TOWN OF SOUTH KINGSTOWN
PUBLIC SERVICES DEPARTMENT

MUNICIPAL WATER DISTRIBUTION CONSTRUCTION INSTALLATION PROCEDURES AND TECHNICAL SPECIFICATIONS

TOWN OF SOUTH KINGSTOWN
PUBLIC SERVICES DEPARTMENT

Revised January 1, 2006

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TOWN OF SOUTH KINGSTOWN
UTILITIES DEPARTMENT

MUNICIPAL WATER DISTRIBUTION CONSTRUCTION INSTALLATION PROCEDURES AND TECHNICAL SPECIFICATIONS

PROCEDURE NUMBER: W-1

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DATE: January 25, 2006

ORIGINATOR _____ DATE _____

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APPROVAL SIGNATURES:

UTILITIES
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WATER
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PROCEDURAL CHANGE NOTICE - (PCN)

PCN NUMBER	DATE OF CHANGE	SECTION	DESCRIPTION	APPROVAL
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Division 1
GENERAL REQUIREMENTS
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1.01 PREFACE

This procedure shall be utilized for installation of all water utility construction. This document shall be utilized, but not limited to, as inspection criteria for the Town of South Kingstown Public Services Department.

Any contractor wishing to utilize accessories and appurtenant material other than specified in this procedure must demonstrate in writing the purpose and need of alternate materials which is subject to, and shall receive written authorization from the Director of Public Services.

The Contractor shall conduct all construction activities regarding the installation of pipe, pipe fittings, accessories, appurtenances, and backfilling between 8:00 a.m. and 4:00 p.m., Monday through Friday. No construction work shall be allowed on Saturdays, Sundays or Holidays without prior written authorization from the Director of Public Services.

The Contractor is advised that a minimum forty-eight (48) hour, working day notice must be given to the Public Service Department prior to start of construction. The Contractor is further advised that prior to notifying the Public Service Department of the start of construction all material specification submittals from the manufacturer must be received and approved by the Public Service Department prior to material site delivery. A pre-construction meeting shall also be scheduled prior to the start of construction if the Director of Public Services so chooses.

1.02 DEFINITIONS

Contractor repairs: The Contractor shall repair and make good at his own expense all defects or deficiencies in work or materials appearing during a period of one (1) year following the final acceptance of the work by the Town. Final acceptance is defined as the period of time when all site improvements have been completed and a maintenance bond (if applicable) is set. In the event of a defect arising in the Contractor's work as specified, the Town will notify the Contractor immediately by telephone, and promptly send written communication of the same to the Contractor. The Contractor shall be responsible for beginning necessary non-emergency repairs in good faith within ten (10) days of the receipt of notification and completing the repairs promptly. A non-emergency repair is defined as any repair work, which in the opinion of the Director of Public Services, does not impact the health, safety and welfare of its welfare users and/or general public. Failure to commence repairs within ten (10) days may result in the Town or its designee to effectuate repairs and backcharge the project owner and/or contractor.

In case emergency situations arise during construction or the guarantee period which affect the public health or public safety as determined by the Town, the Contractor shall undertake repairs immediately in any situation arising from or related to his work. These repairs shall be started in good faith within a period of time determined by the Director of Public Services otherwise the Town may employ other persons to make such repairs and backcharge the Contractor.

Lines, Grades, and Elevations: The Contractor shall establish field controls, all lines, elevations, reference marks, etc., needed during the progress of the work. The Town shall be permitted at any time to check the lines, elevations, reference marks, etc., set by the Contractor.

Contractor's Representative: The Contractor shall designate a representative who will be available to respond to emergency calls by the Town at any time day and night and on weekends and holidays should such a situation arise during any project construction activities.

Town: Town of South Kingstown as applicable to where the work lies, or the Director of Public Services acting in his official capacity.

Director of Public Services: The Town of South Kingstown Director of Public Services or his authorized agent.

Inspector: An authorized representative of the Director of Public Services.

Department: South Kingstown Department of Public Services.

Crushed Stone or Broken Stone: The product resulting from the artificial crushing of rocks, boulders or large cobbles, substantially all faces of which have resulted from the crushing operations.

Gravel: The coarse granular material larger than sand resulting from the natural erosion of sand.

Trench: An excavation, later refilled, necessary to the installation or removal of pipes, drains, endwalls, catch basins, manholes, etc.

1.03 LEGAL RELATIONS AND RESPONSIBILITY TO PUBLIC

The contractor at all times shall: Observe and comply with all State and Federal laws, ordinances and regulations in any manner effecting his work; procure all permits and licenses; pay all charges and fees and give all notices; provide and maintain in a neat and sanitary condition accommodations for the use of employees; conduct work at all times in such a manner as to ensure the least possible obstruction to public traffic; be responsible for the preservation of all public and private properties; indemnify and save harmless the Department and Town.

SECTION 1. CLEARING AND GRUBBING

1.1 **SCOPE:** This work covered under this Section includes the furnishing of all labor, equipment and materials, and performing all operations in connection with the clearing and grubbing and the preparation of the site within the limits of the construction shown on the drawings. The work also includes the disposal off the site of materials resulting from clearing and grubbing and site preparation operations, and all appurtenant work, complete in accordance with the specifications and the drawings, and as directed.

1.2 **CLEARING:** Clearing shall include the felling and cutting up of all trees, and the satisfactory removal and disposal of trees, downed timber, brush and debris and obstructions of any nature. Individual trees directed to be left standing shall be protected in a satisfactory manner to prevent damage incident to construction operations.

1.3 **GRUBBING:** Grubbing shall include the satisfactory removal and disposal of all stumps, roots larger than one (1) inch in diameter, matted roots, debris and other obstructions to a depth not less than eighteen (18) inches below finish ground grades, except that in areas to be occupied by structures they shall be removed in their entirety. All depressions resulting from grubbing shall be refilled with selected materials from earth excavation, graded and compacted so as to conform to adjacent ground surfaces.

1.4 **DISPOSAL OF CLEARED AND GRUBBED MATERIAL:** All timber, stumps, roots, brush, and other debris, obstructions and objectionable material resulting from clearing and grubbing and site preparation operations shall be removed and disposed of by the contractor off the site. Disposal by burning or burying on the site is not permitted.

SECTION 2. STRIPPING, STOCKPILING AND REPLACING TOPSOIL

Paragraph
Number Paragraph Title

2.1 **SCOPE:** The work covered under this Section includes the furnishing of all labor, equipment and materials and performing all operations in connection with the stripping, stockpiling and replacing of topsoil including marsh soils within the limits of the areas as indicated or directed, completed and accepted, in accordance with the drawings and specifications, and as directed. The work shall also include all hauling, handling and rehandling of topsoil, maintaining and protecting of stockpiled topsoil; preparation of subgrades; spreading; compacting, grading and replacing deficiencies in quantities of topsoil; protection of completed topsoiled areas; and all other work incidental and necessary for the satisfactory completion of this Section.

2.2 **STRIPPING (REMOVAL) OF TOPSOIL:** Topsoil shall be carefully removed to the depths and within the limits indicated or directed for removal and replacing of topsoil. Topsoil shall be transported and deposited in storage piles in approved locations convenient to the areas from which it is removed. The topsoil shall be stockpiled, separate from other excavated materials and free of roots, stones, and other undesirable material. The Contractor shall take all necessary precautions to prevent other excavated materials or objectionable materials from becoming intermixed with topsoil during any operations. Stripping operations shall be completed prior to excavation, compacting, or grading operations.

2.3 **STOCKPILES:** Stockpiles shall be neatly trimmed and graded to provide drainage from surfaces and to prevent depressions where water may become impounded. After being trimmed and graded, stockpiles shall be protected and shall not be disturbed except for subsequent reuse of topsoil. Any deficiencies in the quantities of topsoil obtained from the stripping operations and caused by the Contractor's operations shall be replaced by the Contractor with approved topsoil.

2.4 **PREPARATION OF SUBGRADE:** 2.4.1 The subgrade of all areas to be topsoiled shall be cleared of all vegetation, stones and roots larger than one (1) inch in diameter, brush, stakes or any other material which might hinder proper grading or tillage operations or which might interfere with or be harmful to plant growth. The subgrade of all such areas shall be brought to the elevations required by filling, excavation or grading, free of depressions or irregularities, so that topsoil may be placed to the depth as directed.

2.4.2 After subgrades of areas to be topsoiled have been brought to the proper condition, the subgrade shall be loosened immediately prior to placing topsoil by disking, scarifying or other approved method to a depth of approximately three (3) inches, to permit bonding of the topsoil to the subgrade.

2.5 **PLACING TOPSOIL:** 2.5.1 Before the stockpiled topsoil is reused, it shall be cleaned of all debris, roots and stones larger than one (1) inch in diameter and other objectionable material. Topsoil shall not be placed when the topsoil or subgrade is frozen, excessively wet, extremely dry or in a condition which would be detrimental to the topsoiling operations.

2.5.2 Topsoiling shall be performed only when it can be followed within a reasonable time by seeding. Topsoil shall be loaded, hauled and uniformly spread and compacted to the depth as directed by the Public Services Director. The topsoil shall be distributed in sufficient depth to compensate for any shrinkage or settlement so that the surfaces of the topsoiled areas shall finish evenly with the adjacent undisturbed surfaces.

2.5. 3 The whole surface shall be rolled with a hand roller weighing not more than one-hundred (100) pounds per foot of width. During rolling, all depressions shall be filled with additional topsoil, and the surfaces shall be regraded and rerolled until they present a smooth and uniform finish at the required grade. Areas consisting of marsh soils shall not require rolling.

SECTION 3. DEWATERING, CONTROL AND DIVERSION OF WATER

3.1 **SCOPE:** The work covered under this Section includes the furnishing of all labor, equipment and materials, and performing all operations in connection with the dewatering, control and diversion of water, and all other operations necessary to maintain in the dry condition all excavations and work areas of this contract. The Contractor shall be responsible for providing, maintaining, operating and removing all dewatering, and other facilities, including all pumping and appurtenant equipment, required to maintain in a dry condition the areas in which construction of this contract is to be conducted. The Contractor shall be responsible for performing all required dewatering in a manner to prevent injury to persons or public health and damage to existing facilities or the work in progress.

3.2 **DEWATERING EXCAVATIONS:** 3.2.1 The excavations for work required under this contract are to some extent below existing ground water levels. The Contractor shall provide, operate, and maintain all pumps, drains, well points or any facility necessary for the control collection and disposal of all surface and subsurface water encountered in the performance of the contract work. All excavations shall be kept dry at all times, and all construction work shall be performed in the dry, unless otherwise authorized or directed by the Public Services Director.

3.2.2 Any damages to existing facilities or new work resulting from the failure of the Contractor to maintain the work areas in a dry condition shall be repaired by the Contractor, as directed by the Public Services Director. Pumping shall be continuous where specified or directed or as necessary to protect the work and to maintain satisfactory progress.

3.2.3 The Contractor's pumping and dewatering operations shall be carried out in such a manner that no loss of ground will occur. All pipelines or structures not stable against uplift during construction or prior to completion shall be thoroughly braced or otherwise protected against movement or damage.

3.2.4 Water being disposed of by the pumping and dewatering operations shall be disposed of in such a manner to avoid injury to persons or public or private property, or to the work completed or in progress. Dewatering shall be accomplished by approved methods which have a background record of successful dewatering of similar excavations and subsurface conditions expected to be encountered in the work.

3.2.5 The Contractor's pumping of dewatering operations shall be carried out in a manner to minimize erosion of wetland areas or deposition of sediment in streams or wetlands. If in the opinion of the Public Services Director excessive sedimentation is occurring, the Contractor shall alter his operations as required by the Public Services Director.

3.3 **COFFERDAMS:** 3.3.1 Where cofferdams are necessary so that the work may be performed in the dry, the Contractor shall design, furnish, install and maintain and remove all

such cofferdam facilities. Cofferdams shall be designed to withstand all imposed loads and to prevent injury to persons or damage to existing structures and property and to the work.

3.3.2 Cofferdams shall be installed to sufficient depths to allow a reasonable depth of below-grade excavation below the work to be constructed. They shall be as watertight as necessary for the construction of the work in the dry. They shall be of such dimensions as to give sufficient clearance for construction and inspection of the work, and to permit installation of all necessary dewatering facilities.

