

MERRIMACK VILLAGE DISTRICT



WATER WORKS
www.mvdwater.org

Specifications for Water Main Installation, Extensions, Service & Distribution System

SPECIAL NOTE:

**48 Hour Notice Required
Prior to ANY Installation
of Merrimack Village
District Water Lines and
Services.**

Revised: March 10, 2008

Accepted and approved by the Merrimack Village District Board of Commissioners
on August 21, 2006.



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**SHOULD CONFLICTING REQUIREMENTS BE
FOUND AMONG THESE STANDARDS, THE MORE
STRINGENT SHALL GOVERN**

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A. CONSTRUCTION MEETING INFORMATION AND CHECKLIST

DATE: _____

TIME: _____

JOB NAME: _____

LOCATION: _____

DEVELOPER NAME AND PHONE: _____

CONTRACTOR NAME AND PHONE: _____

JOB SUPERINTENDENT NAME AND PHONE: _____

ITEMS HANDED OUT:

- Mainline Extension Policy
- Mainline Extension Process
- Application for Mainline Extension
- Water Mainline Specifications
- Current Schedule of Rates
- Fire Sprinkler Application
- Entrance Application
- Current By-Law Book
- Deviations discussed from plans submitted:

ADDITIONAL COMMENTS: _____



MAINLINE EXTENSION PROCESS

1. Pre-construction meeting. (Minimum two (2) day notice required.)
2. Application for any mainline extension, entrance or fire sprinkler to be signed by owner, developer or developer's representative and fee paid as per the MVD "Schedule of Rates".
3. Record Drawings Deposit as per the MVD "Schedule of Rates".
4. Plan submission by owner, developer/developer's representative. Detail sheets/drawings shall include utility design and layout.
5. In house plan review to determine if plans need further engineer review at the hourly rate as listed in the MVD "Schedule of Rates".
6. Plan review by MVD engineer (cost to be borne by the developer).
7. Letter of water availability will be supplied only after in-house and/or engineer review has been completed and applicant has agreed to any changes/recommendations by the MVD.
8. Construction detail sheets and specs provided by MVD.
9. Schedule of Rates provided by MVD.
10. Construction Meeting and Information Checklist provided by MVD.
11. Inspection by MVD while work is in progress (cost to be borne by the developer at the hourly fee listed in the MVD "Schedule of Rates").
12. Pressure test results provided to MVD.
13. Bacterial test results provided to MVD.
14. Compaction test results provided to MVD.
15. Statement of Approval from the Town of Merrimack that all line locations in the Town Right-Of-Way or roadway has been met.
16. Final inspection for water turn-on. (Minimum 48 hour notice to MVD necessary).
17. Exit conference at completion of installation.
18. Submission of Record Drawings and return of deposit.

*Subject to change by the MVD Schedule of Rates as may be adopted from time to time by Board of Commissioners.

MAINLINE EXTENSION PROCESS

Note: The District may require the developer/contractor to extend the proposed water main to an existing part of the system that will provide better service to the area (example: completing a loop of the system). This to be determined by the MVD engineer and at the developer/contractor's cost.

The developer/contractor is required to meet in person with the MVD after final acceptance by the Town of Merrimack Planning Board to discuss any changes made to the plans.

I understand and agree that all of the above items have been conducted, reviewed and/or supplied to me and that no letter of water availability or water will be supplied until all above areas are satisfied and in compliance with the District By-Laws, Rules and Regulations.

Developer Signature

Date

Contractor Signature

Date

Printed Name

Printed Name

Authorized Rep – MVD

Date

Owner's Signature

Date

Printed Name

Printed Name

C. GENERAL INFORMATION

1. **Definitions.** The following terms are used throughout these specifications and shall have the meanings as set forth:
 - **Merrimack Village District (MVD):** A municipal utility that provides water service in the Town of Merrimack.
 - **MVD Board of Commissioners (BOC):** Governing body of the MVD.
 - **Owner/Developer:** Person or persons who owns and develops real estate.
 - **Contractor:** Within the context of these specifications, a person or persons, co-partnership or corporation working under a legal contract for the purpose of installing water system extensions or replacements.
 - **Subcontractor:** an individual or business firm contracted to perform part of all of the contractor's contract.
 - **Superintendent:** Superintendent shall mean the Water Superintendent who operates under the authority of the MVD Board of Commissioners.
 - **Distribution System:** Mains, including all necessary valves, fire hydrants, taps, meters, service pipes, storage tanks and associated material required to deliver water to individual customers.
 - **Inspector:** Any authorized representative of the MVD assigned to a particular construction project.
 - **Main Extension:** Extensions to the existing MVD water distribution system.
 - **Potable Water:** Water intended and suitable for human consumption.
 - **Service Line:** The water line extended from the water distribution main up to the premises.
 - **Water Main:** Water lines which transmit or distribute water to the Town of Merrimack from storage facilities to the users, excluding service lines.
 - **Water user, user, customer:** An individual, company, corporation, church, municipal entity, etc. who is connected to the MVD's water system and uses water or received benefit from the service supplied or any building, property within 600' of a hydrant.
2. **Revisions and Amendments.** At any time, these specifications may be revised or amended. Any changes will be enforceable after revisions or amendments are documented in writing.
3. **Control.** These specifications will apply to any part of the water distribution system under the control of the MVD
4. **Discrepancies.** Any discrepancies or varied interpretations found in these Specifications shall be decided upon by the Superintendent of the Merrimack Village District. The MVD By-Laws will govern in cases of conflict.
5. **Water Industry Abbreviations.**
 - **ANSI** – American National Standard Institute
 - **ASTM** – American Society for Testing and Materials
 - **AWWA** – American Water Works Association
 - **OSHA** – Occupational Safety and Health Administration
 - **SDWA** – Safe Drinking Water Act
 - **CIP** – Cast Iron Pipe
 - **DIP** – Ductile Iron Pipe
 - **PVC** – Polyvinyl Chloride, plastic pipe
 - **GPM** – Gallons Per Minute
 - **PSI** – Pounds Per Square Inch
 - **PPM** – Parts Per Million

- MVD – Merrimack Village District
 - TOM – Town of Merrimack
 - MDPW – Merrimack Department of Public Works
6. **Conflict Resolution.** Should a conflict occur between Standards or within drawings or specifications, an interpretation shall be made by the Business Manager/Superintendent of the MVD or the Engineer for the MVD which will provide the overall best installation.
 7. **Distribution System Sizing.** All mains shall be sized large enough to provide for domestic and fire protection flows to the area requesting water service. The Merrimack Village District reserves the right to size mains to provide service for projected future needs. In business and industrial areas, water main sizes may be increased in adherence with recommendations the Uniform Fire Code to provide adequate fire flows. Apartment complexes and other high density housing may be subject to larger mains for adequate fire flows even though their water system may remain private.
 8. **Fire Protection.** The number and location of fire hydrants in a given area is determined by the Town of Merrimack Fire Department.
 9. **Private Lines.** Private main installations shall be limited to single platted lots. Water extensions will not be allowed to cross lot lines for the purpose of serving two or more platted lots and buildings. Private main extensions and fire hydrants shall be installed in accordance with these Standards and approved by the MVD Business Manager/Superintendent or the Engineer for the MVD.
 10. **Required Safety and Protection.** Safety of workers shall be provided as required by the Occupational Safety and Health Administration (OSHA). The contractor shall be solely responsible for implementing and supervising all safety precautions and programs associated with the work, including preventing damage, loss or injury to all persons on the site who may be affected by the work, materials and equipment used at the site and other property adjacent to the site, including trees, shrubs, sidewalks, curbs, lawns, structures, roads, other utilities, etc. The contractor shall be responsible for exchanging any safety information with employees or subcontractors including Material Safety Data Sheets (MSDS) or other hazard communication information as required by OSHA. The contractor shall be responsible for obtaining all utility location and will notify other utilities and owners of adjacent property within 100 feet of work by utilizing DigSafe.
 11. **Inspections.** New installation, replacement or relocation of existing facilities or any other work involving the MVD water distribution system shall be inspected and approved by the MVD inspectors. This shall include both public and private mains. The contractor shall give at least 48 hours notice (excluding weekends) to the MVD prior to beginning construction. All materials shall be subject to the inspection and approved of the MVD inspector. Material acceptance by the MVD inspector shall not relieve the contractor of responsibility in the event any inferiority of work arises prior to completion of the one (1) year warranty period.
 12. **Service Inspections.** All water services, fire and potable, shall be inspected by the MVD inspector. The inspection shall include an inspection of the water service line from the corporation to the curb stop, from the curb stop to the structure, and an inspection of the meter and its appurtenances.
 13. **Design.** All plan and profile drawings shall be done by a Professional Engineer registered to practice in the State of New Hampshire. Any deviations from reviewed and approved plans or specifications affecting materials, flow, capacity or distribution system operations shall be reviewed and approved by the MVD Business Manager/Superintendent or the Engineer for the MVD.
 14. **Water Extension Plan Requirements.** Detailed plans shall be prepared by a Professional Engineer registered to practice in the State of New Hampshire. All plans submitted shall

strictly adhere to the Standards contained herein. No work shall commence on any facilities until the plans for construction are approved in writing by the Business Manager/Superintendent or Assistant Business Manager/Superintendent. All materials used in any water distribution construction shall conform to the Merrimack Village District Specifications for Water Main Extension.

