	2.5	3.3	4.8	7.5	10.7

\* ACTUAL TEST PRESSURE IS 200 PSI AND ALL BEARING AREA NUMBERS ABOVE MUST BE MULTIPLIED BY 2

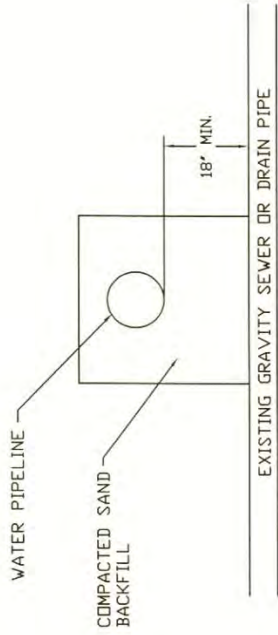
- OTHER TEST PRESSURES ARE DIRECTLY PROPORTIONAL TO THE ABOVE TABLE. FOR INSTANCE AT 200 PSI TEST PRESSURE THE ABOVE NUMBERS DOUBLE. THE ABOVE NUMBERS REPRESENT MINIMUM ALLOWABLE SIZES FOR THRUST BLOCKS
- NOTES
1. POUR THRUST BLOCKS AGAINST UNDISTURBED MATERIAL. WHERE TRENCH WALL HAS BEEN DISTURBED, EXCAVATE LOOSE MATERIAL AND EXTEND THRUST BLOCK TO UNDISTURBED MATERIAL. NO JOINTS SHALL BE COVERED WITH CONCRETE.
  2. ON BENDS AND TEES, EXTEND THRUST BLOCKS FULL LENGTH OF FITTING.
  3. PLACE BOARD IN FRONT OF ALL CAPS BEFORE POURING THRUST BLOCK.
  4. REQUIREMENTS OF THE ABOVE TABLE PRESUME MINIMUM SOIL BEARING OF ONE TON PER SQUARE FOOT, AND MAY BE VARIED BY THE ENGINEER TO MEET OTHER CONDITIONS ENCOUNTERED.



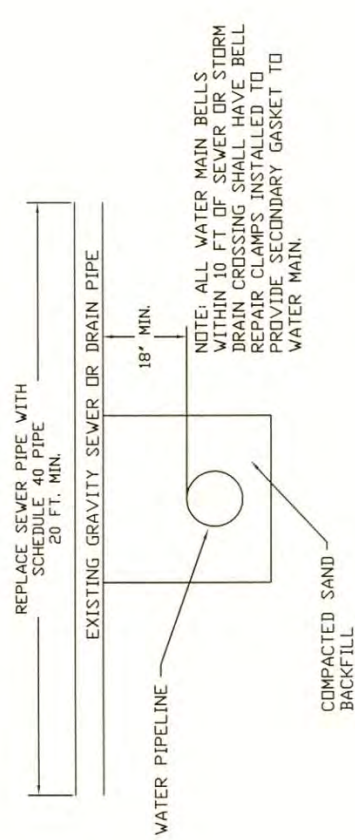
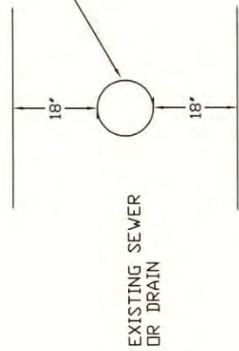
TYPICAL THRUST BLOCK DETAILS AND DIMENSIONS  
NOT TO SCALE