3.3.3 The Contractor shall be solely responsible for the design, construction, adequacy and safety of all cofferdam facilities and for any injury or damage caused by the installation or failure of the cofferdam facilities. Cofferdams, including all sheeting and bracing required, shall be removed by the Contractor after completion of the permanent construction unless otherwise directed by the Public Services Director.

3.4 **DIVERSION OF WATER:** 3.4.1 The Contractor shall be responsible for providing and maintaining all ditching, grading, sheeting, and bracing, pumping and appurtenant work for the temporary diverting of water courses and protection from flooding as necessary to permit the construction of work in the dry.

3.4.2 Upon completion of the contract work, the Contractor shall remove all temporary construction and shall do all necessary earthwork and grading to restore the areas disturbed to their original condition or to such other conditions as indicated or directed by the Public Services Director.

3.4.3 Water shall not be permitted to flow into or through excavations in which work is under way or has been partially completed. The Contractor shall not restrict or close of the natural flow of water in such a way that ponding or flooding will occur, and shall at all times prevent flooding of public and private property. All damages resulting from flooding or restriction of flows shall be the sole responsibility of the Contractor.

SECTION 4. EARTH EXCAVATION AND BACKFILL

4.1 **SCOPE:** The work under this Section includes the furnishing of all labor, equipment and materials, and performing all operations in connection with excavating, backfilling, compacting, grading and all other incidental work necessary for the construction of pipelines, structures, pavement and appurtenant work in accordance with the drawings and specifications and as directed. The work also includes installing, shoring and bracing as the excavation proceeds; providing approved earth borrow and bank-run gravel from off-site sources when directed for backfills or excavations and refills of below-grade excavations; excavation and disposal at approved locations of pavements, surplus and unsuitable materials, protection of existing pipelines; utilities and structures and of new work; compaction of trench bottom, backfills and subgrades; excavation and backfilling of test pits, and all other appurtenant work as required or as directed.

4.1.2 Stripping, stockpiling and replacing topsoil, including marsh soils, is included under Section entitled, "STRIPPING, STOCKPILING AND REPLACING TOPSOIL."

4.1.3 Where required or directed, the use of sand bedding beneath pipe and under structure base slabs is included under Section entitled, "SAND BEDDING."

4.1.4 The required excavations are to some extent below existing groundwater levels. All excavations shall be kept dry at all times, and all construction work shall be performed in the dry, unless otherwise authorized or directed by the Public Services Director.

The providing and maintaining of facilities for dewatering, control and diversion of water, and protection from flooding is included under Section entitled, "DEWATERING, CONTROL AND DIVERSION OF WATER. 11

4.2 **PROTECTION OF TREES AND SHRUBBERY:** Existing trees and shrubbery to remain shall be protected from injury. Except as otherwise permitted, cutting and trimming of existing trees shall not be permitted. All existing trees to remain and which may be damaged by construction operations shall be boxed and protected as directed.

4.3 **DISPOSAL OF EXCAVATED MATERIAL:** All excavated earth materials approved by the Public Services Director as suitable for reuse shall be used for backfilling excavations and for rough grading as necessary for the completion of the contract work. All surplus or unsuitable materials, rock from rock excavation, and boulders and pavement material shall be removed and satisfactorily disposed of off the site by the Contractor.

4.4 **UNSUITABLE MATERIALS:** 4.4.1 Unsuitable materials are herein defined as organic material, peat, organic silt, or combinations thereof, all having unsuitable bearing properties; and all materials of whatever description which are too loose or saturated for use as backfill to provide satisfactory bearing. If unsuitable material is encountered at the depth indicated on the drawings for bottom limit of excavation, the Contractor shall immediately notify the Public Services Director and shall not proceed further until instructions are given.

4.4.2 The Contractor shall satisfactorily excavate and remove all unsuitable material to lines, grades and limits indicated on the drawings or as directed in writing by the Public Services Director, and shall satisfactorily dispose of such material off the site. All resulting below-grade excavations shall be refilled with compacted gravel bedding refill.

4.4.3 Material which becomes unsuitable as a result of the Contractor's lack of dewatering or improper dewatering shall be removed by the Contractor and replaced with gravel bedding all as directed and approved by the Public Services Director.

4.5 **EXCAVATION:** 4.5.1 Earth excavation shall include the excavation, removal and satisfactory disposal of all materials of whatever nature encountered from within the limits indicated or specified, or as directed in writing, other than rock or ledge as defined under Section entitled, "ROCK EXCAVATION." It shall include, but not be limited to, earth materials such as peats, organic or inorganic silts, clay, sand and gravel; pavements; cobbles and boulders less than one (1) cubic yard in volume; soft or disintegrated rock which, in the opinion of the Public Services Director, can be removed without blasting or drilling; brick and concrete masonry; and all obstructions not specifically included in another Section.

4.5.2 All excavation,sheeting, shoring and dewatering operations shall be accomplished to prevent the undermining or disturbing of existing pipelines, utilities and structures or of any completed construction.

4.5.3 Excavation shall be made to the lines and grades shown on the drawings at the end of these specifications, or as modified by the Public Services Director. Excavations shall be accurately graded to allow satisfactory construction of the contract work. Immediately after excavation to the indicated or directed trench bottom, the Contractor shall compact the exposed bottom surface with two (2) passes of an approved plate-type vibratory compactor.

4.5.4 Bell holes and depressions for joints shall be dug after the trench bottom has been graded and compacted, and after gravel bedding, if required, has been placed and compacted. The bottom quadrant of each pipe barrel shall have complete and uniform bearing for the full length of each pipe. The trench bottom shall again be thoroughly compacted just prior to final shaping for bedding and installation of pipe.

4.5.5 Excavation operations adjacent to and below existing structures and utilities shall be done manually and in a manner to prevent disturbance of or damage to the existing structures and utilities.

4.5.6 Existing pavements and base courses shall be carefully cut and removed to obtain sound, vertical edges at the lines indicated. Existing pavements and base courses beyond the indicated lines which are to remain and which have been disturbed or damaged shall be restored or replaced by the Contractor to match existing pavement and base courses. Existing pavements and base courses to remain shall be protected by the Contractor.

4.5.7 The Contractor shall be responsible for keeping all excavated and construction material a safe distance back from the edge or excavations to avoid overloading the sides of excavations and to prevent slides or cave-ins.

4.5.8 If a pipe is to be placed in fill, the pipe shall have a minimum cover not less than (41-6") over the top of the pipe and for a width of five (5) feet beyond each side of the pipeline. Following placement of such fill, excavation and back-fill shall proceed as specified herein. (revised 10/l/97)

4.5.9 All locations where sheeting is indicated or is directed to be used, the use of a trenching box, will not be allowed. The use of a trenching box will be subject to the determination and approval of the Public Services Director.

4.5.10 Where the Contractor elects to use shoring installed as the excavation progresses to maintain or otherwise protect the sides of the excavation from cave-ins in loss of ground, the shorings shall be adequately braced to prevent cave-ins or loss of ground, and portions of the shoring or bracing shall be left in place as directed by the Public Services Director to maintain stability as backfilling progresses.

4.5.11 No excessive trench widths will be allowed to avoid the use of sheeting.

4.5.12 Where existing subsurface utilities or other facilities adjacent to or crossing through the excavation require temporary support or protection, such temporary support or protection shall be satisfactorily provided by the Contractor. All necessary measures shall be taken by the Contractor to prevent lateral movement or settlement of existing facilities or of work in progress.

4.5.13 Grading shall be done as necessary to prevent surface water from flowing into excavations, and any water accumulating therein shall be removed by pumping or other approved method. The pipelines shall not, at any time, be used for trench drainage.

4.6 **BACKFILLING:** 4.6.1 Unless directed otherwise by the Public Services Director, excavations shall not be backfilled until all required pipeline tests have been satisfactorily performed, and until the work is installed conforms to all requirements specified in these Sections. Each layer of backfill material shall be moistened and compacted in such a manner as to permit the proper and desired compaction of the filled excavation, so that paving of excavated areas can proceed immediately after backfilling is completed.

4.6.2 All excavations shall be backfilled as soon as practicable with approved excavated material. If suitable material as approved by the Public Services Director is not available from the excavations in the quantities required for proper backfilling of excavations,

the Contractor shall provide the necessary approved earth borrow for backfills from off-site sources.

4.6.3 All backfill placed in trenches below a level twelve (12) inches above the top of pipe shall consist of select backfill, placed in layers not exceeding four (4) inches in loose depths. Select backfill shall be compactible materials as approved by the Public Services Director, not frozen and free from clods of earth, stones larger than one and a half (1 1/2) inches in diameter or unsuitable materials, per Drawings at the end of these specifications. The select backfill shall be deposited uniformly on both sides of the pipe and shall be thoroughly compacted by tamping under and on each side of the pipe to provide uniform support around the pipe, free from voids.
(revised 10/l/97)

4.6.4 The balance of backfill in trenches shall be compactible materials as approved by the Public Services Director, not frozen and without any stones larger than eight (8) inches in their greatest dimension. It shall be spread in layers not exceeding twelve (12) inches in loose depth, and each layer shall be compacted by at least four (4) passes of an approved plate-type vibratory compactor. All trench backfilling shall be carefully placed to avoid disturbance of new work and of existing utilities or structures. The moisture content of backfill shall be such that proper compaction will be obtained. Puddling or jetting of backfill with water will not be permitted.

4.6.5 During filling and backfilling operation, pipelines will be checked by the Public Services Director to determine whether any displacement of the pipe has occurred. If the inspection of the pipelines shows poor alignment, displaced pipe or any other defects, the defects designated by the Public Services Director shall be remedied in a satisfactory manner by the Contractor.

4.6.6 Backfilling against masonry or concrete shall only be done when approved. Backfilling against concrete within seven (7) days after placement will not be allowed. During backfilling and compacting operations, care should be exercised so that equipment used will not overload the structures. Backfill adjacent to structures shall be placed in layers not more than nine (9) inches in loose depth, and each layer thoroughly compacted with at least four (4) passes of an approved plate-type vibratory compactor.

4.6.7 After backfilling trenches, the Contractor shall maintain the filled surfaces in good condition, with a smooth surface level with adjacent undisturbed surfaces. Any subsequent settling shall be immediately repaired by the Contractor in a manner satisfactory to the Public Services Director and such maintenance shall be provided by the Contractor for the remainder of the project.

4.6.8 The finished surfaces of filled excavations shall be compacted, and reasonably smooth and free from surface irregularities. Subgrade upon which either topsoil is to be placed or pavements are to be constructed shall be maintained in a satisfactory condition until the finish courses are placed. The storage or stockpiling of materials on finished subgrade will not be permitted.

4.6.9 Prior to paving upon the subgrade, all soft or unsuitable material shall be removed and replaced with suitable material from excavation or earth borrow, as approved by the Public Services Director. All low sections, holes or depressions shall be brought to the

required grade with material approved by the Public Services Director. The entire subgrade shall be shaped to line, grade, and cross section and thoroughly compacted.

4.6.10 Replacing topsoil is specified and included under Section entitled, **"STRIPPING, STOCKPILING AND REPLACING TOPSOIL."**

4.7 **PROTECTION OF EXISTING UTILITIES** AND **STRUCTURES:** 4.7.1 Excavations and backfill operations shall be done in such a manner to prevent cave-ins of excavations or the undermining, damage or disturbing of existing utilities and structures or of new work. Backfill shall be placed and compacted so as to prevent future settlement or damage to existing utilities and structures and new work.

4.7.2 Any excavations improperly backfilled or where settlement occurs shall be reopened to the depth required, then refilled with new materials and compacted, and the surface restored to the required grade and condition.

4.7.3 Any damage due to excavation, backfilling or settlement of the backfill, or injury to persons or damage to property occurring as a result of such damage, shall be the responsibility of the Contractor.

4.8 **MATERIALS:** 4.8.1 Earth borrow shall be a well-graded granular material, at least eighty (80) percent of which must be sand and gravel. It shall be free from peat, organic matter and debris, and shall not contain any stones or clay lumps in excess of eight (8) inches in their greatest dimensions. Any materials of whatever description which are too uniformly-graded or saturated to be readily compactible shall not be utilized for earth borrow.

4.9 **TEST PITS:** 4.9.1 Test pits shall be dug at the locations selected and to the dimensions directed by the Public Services Director, to establish locations of existing pipelines or any other buried item for which the exact location is to be determined. The excavation, protection and backfilling of test pits shall be in accordance with the provisions of this Section. The maximum depth of test pits shall be eight (8) feet, measured from the average ground surface existing at the test pit location immediately prior to digging each pit.