15. **Construction Schedule.** Copy must be given to the MVD prior to beginning construction and when any scheduling changes occur.
16. **Permits.** Contractor to provide a copy of all permits regarding mainline installations and the like.
17. **Planning and Design Checklist.** The Merrimack Village District does not guarantee water to any new or developing area.
 1. Allocation of potable water is dependent upon the supply and system pressure at the time of application.
 2. Mains shall not be installed unless they can be extended from an approved permanent water source which can supply sufficient water for chlorinating, flushing and fire flow gallons per minute.
 3. Plans and profiles are required.
 4. Fire hydrant easements are required.
 5. **A minimum twenty foot (20') water main easement is required if not located in a public right-of-way.**
18. **Record Documents.** Contractor shall maintain in a safe place at the site one record copy of all drawings, specifications, addenda, written amendments, change orders, work change directives, field orders, and written interpretations and clarification in good order and annotated to show changes made during construction. These record documents together with all approved samples will be available to the MVD inspector for reference. Upon completion of the work these record documents, samples, etc. will be delivered to the MVD inspector.
19. **Fire Line Connections.** The MVD does not size fire lines. The fire line is sized by the Town of MFD and the persons responsible for the structure it protects. Flushing of fire lines shall meet the requirements of NFPA-13 and shall be witnessed by a representative of the MFD.
20. **Water Line Extension and Tapping Fees.** All extensions to a water main and all water taps are to be paid for in advance and done in a professional manner. Payments may be made at the Merrimack Village District office at 2 Greens Pond Road, Merrimack, NH 03054.
21. **Existing Water System During Construction.** If it is necessary to operate existing water system valves during construction, the contractor shall give the MVD 72 hours notice to arrange valve operation. Valve operations affecting water service to any customers must give the customers 48 hours advance notice. The MFD shall also be notified of any water system shut-down 48 hours in advance and it shall be up to the contractor to provide the total hours required for the work to be done. If the water service interruption will be greater than 8 hours, the work shall be done to minimize customer inconvenience, such as working at night in a continuous operation. If a building or industry is in the affected areas that cannot be with water, such as a hospital, appropriate means shall be taken to provide potable water. The means provided shall be approved by the MVD.
22. **Railroad/Highway Conditions.** Conditions may exist in main installations that require the crossing of a railroad or major highway. Any and all conditions of the other agency must be satisfied. In any conflicts that arise, the plans or specifications that produce the higher quality installation shall prevail.
23. **Leak Services.** The MVD shall repair all leaks occurring on a service line between the curb stop (valve) and the tap. The repair of all other service line leaks shall be the responsibility of the property owner.

24. **Fire Prevention.** All fire service lines shall meet the same requirements as domestic water service lines for materials and installation. Residential fire suppression installations must have plans pre-approved by the MFD. All water charged fire lines, regardless of size, shall have installed a testable double check backflow assembly. These assemblies shall be tested by the MVD on an annual basis by a certified backflow inspector.
25. **Water Regulators.** Where the water system pressure is greater than eighty (80) psi, a water pressure reducing valve designed for 250 psi shall be installed in the water service line after the meter. The water pressure shall not exceed 85 psi at the inlet of the meter under any circumstances. When the MVD determines that a meter bypass is necessary, the bypass shall be installed so that the water passing through the bypass is also regulated into the building.
26. **General Conditions.** All conditions not covered by this specification are to be reviewed by the MVD for suitable alternate installation practices.
27. **Clean-Up.** Upon completion of all work, all unused materials, concrete forms, rubbish and any other like materials shall be removed from the job site and the site shall be left in a state of order and cleanliness.
28. **MVD By-Law #7.A. & B. state in part:** A. "Extensions will be made to the main line of the System upon application of the prospective customer(s) to the Water District Office and will be subject to all rules and regulations of the District. The District may require the developer/contractor to extend the water line to an existing portion of the system to provide better service to the areas to be served (i.e. completing a loop in the system). This is to be determined by the District's engineer and at the developer's cost." B. "All pipeline extensions shall be laid at the sole option of the District Commissioners, under the supervision of the Merrimack Village District and upon completion shall be the property of the District." This supervision/inspection shall be conducted by the MVD's inspector the cost of which shall be charged to the owner/developer/contractor in accordance with the BOC current "Schedule of Rates".
29. **Bacteria Testing** of new waterlines must be done again after 3 days if the line has not been activated.
30. **Any bonding costs** for the installation of waterlines must be included in the Town of Merrimack Road Bond Estimate Form (See Attachment, Page 2).

D. MATERIALS LIST

1. **CONTRACTOR SHALL PROVIDE THE MVD WITH A MATERIALS LIST PRIOR TO COMMENCING CONSTRUCTION.**
2. Materials for new water mains shall be of new and unused materials and shall conform to the requirements specified herein.
3. Ductile iron pipe shall be used on all water mains four (4) inches or larger. All ductile iron pipes shall be double thickness cement-mortar lined and provided with superbell, tyton, or mechanical push-on joints and gaskets. All ductile iron pipe must conform to the requirements of the American Water Works Association (AWWA) C151-86, Class 52 (350 psi) specifications.
4. Polyethylene Pressure Pipe Copper Tube Size (C.T.S.) pipe shall be used for all two (2) inch water mains. All two (2) inch pipe shall be provided a 250 - 300 psi pressure rating. All two (2) inch PVC pipe shall conform to the American Society for Testing and Materials (ASTM) 1248 and 3350 specification.
5. Tracer wire is to be installed directly above all non-metallic water lines in a sand bed located twenty-four (24) inches below finish grade or as directed by the MVD inspector.
6. All materials are subject to the MVD's inspector approval.
7. When the quality of any material is questioned, it will be the owner's responsibility to prove to the MVD's inspector that the materials in question comply with the MVD's requirements.
8. Materials that, in the MVD's inspector's opinion are damaged, mishandled, or defective shall be removed from the construction site.
9. In the absence of a recognized and approved industry standard for miscellaneous hardware, all materials must have the MVD's inspector's approval.
10. Miscellaneous Hardware: underground pipe clamps, transition couplings, three quarter (3/4) inch treaded rod, heavy duty washers, star bolts, duc locs.
11. Tracer Cable: shall be heavy tracer wire manufactured by BMS, Division of Ablestar Corporation, Avon, MA (or equivalent, as approved by the MVD).
12. Nuts and Bolts: all bolts, t-bolts, and nuts for mechanical joint connections shall comply with the AWWA C111 specifications.
13. Pipe Lubricant: must be non-toxic and FDA approved for use in contact with potable water.
14. Teflon pipe tape must be U.L. approved, 100% pure P.T.F.E.
15. Pipe Joint Compound: may be either the conventional type compound or Teflon impregnated resin compound. The selected joint compound must be approved for use in contact with potable water.
16. MJ Restrained Joints: for PVC pipe, shall have full 360-degree restraint. MJ restrainer four - twelve (4 - 12) inches shall be the gripping as manufactured by Romac Industries and meeting or exceeding ASTM A536-80.
17. Hydrants shall be manufactured by one of the following or an approved equal:
 - a) The Mueller Valve Co. of Decatur, IL
Centurion A-421 with Mechanical Joint Base
 - b) Kennedy of Elmira, NY
K81-D with Mechanical Joint Base
 - c) The Waterous Co. of South St. Paul, MN
The Pacer WB-67 with Mechanical Joint Base
18. Tees for hydrants must be MJ Hydrant Tees, Class 350 or an approved equal. All MJ Glands must be Megalug and shall be manufactured of ductile iron conforming to ASTM A-536-80. All water piping for hydrants must be ductile iron, Class 52.
19. Concrete is to be mixed to produce a compressive strength of not less than 3,000 psi after 28 days. Minimum curing time shall be eighteen (18) hours. Approved pre-cast concrete block may also be used.

E. TRAFFIC CONTROL AND UNIFORMED OFFICER

1. For any work that involves the placement of construction equipment, vehicles, or personnel within the traveled way of a Class IV or Class V highway, the party wishing to perform the work shall submit a Traffic Control Plan. The Traffic Control Plan shall be in accordance with Part VI of the Manual on Uniform Traffic Control Devices, latest addition, and Section 619 of the Standard Specifications for Road and Bridge Construction, latest edition, published by the New Hampshire Department of Transportation. The Traffic Control Plan will show proposed signage, its location, proposed use of flaggers and uniformed officers. Uniformed officers shall be required for any work performed on the following town roads:
 - a) Amherst Road
 - b) Baboosic Lake Road
 - c) Back River Road
 - d) Bedford Road
 - e) Continental Boulevard
 - f) Daniel Webster Highway
 - g) Naticook Road
 - h) Turkey Hill Road
2. Uniformed officers may be required at other locations as required by the Merrimack Police Chief, TOM ordinances or its Administrative Code. Coordination, scheduling and reimbursement of uniformed officers shall be with the Merrimack Police Chief, or designee.

F. BLASTING

1. It shall be the contractor's responsibility to notify all utilities of blasting.
2. The contractor must notify MVD inspector, well in advance, of his intention to use blasting. The MVD inspector will require evidence that the proposed blasting will comply fully with applicable laws or regulations.
3. No blasting of rock shall be done where limited or prohibited by any federal, State or local laws or regulations or in violation of any limitation or restriction contained in any right-of-way or wherever specifically prohibited in any drawing or other contract document; nor will any such blasting be done within forty (40) feet of any pipe or structure without specific permission from the MVD inspector.
4. Blasts shall be properly covered and the pipe or structure properly protected. Warning shall be given to all persons in the vicinity.
5. A Notification of Blasting must be published in the local papers that include the name of the blasting company, contact number, project name, location, date of blast, length of time to complete blasting and warning whistles details.
6. It is the contractor's responsibility to perform whatever pre-blast surveys and investigations may be required by the circumstances and/or by federal, state or local laws.
7. Blasting shall be at the risk of the contractor who shall be liable for all damages to persons or property.
8. Necessary permits shall be secured and paid for by the contractor.