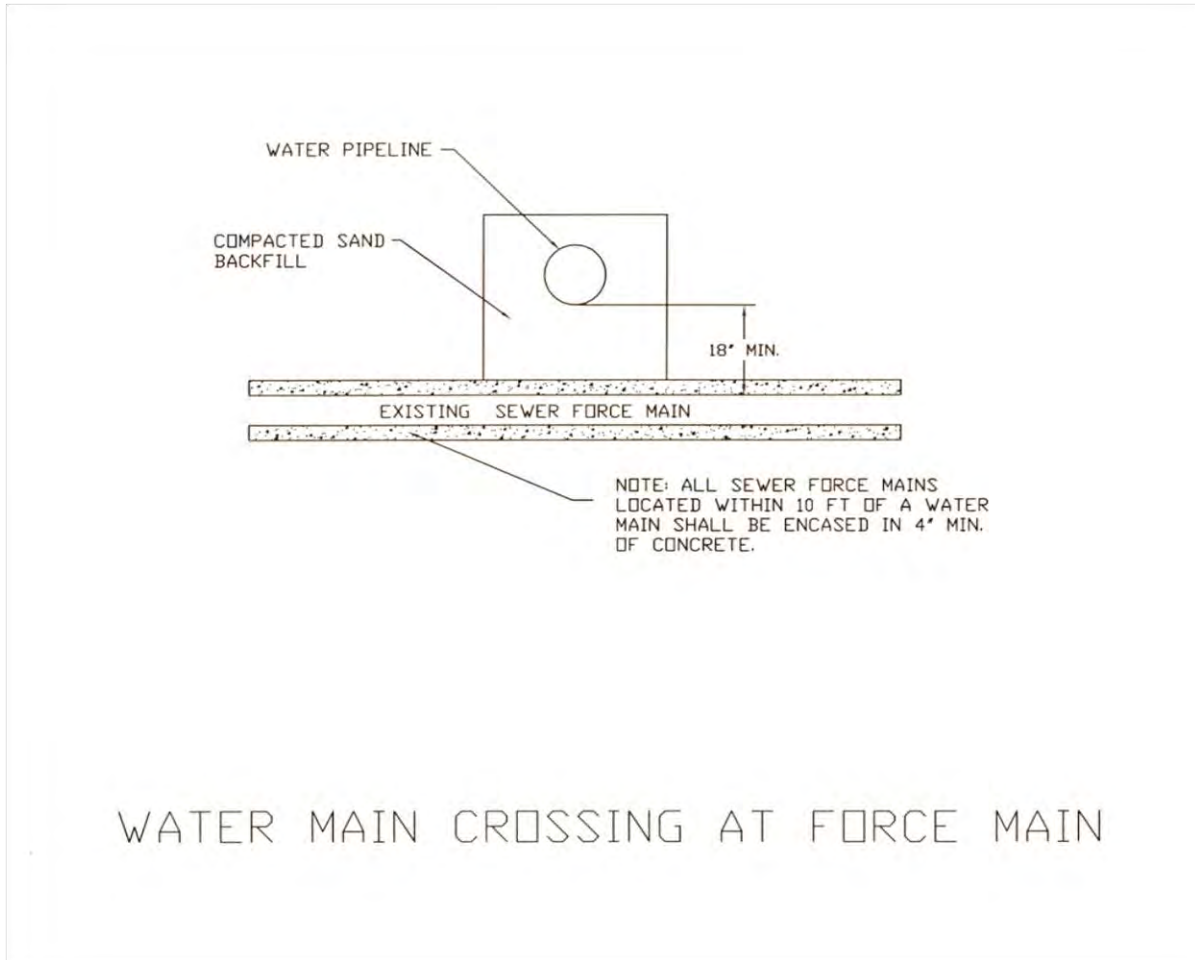
TYPICAL VALVE CONNECTION  
Not To Scale

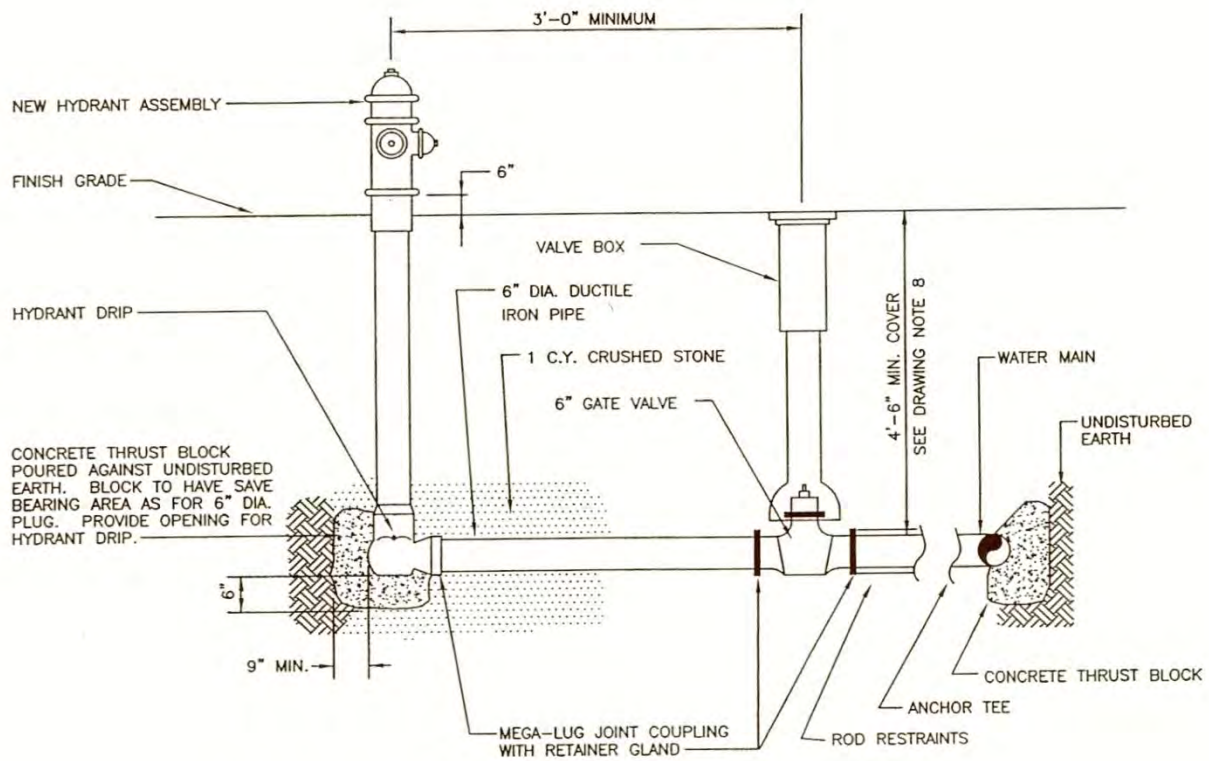


NORMAL LIMITS OF OUTSIDE SURFACE OF WATER LINE. PIPES TO BE INSTALLED WITHIN THESE LIMITS MUST CONFORM TO DETAILS SHOWN.