4.10 **Protection of Water Resources:** The Contractor shall not pollute streams, lakes or reservoirs with fuels, oils, bitumens, calcium chloride, acids or other harmful materials. It is the Contractor's responsibility to comply with all applicable Federal, State, County and Municipal laws regarding pollution of rivers and streams. (revised 10/l/97)

4.11 **Maintenance of Drainage Facilities:** All existing drainage facilities including, but not limited to: brooks, streams, canals, channels,, ditches, culverts, catch basins and drainage piping shall be adequately safeguarded so as not to impede drainage or to cause siltation of downstream areas in any manner whatsoever. I f the Contractor damages or impairs through circumstances beyond his control any of the aforesaid drainage facilities, he shall repair the same within the same day. (revised 10/l/97)

4.12 **Dust Control:** During the progress of the work, the Contractor shall conduct T71s operations and maintain the area of his activities, including sweeping and sprinkling of streets as necessary, to minimize creation and dispersion of dust. If the Public Services Director

decides it is necessary to use calcium chloride for more effective dust control, the Contractor shall furnish and spread the material, as directed. Calcium chloride shall not be used for dust control within a drainage basin or in the vicinity of any source of potable water. (revised 10/l/97)

4.13 **Environmental Protection:** 4.13.1 Baled Hay or Straw: To trap sediment and to prevent sediment from clogging drainage systems, baled hay or straw shall be used where applicable as determined by the Public Services Director. Care shall be taken to keep the bales from breaking apart. The bales should be securely staked to prevent overturning, flotation, or displacement. All deposited sediment shall be removed periodically. Hay bales shall not be placed within a waterway during construction of the pipeline crossing. (revised 10/l/97)

4.13.2 Silt Fence: As directed by the Public Services Director, the Contractor shall erect and maintain a temporary silt fence. In areas designated as wetlands, the Contractor shall line the limits of the construction easement with silt fence. The silt fence shall be used specifically to contain sediment from runoff water and to minimize environmental damage caused by construction. (revised 10/l/97)

4.13.2.1The silt fence shall consist of a 3-foot wide continuous length sediment control fabric, stitched to a 2 1/2-foot wide, continuous length support netting, and stapled to pre-weathered oak posts. The oak posts shall be two (2) inches by two (2) inches by four (4) feet six (6) inches and shall be tapered. The support netting shall be industrial strength polypropylene. (revised 10/l/97)

SECTION 5. ROCK EXCAVATION

Paragraph Number | Paragraph Title

5.1 **SCOPE:** The work covered under this Section includes the furnishing of all labor, equipment and materials, and performing all operations in connection with rock excavation and subsequent earth refill within the property as indicated on the drawings, and all incidental work in accordance with the drawings and specifications, and as directed. The work shall also include providing and compacting gravel for refilling depressions resulting from removal of boulders, the satisfactory removal and disposal of the excavated rock materials; and the protection of existing pipelines, structures and appurtenant facilities.

5.2 **ROCK EXCAVATION:** 5.2.1 Rock excavation shall include the excavation, removal and disposal of all boulders and detached rock fragments one (1) cubic yard or more in volume; and all ledge rock, the removal of which, in the opinion of the Public Services Director, can be accomplished only by drilling and splitting mechanically or by hand or by blasting. Boulders of less than one (1) cubic yard in volume, and all soft or disintegrated rock which can be removed without the manipulation noted above, shall be classified as "earth excavation."

5.2.2 Where boulders and ledge are exposed on the sides of or in the bottom of excavations, they shall be wholly or partially removed, as specified or directed. Boulders shall be removed to not less than the lateral trench width indicated, not less than twelve (12) inches outside structure walls, and to not less than twelve (12) inches below the underside of pipes or structure foundation slabs, per Drawings at the end of these specifications. Depressions resulting from the removal of boulders and ledge shall be refilled with approved compacted bank-run gravel.

5.2.3 Unauthorized excavations in rock, or excavations made beyond or below the indicated or directed limits, shall be refilled with compacted gravel as directed by the Public Services Director.

5.2.4 Whenever rock is encountered, it shall be stripped of the overlying material in sections as directed by the Public Services Director. Drilling through the existing overburden and blasting prior to stripping will be allowed only at locations approved by the Public Services Director.

5.2.5 Rock excavation for future connections: 5.2.5.1 Whenever provisions for a future connection are placed in the sewer lines or structure in an area of rock excavation, the rock shall be removed for a distance of at least two (2) feet or more if directed, horizontally from the end of the pipe or tap and in the direction of the future connection.

5.2.5.2 If directed by the Public Services Director, the Contractor shall also drill a hole in rock not less than three (3) feet but not more than five (5) feet beyond the outer limit of his excavation and to a point lower than the level of the branch, and shall explode a charge therein adequate to shatter the rock sufficiently to permit its subsequent removal by others when any future connection is made.

5.3 **BLASTING:** 5.3.1 No blasting will be permitted at any locations within a railroad right-of-way, within twenty (20) feet of existing utilities nor within fifty (50) feet of existing structures.

5.3.2 Where blasting is permitted by the Public Services Director, the Contractor shall take every precaution to protect persons, property and the work. The Contractor, in addition to complying with all other requirements specified elsewhere in these specifications, shall also conform to any further regulations which the Public Services Director may deem necessary in this respect. The Contractor shall be held liable for all injury to persons and damage to property and the work caused by blast or explosion.

5.3.3 Rock encountered within areas where blasting is not permitted, shall be removed by drilling and splitting mechanically or by hand, or by any other approved method not requiring the use of explosives.

SECTION 6. SAND BEDDING

Paragraph
Number Paragraph Title

6.1 **SCOPE:** The work covered under this Section includes the furnishing of all labor, equipment and materials, and performing all operations in connection with providing and compacting sand for pipe bedding and under structure base slabs in accordance with the drawings and specifications, at the locations indicated and as directed. The work shall also include compaction and shaping of bedding just prior to laying pipe, to provide proper bedding of pipe.

6.2 **MATERIAL:** Sand for pipe bedding and under slab shall be provided from off-site sources in the quantities required for completion of the work and shall be as approved by the Public Services Director. Sand bedding shall consist of clean, hard and durable particles or fragments, and shall be free from clay, organic matter and other objectionable material and must meet the gradation requirements below:

U.S. Standard Sieve Size	% Passing By Weight	Remaining Wt. of ¾"
3/4 inch	100	0
1/2 inch	50-85	50-15
3/8 inch	45-80	55-20
No. 4	40-75	60-25
No. 40	0-45	100-55
No. 200	0-10	100-90

6.3 **PLACING:** 6.3.1 General: The bottoms of excavations shall be thoroughly compacted and in approved condition prior to placing sand bedding. Sand bedding shall be placed in layers not exceeding six (6) inches in loose depth, and each layer shall be compacted by at least two (2) passes of an approved plate-type vibratory compactor. The moisture content of the sand shall be adjusted, by moistening or drying, so that proper compaction will be obtained.

6.3.2 Sand bedding shall be graded, compacted and shaped so that the full length of pipe barrel has complete and uniform bearing for the bottom quadrant of each pipe. Bell holes and depressions for joints shall be dug after the sand bedding has been graded and compacted, and shall be the proper clearance for jointing of pipes. Sand bedding shall be placed to a minimum height flush with the top of the pipe, for the entire trench width, per Drawings at the end of these specifications.

6.3.3 The Contractor shall exercise care in all operations to prevent disturbing joints, displacement of or damage to the pipes already installed. As the work progresses, the pipelines will be checked by the Public Services Director to determine whether any disturbance, displacement or damage has occurred. If inspection shows poor alignment, displaced or damaged pipe, disturbed joints, or any other defects, all defects designated by the Public Services Director shall be remedied in a satisfactory manner by the Contractor.

SECTION 7. TIMBER SHEETING AND BRACING

7.1 **SCOPE:** The work covered under this Section includes the furnishing of all labor, equipment and materials, and performing all operations in connection with the installation, maintenance and removal of all temporary and permanent timber sheeting and bracing necessary to permit the proper installation and construction of the work; to prevent injury to persons or damage to pavements, utilities or structures; to prevent injurious caving or erosion, or loss of ground; to maintain at all times pedestrian and vehicular traffic on public or private streets; or where shown on drawings, necessary for unforeseen reasons, or where directed by the Public Services Director, all in accordance with the specifications and the drawings and as directed.

7.2 **MATERIAL**: 7.2.1 Timber sheeting and bracing may be of any species of wood which will satisfactorily withstand all driving and construction stresses and the loads to which the members will be subjected. Sheeting shall not be less than three (3) inches nominal thickness. All timber sheeting and bracing shall be free from wormholes, windshakes, loose knots, decayed or unsound portions or other defects which might impair its strength or tightness.

7.2.2 The Contractor shall provide all necessary hardware and fastenings necessary in connection with satisfactory installation of all sheeting and bracing.

7.3 **INSTALLATION:** 7.3.1 Sheeting and bracing shall be of sufficient strength to safely sustain all loads from the sides of the excavations together with all water pressure and surcharge. The Contractor shall be entirely responsible for adequacy of sheeting and bracing used, and shall take all precautions necessary to prevent movement of material along the sides of excavations. Sheeting shall be permanently left in place where indicated or directed. It is expressly understood and agreed that whenever sheeting and bracing is used, it shall not relieve the Contractor of the sole responsibility for any damages or injury due to installation or failure of the sheeting or bracing or the settling of the backfill, the pipeline or the adjacent ground.

7.3.2 Where timber sheeting is used, it shall be driven ahead of all excavation operations. Sheeting shall be driven to sufficient depths below the deepest excavation level to maintain sufficient restraint of the adjacent soil and to prevent movement of the sheeting. If voids occur behind the sheeting, they shall be filled immediately with selected material from earth excavation to the satisfaction of the Public Services Director.

7.3.3 Unless otherwise directed by the Public Services Director, timber sheeting shall be cut-off and the remainder permanently left in place as follows, after the excavations have been satisfactorily backfilled and compacted to within six (6) inches of the cut-off grade:

(1) In paved areas, at grade eighteen (18) inches below existing ground surface.

(2) At all other locations, at a level two (2) feet above the top of pipe.

7.3.4 Withdrawal of sheeting shall be carefully performed to prevent movement of material along the sides of the backfilled excavations; to prevent damage to utilities, structures or the work; and to avoid injury to persons. Unless otherwise permitted, sheeting shall be withdrawn in lifts of not more than four (4) feet, and all voids shall be filled immediately with selected materials and thoroughly compacted.

SECTION 8. STEEL SHEETING AND BRACING

Paragraph
Number Paragraph Title

8.1 **SCOPE:** The work covered under this Section includes the furnishing of all labor, equipment and materials, and performing all operations in connection with the furnishing, installation, maintenance and removal of all temporary and permanent steel sheeting and bracing necessary to permit the proper and satisfactory installation and construction of the work; to prevent injurious caving or erosion, or loss of ground to maintain at all times pedestrian, vehicular and railroad traffic on public and private streets, property and rights-of-way; or where shown on drawings, necessary for unforeseen reasons, or where directed by the Public Services Director, and all in accordance with the specifications and the drawings, and as directed.

8.2 **MATERIAL:** 8.2.1 The shapes, sizes and lengths of steel sheeting to be utilized are optional with the Contractor, providing they are satisfactory to withstand all driving and construction stresses and are driven in continuous interlock. Bracing and other supports whether of steel or of timber, shall be of the strength and dimensions necessary to satisfactorily withstand the loads to which they will be subjected. All bracing and other supports shall be free from any defects which might impair this strength.

8.3.2 The Contractor shall provide all necessary hardware and fastenings necessary in connection with satisfactory installation of all sheeting and bracing.

8.3 **INSTALLATION AND REMOVAL:** 8.3.1 Steel sheeting and bracing shall be of sufficient strength to safely sustain all loads from the sides of the excavations together with all water pressure and reasonable surcharge. The Contractor shall at all times be entirely responsible for adequacy of sheeting and bracing used to permit the satisfactory and safe installation and construction of the work, to provide adequate protection against damage to all existing utilities, structures and complete portions of the work, and to prevent injury to persons.