G. EXCAVATING

- 1. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO CONTACT THE LOCATOR SERVICE DIGSAFE (811) AND THE MVD (603-424-9241 X100) 72 HOURS PRIOR TO ANY EXCAVATING.**
2. General excavation shall consist of the satisfactory removal and disposal of all materials taken from within the limits of the work contracted, meaning the material lying between the original ground line and the finished ground line as shown on the drawings regardless of whether the original ground line is exposed to air or is covered by water. Excavation below existing ground line to enable any required construction or removals is included. It is distinctly understood that any reference to earth, rock, silt, debris or other materials on the drawings or in the specifications is solely for the contractor's information and shall not be taken as an indication of classified excavation or the quantity of earth, rock, silt, debris or other material encountered.
3. All excavation shall be made to the lines and grades indicated on the drawings or established in the field by the MVD inspector.
4. Excess excavated materials and excavated materials unsuitable for backfilling shall be properly disposed of by the contractor clear of the site. The contractor shall furnish to MVD inspector satisfactory evidence that an appropriate disposal site will be used.
5. The contractor shall exercise the utmost care in trench excavations so that the exact locations of both known and unknown structures and utilities may be determined. The contractor shall be held responsible for the repair of such utilities and structure when damaged or broken because of carelessness on his part. The MVD shall not be responsible for inaccuracy in locations of its underground utilities and structures, and therefore, will not be responsible for their damage during construction.
6. If in the opinion of the MVD inspector, it is necessary to explore and excavate to determine the location of underground utilities that may interfere with construction, the contractor shall perform them at his expense.
7. All excavations shall be made to the lines and grades established by the project's approved drawings. Pipe trenches shall be excavated to the depth required to provide a uniform and continuous bearing for the pipe on solid, undisturbed ground between bell holes. Parts of the trench that are excavated below the specified grade shall be corrected with approved material and properly compacted as directed by the MVD. Deviations from line and grade may be allowed when approved by the MVD inspector.
8. If the MVD inspector believes that the sub grade is unstable and cannot satisfactorily support the pipe, the contractor shall remove the unsuitable material as specified by the MVD inspector. It must be replaced with an approved material that will support the pipe properly.
9. All excavated material shall be piled and equipment placed and used in a manner that will avoid obstructing traffic and not endanger the work or workers. Active fire hydrants, active line valves, or other utility controls shall be left unobstructed and accessible until the work is completed.
10. All excavations shall be kept free from water during pipe laying and related work. Dewatering shall keep foundation grades of the excavation dry until pipe assembly is complete and enough backfill is added to prevent flotation. Water shall not be allowed to rise until any concrete used has been set and the forms removed.

H. TRENCHING

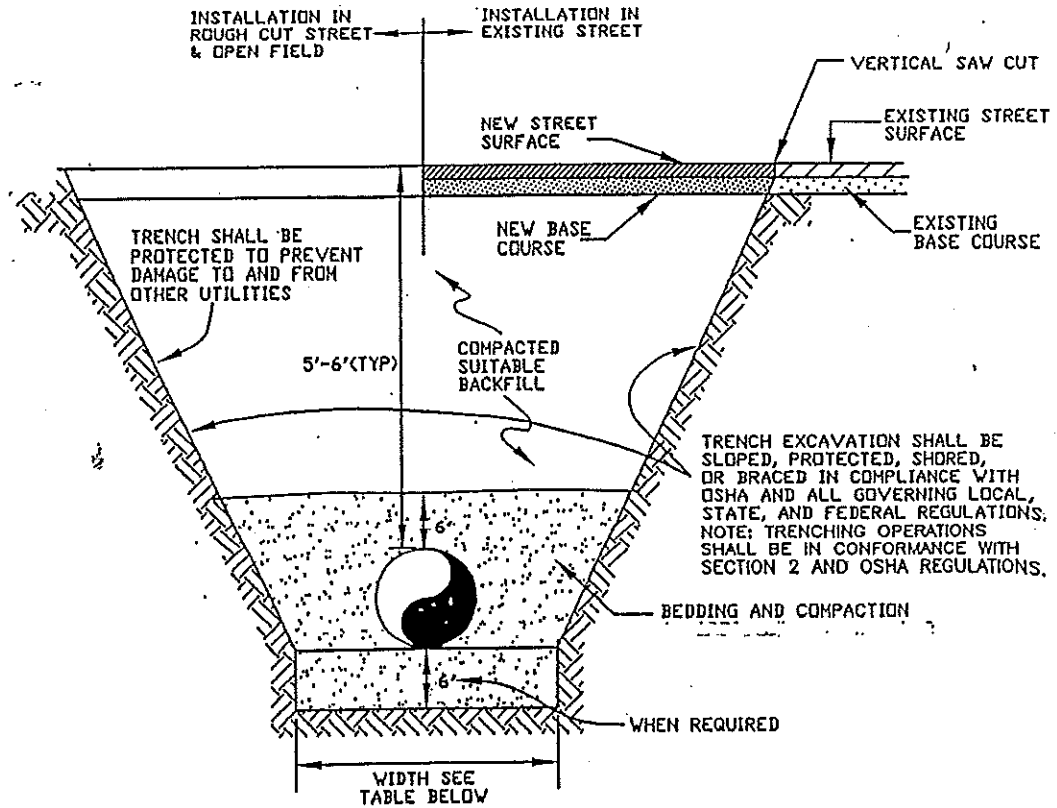


DIAGRAM 1

BOTTOM OF TRENCH WIDTH		
PIPE DIAMETER	MINIMUM WIDTH	MAXIMUM WIDTH
4'	1'-5"	3'-9"
6'	1'-7"	3'-11"
8'	1'-9"	4'-1"
12'	2'-1"	4'-3"
16'	2'-6"	4'-9"
20'	2'-10"	5'-2"
24'	3'-2"	5'-6"
30'	3'-8"	6'-0"
36'	4'-2"	6'-6"

1. The contractor shall be responsible for the condition of the trenches for a minimum period of one (1) year from the date of the final acceptance of the contractor's work, or as required by state or local authorities, and any materials required for filling depressions caused by settlement or washout shall be supplied and placed by the contractor at his expense.
2. The contractor shall be responsible for the repair or correction of trench settlement. The MVD retains the right to repair the settlement and the cost of repairs will be charged to the contractor.
3. Any compaction testing must be done by an outside company at the expense of the contractor/developer.

4. Widths of trenches shall be held to a minimum to accommodate the pipe and appurtenances. The trench width shall be measured at the top of the pipe barrel and shall conform to the following limits:

a) Earth

Minimum: Outside diameter of the pipe barrel plus 8 inches, i.e., 4 inches each side.

Maximum: Nominal pipe diameter plus 24 inches.

b) Rock

Nominal Pipe Diameter

12 inches or less

16 inches or larger

Minimum: Outside diameter of the pipe barrel plus 16 inches, i.e., 8 inches each side.

Outside diameter of the pipe barrel plus 24 inches, i.e., 12 inches each side.

Maximum: Nominal pipe diameter plus 24 inches.

5. If, for any reason the trench width exceeds the maximum trench width the contractor shall provide additional bedding and backfill material to fill the additional width of trench, at no cost to the MVD.

6. Depths of trenches are as follows:

a) General. All trenches shall provide for a minimum of 5'-0" of cover over the top of the pipe barrel to the top of the finished grade of the roadway unless otherwise authorized by the MVD inspector. (See Diagram 1)

b) Earth. The trench shall be excavated to the depth required, so as to provide a uniform and continuous bearing and support for the pipe barrel on solid and undisturbed ground at every point between joints, except that it will be permissible to disturb the finished trench bottom over a maximum length of 18 inches near the middle of each length of pipe by the withdrawal of pipe slings or other lifting tackle. When required, bell holes shall be provided. The finished trench bottom shall be accurately prepared by means of hand tools.

c) Rock. Where excavation is made in rock or boulders, the trench shall be excavated 8 inches below the pipe barrel for pipe 12 inches in diameter or less, and 12 inches below the pipe barrel for 16 inch diameter pipe and larger. All loose material shall be removed from the trench bottom. After preparation of the trench bottom, a pipe bed shall be prepared using bedding material.

d) Unsuitable Bottom. When unsuitable material is found below subgrade, as determined by the MVD's inspector, the contractor shall remove the material to a depth determined by the MVD inspector and provide compacted bedding material to backfill the trench in the area where unsuitable material has been excavated.

7. The trench surface shall be regularly attended to during the course of the contract. The contractor shall take prompt corrective measures to correct any settlement or wash-out. The trench surface shall be maintained in a safe condition and shall not interfere with natural drainage.

8. Unsupported open cut excavation for mains will not be permitted where trenching may cause danger to life, unnecessary damage to street pavement, trees, structures, poles, utilities, or other private or public property. During the progress of the work, whenever and wherever it is necessary, the contractor shall, at his expense, support the sides of the excavation by adequate and suitable sheeting, shoring, bracing or other approved means. Such trench support materials and equipment shall be maintained and remain in place until backfilling operations have progressed to the point where the supports may be withdrawn without endangering property.

9. All trenching operations shall conform to the most recent OSHA Standards and Guidelines. The trench shall be adequately supported and the safety of workers provided for. Trench support is the sole responsibility of the contractor. The MVD's presence in no way implies approval of the trench support methods being utilized.