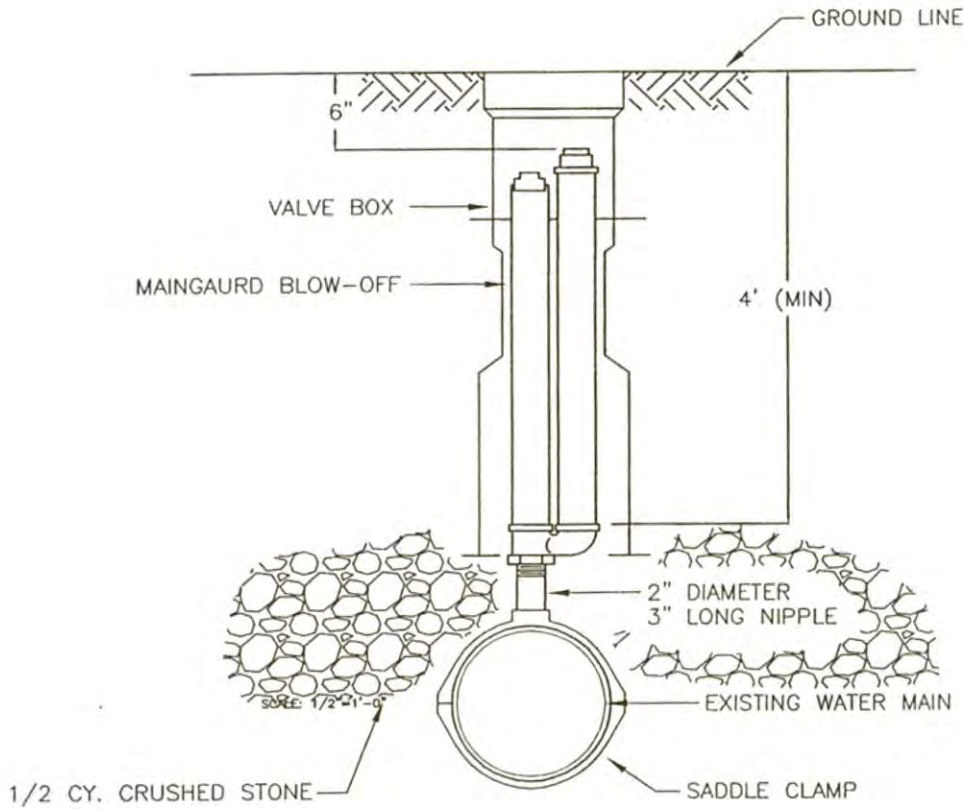
# WATER MAIN CROSSING AT GRAVITY SEWER





TYPICAL HYDRANT INSTALLATION DETAIL

NOT TO SCALE

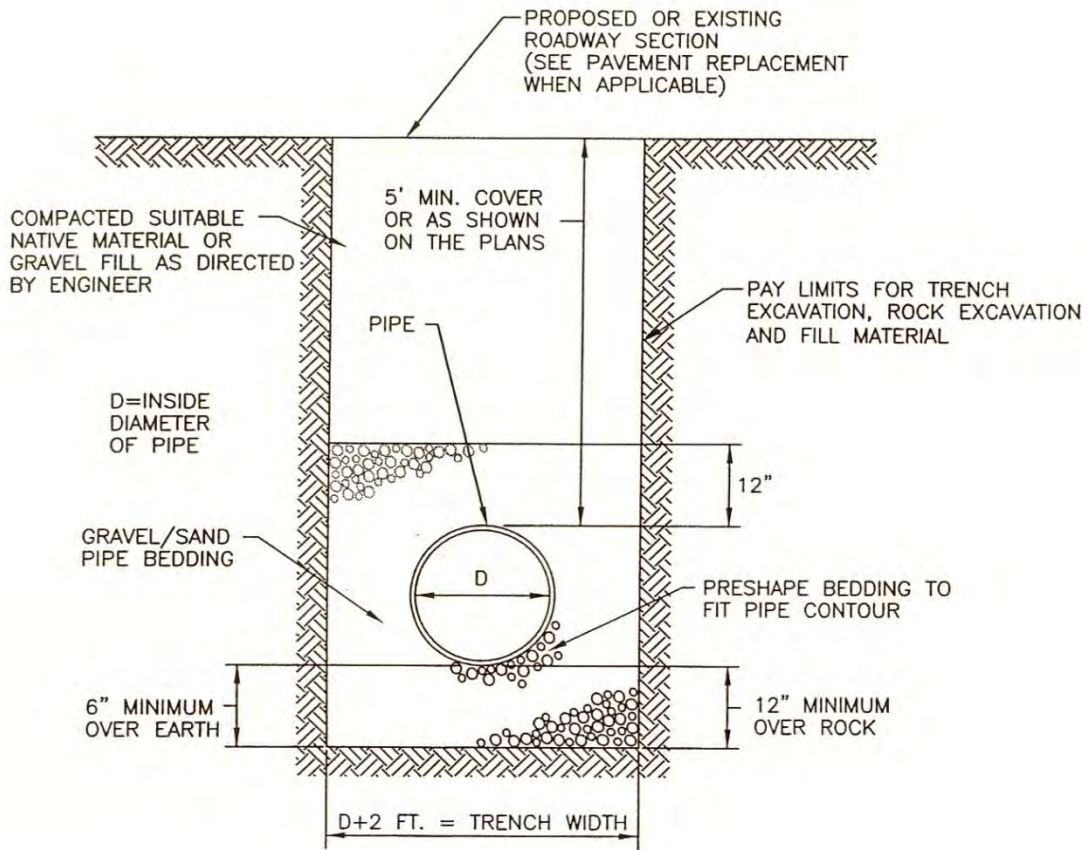


**NOTES:**

1. BLOW-OFF HYDRANTS SHALL BE NON-FREEZING, SELF DRAINING TYPE, SET UNDERGROUND IN A 5 1/4" VALVE BOX.
2. THESE HYDRANTS WILL BE FURNISHED WITH A 2" FIP INLET, A NON-TURNING OPERATING ROD, AND SHALL OPEN TO THE LEFT.
3. ALL WORKING PARTS SHALL BE OF BRONZE-TO-BRONZE DESIGN, AND BE SERVICABLE FROM ABOVE GRADE WITH NO DIGGING.
4. THE OUTLET SHALL BE A 2" FIP COUPLING WITH PLUG, AS MANUFACTURED BY KUPFERLE FOUNDRY CO., ST. LOUIS, MO, OR APPROVED EQUAL.