8.3.2 The Contractor shall take all precautions necessary to prevent lateral or inward movement of material along the sides or the bottoms of excavations. It is expressly understood and agreed that whenever steel sheeting and bracing are used, it shall not relieve the Contractor of the sole responsibility for any damages or injury due to the installation or failure of the sheeting or bracing or the settling of the backfill, the pipeline or of the adjacent ground, structures utilities or other work.

8.3.3 Where steel sheeting is used, it shall be driven ahead of all excavation operations. Sheeting shall be driven to sufficient depths below the deepest excavation level to maintain sufficient restraint of the adjacent soil and to prevent movement of the sheeting, excessive inflow of water, and intrusion of soils into or instability of the bottom of the excavations. If void occurs behind the sheeting, they shall be filled immediately with selected materials from earth excavation to the satisfaction of the Public Services Director.

8.3.4 The Contractor shall provide inspection prior to and during his operations of all existing utilities, structures and other facilities which might be damaged by his sheeting operations. The Contractor shall utilize the most modern techniques and devices available for monitoring and controlling his construction operations to prevent damage to the existing adjacent utilities, structures, and completed portions of the work.

8.3.5 Steel sheeting used on railroad property or within railroad rights-of-way shall be cut-off at a level of eighteen (18) inches below existing ground surface and the remainder permanently left in place. Unless otherwise directed by the Public Services Director, all other steel sheeting shall be extracted from the work area. Steel sheeting shall be withdrawn in small progressive vertical increments not exceeding two (2) feet, carefully performed to prevent any lateral or vertical movement of material on the sides of the sheeting and to prevent damage to existing utilities, structures or the construction and to avoid injury to persons. All voids left or caused by withdrawal of steel sheeting shall be immediately filled with selected earth materials from excavations and thoroughly compacted to the satisfaction of the Public Services Director.

8.3.6 The use of a trenching box will not be permitted within the limits or locations where the use of steel sheeting and bracing is indicated, specified or directed.

SECTION 9. DUCTILE IRON WATER PIPE

9.1 **SCOPE:** The work covered under these items includes the furnishing of all plant, labor, equipment, appliances and materials, and in performing all operations in connection with providing the construction of ductile iron pipe water distribution mains at the locations and to the lines and grades indicated and/or as directed, including all pipe, pipe fittings and accessories, connections to other piping and structures, testing of pipelines and material tests, jointing and jointing materials, services of manufacturer's representatives, and all other related and appurtenant work, complete in place and accepted, in accordance with the drawings and specifications, and as directed.

9.2 **SUBMITTALS:** One (1) sets of all shop drawings shall be submitted to the Town for review. Shop drawings shall consist of manufacturer's scale drawings, cuts or catalogs including descriptive literature and complete characteristics and specifications, and code requirements. Shop drawings shall be submitted for the ductile iron pipe, type of joint, fittings, couplings, filling rings, and lining and coating in accordance with specifications. (revised 10/l/97)

9.3 **MATERIAL**: 9.3.1 Ductile Iron Water Pipe: All piping and pipe fittings used in municipal water distribution main construction shall be ductile iron pipe and pipe fittings as specified hereafter in this Section. (revised 10/l/97)

Any deviation from this material must be approved in writing by the Public Services Director prior to installation. (revised 10/l/97)

9.3.2 Extra strength bell-and-spigot ductile iron pipe and pipe fittings shall be utilized for municipal water main piping and shall meet the requirements of AWWA Designation: Latest Designation C151 and C153, thickness Class 52, cement lining in compliance with C21.4 except cement thickness shall be double that called for in the aforementioned specification as amended to date. The length of the pipe, bends, fittings and other data shall be as shown on the manufacturer's drawings or as approved by the Public Services Director. (revised 10/l/97)

All ductile iron pipe and pipe fittings shall meet all test requirements of AWWA Designation: Latest Designation C151 and C153, thickness Class 52, cement lining in compliance with C21.4 except cement thickness shall be double that called for in the aforementioned specification and the test requirements specified above, and to the acid resistance test, and pipe manufacturer's notarized test reports showing conformance with these test requirements shall be furnished to the Public Services Director. Pipe and fittings shall be subject to thorough inspection and tests and all pipe and fittings not conforming to the requirements specified shall be rejected and shall be immediately removed from the site by the Contractor. (revised 10/l/97)

Each pipe and each fitting shall be marked with the name or initials of the manufacturer and a symbol or symbols identifying the strength of the pipe and fittings; the markings shall be indented on the exterior of the pipe and fitting and shall be plainly legible for purposes of identification. All fittings shall have bell mechanical joint ends. (revised 10/l/97)

9.3.3 JOINTS: Joints for ductile iron pipe shall conform to AWWA Clll. Pipe and fittings shall be furnished with approved joint restraining appurtenances to keep the piping from pulling apart under pressure. (revised 10/l/97)

9.3.4 GASKETS, GLANDS, NUTS AND BOLTS: Gaskets, glands, nuts, bolts and accessories shall conform to AWWA Clll or C153, as appropriate. Compression ring shall be marked "Neoprene. 11 The jointing of the bell-and-spigot ductile iron pipe and pipe fittings using the watertight factory-fabricated joints specified above shall be installed in strict accordance with the printed recommendations of the pipe manufacturer, and as approved. Lubricants shall be used for jointing of pipe and fittings and shall be as recommended by the pipe manufacturer. Glands shall be ductile or cast iron. Bolts and nuts shall be high strength alloy. (revised 10/l/97)

Gaskets for pipe installed in areas contaminated with gasoline shall be of the special nitrile type suitable for exposure to gasoline and its organic end products. (revised 10/l/97)

9.3.5 LINING AND COATING: The inside of pipe and fittings shall be given a cement lining and asphaltic seal coat in accordance with AWWA C104. The thickness of the lining shall be double that specified in AWWA C104. The outside of pipe and fittings shall be coated with the standard asphaltic coating specified under the appropriate AWWA Standard Specification for pipe and fittings. Machined surfaces shall be cleaned and coated with a suitable rust preventative coating at the shop immediately after being machined. (revised 10/l/97)

9.3.6 JOINT RESTRAINTS: Where indicated or necessary to prevent joints or sleeve couplings from pulling apart under pressure,, anchoring and joint restraint methods shall be utilized. Methods shall include concrete backing and anchor blocks, tie rods, and restrained joint systems. Methods that rely on the use of friction clamps and/or retainer glands with set screws alone are not acceptable. All restraining appurtenances and tie rods shall be coated with an approved bituminous paint after assembly. The completed joint shall be inspected and the paint repaired/touched up as necessary. (revised 10/l/97)

Restrained joint systems shall be Flex-Ring, Lockring or Lokfast

Joint by American Cast Iron Pipe Company, Birmingham, AL; Tr-Flex
Joint by United States Pipe and Foundry Company, Birmingham, AL;
Super-Lock Joint by Clow Corporation, Bensenville, IL; Fastite
Joint by Atlantic States Cast Iron Pipe Company, Philipsburg, NJ;
Snap-Lok or Bolt-Lok by Griffin Pipe Products Company, Oak Brook,
IL; or approved equal. (revised 10/l/97)

9.4 **EXECUTION:** 9.4.1 INSPECTION BEFORE INSTALLATION: Pipes and fittings shall be subjected to a careful inspection just before being laid or installed. (revised 10/l/97)

9.4.2 HANDLING AND CUTTING: Any pipe or fitting which has a damaged lining, scratched or marred machine surface and/or abrasion of the pipe coating or lining shall be rejected and removed from the job-site. (revised 10/l/97)

Any fitting showing a crack and any fitting or pipe which has received a severe blow that may have caused incipient fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work. In any pipe showing a distinct crack and in which it is believed there is no incipient fracture beyond the limits of the visible crack, the cracked portions, if so approved, may be cut off by and at the expense of the Contractor before the pipe is laid so that the pipe used will be perfectly sound. The cut shall be made in the sound barrel at a point at least 12 inches from the visible limits of the crack. (revised 10/l/97)

All cutting shall be done with a machine suitable for cutting ductile iron pipe. Hydraulic squeeze cutters are not acceptable for cutting ductile iron pipe. Travel type cutters or rotary type abrasive saws may be used. All cut ends shall be examined for possible cracks caused by cutting. (revised 10/l/97)

Lined and coated pipe and fittings shall be installed as, and assembled with approved packing or gaskets of the type recommended by the pipe manufacturer for the particular lining used. (revised 10/l/97)

9.5 **INSTALLATION:** 9.5.1 Minimum piping depth installation below grade shall be four feet six inches (41-611) to top of pipe outside diameter. (revised 10/l/97)

9.5.2 Pipe and Fittings: No defective pipe or fittings shall be laid or placed the piping, and any piece discovered to be defective after having been laid or placed shall be removed and replaced by a sound and satisfactory piece. Each pipe and fitting shall be cleared of all debris, dirt, etc., before being laid and shall be kept clean until accepted in the complete work. Pipe and fittings shall be laid accurately to the lines and grades indicated on the drawings or as required. Care shall be taken to ensure good alignment both horizontally and vertically. Each pipe shall have firm bearing along its entire length. The rubber joint surface shall be coated with the proper lubricant, as recommended by the joint manufacturer. Pipe, pipe fittings and accessories shall be satisfactorily handled, stored, installed, jointed and protected by the contractor in strict accordance with the printed recommendations of the manufacturers of the pipe and pipe jointing materials.

The contractor shall furnish to the Public Services Director, for his use, copies of the printed recommendations of the pipe and pipe jointing manufacturers for

the handling, storing, protection and installation of pipe and fittings and the factory-applied joint materials and neoprene gaskets. (revised 10/l/97)

9.5.3 PIPE STOPPERS: 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 two hundred (200) psi; concrete blocking shall be of adequate size and arrangement to prevent the stopper from being blown off the line. The blocking shall extend back to the undisturbed end of trench.

9.5.4 PUSH ON JOINTS: Joining of push-on joint pipe shall conform to the AWWA C600. If effective sealing of the joint is not attained, the joint shall be disassembled, thoroughly cleaned, a new gasket inserted and joint reassembled. (revised 10/l/97)

Deflection of alignment at a joint shall not exceed the appropriate permissible deflection as specified in the following table. These values indicate the maximum permissible deflection for 18-foot lengths. Maximum permissible deflections for other lengths shall be in proportion to such lengths. (revised 10/l/97)

Pipe Deflection Allowance

Maximum permissible deflection, inches

Diameter of Pipe, Inches	Push-on Joint
3-12	19
14-30	11

9.5.5 MECHANICAL JOINTS: Assembling of fittings with mechanical joint ends shall conform to AWWA C600. If effective sealing of the joint is not attained at the maximum torque indicated in the above standard, the joint shall be disassembled and thoroughly cleaned, then reassembled. Bolts shall not be overstressed to tighten a leaking joint. (revised 10/l/97)

The deflection of alignment at a joint shall not exceed the appropriate permissible deflection as specified in the following table. These values indicate the maximum permissible deflection for 18-foot lengths. Maximum permissible deflections for other lengths shall be in proportion to such lengths. (revised 10/l/97)

Pipe Deflection Allowances

Maximum permissible deflection, inches

Diameter of Pipe, Inches	Mechanical-Joint
6	27
8-12	20
16	13.5
20	11
24	9

9.5.6 **RESTRAINED JOINTS:** Joining of restrained joint piping shall conform to the manufacturer's recommendations. If effective sealing of the joint is not attained, the joint shall be disassembled, thoroughly cleaned, a new gasket inserted and joint reassembled. Deflection of alignment at a joint shall not exceed the appropriate permissible deflection recommended by the manufacturer. (revised 10/l/97)

9.5.7 **SLEEVE-TYPE COUPLINGS:** Pipe ends shall be cleaned thoroughly prior E-o installation. After the bolts have been inserted and all nuts have been made up fingertight, diametrically opposite nuts shall be progressively and uniformly tightened all around the joint, preferable by use of a torque wrench of the appropriate size and torque for the bolts. The correct torque as indicated by a torque wrench shall not exceed 90 foot-lb. (revised 10/l/97)

9.5.8 **Synthetic detection tape:** that is not biodegradable shall be utilized and placed a minimum distance of two (2) feet above top of water mains and service laterals. Tape shall state "Water line buried below" or similar approved statement depicting underground water utilities. (revised 10/l/97)

9.6 **TESTING:** 9.6.1 Prior to the pressure and leakage tests, the piping shall be thoroughly flushed clean of all dirt, dust, oil, grease and other foreign material. This work shall be done with care to avoid damage to linings and coatings. (revised 10/l/97)

9.6.2 PRESSURE AND LEAKAGE TESTS: All pipelines shall be given combined pressure and leakage tests in sections designated by the Town. The Contractor shall furnish and install suitable temporary testing plugs or caps; all necessary pressure pumps, pipe connections, meters, gates, and other necessary equipment; and all labor required. The Town shall have the privilege of using their own meters and gauges. (revised 10/l/97)

Minimum waiting period before testing the water system shall be thirty (30) days after the installation of the water system. This shall include the pressure and leakage tests. (revised 10/l/97)

Water shall be slowly supplied to the plugged pipeline until all water mains are full and water is discharged from newly installed fire hydrants. Filled mains shall then remain static for a twenty-four (24) hour period prior to testing. (revised 10/l/97)

All air shall be expelled from the pipe prior to starting the pressure and leakage tests. In those cases where fire hydrants and/or blow-offs are not available at high points in the distribution system for purposes of expelling and releasing trapped air, the contractor shall install taps at high points as pre-approved by the Public Services Director.