I. COMMON TRENCH LAYOUT

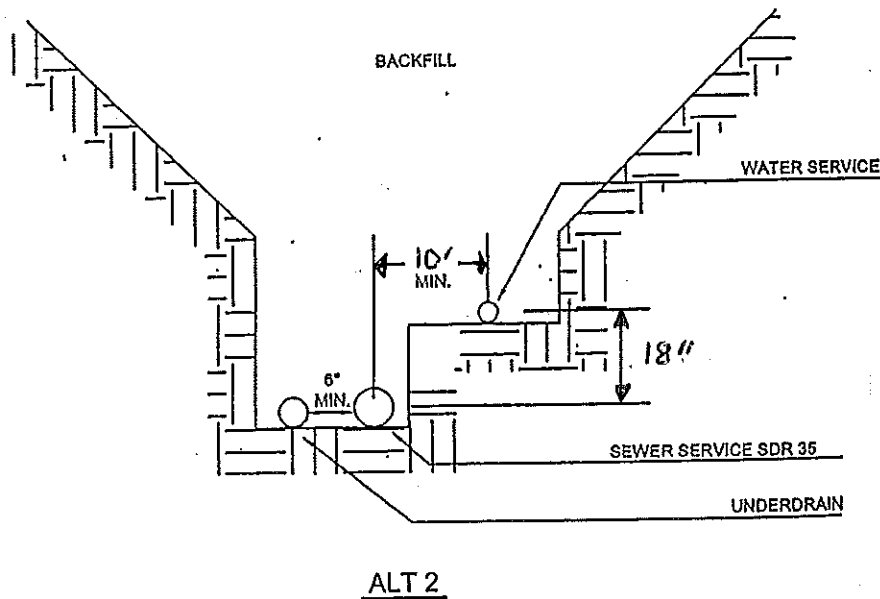
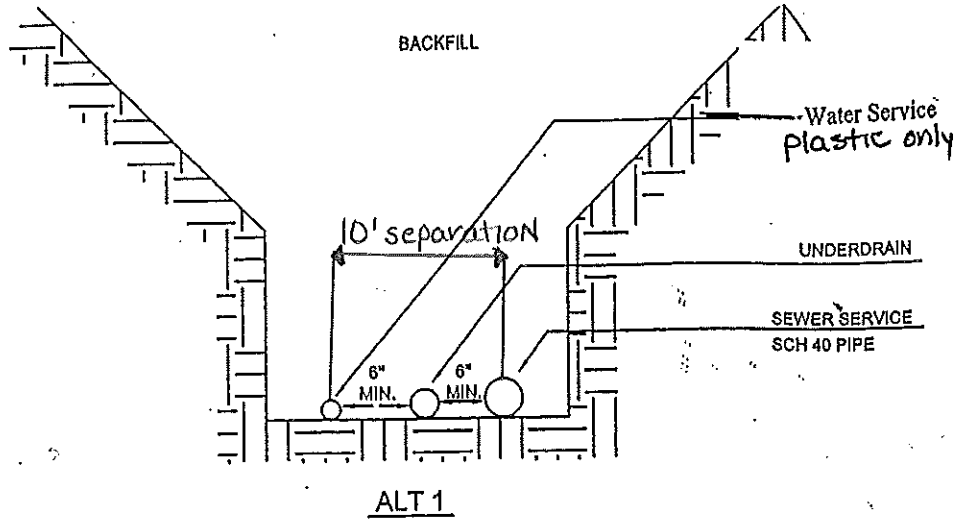


DIAGRAM 2

1. Utility Separation

- a. Separation of water from other utilities and septic shall be in accordance with New Hampshire Code of Administrative Rules ENV-Ws 1000 and ENV-Ws 372, Section 9. (Also see Diagram 2)
- b. Utilities and other structures encountered during construction may require added protection or temporary support structures. This work shall be furnished by the contractor at his expense. The contractor shall notify a utility if any structures or utilities are disturbed or damaged during construction. The repairs to the utility will be done at the contractor's expense.

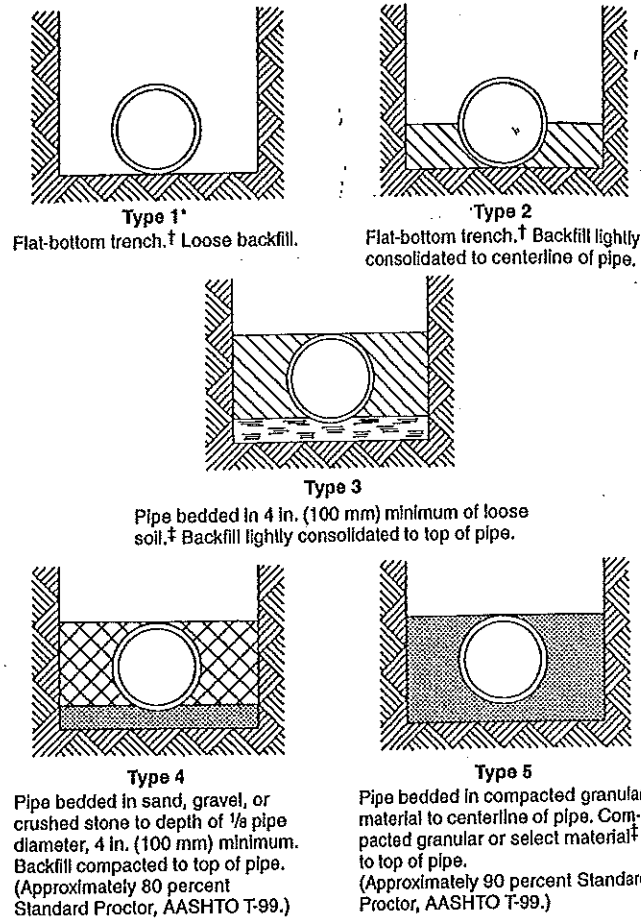
2. **Rock Conditions**

- a. All rocks over four (4) inches common Fill type B shall be removed from the trench line.
- b. All blasting permits, licenses, damages and the like will be the sole responsibility of the contractor.
- c. The MVD reserves the right to require sub-grade analysis by a geotechnical engineer in order to render an opinion on sub-grade quality. **All analyses will be performed at the contractor's expense.**

J. SURVEYING

1. Prior to the start of water main installation, grade stakes are to be installed along the proposed course of the water main. Grade stakes shall clearly delineate finish grade, edge of right-of-way and centerline of roadway, and all proposed utility locations.
2. Line and grade for water mains and appurtenances shall be established by a Professional Engineer or Land Surveyor, licensed to practice in the State of New Hampshire, or his authorized representative. Responsibility for correct alignment and grade of the mains shall be with the owner/developer/contractor.
3. The project engineer is not relieved from the responsibility of field errors because an MVD representative approves any staked alignments or elevations. Should a field discrepancy arise, the contractor has the option to have the plans re-engineered on field adjustments with the approval of the MVD inspector.

K. PIPE CONSTRUCTION METHODS AND INSTALLATION



Source: ANSI/AWWA C150, Thickness Design of Ductile-Iron Pipe.

For 14-in. (355-mm) and larger pipe, consideration should be given to the † use of laying conditions other than type 1.

‡ "Flat-bottom" is defined as undisturbed earth.

* "Loose soil" or "select material" is defined as native soil excavated from the trench, free of rocks, foreign materials, and frozen earth.