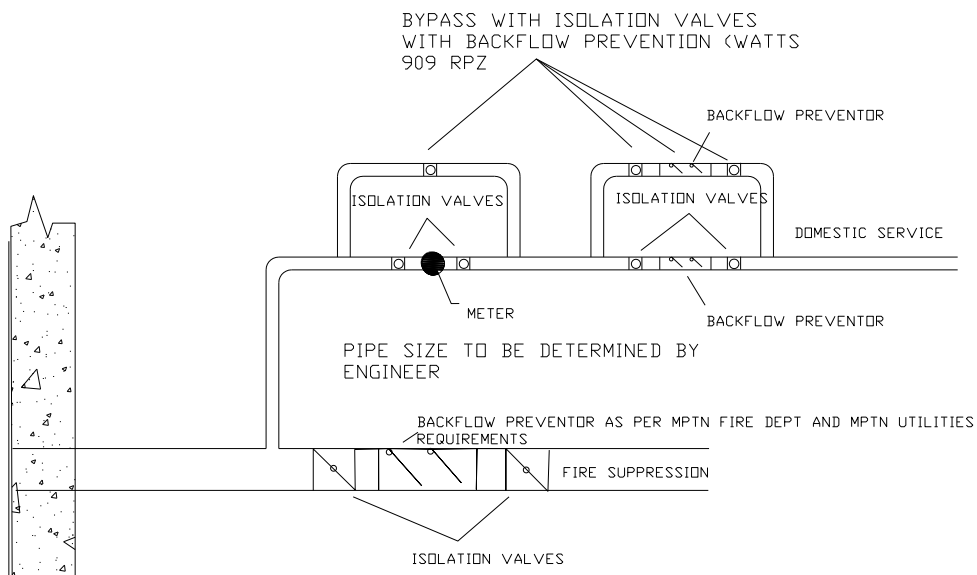
**MANUAL AIR BLOW-OFF VALVE**





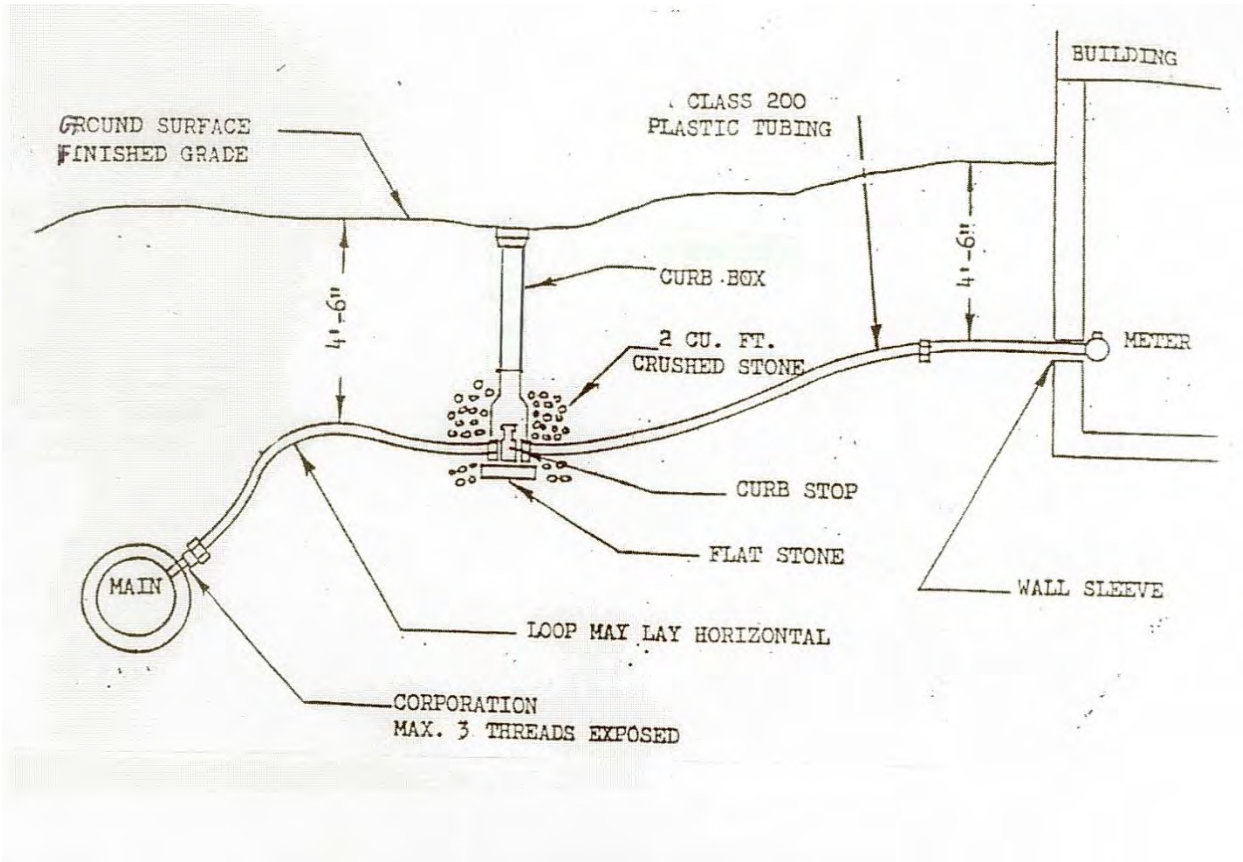
# WATER MAIN TRENCH DETAIL

NOT TO SCALE



NOTE: METER SHALL BE HERSEY  
TURBINE WATER METER WITH  
TRANSLATOR TO ALLOW INTERFACE  
WITH REMOTE READING SYSTEM AND  
SUBJECT TO APPROVAL BY MPTN  
UTILITIES DEPT.  
BACKFLOW PREVENTION SHALL BE  
WATTS 909 TYP RPZ SUBJECT TO  
APPROVAL BY MPTN UTILITIES DEPT.

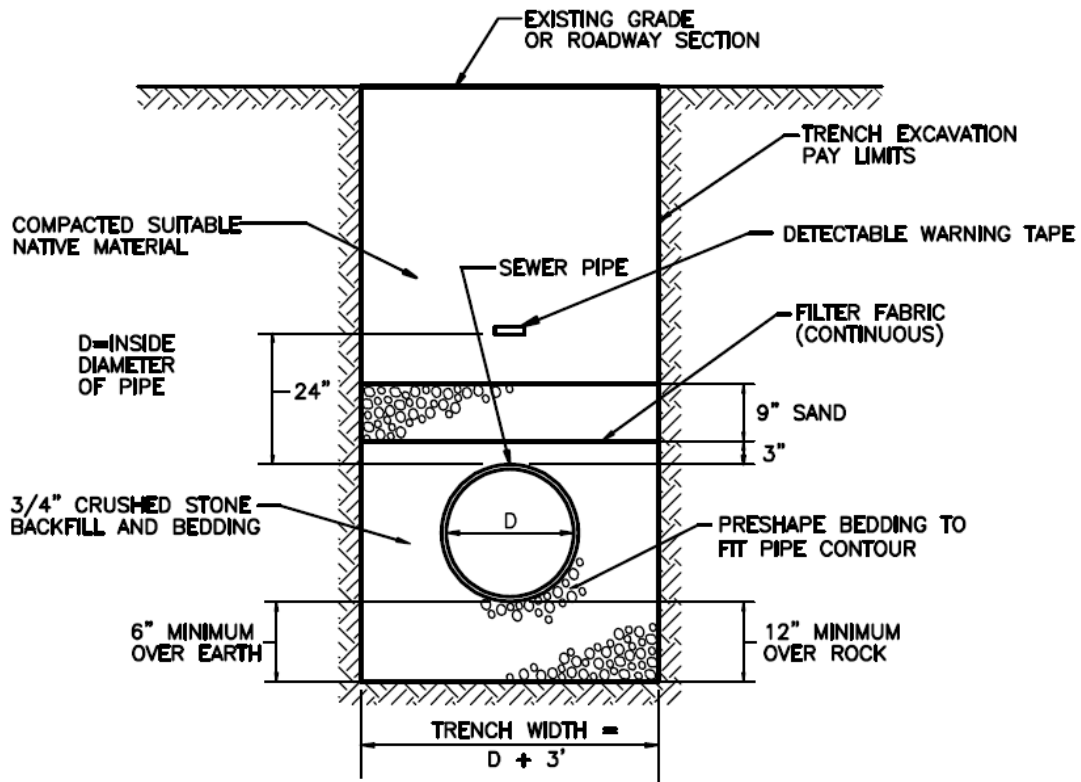
TYPICAL METER/BACKFLOW SCHEMATIC



### WATER SERVICE DETAIL

- MINIMUM SIZE OF ANY WATER SERVICE INSTALLED FROM MAIN TO PROPERTY LINE SHALL BE 1-1/2"
- SMITH BLAIR DOUBLE SADDLE TYPE SB313 SHALL BE USED FOR WATER TAPPING SLEEVE
- CTS SDR 9 HDPE Pipe CLASS 200 PLASTIC TUBING MUST BE INSTALLED FROM MAIN TO PROPERTY ASSIGNMENT LINE
- CTS SDR 9 HDPE Pipe CLASS 200 PLASTIC TUBING MUST BE INSTALLED FROM PROPERTY ASSIGNMENT LINE TO BUILDING
- GATE BOX SHALL BE TYLER UNION - 2 1/2" SLIP SERVICE BOX WITHOUT ROD AND RING WITH ENLARGED BASE TO ACCOMMODATE 1-1/2" GATE VALVE
- ALL COUPLINGS AND CORPORATIONS SHALL BE MUELLER COMPRESSION FITTINGS
- SERVICE LINES MUST BE CAULKED INSIDE FOUNDATION WALL SLEEVE
- BACKFILL: HAND-FILL WITH SAND OR EQUAL TO 6" AROUND PIPE