Said taps shall be properly shut off at water main corporation valve and secured upon successful completion of pressure testing, disinfecting and bacteriological examination of the newly constructed water main. (revised 10/l/97)

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 corrected to the gauge location) to a pressure in pounds per square inch numerically equal to the pressure rating of the pipe (normally 150 psi). The test pressure shall not be less than 1.25 times the working pressure at the highest point along the test section. The test shall be conducted for a period of two (2) hours. (10/l/97)

Leakage is defined as the quantity of water that must be supplied to any installed pipeline, or valved section thereof, to maintain pressure within 5 psi of the specified test pressure after the air in the pipeline has been expelled and the pipe has been filled with water. Leakage is not measured by a drop in pressure in a test section over a period of time. No pipe installation should be accepted if the leakage is greater than that determined using the following formula: (revised 10/l/97)

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

Where:

L = allowable leakage, gph
S = length of pipe test, ft
D = nominal diameter of the pipe, in.
P = average test pressure during the leakage test, (gauge)

This formula is based on al allowable leakage of 11.6 gpd/mile/in of nominal diameter of pipe at a pressure of 150 psi. allowable leakage at various test pressures is shown at the end of this booklet. (revised 10/l/97)

If the section fails to pass the pressure and leakage test, the Contractor shall do everything necessary to locate, uncover, and repair or replace the defective pipe, fitting, or joint, all at his/her own expense. Additional tests and repairs shall be made until the section passes the specified test. All visible leaks shall be repaired regardless of the amount of leakage. (revised 10/l/97)

9.7 **DISINFECTION AND FLUSHING:** 9.7.1 The Contractor shall disinfect all pipe, fittings, hydrants and other appurtenances prior to installation. The contractor shall apply Sodium Hypochlorite (minimum of 12% solution) to all pipe sections and fittings. The application of Sodium Hypochlorite shall be done with a swab or by other methods deemed acceptable to the Public Services Director. The Contractor shall furnish all equipment, labor and materials necessary to do the work of disinfecting. (revised 10/l/97)

9.7.2 Final Disinfection and Flushing. The Contractor shall disinfect the lines carrying potable water. The Contractor shall furnish all equipment and materials necessary to do the work of disinfecting, and shall perform the work in accordance with the procedure outlined in AWWA C651 and all amendments thereto. In general, the procedure of disinfecting the main shall be to apply chlorine through a tap in one end of the section and bleed it off through a tap at the other end. The applied dosage shall be such as to produce a residual chlorine concentration of not less than 10 mg/l after a contact time of not less than 24 hours. During the disinfection period, care shall be exercised to prevent contamination of water in existing mains. (revised 10/l/97)

Any temporary connection to the mains or other facilities required to accomplish the disinfection of the mains shall be at the Contractor's expense. (revised 10/l/97)

9.7.3 Preliminary Flushing. Before being chlorinated, the main shall be filled to eliminated air pockets and shall be flushed to remove particulates. The flushing velocity in the main shall not be less than 2.5 ft/sec. Table "Required Flow and Openings to flush Pipelines" at the end of this booklet shows the rates of flow required to produce a velocity of 2.5 ft/sec in pipes of various sizes. Note that flushing is not a substitute for preventive measures during construction. Certain contaminants, such as caked deposits, resist flushing at any feasible velocity. (revised 10/l/97)

9.7.4 Chlorinating the main. The Contractor is to use the "Continuous-Feed Method" as described in procedure AWWA C651. Water from the existing distribution system or other approved sources of supply shall be made to flow at a constant, measured rate into the newly laid water main. At a point not more than 10 ft. downstream from the beginning of the new main, water entering the new main shall receive a dose of chlorine fed at a constant rate such that the water will have not less than 25 mg/L free chlorine. (revised 10/l/97)

During the application of chlorine, valves shall be positioned so that the strong chlorine solution in the main being treated will not flow into water mains in active service. Chlorine application shall not cease until the entire main is filled with heavily chlorinated water. The chlorinated water shall be retained in the main for at least 24 hours, during which time all valves and hydrants in the treated section shall be operated to ensure disinfection of the appurtenances. At the end of this 24 hour period, the treated water in all portions of the main shall have a residual of not less than 10 mg/L free chlorine. (revised 10/l/97)

Direct-feed chlorinators, which operate solely from gas pressure in the chlorine cylinder, shall not be used for application of chlorine. The preferred equipment for applying chlorine is a solution-feed, vacuum-operated chlorinator and a booster pump. The vacuum-operated chlorinator mixes the chlorine gas in solution water; the booster pump injects the chlorine-gas solution into the main to be disinfected. Feed lines shall be of such material and strength as to safely withstand the corrosion caused by the concentrated chlorine solutions and the maximum pressures that may be created by the pumps. All connections shall be checked for tightness before the solution is applied to the main. (revised 10/l/97)

9.7.5 Final Flushing. After the applicable retention period, heavily chlorinated water should not remain in prolonged contact with the pipe. In order to prevent damage to the pipe lining or corrosion damage to the pipe itself, the heavily chlorinated water shall be flushed from the main until chlorine measurements show that the concentration in the water leaving the main is not higher than that generally prevailing in the system or is acceptable for domestic use. (revised 10/l/97)

9.7.6 Bacteriological tests. After final flushing and before the water main is placed in service, a sample or samples shall be collected and shall be tested for bacteriological quality. Bacteriological sampling and testing shall be done in accordance with AWWA C651 for each main and each branch at a laboratory approved by the RI Department of Health for Drinking Water Analysis. Sampling shall be accomplished with sterile bottles treated with sodium thiosulfate, as required by Standard Methods for The Examination of Water and Wastewater (current edition) At least one sample shall be collected from the new main and one from each branch. The Town reserves the right to pick the location and the number of samples required. No hose or fire hydrants shall be used in the collection of samples. A corporation stop installed on the main as designated by the approval of the Public Services Director, with a removable copper tube gooseneck assembly, is the recommended method.

The laboratory shall analyze the sample for Total Coliform organisms using the "Membrane Filter Technique". In the event a bacteriological sample is found to have a presence of total Coliform, a fecal coliform sample shall be performed by the contractor's laboratory. A Heterotrophic Plate Count (HPC) examination shall be required. The Town also reserves the right to collect their own samples and have them analyzed at a laboratory approved by the Town. (revised 10/l/97)

9.7.7 Redisinfection & Reexamination. If the presence of Total Coliform and/or Fecal Coliform organisms are found in a sample, the contractor shall reflush, redisinfect and resample the system for Total coliform, Fecal coliform organisms and HPC. The HPC shall not have a count greater than 250/ml. If the samples show the absence of Total coliforms or Fecal coliform organisms but the HPC is greater than 250/ml then the Contractor shall reflush the system and resample for HPC. (revised 10/l/97)

9.8 **TEST REPORTS AND CERTIFICATES OF COMPLIANCE:** In addition to other requirements specified herein, the Contractor shall furnish to the Public Services Director 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 specification requirements; and pipe manufacturer's notarized certificates of conformance stating that all materials to be furnished under these items conform with all specification requirement; and each shipment of pipe and pipe fittings shall be accompanied with the pipe manufacturer's notarized certificate of conformance, certifying that the pipe and pipe fittings meet all requirements of the specifications. All testing of all material furnished under this Section of the specifications shall be provided by the Contractor.

9.9 **SERVICES OF MANUFACTURER'S REPRESENTATIVES:** The Contractor shall furnish to the Public Services Director, the services of pipe manufacturer's representatives for such lengths of time as may be necessary to properly instruct the Contractor's personnel in the proper handling, installation and jointing of the piping in accordance with the printed recommendations of the manufacturer of the pipe.

9.10 **GUARANTEE:** The Contractor shall furnish to the Public Services Director a written guarantee signed by the Contractor and the manufacturer of the ductile iron pipe and pipe fittings which shall warrant and guarantee that the ductile iron pipe and pipe fittings installed in the work of this contract meet all requirements of the specifications and that the ductile iron pipe and pipe fittings shall not fail or be injured or be damaged or service shall not be impaired as a result of:

(1) Conveying municipal potable drinking water of any nature whatsoever. The manufacturer of the ductile iron pipe and pipe fittings shall agree and bind itself for:

(a) A period of one-hundred (100) years from the date of installation of the ductile iron pipe and pipe fittings to be replaced promptly with new ductile iron pipe and pipe fittings in the same quantity and sizes all ductile iron pipe and pipe fittings as may have been injured, damaged or destroyed in service due to defects in material or manufacture or as a result of the conditions enumerated in 11(l)" above;

b) A period of ten (10) years from the date of installation of the ductile iron pipe and pipe fittings to assume full responsibility for all costs of labor, materials and equipment for furnishing and installing promptly with new ductile iron pipe and pipe fittings in the same quantity and sizes for the replacement of all water main pipelines of ductile iron pipe injured, damaged or destroyed in service due to defects in material or manufacture or as a result of the conditions enumerated in "(1)" above.

SECTION 10. FIRE HYDRANTS

10.1 **SCOPE:** The work covered under these items includes the furnishing of all plant, labor, equipment, appliances and materials, and in performing all operations in connection with providing the construction of fire hydrant assemblies, at the locations and to the lines and grades indicated and/or as directed, including all pipe, pipe fittings and accessories, connections to other piping and structures, testing of pipelines and material tests, jointing and jointing materials, services of manufacturer's representative, and all other related and appurtenant work, complete in place and accepted, in accordance with the drawings and specifications, and as directed.

10.2 **SUBMITTALS:** One (1) set of shop drawings shall be submitted for the hydrants and appurtenances indicating type of joint, and lining and coating, etc., in accordance with the specifications. Shop drawings shall consist of manufacturer's scale drawings, cuts or catalogs including descriptive literate and complete characteristics and specifications, and code requirements. (revised 10/l/97)

10.3 **MATERIAL:** 10.3.1 The hydrant and hydrant fittings for all items under this Section of the specifications shall be as specified in Section 10.3.2.