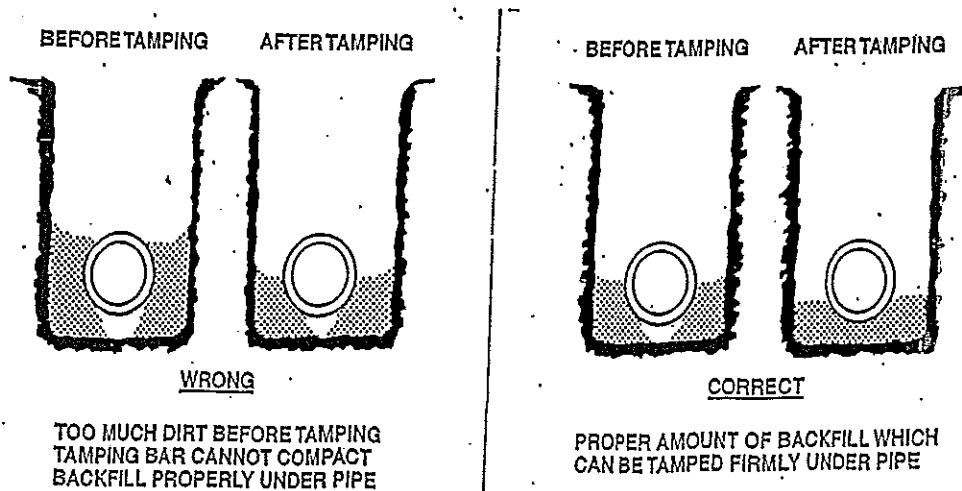


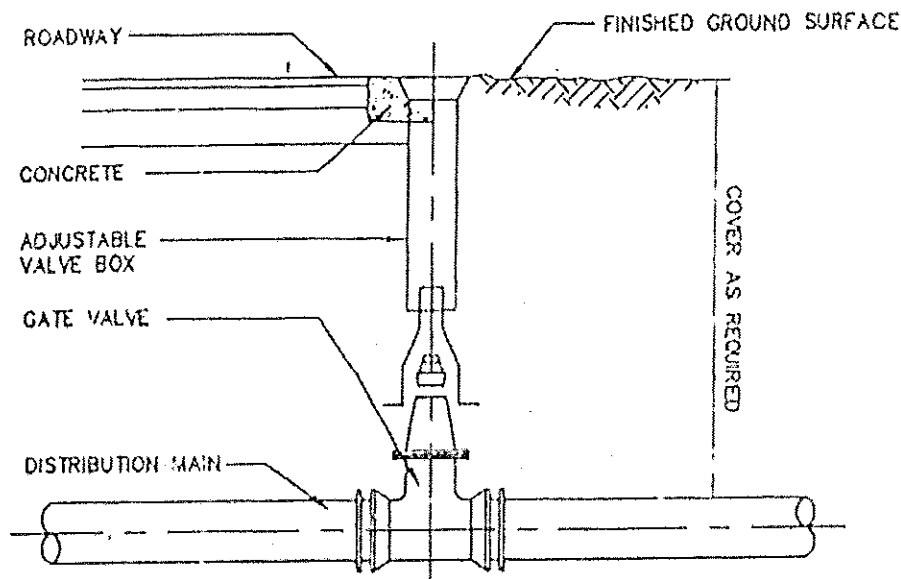
DIAGRAM 3

1. All water pipe excavations shall be made according to the approved drawings and these specifications. Pipe trenches shall be excavated to maximize support for the pipe. Any part of the bottom of the trench excavated below the specified grade shall be corrected with approved material as directed by the MVD inspector and thoroughly compacted.
2. All right of ways and or lot corner points/property lines shall be set and clearly visible before any water installation can proceed. Offset stakes for alignment and grade shall also be set.
3. All pipelines shall be installed to the depth shown on the approved drawings. The depth of the pipe, measured from the finished grade over the pipeline to the top of the pipe shall be between 5 feet and 7 feet. If obstructions or other conditions make it necessary to adjust the pipeline depth, deviations shall be permitted upon approval by the MVD inspector. No bends or joints shall be permitted under another utility crossing. Restraint joint pipe may be required along stream, creek banks, areas of fill, or other areas that are deemed unstable.
4. Where water mains cross sewers, a minimum of eighteen inches (18") of vertical separation shall be provided. One full length of water pipe shall be placed over the sewer pipe so that both joints are as far from the sewer as possible. Water mains installed parallel to sewers shall maintain a ten foot (10') separation. Deviations may be allowed on a case-by-case basis.
5. Pipe shall be laid with the bell ends facing the direction of the laying unless directed otherwise by the MVD inspector. If pipe is to be installed on a grade greater than ten percent (10%), the laying shall start going in an upward direction with the pipe ends on the upgrade.
6. All pipe shall be laid and maintained to the required lines and depths. Fittings, valves and hydrants shall be at the required locations with joints centered, spigots home and all valve and hydrant stems plumb and otherwise in strict accordance with the specifications.
7. All buried steel lugs, rods, brackets and flanged joint bolts and nuts shall be given one (1) coat of Koppers #50 coal tar coating prior to backfilling and polyethylene encased if the specifications require polyethylene encasement of pipe.
8. No deviation shall be made from the required alignment, depth or grade except with the written consent of the MVD's inspector.
9. All pipe shall be laid to the depth specified. The depth shall be measured from the final surface grade to the top of the pipe barrel. The minimum pipe cover shall be as shown on the drawings or as specified in the specifications.
10. All pipe and fittings are to be cleaned and kept clean at all times during installation. All pipe and fittings are to be examined for any defects, with particular attention given to bell and spigot ends. **Pipe being stored on site for more than 24 hours shall be temporarily capped so as to prevent foreign matter or animals from entering the pipe.**
11. All pipe cuts shall be straight and true, and in a workmanlike manner so as to leave a smooth end without damaging the pipe or its cement lining.
12. All valves, vaults, hydrants, curb boxes and valve boxes are to be installed plumb.
13. Prior to any line installation, offset stakes for alignment and grade shall be set. Any stake replacement shall be at the expense of the contractor. When laying pipe on curves, the pipe's maximum allowable deflection, as specified by the manufacturer, shall not be exceeded.
14. All pipes shall be installed to the depth shown on the approved plan and profile drawings. Depth is defined as the cover from the top of the pipe to the finished grade. Minimum depth shall be five feet (5') and maximum depth shall be seven feet (7'). Variations in alignment and depth due to obstruction may be allowed subject to the approval.
15. Caution should be taken to prevent foreign material from entering the pipe during installation. The pipe shall be secured in place with approved backfill material and tamped. No blocking of pipe.
16. No pipe or appurtenant structure shall be installed in a trench or foundation where frost has penetrated. Backfilling shall be completed before the formation of frost.
17. When casing or sleeve is to be required for a main, insulating skids shall be provided for each joint of the water main.
18. If, in the opinion of the MVD's inspector, uncertainty exists with regards to the depth of the water pipe, the owner shall dig test pits at the owner's expense at locations specified by the MVD inspector to ensure the depth of pipe to a minimum depth of five (5) feet below finish grade.

19. Materials used for bedding and the haunch around the pipe shall be a course to fine sandy material with maximum stone size of 1-inch, common fill type A. The material shall conform to ASTM D2487 "Standard Method for Classification of Soils for Engineering Purposes" using the "Unified Soil Classification System", except where a higher standard is required elsewhere in the contract documents or by rules or regulations of federal, state or local governmental bodies having jurisdiction over the site of the work.
20. The material shall meet a Class II designation. Soil types GW, GP, SW and SP, non-cohesive, well graded and containing some fines are included in this Class. Where voids, finer grained soils or movement may allow migration of this material, a filter fabric as directed by the MVD inspector will be used in the trench bottom and sides before the select fill bedding is placed.
21. Bedding material may be obtained from the trench excavation provided it has been tested and approved by the MVD inspector. If the approved material obtained from the trench excavation is insufficient to complete the bedding, the contractor shall obtain the necessary tested and approved bedding materials from an off-site source.
22. Filter fabric shall be non-woven, synthetic fiber material with sieve design to not permit the select material in the pipe bedding and haunching to migrate into the surrounding soils. The material shall have a minimum thickness of 15 mils, tensile strength of 130 lbs., elongation at break of 62% and trapezoidal tear strength of 70 lbs.
23. All pipe shall be installed in such a manner as to ensure full support of the pipe barrel over its entire length. After adjustment for line and grade and the pipe joint is made, the bedding material shall be carefully placed and tamped under the haunches of the pipe and its bell holes.
24. For ductile iron pipe. The limits of the bedding shall be from six inches (6") below the bottom of the pipe to six inches (12") above the top of the pipe. Compaction of select bedding is not required. Approved backfill may then be placed in the trench to ground level. No rock or stone shall be placed closer to the pipe than twelve (12) inches above the pipe barrel and the minimum trench width outside the diameter plus eight (8) inches.

SEE DIAGRAM 3

L. VALVES AND VALVE BOXES



TYPICAL WATER GATE VALVE
NOT TO SCALE

DIAGRAM 4

1. All valves shall be thin wall ductile iron body, meeting or exceeding requirements of AWWA C509 with minimum wall thickness which exceeds the minimum requirements of AWWA C153. Valve shall be AFC 2500.
2. Vales shall be handled to prevent damage; cleaned and operated before installation.
3. Valves shall be set in such a manner that the valve stems are plumb.
4. Where deemed necessary by the MVD inspector, additional valves not shown on the plans shall be required.
5. All seating surfaces in body shall be inclined to the vertical at a minimum angle of 32° [degrees] (when stem is in vertical position) to eliminate abrasive wear of rubber sealing surfaces.
6. Stem shall be sealed by a least two O-rings; all stem seals shall be replaceable with valve open and subjected to full rate pressure.
7. Waterway shall be smooth and shall have no depressions or cavities in seat area where foreign material can lodge and prevent closure or sealing.
8. Valve body and bonnet shall be coated inside and out with a fusion bonded epoxy, which meets or exceeds AWWA C550 "Standards for Epoxy Interior Coatings for Valves & Hydrants."
9. Water main gate valves shall be rated for 200 psi minimum working pressure and a 400 psi minimum test pressure. The operating nuts shall be 2-inch square. **All valves shall open right or clockwise (MVD standard opening direction).** Gate valves shall be mechanical joint, AWAA C111 except where shown otherwise.
10. Valves or other equipment which does not operate easily or are otherwise defective shall be replaced or repaired at the owner's expense.
11. Valves shall be placed at 500' intervals in commercial districts and at 800' intervals in all other districts.

12. Valve boxes shall be of tough, even grain cast iron and of the adjustable, slip, heavy pattern type. They shall be so designed and constructed as to prevent the direct transmission of traffic loads to the pipe or valve. All gate boxes shall be manufactured to ASTM A.48, Class 25, 25,000 – 30,000 psi. A valve box shall be provided for every valve. The box shall be installed so as not to transmit weight and shock from traffic or equipment to the valve and shall be plumb.
13. Valve Boxes shall be cast iron and for water use only (cover marked “Water”), and shall have the following characteristics:
 - a) Flange shall be located at top of top section.
 - b) Bottom section shall be bell based.
 - c) Boxes shall be two-piece with covers; thirty-six (36) inch bottoms and twenty-six (26) inch tops.
 - d) Boxes shall have slip-tight shaft; five and one quarter (5-1/4) inches.
 - e) Gate box covers shall fit properly and seat flush in the gate valve box top sections.
 - f) Gate boxes shall be manufactured in the United States.
 - g) Covers shall be close fitting and substantially dirt-tight. The top of the cover shall be flush with the top of the box rim.
 - h) The bottom of the lower section shall enclose the stuffing box and operating nut of the valve.
 - i) Valve boxes shall be hot coated inside and out with coal tar or asphaltic compound.