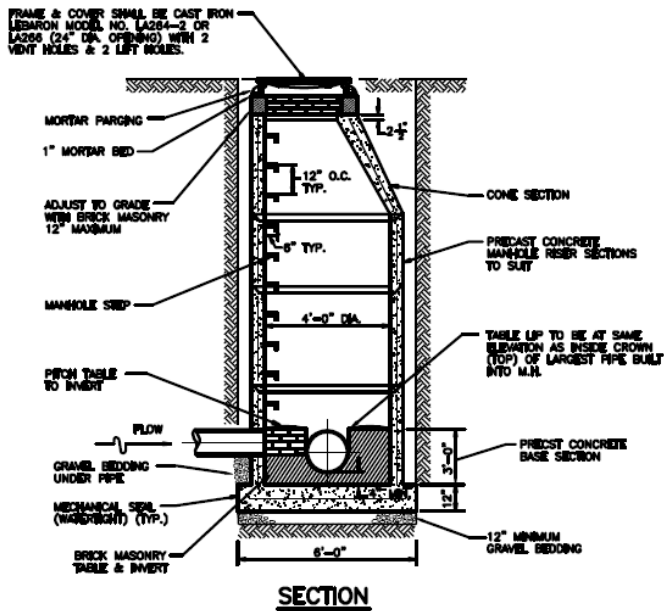
**APPENDIX II:**  
**SEWER CONSTRUCTION DETAILS**



### SANITARY SEWER TRENCH DETAIL

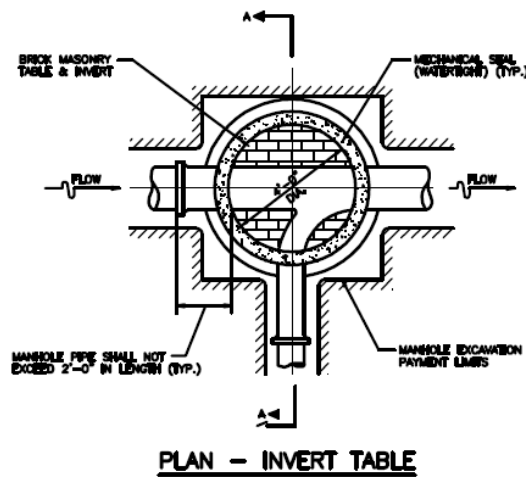
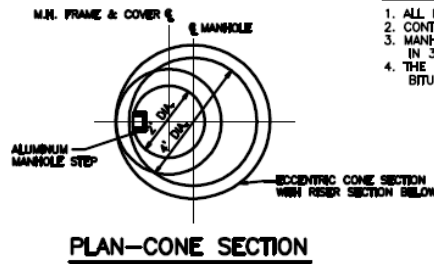
NOT TO SCALE