10.3.2 Fire Protection Hydrant and Hydrant Fittings: Hydrants shall conform to the requirements of AWWA C501. Hydrants shall be Mueller "Super Centurion 200,11 as manufactured by Mueller Co., Decatur, IL. They shall be equipped with a 5-1/4-inch hydrant shoe valve left turn open (counterclockwise) and 6-inch mechanical joint inlet. Hydrants shall have one 4-1/2-inch pumper and two 2-1/2inch hose connections. Threads shall be NPT. (revised 10/l/97)

Hydrant fittings shall also be manufactured by the Mueller Corporation for specific use with the Super Centurion 200 fire hydrants. Hydrant operating and nozzle cap nuts shall be of pentagonal shape and measure one and one-half inches from flat to point. The height of the nut shall not be less than one (1) inch. All internal operating parts including main valve, main valve seat, drain valve mechanism, operating rod, etc., shall be removable without excavating. Hydrants shall be traffic models with frangible bolts or breakaway couplings. Details of hydrant design shall meet the requirements of the Owner. (revised 10/l/97)

Hydrants installed in areas contaminated with gasoline shall have special nitrile gaskets for all joints which could be exposed to groundwater. These gaskets include, as a minimum, mechanical joints, gaskets and drain hole seal gaskets. (revised 10/l/96)

10.3.3 HYDRANT PAINT: Hydrants shall be thoroughly cleaned and given two (2) shop or field coats of paint in accordance with AWWA C502 and the instructions of the paint manufacturer. Paint color shall be standard hydrant color of the Owner as follows: (revised 10/l/97)

1. Barrel - OSHA red
2. Bonnet - OSHA red
3. Nozzle Caps - OSHA red

If the hydrants are delivered with the Owner's standard color, they shall be given one (1) matching field coat of an alkyd gloss enamel. If the hydrants are not delivered with the owner's standard color, they shall be given two (2) coats of an alkyd gloss enamel, colors as indicated above. Hydrant paint shall be as manufactured by PPG Industries, Pittsburgh, PA; Koppers Company, Inc., Pittsburgh, PA; Tnemec Company,, Inc., Kansas City, MO; or Minnesota Mining and Manufacturing Co.;, (3M), St. Paul, MN; or approved equal. Alkyd glass enamel shall be Series 54-300 by PPG, Glamortex by Koppers, or 2H-Tneme by Tnemec; or approved equal. (revised 10/l/97)

10.4 **INSTALLATION:** Fire hydrants shall be installed a minimum distance of five (5) feet but no greater than ten (10) feet from roadway curb and fire hydrant breakaway flange shall be a minimum of six (6) inches above grade but not greater than twelve (12) inches above grade. Fire hydrant assemblies shall be installed in accordance with the manufacturer's installation specifications and criteria. Any deviation from manufacturer's requirements shall be approved in writing by the Public Services Department. Fire hydrant thrust blocks shall be installed in accordance with Section 15.14 of this technical specifications.
(revised 10/l/97)

A fire hydrant shall be installed at: a) the end of all cul-de-sacs, and dead end water distribution mains (4" diameter and greater) regardless of length of extension, and b) as required by Section 19-189 of the Water Supply Management Ordinance. (revised 10/l/97)

Hydrants shall be set plumb. Earth fill shall be carefully tamped around the hydrants to a distance of four (4) feet on all sides of the hydrant, or to the undisturbed trench face, if less than 4 feet. Hydrants and connecting pipe shall have at least the same depth of cover as the distributing main. Hydrants shall be set upon a layer of stone or a slab of concrete not less than four (4) inches thick and 15 inches square. The side of the hydrants opposite the pipe connections shall be firmly wedged against the vertical face of the trench with a concrete thrust block, as indicated on the drawings. (revised 10/l/97)

Crushed stone shall be placed around the base of the hydrants at the location of the drain holes, and backfill around the hydrants shall be thoroughly compacted to the grade line in a satisfactory manner. Hydrants shall have the interiors cleaned of all foreign matter before installation, and shall be inspected in both the open and closed positions. (revised 10/l/97)

The body of the hydrants shall be of sufficient length to allow the hydrants to be set at the proper elevation, as established by the manufacturer. Extensions shall be furnished and installed at the Contractor's expense, when required for greater depth. (revised 10/l/97)

10.5 **PRESSURE AND LEAKAGE TESTS:** Fire hydrants and hydrant assemblies, including but not limited to hydrant shoe valve, shall be connected in a watertight manner to pass the hydrostatic test criteria specified in chapter 9. (revised 10/l/97)

When performing the Pressure and leakage tests as specified in Chapter 9 the hydrant isolation valve must be open and the hydrant shoe valve shall be closed. (revised 10/l/97)

The Public Services Director may at his discretion choose to perform high pressure and leakage test on each hydrant assembly from the hydrant isolation valve to the hydrant outlets. (revised 10/l/97)

10.6 **TEST REPORTS AND CERTIFICATES OF COMPLIANCE:** In addition to other requirements specified herein, the Contractor shall furnish to the Public Services Director 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 specification requirements; and fire hydrant manufacturer's notarized certificates of conformance stating that all materials to be furnished under these items conform with all specification requirements; and each shipment of fire hydrants and hydrant fittings shall be accompanied with the fire hydrant manufacturer's notarized certificate of conformance, certifying that the fire hydrants and hydrant fittings meet all requirements of the specifications. All testing of all material furnished under this Section of the specifications shall be provided by the Contractor.

10.7 **SERVICES OF MANUFACTURER'S REPRESENTATIVES:** The Contractor shall furnish to the Public Services Director, the services of fire hydrant manufacturer's representatives for such lengths of time as may be necessary to properly instruct the Contractor's personnel in the proper handling, installation and jointing of the fire hydrant assembly in accordance with the printed recommendations of the manufacturer of the fire hydrant.

SECTION 11. WATER MAIN GATE VALVES

11.1 **SCOPE:** The work covered under these items includes the furnishing of all plant, labor, equipment, appliances and materials, and in performing all operations in connection with providing the construction of water main gate valves, at the locations and to the lines and grades indicated and/or as directed, including all valves, valve fittings and accessories, connections to other piping and structures, testing of pipelines and associated isolation gate valves and material tests, jointing and jointing materials, services of manufacturer's representative, and all other related and appurtenant work, complete in place and accepted, in accordance with the drawings and specifications, and as directed.

11.2 **SUBMITTALS:**One (1) set of shop drawings shall be submitted for the valves and appurtenances indicating type of joint, and lining and coating, etc., in accordance with the specifications. Shop drawings shall consist of manufacturer's scale drawings, cuts or catalogs including descriptive literate and complete characteristics and specifications, and code requirements. (revised 10/l/97)

11.3 **MATERIAL:** 13.3.1 The water main gate valves and gate valve fittings for all items under this Section of the specifications shall be as specified in Section 13.3.2.

11.3.2 Water Main Gate Valves and Gate Valve Fittings: Gate valves shall be ITT Kennedy "Ken-Seal" resilient seated gate valves (or approved equal) for each applicable outside diameter water main or approved equal by the Public Services Director. Gate valves shall open left turn (counterclockwise) . Resilient seat, wedge type gate valves shall be manufactured to meet all applicable requirements of AWWA C509. Valves 12 inches and smaller shall be bubble-tight at 200 psi water working pressure, tested in both directions. (revised 10/l/97)

Valve bodies shall be of cast iron and shall have non-rising threaded bronze stems acting through a bronze stem nut. opening nuts shall be two (2) inches square and shall open as specified above. All buried valves shall have mechanical joint ends. Valve wedges shall be of cast iron with resilient seating surfaces permanently bonded to the wedges in strict accordance with ASTM D429 or attached to the face of the wedges with stainless steel screws. Each valve shall have a smooth, unobstructed water way free from sediment pockets. (revised 10/l/97)

Valves shall have low friction, torque-reduction thrust bearings. All o-rings and gaskets shall be removable without taking the valves out of service. (revised 10/l/97)

A non-toxic epoxy coating which is safe for potable water shall be applied to exterior and interior valve surfaces. (revised 10/l/97)

11.3.3 VALVE BOXES AND EXTENSIONS: The inside diameter of the boxes shall be at least 4-1/2 inches for 4-inch and smaller valves and 5-1/2 inches for 6-inch and larger valves and the lengths shall be as necessary to suit the ground elevation and the depth of each valve operated, regardless of the depth of cover. (revised 10/l/97)

When there is more than six (6) feet of cover, valve operators shall have non-rising extension stems which raise the operating nut to a depth of approximately four (4) feet below grade. The extension stem shall have a centering support ring at the upper end. The lower socket shall be tapped with a set screw into the valve nut to prevent the extension stem from lifting off the valve nut. (revised 10/l/97)

Each valve shall be provided with a box which has a close fitting cover and is substantially dirt-tight. The top of the cover shall be flush with the top of the box rim. The word "WATER" shall be cast in the top of the cover. (revised 10/l/97)

Valve boxes shall be of cast iron and of the adjustable sliding, heavy pattern type. They shall be so designed and constructed as to prevent direct transmission of traffic loads to the pipe or valve. The upper or sliding section of the box shall be provided with a flange having sufficient bearing area to prevent undue settlement. The lower section of the box shall be designed to enclose the operating nut and stuffing box of the valve and to rest on the backfill. The boxes shall be adjustable through at least six (6) inches vertically without reduction of lap between sections to less than four (4) inches. (revised 10/l/97)

11.4 **INSTALLATION:** Water main gate valves shall be installed as depicted on construction drawings submitted and approved by the Utilities Department. Water main gate valve access boxes shall be installed to roadway grade elevation. Water main gate valves shall be installed in accordance with the manufacturer's installation specifications and criteria. Any deviation from manufacturer's requirements shall be approved in writing by the Public Services Department. Water main gate valves thrust blocks shall be installed in accordance with Section 15.14 of these technical specifications. (revised 10/l/97)

All valves shall be carefully installed and supported in their respective positions free from distortion and strain. Care shall be taken to prevent damage or injury to the valves and appurtenances during handling and installation. (revised 10/l/97)

All material shall be carefully inspected for defects in workmanship and all debris and foreign material cleaned out of valve openings and seats. All mechanisms shall be operated to check for proper functioning, and all nuts and bolts checked for tightness. (revised 10/l/97)

Valves and other equipment which do not operate easily or are otherwise defective shall be repaired or replaced at the Contractor's expense. (revised 10/l/97)

Valve boxes shall be set plumb and centered directly over the operating nut of the valves. Earth fill shall be carefully tamped around the valve boxes to a distance of four (4) feet on all sides of the boxes or to the undisturbed trench face, if less than four (4) feet. (revised 10/l/97)

11.5 **PRESSURE AND LEAKAGE TESTS:** Water main gate valves and fittings shall be connected in a watertight manner to pass the hydrostatic test criteria specified in chapter 9. (revised 10/l/97)

When performing the Pressure and leakage tests as specified in chapter 9, the Public Services Director shall specify which valves remain open and which valves will remain closed. (revised 10/l/97)

The Public Services Director may at his discretion choose to perform high pressure and leakage tests on each valve. (revised 10/l/97)

The Contractor is advised that valves may not be operated while under test pressures. If a valve is to be operated the Contractor must reduce the pressure to the normal working pressure of the system. (revised 10/l/97)

11.6 **TEST REPORTS AND CERTIFICATES OF COMPLIANCE:** In addition to other requirements specified herein, the Contractor shall furnish to the Public Services Director 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 specification requirements; and valve manufacturer's notarized certificates of conformance stating that all materials to be furnished under these items conform with all specification requirements; and each shipment of valve and valve fittings shall be accompanied with the valve manufacturer's notarized certificate of conformance, certifying that the valve and valve fittings meet all requirements of the specifications. All testing of all material furnished under this Section of the specifications shall be provided by the Contractor.

11.7 **SERVICES OF MANUFACTURER'S REPRESENTATIVES:** The Contractor shall furnish to the Public Services Director, the services of valve manufacturer's representatives for such lengths of time as may be necessary to properly instruct the Contractor's personnel in the proper handling, installation and jointing of the valves in accordance with the printed recommendations of the manufacturer of the valve.

SECTION 12. SERVICE LATERALS

12.1 **SCOPE:** The work covered under this item includes the furnishing of all plant, labor, equipment, appliances and materials, and in performing all operations in connection with furnishing and setting in place all service laterals in accordance with the drawings and specifications, and as directed.

Service laterals within the Town right-of-way (from water main to customer's property line) shall be installed by the Town of South Kingstown Water Division or its designated representative.

Qualified contractors may be permitted to install water services from water main to lot property line in new subdivisions upon authorization by the Public Services Director. Said contractor shall demonstrate to the satisfaction of the Public Services Director substantial and qualified experience in tapping energized water mains.

Qualified contractors will be permitted to construct water services from curbstop shut-off to dwelling structure.

12.2 **SUBMITTALS**: One (1) set of manufacturer's literature of the materials of this section shall be submitted for review.
(revised 10/l/97)

12.3 **MATERIAL**: 12.3.1 Service lateral material: All piping and associated piping fittings used in municipal water service laterals shall be in accordance with Section 14.2.2.