M. BENDS, TEES REDUCERS AND FITTINGS

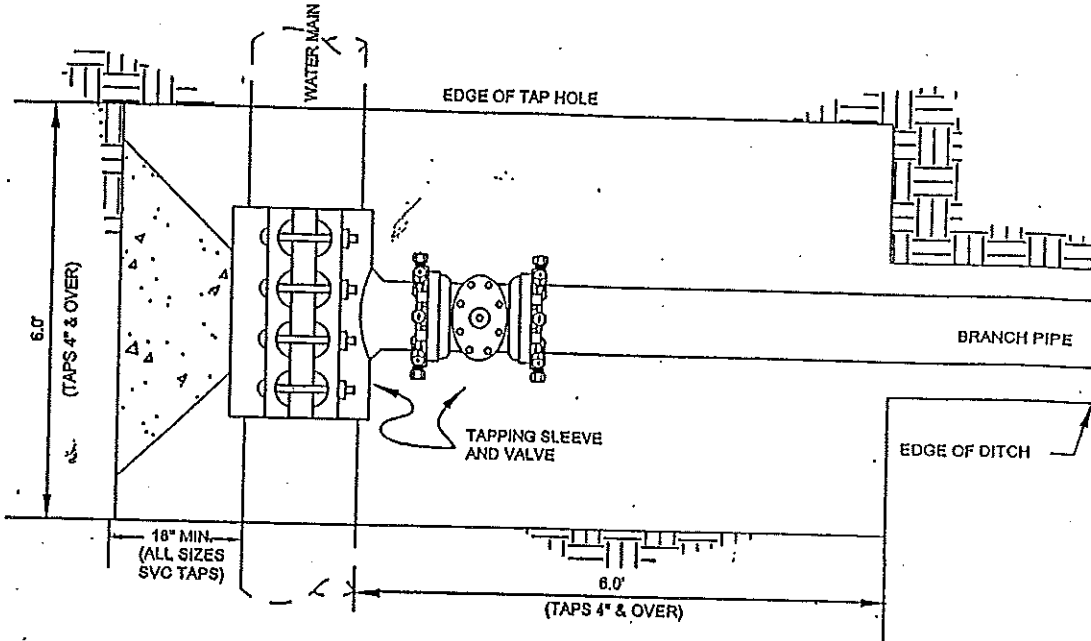


DIAGRAM 5

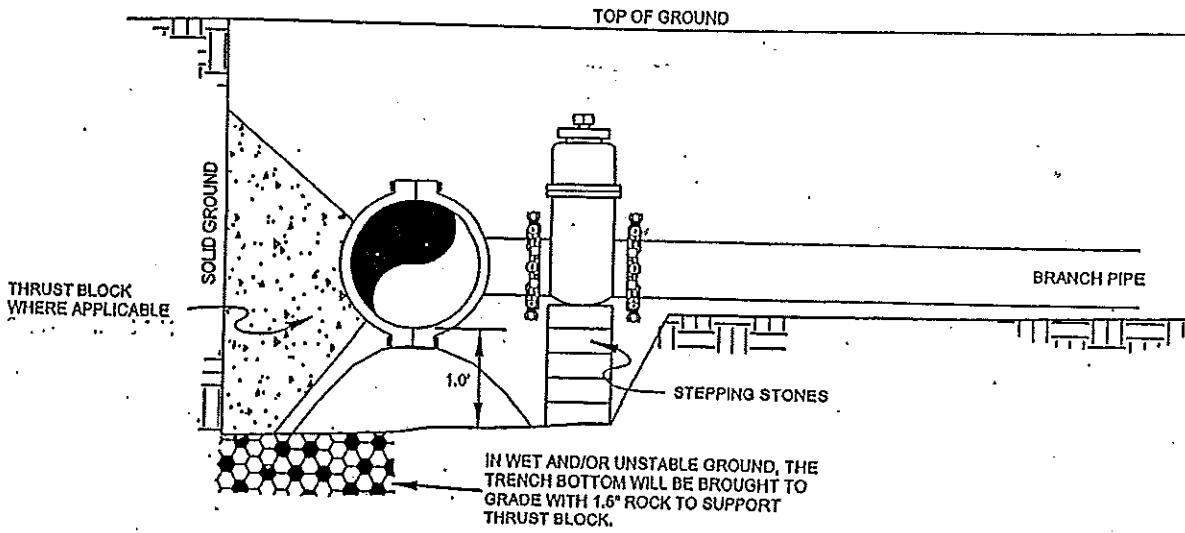
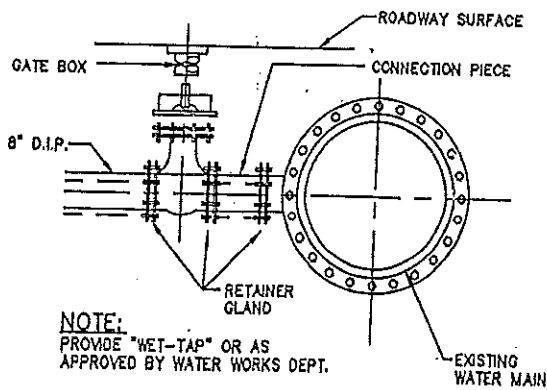
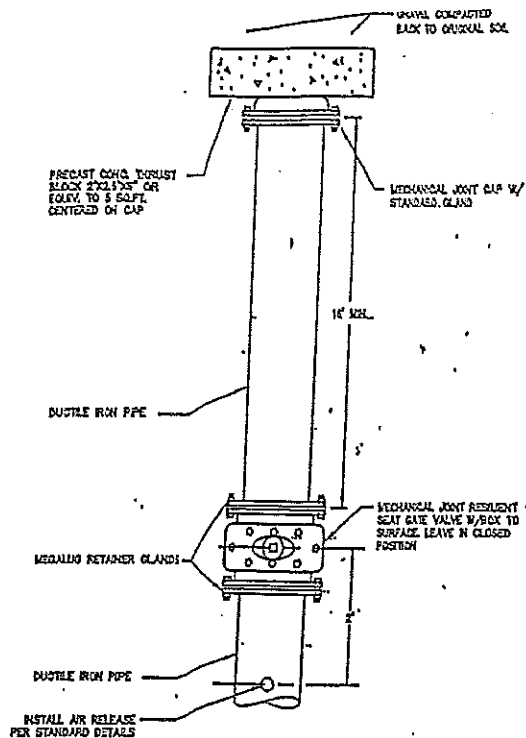


DIAGRAM 6



TYPICAL WATER MAIN CONNECTION DETAIL
NOT TO SCALE



**TYP. END OF MAIN
INSTALLATION**

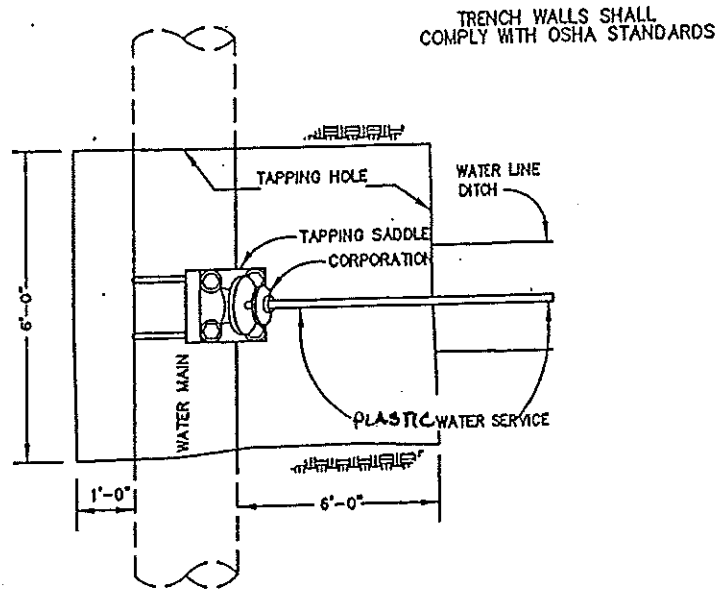
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DIAGRAM 7

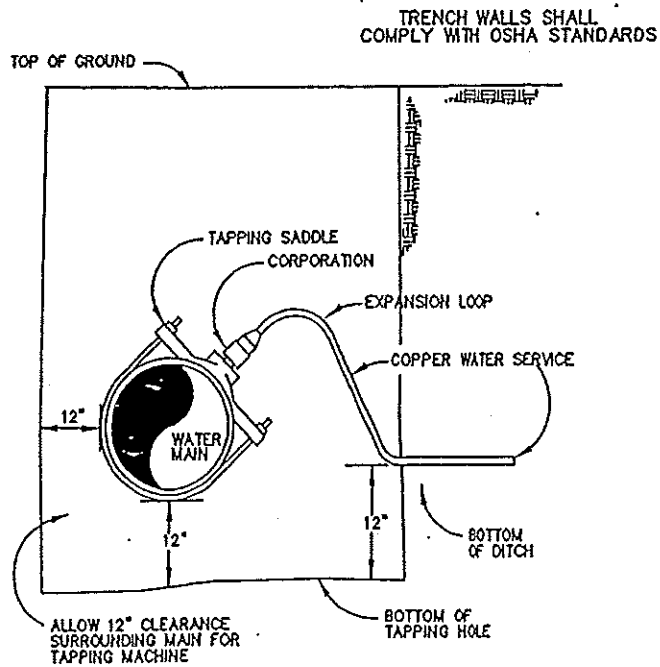
1. Unless otherwise specified, all fittings shall be mechanical joint, complete with accessories and shall conform to AWWA C104/ANSI A21.4, C1111/A21.10 or C153/A21.53. All fittings shall be Class 350 ductile iron with double thickness cement-lining and seal coated inside and out, and shall be manufactured in the United States. Fittings four to twenty-four (4-24) inches shall be "compact" pattern.
2. In addition, all fittings purchased are subject to inspection and acceptance by the MVD. The supplier and/or manufacturer shall be responsible for such accommodations and handling as are required to allow for proper inspection if so requested by the owner.
3. All fittings, in addition to meeting all of the appropriate requirements of AWWA and ANSI, shall conform to the following:
4. All fittings shall be free of all significant casting flaws both inside and out, including slag holes, slag inclusions, laps, laminations, mold spach, and pin holes.
5. All linings shall be of uniform thickness with no significant waving and/or roughness.
6. Mechanical joint bells and glands shall be dimensionally correct and free of all slag and rough edges at bolt holes.
7. Mechanical joints for fittings shall be furnished with retaining glands. This means retaining gland will be used at every mechanical joint.
8. Retainer glands shall be designed to impart multiple wedging action against the pipe, increasing its resistance as the pressure increases. Glands shall be manufactured of ductile iron conforming to ASTM A536-80. Restraining devices shall be manufactured of ductile iron heat-treated to a minimum hardness of 370 BHN. Twist-off nuts shall be used to insure proper actuating of the retainer gland. Dimensions of the gland shall be such that it can be used with the standard mechanical joint bell and tee-headed bolts conforming of ANSI A21.1/AWWA C110 and ANSI A21.5/AWAA C153. The retainer gland shall have a working pressure of 250 psi with a minimum safety factor of 2:1 and shall be certified by the manufacturer to be compatible with the pipe class and pipe manufacturer for all sizes provided on the job. The retainer gland shall be Mega-Lug as manufactured by EBAA Iron, Inc., or approved equal. (See Diagram 7)

N. SADDLE AND CORPORATIONS

SERVICE TAPS 1-1/2" & 2"
TAPPING SADDLE.