S-1



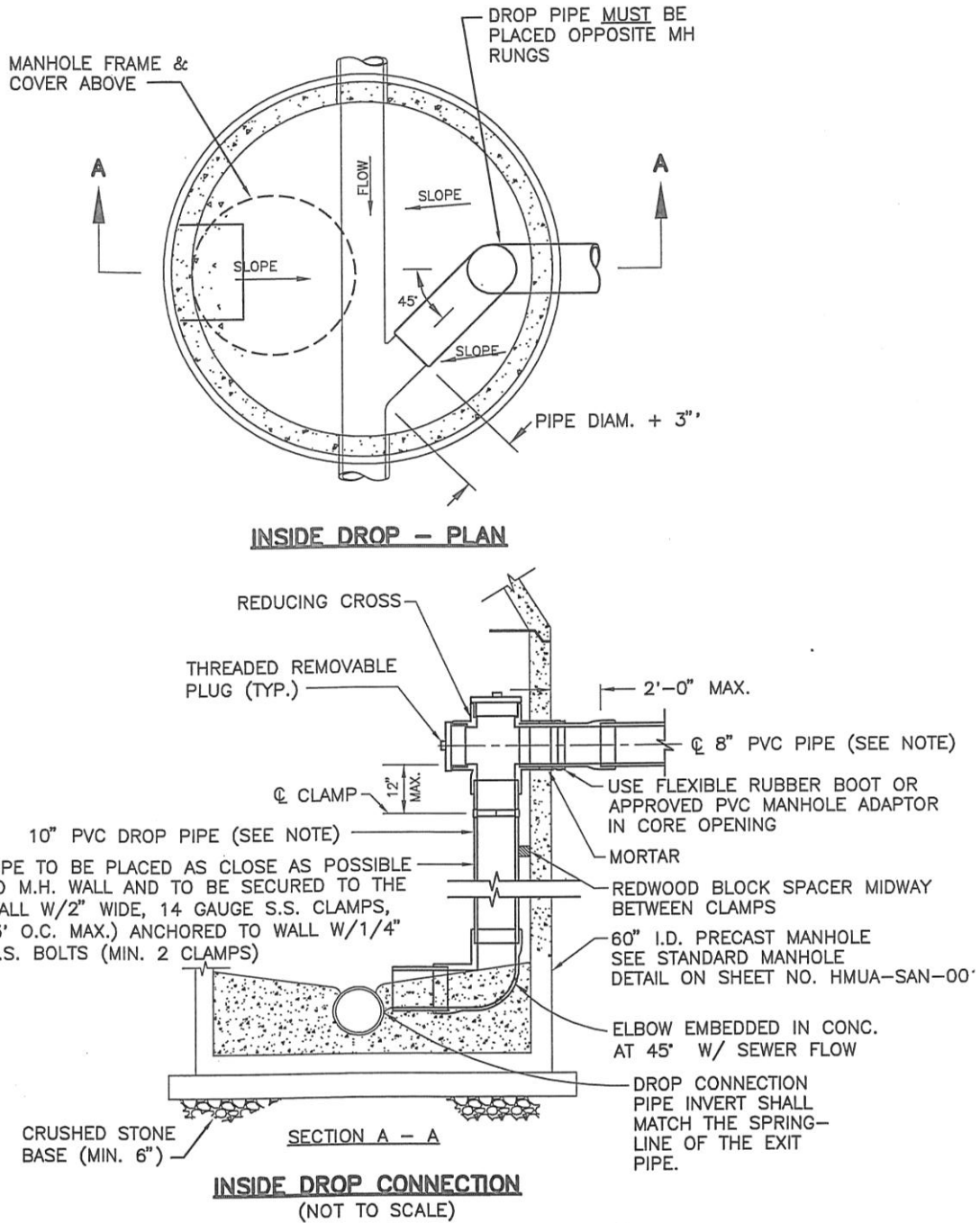
**MANHOLE NOTES**

1. ALL PIPES SHALL BE CUT FLUSH WITH INSIDE WALL OF STRUCTURE.
2. CONTRACTOR SHALL MORTAR IN LIFTING HOLES.
3. MANHOLE COVERS SHALL HAVE THE WORDS "SEWER" CAST INTO THE CENTER IN 3" LETTERS.
4. THE OUTSIDE OF MANHOLE STRUCTURES SHALL BE PAINTED WITH 2 COATS OF BITUMINOUS MATERIAL.



**SEWER MANHOLE DETAIL**  
NOT TO SCALE

S-2

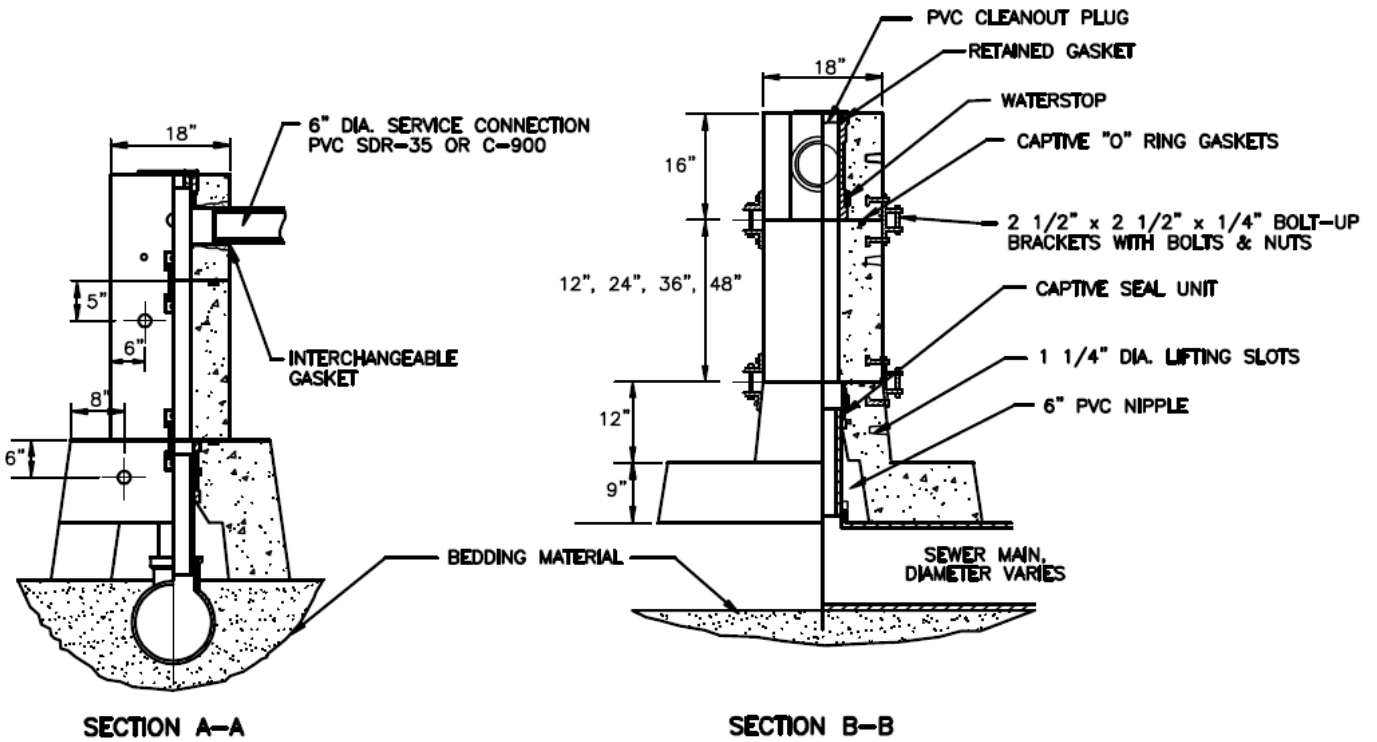
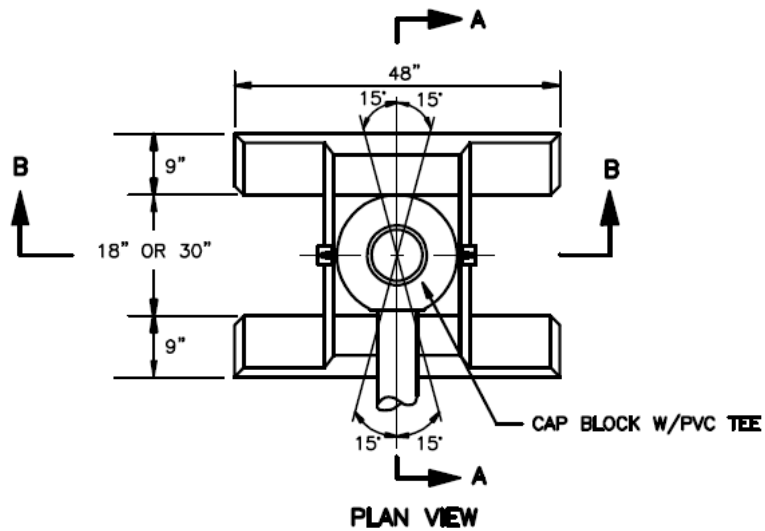


NOTE:  
 FOR 8" PVC PIPE PROVIDE  
 10" PVC INTERNAL DROP PIPING  
 FOR 10" PVC PIPE PROVIDE  
 12" PVC INTERNAL DROP PIPING

**S-3**

**DESIGN AND DIMENSIONAL INFORMATION**

- 1) CONCRETE STRENGTH 5,000 PSI @ 28 DAYS. DENSITY 150 PCF.
- 2) CEMENT PER ASTM C150-81.
- 3) REINFORCING PER ASTM A615.
- 4) PVC FITTINGS PER ASTM D3034.