12.3.2 WATER MAIN SERVICE-ROCKWELL 313 PIPE SERVICE SADDLE OR APPROVED **EQUAL** CORPORATION STOP- FORD "BALLCORP" TYPE FB1000 (AWWA CC MALE PIPE THREAD INLET, COMPRESSION OUTLET) OR APPROVED EQUAL

SERVICE PIPE	3/4" NOMINAL DIAM. PLASTIC TUBING WATER SERVICE PIPE COPPER TUBING SIZE - (CTS) MIN. PRESSURE CLASS 160 PSI
CURB STOPS	RD B 44 - 333 3/4" (CTS) BALL VALVE CURBSTOP, OPEN LEFT FLAT VALVE KEY, COMPRESSION FITTINGS BOTH ENDS

CURB STOP BOX	"ERIE STYLE/ARCH BASE" CAST IRON CURB BOX, 30" ROD LENGTH ADJUSTABLE 4-5 FEET BOX LENGTH, PENTAGON NUT CURB BOX LID
WATER METER	NEPTUNE 5/8" X 3/4" T-10 NUTATING COLD WATER METER WITH "PRO-READ" RECEPTACLE WITH 3 LEAD WIRE
METER SETTING	FORD 5/8" X 3/4" NO. 2 "KORNERHORN" OR APPROVED EQUAL (NEW INSTALIATIONS)
DUAL CHECK VALVE	FORD 3/4" "KORNERHORN" DUAL CHECK VALVE STYLE HHS (CARTRIDGE TYPE) OR APPROVED EQUAL
METER ISOLATION VALVE	FORD 3/4" "KORNERHORN" STRAIGHT BALL VALVE WITH HANDLE OR APPROVED EQUAL

Above lateral service components shall be installed in accordance and as depicted in the details as shown at the end of these specifications.

12.4 **INSTALLATION**: 12.4.1 General: A water permit issued by the Public Services Department must be obtained by the Contractor prior to commencing water service installations from water main to property line.

All piping, fittings, and accessories shall be carefully inspected by the Contractor for defects before installation and all defective, unsound or damaged materials shall be rejected. The Public Services Director shall make such additional inspection as he deems necessary and the Contractor shall furnish all necessary assistance for such inspection. Proper implements, tools and facilities, satisfactory to the Public Services Director, shall be provided by the Contractor for the proper and satisfactory execution of the work. (revised 10/l/97)

Pipe, pipe fittings, accessories and appurtenances shall be new and unused and shall be of the types and materials specified, as indicated and as directed. 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. The trench bottom and sand bedding shall be shaped and compacted to give substantially uniform unyielding circumferential support to the service piping. (revised 10/l/97)

Trenches shall be kept free from water at all times so as to prevent flotation of the pipes. Service lines shall be constructed in dry trenches and shall not be laid when the condition of the trench or the weather is unsuitable for such work. At times when work is not in progress, open ends of piping and fittings shall be securely closed so that no trench water, earth or other substance will enter the pipe or fittings. All materials found to be defective during the progress of the work will be rejected by the Public Services Director and the Contractor shall promptly remove such defective material from the site of the work. (revised 10/l/96)

All defective material shall be replaced by the Contractor with new sound material. The Contractor shall be responsible for the safe storage of all material. No spalls, shims or lumps shall be used to raise the service piping to grade. All service piping shall be maintained accurately to the required line and grade. No pipe fitting joints shall be covered in any way until the joints have been inspected. Service piping shall be protected at all times during construction against flotation and shall be thoroughly secured, properly supported and bedded to prevent settlement or disturbance. (revised 10/l/97)

At each service, a curb stop and box shall be installed at the property line. Curb stops and boxes shall be set plumb and centered with the box located directly over the stop. The box shall be set on a concrete block or flat stone. Earth fill shall be carefully tamped around the boxes to a distance of four (4) feet on all sides of the box or to the undisturbed face of the trench, if less than four (4) feet. (revised 10/l/97)

12.4.2 Jointing plastic service piping/tubing: The Contractor shall furnish to the Public Services Director, for his use, copies of the printed recommendations of the pipe and pipe jointing manufacturers for the handling, storing, protection and installation of pipe and fittings. Cutting of pipe where approved by the Public Services Director shall be performed by qualified workmen using approved mechanical cutters; irregularly cut pipe will not be acceptable.

The water service line shall be continuous in length and without joint from the curbstop shut-off valve to water meter location. In cases where the service line exceeds 500 feet in length prior written approval from the Public Services Director is required to use a compression type union.
(revised 10/l/97)

12.4.3 Joint surfaces where approved by the Public Services Director shall be protected from damage and shall be kept free from dirt or other foreign material at all times; all joint surfaces shall be free from any defects or material which would impair the proper jointing and watertightness of joints. Pipe and fittings on which, in the opinion of the Public Services Director, the joint materials or joint surfaces have been damaged, deformed, indented, marred or otherwise become defective shall be rejected and shall be removed from the site and the Contractor shall replace the rejected material with new and sound material. (revised 10/l/97)

12.4.4 Synthetic detection tape that is not biodegradable shall be utilized and placed a minimum distance of two (2) feet above top of service laterals. Tape shall state "Water" or similar approved statement depicting underground water utilities. (revised 10/l/97)

12.4.5 Minimum piping depth installation below grade shall be four feet six inches (41-611**)** to top of pipe outside diameter.
(revised 10/l/97)

12.4.6 Service connections shall be tested and disinfected in accordance with AWWA standards.
(revised 10/l/97)

SECTION 13. MISCELLANEOUS CONCRETE WORK

13.1 **SCOPE:** 13.1.1 The work covered under this item includes the furnishing of all plant, labor, equipment, appliances and materials, and in performing all operations in connection with providing the construction of all plain cement-concrete work for pipe cradles, encasements, thrust blocks, and appurtenant work, as shown on the drawings and as directed, complete in place and accepted, in accordance with the drawings and specifications. Prior to placing the concrete, the Contractor shall be responsible for checking and maintaining the proper locations of all parts to be embedded in concrete work.

13.2 **CLASS OF CONCRETE:** All cast-in-place concrete shall have a compressive strength at the end of twenty-eight (28) days of not less than 3,000 pounds per square inch.

13.3 **MATERIALS:** 13.3.1 Cement shall conform to the standard specifications for Portland cement of ASTM Designation: C 150-74, Type 1, unless otherwise directed. Whenever directed by the Public Services Director, a quick-setting cement shall be used where directed for any purpose.

13.3.2 Fine aggregate shall consist of washed sand having clean, hard, durable, uncoated grains free from deleterious substances and shall range in size from coarse to fine within the following percentages by weight:

Passing No.	4 sieve	----------	95-100%
Passing No.	16 sieve	----------	45- 70%
Passing No.	50 sieve	----------	15- 30%
Passing No.	100 sieve	----------	3- 8%

Volume removed by sedimentation not more than three (3) percent. Fine aggregate shall conform in all other respects to ASTM Designation: C-33-74.

13.3.3 Coarse aggregate shall consist of crushed trap rock or hard ledge stone having clean, hard, durable, uncoated particles free from deleterious matter. The grading shall be within the following percentages by weight:

Passing 1-1/211	sieve	----------	100%
Passing 111	sieve	----------	95-100%
Passing 1/211	sieve	----------	25- 60%
Passing No. 4	sieve	----------	0- 10%

Coarse aggregate shall comply in all other respects to standards of ASTM Designation: C 33-74.

13.3.4 Mixing water for concrete shall be clean and shall preferably be obtained from the municipal supply.

13.3.5 Admixture: Cement-concrete for manhole bases shall contain a retarding densifier admixture as an integral part of the design mix. Unless specified otherwise, the amount of densifier used shall not exceed the proportion of 1/2 pound per bag of cement at concrete placing temperatures below 65 degrees F. and 3/4 pound at temperatures above 65 degrees F. The densifier shall have the following characteristics and when used in the proportions required at specified temperatures, shall secure the following improvements of concrete containing densifier compared to reference concrete without the densifier.

(1) For equal water cement ratio - increase the slump from three (3) to at least four and one-half (4-1/2) inches and increase the compressive strength at twenty-eight (28) days at least ten (10) percent.

(2) For reduced water cement ratio - maintain a slump and increase compressive strength at twenty-eight (28) days at least fifteen (15) percent.

(3) For reduced water cement ratio - delay the setting time of concrete at least twenty (20) percent under normal temperature conditions.

(4) For equal or reduced water cement ratio - increase the unit weight of concrete.

The Contractor shall submit a statement from the manufacturer of the densifier certifying that his product meets specification requirements.

13.4 **STORAGE OF MATERIALS:** 13.4.1 Cement shall be stored immediately upon receipt at the site of the work. Cement in sacks shall be stored in a suitable weatherproof structure which shall be as airtight as practicable, floors shall be elevated above the ground a distance sufficient to prevent the absorption of moisture. Sacks shall be stacked close together to reduce circulation of air, but shall not be stacked against outside walls; the manner of storage shall permit easy access for inspection and identification of each shipment. Bulk cement shall be transferred to elevated airtight and weatherproof bins. At the time of use, all cement shall be free-flowing and free from lumps. Cement that has hardened or partially set shall be removed from the site and not used in the work.

13.4.2 Aggregates shall be stored on areas covered with tightly laid wood planks, sheet metal or other hard and clean surface, and in a manner that will preclude the inclusion of foreign material. Aggregate of different sites shall be stored in separate piles. Stockpiles of coarse aggregate shall be built in horizontal layers not exceeding four (4) feet in depth to avoid segregation. Should the coarse aggregate become segregated, it shall be remixed to conform to the grading requirements given here.

13.5 **INSPECTION:** Cement-concrete shall be proportioned, mixed and placed only in the presence of the Public Services Director, and the Contractor shall give ample notice to the Public Services Director before mixing is commenced.

13.6 **TESTS:** 13.6.1 Portland cement will be tested by the Public Services Director.

13.6.2 Aggregates will be tested by the Public Services Director.

13.6.3 Tests of cement-concrete test specimens will be made by the Public Services Director. When required by the Public Services Director, six (6) inch by twelve (12) inch test cylinders shall be made in accordance with the requirements of ASTM Designation: C 1992-69; test cylinders will be tested in accordance with the requirements of ASTM Designation: C 39-72 as revised to date. The cost of making laboratory tests for concrete work will be at the expense of the Public Services Director, but the Contractor shall furnish the facilities for making, protecting, caring for and transporting the test specimens.

13.7 **PROPORTIONING OF CONCRETE MIXES:** The proportioning of concrete materials shall be based on the requirements for a plastic and workable mix. Not less than six (6) sacks (94 pounds per sack) of Portland cement per cubic yard, and not more than 6-1/2 gallons of water per sack of cement shall be used in the mix. The surface water contained in the aggregates shall be included in the total water used. Slump shall not exceed three (3) inches. Concrete for all concrete work shall attain a twenty-eight (28) day compressive strength of not less than 3,500 pounds per square inch, as determined by the "Standard Method of Making Compression Tests of Concrete," ASTM Designation: C 39-72; the design of the concrete mix to be used in the work shall be subject to the approval of the Public Services Director.

13.8 **CONCRETE MIXING:** 13.8.1 Concrete shall be mixed until there is a uniform distribution of the materials and shall be discharged completely before the mixer is recharged. Concrete shall be delivered in watertight containers which will not permit segregation of the material. When delivered the concrete shall be uniform throughout the mass. Concrete mixing shall conform to all requirements of ASTM Designation: C 94-74, except as modified herein.

13.8.2 Type of plant: The batching plant and mixing equipment shall have a capacity as required to perform the work within the specified time. Either a manual or semi-automatic plant may be used, subject tothe approval of the Public Services Director. A manual plant is defined as one in which batch weights are set manually and materials are batched manually. A semi-automatic plant is defined as one in which batching weights are set manually, mixes are charged manually, and materials are batched automatically.

13.8.3 Job-mixed concrete shall be mixed in a batch mixer for not less than one (1) minute after all the material is in the mixer drum and until there is a uniform distribution of the material and the mass is uniform in color and is homogeneous. The mixer shall rotate at a

peripheral speed of about two-hundred (200) feet per minute and shall not be loaded above its rated capacity.

13.8.4 Truck-mixed concrete may only be used when and as approved by the Public Services Director.

13.8.5 Sampling and Inspection: The Public Services Director shall have free access at all times to the batching and mixing plant for sampling of all material and inspection of work performed for this project.

13.9 **CONSTRUCTION JOINTS**: The placing of concrete shall be such that the concrete for each structure shall be placed in one continuous operation, except that where construction joints are indicated the concrete shall be placed in one continuous operation between construction joints. Construction joints in addition to those indicated or changes in location of construction joints indicated will not be permitted except upon written permission of the Public Services Director.