PLAN



NOT TO SCALE

DIAGRAM 8

O. TAPPING SLEEVES, BLEEDERS AND FLEXIBLE CONNECTIONS

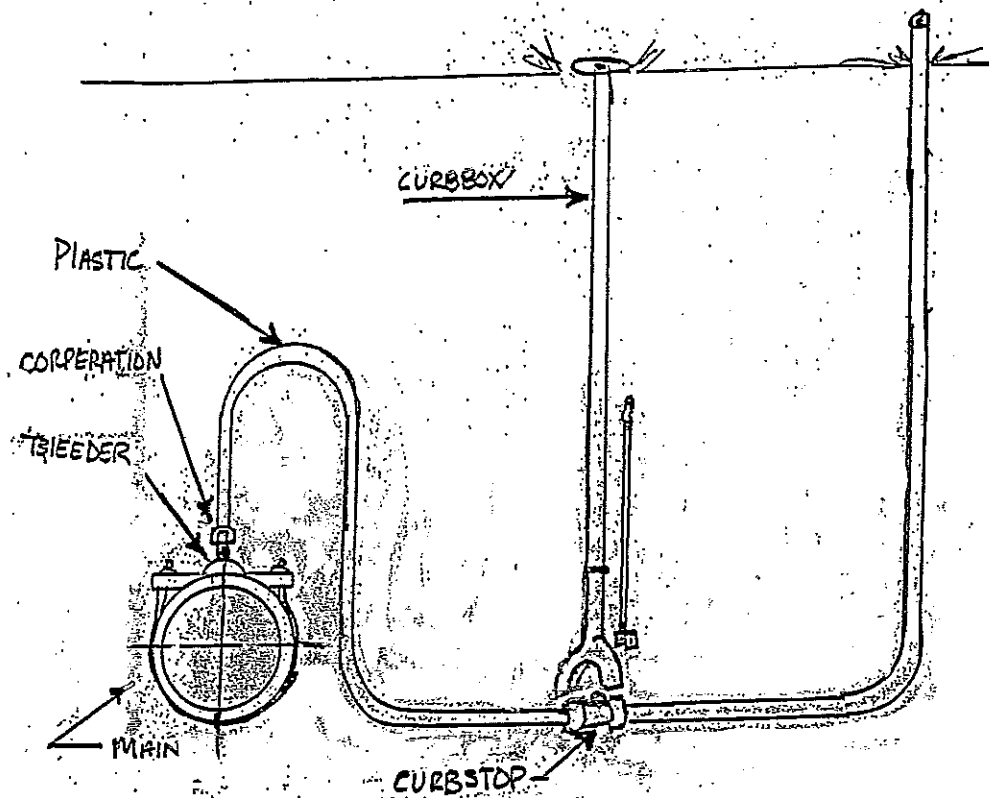


DIAGRAM 9

NOT TO SCALE

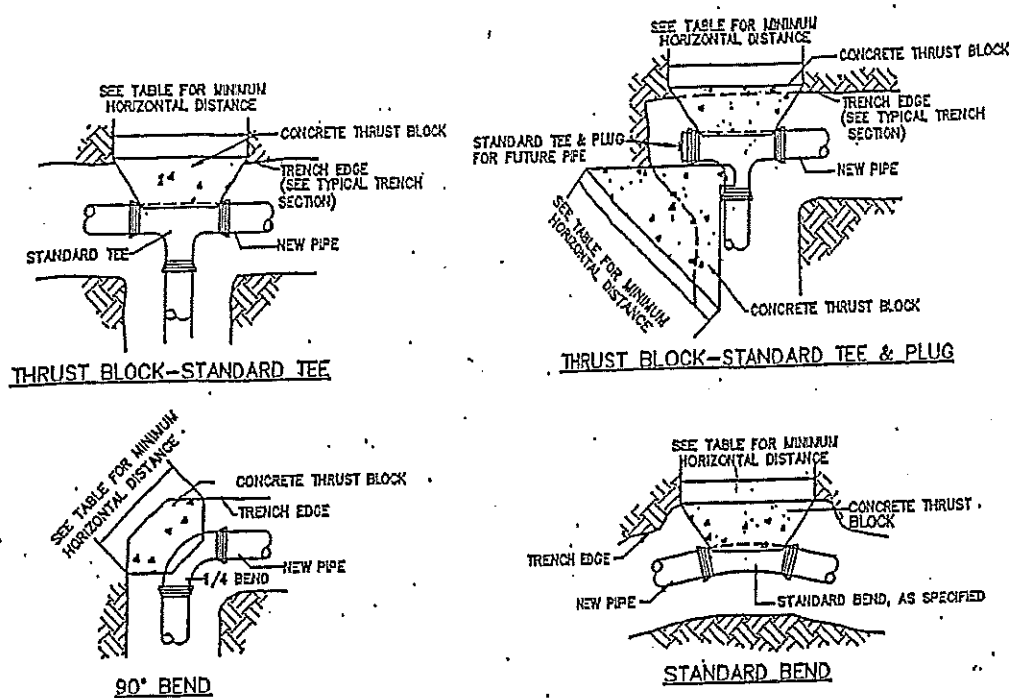
1. Tapping sleeves and tapping valves shall be installed by skilled workers experienced in such work. Prior to any pipe cutting, tapping sleeves and valves will be pressure tested.
2. The testing of tapping sleeves and valves will be conducted hydrostatically at the same pressures that the water main is required to be tested at (150 psi minimum). The hydrostatic test shall be not less than 60 minutes in duration. The installer, developer or contractor is required to supply all material and equipment necessary for testing. Pressure testing with water may be conducted at the installer, developer or contractor's option. **All costs relating to a faulty tap, and the shutdown of MVD water system for repair will be at the customer's expense.** Contractor should start with own valve to ensure good pre-test; old valve may not hold.
3. During any tapping operation an inspector is to be on-site with a minimum of 24-hour notice given to MVD prior to start of any work.
4. Tapping Sleeves shall be manufactured by one of the following or an approved equal:
 - a) The Mueller Valve Co. of Decatur, IL .
Model H-615
 - b) The American-Daring Valve Co. of Birmingham, AL
Series 2800 Tapping Sleeve

5. Once the tap is complete, the contractor shall be responsible for protection the tapping sleeve/saddle and tapping valve from any damage.
6. Bleeders will be tapped on the top of the pipe no more than two (2) feet away from the end of the pipe, and at highest points within the testing area. (See Diagram 9)
7. Bleeders will be sized as follows:

<u>Water Main Size</u>	<u>Bleeder Size</u>
2 inch	3/4 inch
4, 6 & 8 inch	as directed by MVD inspector
12 inch and over	as directed by MVD inspector

8. Bleeder location is dependent upon hydrant locations.
9. All bleeders will be plugged upon completion. The terminus of the bleeder shall not be more than six (6) inches below finish grade, perfectly cut at grade.
10. Permanently installed bleeders must be located within the right-of-way in line with property lines, where applicable.
11. Connections to the MVD water system shall be accomplished in a neat and professional manner. The Inspector shall be present during construction of the connection. No connections are allowed to an existing main with the installation of an isolation valve(s) unless approved by the MVD inspector. If conditions warrant, cutting in tees are allowed. The MVD does not guarantee water tightness of valves on existing water mains. If a valve leaks, the MVD will assist in reducing the influx of water, but the contractor must use methods at his disposal to work with the resulting leakage.
12. Where flexible connections in the piping are specified or indicated on the drawings, they shall be obtained by the use of sleeve-type couplings. Such couplings shall be as herein specified.
13. Sleeve-type couplings: solid sleeves shall comply with the AWWA C110-87 ductile iron, mechanical joint (DIMJ) specification. The couplings shall be furnished with the pipe stop removed.