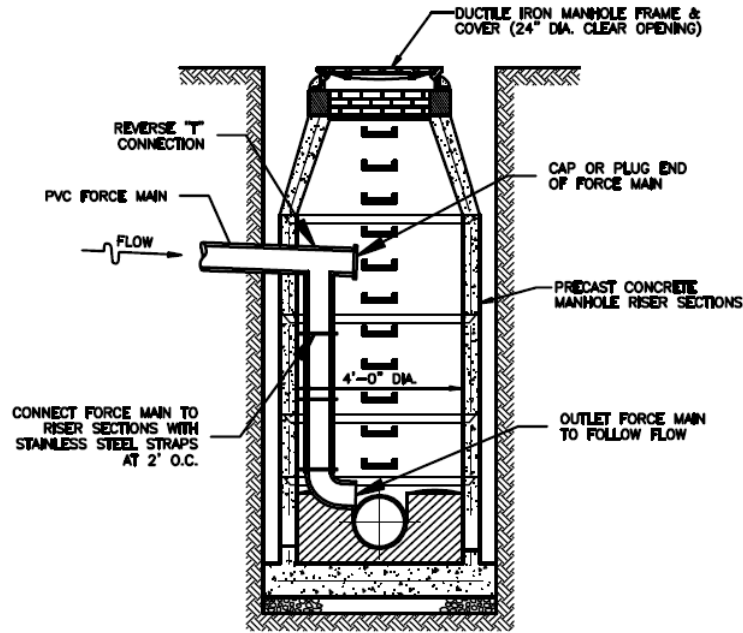


**PRECAST SEWER CHIMNEY**

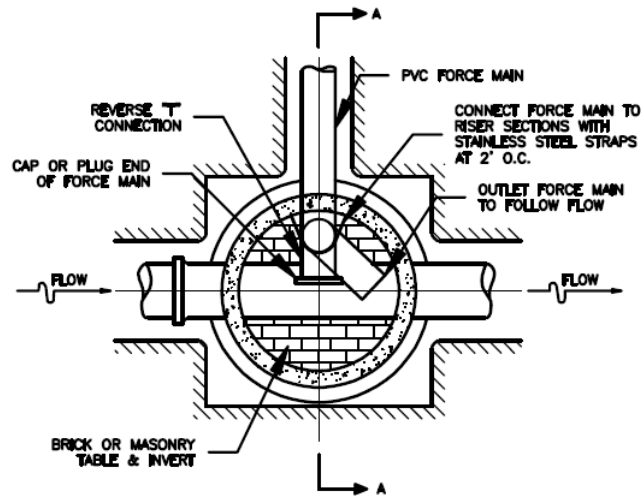
SUPERIOR PRODUCTS DISTRIBUTOR, INC. OR EQUAL  
NOT TO SCALE

**S-4**





**SECTION**

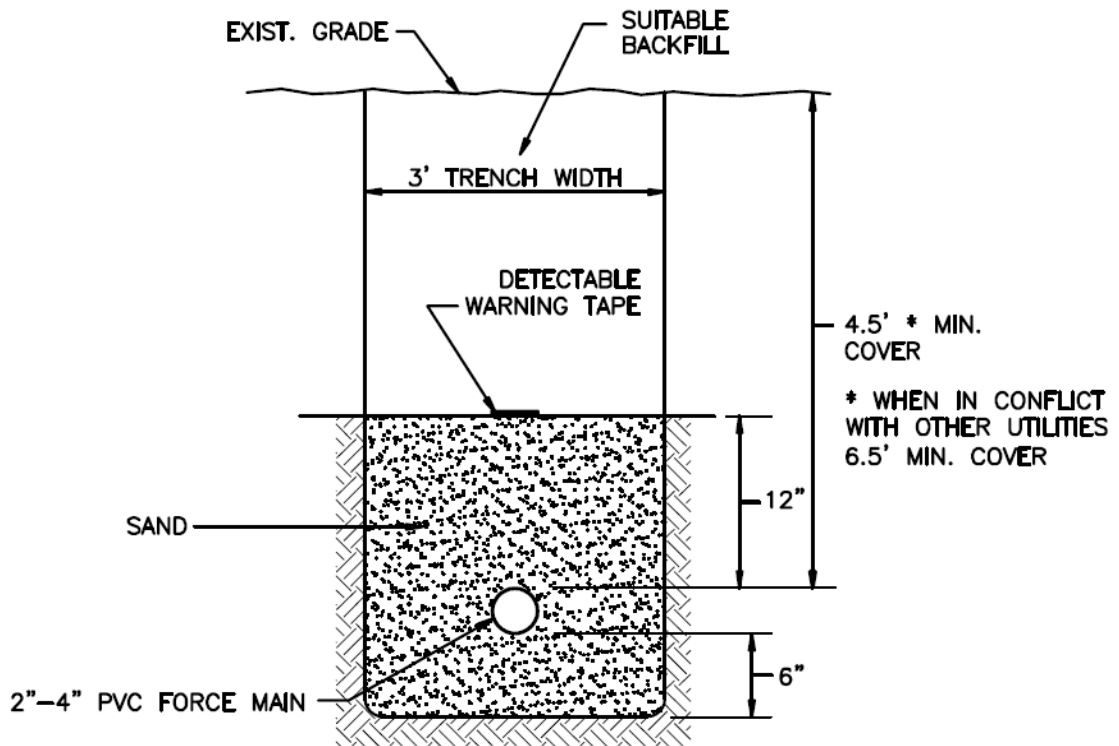


**PLAN - INVERT TABLE**

**FORCE MAIN CONNECTION**  
**INTO STANDARD MANHOLE**

NOT TO SCALE

**S-5**



**FORCE MAIN TRENCH DETAIL**  
NOT TO SCALE

**S-6**

**APPENDIX III:**  
**GAS SERVICE INSTALLATION DETAILS:**

Figure A

APPROVED LOCATION OF RESIDENTIAL METER SET