13.10 **PLACING CONCRETE**: 13.10.1 Preparation for placing: Water shall @e removed from excavations before concrete is deposited. Any flow of water shall be diverted through proper side drains and shall be removed without washing over the freshly deposited concrete. Hardened concrete, debris and foreign materials shall be removed from interior of forms and from inner surfaces of mixing and conveying equipment. The subgrade for concrete work placed on said bedding foundation shall be maintained in an approved, smooth and thoroughly compacted condition in conformity with the required section and grade until the concrete is in place. The subgrade shall be thoroughly moistened, but not muddy, at the time the concrete is deposited. No concrete shall be placed until forms and all work to be built into concrete have been satisfactorily installed and inspected.

3.10.2 Placing temperature during cold weather: Concrete shall not be placed when the ambient temperature is below thirty-five (35) degrees F. nor when the concrete without special protection is likely to be subjected to freezing temperature before the expiration of the specified curing period. If necessary to place concrete under conditions of low temperature, placement shall be approved by the Public Services Director. The temperature of the concrete when placed shall be not less than fifty (50) degrees F. nor more than seventy (70) degrees F. Heating of the mixing water and/or aggregates will be required as necessary to maintain the minimum temperature of fifty (50) degrees F., and all methods and equipment for heating shall be satisfactory to the Public Services Director. Materials shall be satisfactory to the Public Services Director. Materials shall be free from ice, snow and frozen lumps before entering the mixer. Suitable covering and other means Shall be provided for maintaining the concrete at the temperatures and the lengths of time as specified herein under paragraph entitled, "CURING." Salt, chemicals or other foreign materials shall not be mixed with the concrete to prevent freezing. Any concrete damaged by freezing shall be removed and replaced by the Contractor.

13.10.3 Placing: The gravel foundations on which concrete is placed shall be clean, damp and free from frost, ice and standing or running water and shall be thoroughly compacted in a satisfactory manner. Concrete shall be handled from mixer to transport vehicle to place of final deposit in a continuous manner, as rapidly as practicable, and without

segregation or loss of ingredients until the unit of construction is completed. Concrete that has attained its initial set or has contained its mixing water for more than thirty (30) minutes shall be not placed in the work. Placing will not be permitted when, in the opinion of the Public Services Director ' the sun, heat, wind, temperature of limitations of facilities furnished by the Contractor prevent proper finishing and curing of the concrete. Forms shall not be splashed with concrete in advance of pouring. When placing concrete for encasements, precautionary measures shall be taken to prevent the displacement of piping or disturbing of joints of the piping, displaced piping or disturbed joints shall be made good by the Contractor in a manner satisfactory to the Public Services Director. Concrete shall be placed in the forms in uniform layers as nearly as practicable in final position. Immediately after placing, concrete shall be compacted thoroughly in a satisfactory manner. Tapping or other external vibration of forms will not be permitted. Concrete shall not be placed on concrete sufficiently hard to cause formation of seams and planes of weakness within the section. Concrete shall not be allowed to drop freely more than five (5) feet. Concrete to receive other construction shall be screened to the proper level.

13.10.4 Concrete on gravel foundation: Gravel foundation on which concrete is placed shall be clean, damp and free from frost, ice and standing or running water. Prior to placing concrete, the gravel foundation shall be satisfactorily compacted as specified under Section entitled, **"SAND BEDDING."**

13.11 **PATCHING:** 13.11.1 Any concrete which is not formed to the details as shown on the drawings or for any reason is out of alignment or level or shows a defective surface shall be considered as not conforming with the intent of these specifications and shall be removed from the job by the Contractor unless the Public Services Director grants permission to patch the defective area.

13.11.2 Permission to patch defective work will not be considered a waiver of the right of the Public Services Director to require complete removal of the defective work, if, in the opinion of the Public Services Director, the patching does not satisfactorily restore the quality and appearance of the surface.

13.12 **FINISH:** 13.12.1 Immediately after removal of the forms, all fine and loose material shall be removed; honeycomb, aggregate pockets, voids and holes over 1/2 inch in diameter shall be cut out to solid concrete, thoroughly wetted, brush-coated with neat cement-grout and filled with cement-mortar composed of one (1) part cement to two (2) parts of fine aggregate. Patching of any surface irregularities, especially those resulting from honeycombing, shall be done only after inspection by the Public Services Director for his determination as to whether or not the work is satisfactory enough to remain in the structure. Mortar shall be placed in layers as required, with each layer being thoroughly compacted in place. The final layer shall be finished flush and in the same plane as adjacent surfaces. Patchwork shall be damp-cured for seventy-two (72) hours.

13.12.2 Uniformed exposed surfaces to receive masonry or mortar setting beds shall be finished by tamping the concrete with special tools to force aggregate away from the surface, then screening and floating to bring surfaces to the required finished levels and form, wood-floated to true even surfaces and then given a broom finish for the proper bonding of masonry or mortar. Other uniformed surfaces shall be finished as directed. Formed surfaces

to receive masonry shall be free from loose material, foreign particles or any other condition which would impair the bonding of the masonry to the concrete.

13.13 **CURING:** Curing shall be accomplished by preventing loss of moisture, rapid temperature change and mechanical injury or injury from rain or flowing water, and kept moist for a period of at least seven (7) days after placing. During this period concrete shall be maintained at seventy (70) degrees F. for at least four (4) days or above fifty (50) degrees F. for at least seven (7) days. All concrete shall be damp-cured in a suitable and approved manner and curing shall be started as soon after placing and finishing as practicable.

13.14 **THRUST BLOCKING:** Thrust blocking of water distribution mains are mandatory in the following applications:

a) At any joint fitting
b) When piping changes elevation or horizontal direction due to a joint fitting
c) At termination of a water main
d) At a fire hydrant **(NOTE:** Under no circumstances shall a concrete thrust block be poured around a fire hydrant shoe, as to prevent (1) access to flange bolts and/or blockage of hydrant shoe drains).

All thrust blocks shall be installed as depicted in Drawings at the end of these specifications.

SECTION 14. FERTILIZING, GRASSING AND APPURTENANT WORK

14.1 **SCOPE:** The work covered under this item includes the furnishing of all plant, labor, equipment, appliances and materials, and in performing all operations in connection with the preparation of the ground for seeding, liming, fertilizing, and rolling of the top-soiled areas within the limits If the areas indicated for grassing and/or where directed, and the raking, rolling, watering and maintenance of all seeded areas, complete and accepted, in accordance with the specifications and the drawings.

14.2 **MATERIALS:** 14.2.1 Commercial fertilizer shall be a complete fertilizer with thirty (30) to forty (40) percent of the nitrogen derived from natural organic sources and containing in available form by weight eight (8) percent nitrogen, six (6) percent phosphoric acid and four (4) percent potash. The commercial fertilizer shall be delivered to the site in the original unopened containers which shall bear the guaranteed statement of analysis of the manufacturer.

14.2.2 Lime shall be ground, dolomitic, agricultural lime-stone and shall contain a minimum of eighty-five (85) percent total carbonates. It shall be ground to a fineness so that eighty (80) percent will pass through a one-hundred (100) mesh sieve and ninety-five (95) percent through a sixty (60) mesh sieve. A certificate from a reputable producer of ground, dolomitic agricultural limestone attesting that his product meets the above specifications shall be submitted by the Contractor.

14.2.3 Lawn seed shall be fresh, clean, new crop seed. Seed may be mixed by an approved method on the site or may be mixed by the dealer. If the seed is mixed on the site each variety shall be delivered in the original containers which shall bear the guaranteed analysis of the dealer. If the seed is mixed by the dealer, the Contractor shall furnish to the Public Services Director the guaranteed statement of the dealer of the composition of the mixture and percentages of purity and germination of each variety.

Grass seed for the grassed areas shall be composed of the following seeds mixed in the proportions by weight and testing the minimum percentages of purity and germination as indicated below.

	Proportion	%of	% Germination

Type of Seed	by Wgt. %	Purity	
Penn Lawn Chewings Rescue	40	95	88
Kentucky Blue grass	25	95	90
Merion Blue grass	25	95	90
Perennial Rye grass	10	98	90

14.3 **PREPARATION OF SEED BED:** Before starting work, approved types of equipment shall be on hand and it shall be demonstrated that the application of lime, fertilizer and seed will be made at the specified rates.

14.3.1 The seed bed shall be brought to the required finished grades, free from ridges and depressions, through successive stages of light rolling, fine grading and raking operations. The surfaces shall be cleared of all objectionable weeds and shall be free from stone, roots or objects larger than one (1) inch in diameter and other material which would be a hindrance to planting operations or to plant growth. A finely pulverized seed bed shall be obtained.

14.3.2 Application of lime and fertilizer: Lime shall be spread uniformly over the areas to be seeded at a rate of 2,000 pounds per acre. Fertilizer shall be spread uniformly over the areas to be seeded at a rate of nine-hundred (900) pounds of 8-6-4 commercial fertilizer per acre. Each material shall be incorporated independently into the top three (3) inches of soil by disking, harrowing or other acceptable methods. Sticks, stones and debris shall be removed from the areas and satisfactorily disposed of. After incorporation of the lime and fertilizer with the topsoil, the areas shall be rolled or dragged to form a firm seed bed.

14.4 **PLANTING SEED:** After the areas to be seeded have been prepare @ as specified herein, the specified seed mixture shall be uniformly sown thereon at a rate of four (4) pounds per 1,000 square feet. Hand seeders, power-drawn drills or other approved equipment shall be used. After sowing, the seed shall be lightly covered and the seeded areas compacted by rolling. Seed shall be sown only between the periods from April 5th to May 25th, and August 25th to September 25th.

14.5 **PROTECTION:** All seeded areas shall be protected against traffic or other use by erecting barricades, warning signs or by other approved methods. The Contractor shall repair any damage resulting from his operations at no additional expense to the Public Services Director.

14.6 **MAINTENANCE AND ACCEPTANCE:** All areas and parts of areas which fail to show a satisfactory stand of grass for any reason whatsoever, shall be reseeded, repeatedly if necessary, until all areas are covered with an adequate growth of grass. All seeded areas shall be maintained including watering, mowing and weeding, and all reseeding shall be provided by the Contractor at no additional expense to the Public Services Director, until the work has been accepted.

SECTION 15. TRAFFIC POLICE

Paragraph
Number Paragraph Title

15.1 Scope

15.1 **SCOPE:** 15.1.1 The work covered under this item includes the furnishing of the services of police officers for supplementary traffic control in the vicinity of the work sites, at the times and locations as directed by the Public Services Director and in accordance with the following requirements:

(1) All services of police officers for whom compensation is to be paid under Section 18 shall have been employed by the Contractor only at such locations and times and for such lengths of time as directed by the Public Services Director.

(2) Police officers shall be paid on an hourly basis at a rate not less than the prevailing wage rates paid to police officers of the Town of South Kingstown, Rhode Island.

(3) Police officers shall be stationed at the locations directed by the Public Services Director.

15.1.2 The Contractor shall provide all lights, barriers, watchmen ' flagmen and such other facilities at the sites of the work for the prevention of accidents, protection of persons, property and the work, direction of traffic and such other purposes at the sites of the contract work in accordance with the requirements specified elsewhere in these specifications, at no additional expense to the Utilities Department.

15.1.3 When, in the opinion of the Public Services Director, conditions in the vicinity of the work site are such as to require traffic control measures to supplement those required to be provided by the Contractor as described in the preceding paragraph, the Public Services Director may direct the Contractor to furnish the services of police officers for traffic control in the vicinity of the work site at the specific locations, times and lengths of time as directed by the Public Services Director.

Table Required Flow and Openings to Flush Pipelines (40 psi Residual Pressure in Water Main)*

Pipe Diameter *in.*	Flow Required to Produce 2.5 ft/s (approx.) Velocity in Main *gpm*	Size of Tap *in.* *1 1/2*	2	Number of 2 1/2-in. Hydrant Outlets*
		Number of Taps on Pipet		
4	100	-		1
6	200	1		1
8	400	2	1	1
10	600	3	2	1
12	900	-	2	2
16	1600		4	2

*With a 40-psi pressure in the main with the hydrant flowing to atmosphere, a 2 1/2-in. hydrant outlet will discharge approximately 1000 gpm and a 4 1/2-in. hydrant outlet will discharge approximately 2500 gpm. The number of taps on pipe based on discharge through 5 ft of galvanized iron (GI) pipe with one 90' elbow.