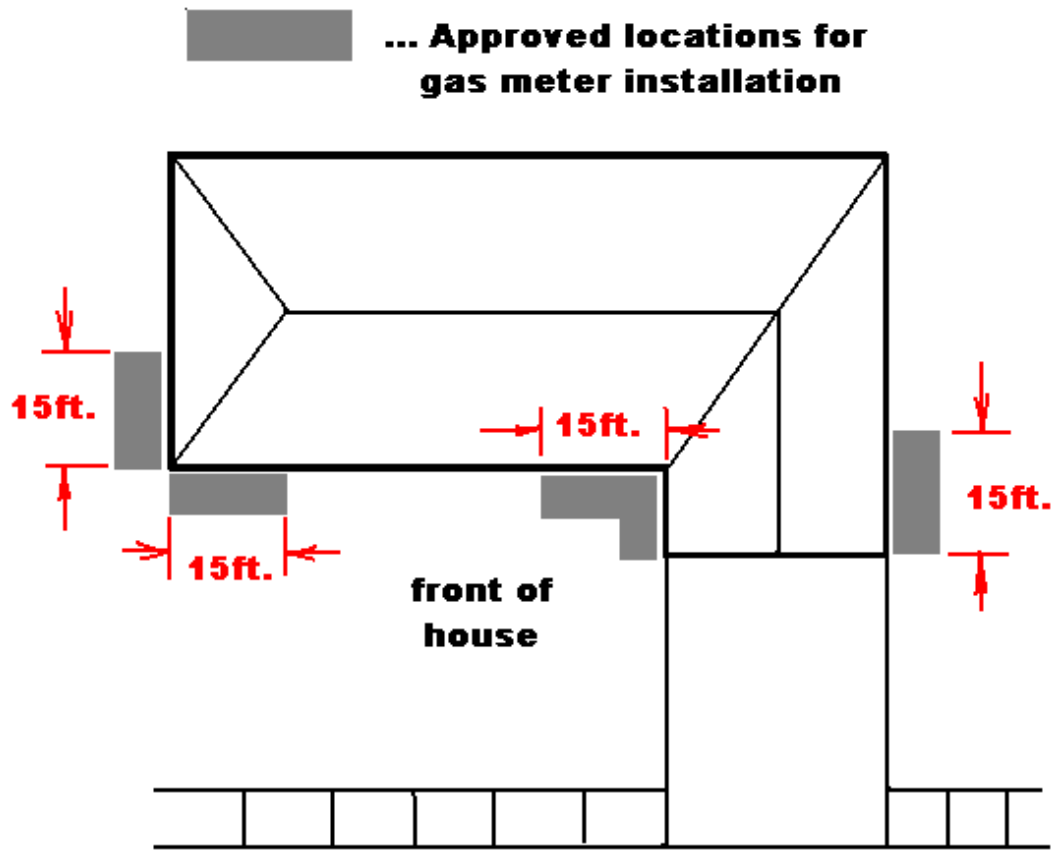
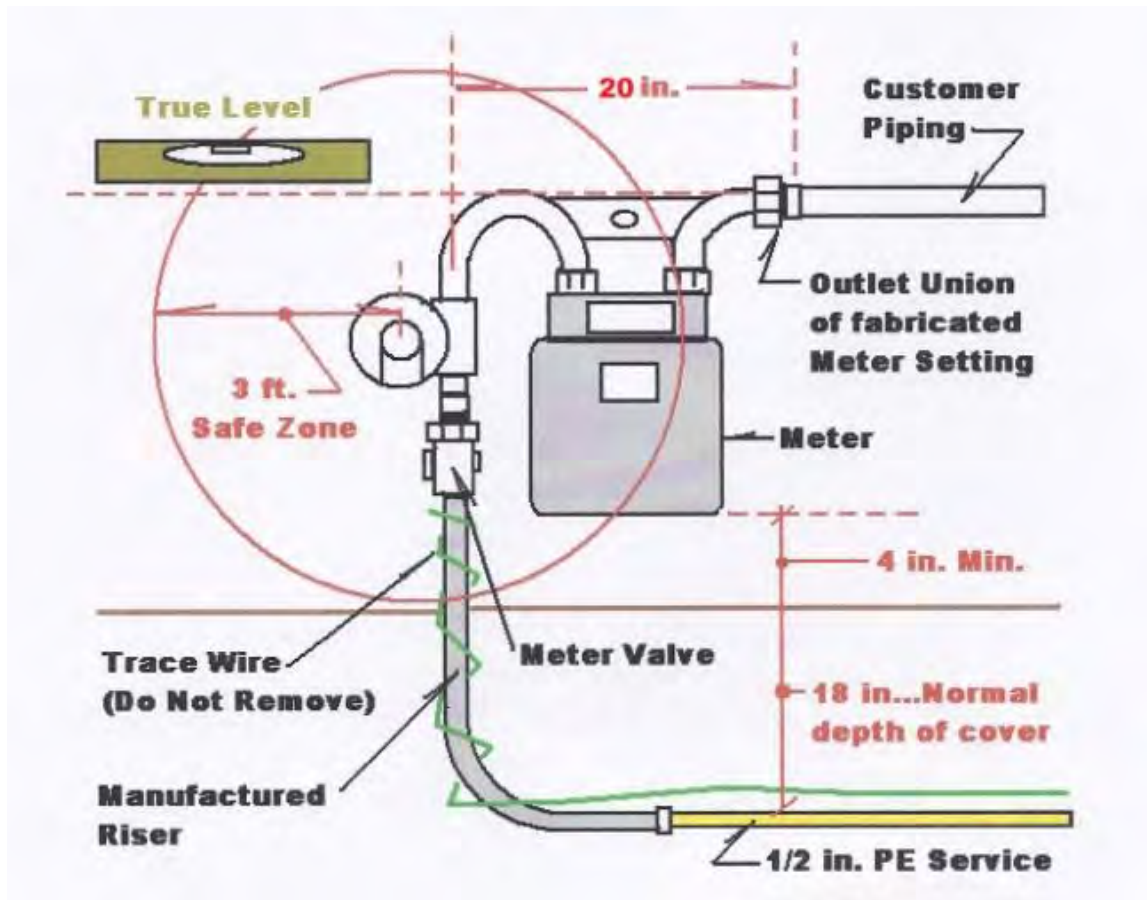


Figure B

RESIDENTIAL GAS METER STANDARD



3 ft. “SAFE ZONE”

All ignition sources such as: electric meters, air conditioners, etc. MUST NOT be located within 3 ft. in all directions from the center of the regulator vent on the meter setting.

Keep meter sets a safe distance from windows, doors, air intakes or other vents.

NEVER install a meter set directly below any window that may be opened and used for egress