P. THRUST BLOCKS



THRUST BLOCK TABLE

SIZE	TYPE	HORIZONTAL DISTANCE		VERTICAL DISTANCE
		IN SAND OR GRAVEL	IN ROCK	
4"	TEE BRANCH	2'-0"	2'-0"	2'-0"
	90° BEND	2'-0"	2'-0"	2'-0"
	45° BEND	2'-0"	2'-0"	2'-0"
6"	22 1/2° BEND OR LESS	2'-0"	2'-0"	2'-0"
	TEE BRANCH	2'-0"	2'-0"	2'-0"
	90° BEND	2'-0"	2'-0"	2'-0"
8"	45° BEND	2'-0"	2'-0"	2'-0"
	22 1/2° BEND OR LESS	2'-0"	2'-0"	2'-0"
	TEE BRANCH	2'-6"	2'-0"	2'-6"
10"	90° BEND	3'-0"	2'-0"	2'-0"
	45° BEND	2'-6"	2'-0"	2'-0"
	22 1/2° BEND OR LESS	2'-0"	2'-0"	2'-0"
12"	TEE BRANCH	3'-0"	2'-0"	3'-0"
	90° BEND	4'-0"	3'-0"	4'-0"
	45° BEND	3'-6"	2'-0"	3'-0"
16"	22 1/2° BEND OR LESS	2'-0"	2'-0"	2'-0"
	TEE BRANCH	4'-0"	3'-0"	4'-6"
	90° BEND	6'-0"	4'-0"	6'-0"
20"	45° BEND	4'-0"	3'-0"	4'-0"
	22 1/2° BEND OR LESS	3'-0"	2'-0"	3'-0"
	TEE BRANCH	6'-0"	3'-0"	4'-0"

THRUST BLOCK DETAIL

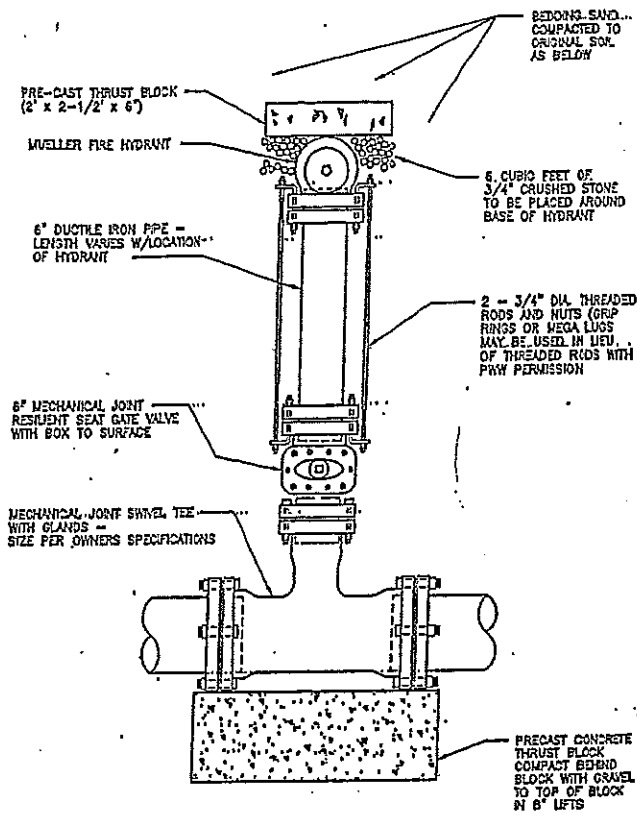
NOT TO SCALE

DIAGRAM 10

1. All thrust blocks shall be made from standard 3000 psi rated concrete after 28 days.
2. Concrete Thrust Blocks (See Diagram 10) - vertical and horizontal thrust blocks shall be made of concrete. Thrust blocks shall be precast or poured between solid ground and the fitting to be anchored. The size of the thrust block shall be not less than four (4) inches thick and fifteen (15) inches square. The thrust blocking shall be located so as to contain thrust forces in such a way the pipe and fitting joints will be accessible for repairs. Polyethylene wrap shall be used to prevent encasement of bolts or fittings within the concrete. The MVD may require the submission of thrust blocking designs to be performed by a registered professional engineer in the event of unusual thrust blocking installations.
3. Thrust blocks shall be sized according to the internal pipe pressure and the surrounding soil bearing capacity. The thrust blocks shall be constructed in a neat and workmanlike manner. Care shall be taken to ensure that the pipe fitting, including the bolts, will be accessible and encasement of the pipe and filling is avoided. A minimum of 8 mil polyethylene sheeting shall be placed between the pipe/fitting/bolts and concrete.
4. Thrust blocks and/or anchors shall be constructed at all hydrants, bends, tees, plugs and fittings which require reaction support from line thrust. During installation, care shall be taken not to cover bolts, nuts, clamps or other fittings making them inaccessible. Encasement of the pipe is not allowable. A minimum of 8 mil of polyethylene sheeting must be placed between the pipe/fitting and the concrete. Form work for thrust blocks must be done offsite and may be done with wood, however, all wood is to be removed before backfilling. Forming may also be done by bulkheading around the shape of the thrust block using burlap or paper sacks filled with sand or earth, and these may be left in place.

5. Provide all plugs, caps, tees, and bends (both horizontal and vertical) with concrete reaction backings and restrained joint pipe.
6. Place concrete reaction backing, between undisturbed solid ground and the fitting to be anchored. This should be done offsite. The backing unless otherwise shown or directed, shall be located as to contain the resultant thrust force and so that the pipe and fitting joints will be accessible for repair.
7. Temporary thrust restraint at temporary caps or plugs shall be the responsibility of the contractor. Submit details of temporary restraint to MVD for approval.
8. At connections with existing water mains, where there is a limit on the time the water main may be removed from service, use metal harnesses or anchor clamps, tie rods and straps; mechanical joints utilizing set-screw retainer glands; or restrained push-on joints. **Metal harnessing may not be used by the contractor in lieu of concrete backing without the approval of the MVD's inspector. Submit details of the proposed installation to the MVD's inspector for approval.** For pipe up to 12 inches in size, use a minimum of two 3/4-inch tie rods. For pipe 16-inch in size, four 3/4-inch tie rods are required and for 20-24 inch pipe, six 3/4-inch tie rods are required. For larger pipe sizes, consult the MVD's inspector. Install retainer glands in accordance with the instructions of the particular manufacturer furnishing the glands.
9. Material for metal harnessing and tie-rods shall be ASTM A-36 or A-307 as a minimum requirement. Protection of Metal Harnessing: Protect ties rods, clamps and other metal components against corrosion by hand application of a bituminous coating or by encasement of the entire assembly with 8-mil thick, loose polyethylene film in accordance with AWWA C105. Grease all tie rods prior to installing polyethylene.

Q. HYDRANT INSTALLATION AND CARE



NOTE:

1. ALL THREADED RODS AND NUTS MUST BE COATED WITH Koppers BITUMASTIQ AFTER INSTALLATION.
2. MINIMUM DEPTH OF 8" AT FLOWLINE.
3. WHERE DISTANCE FROM WATERMAIN TO HYDRANT IS MORE THAN 10 FT. SUBSTITUTE MEGALUGS IN LIEU OF THREADED RODS OR GRIP RINGS.

DIAGRAM 11

NOT TO SCALE

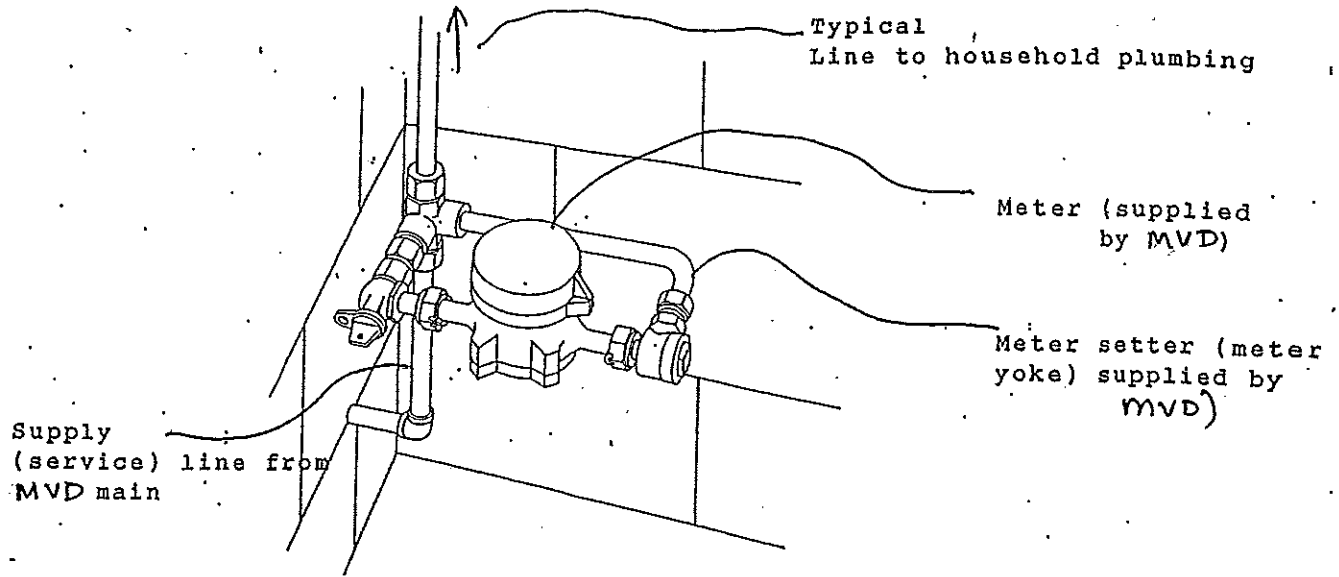
1. The cost of fire hydrants necessary for fire protection is the responsibility of the owner/developer/contractor in accordance with the BOC's current "Schedule of Rates".
2. Hydrants will be bedded in with a four (4) foot square area of one and one half (1-1/2) inch stone, installed to a depth of two (2) feet around the hydrant drains. A Polyethylene sheet shall be installed over the area of one and one half (1-1/2) inch stone before completing backfill around the hydrant. All hydrants found not to be set at finished grade upon final inspection by the MVD will become the responsibility of the contractor to raise or lower at his cost. If it becomes necessary for the MVD to adjust the hydrant to the correct height, the contractor will be charged in accordance with MVD's current Schedule of Rates for material, labor, etc.
3. Hydrants shall all open right or clockwise (MVD standard opening direction) with a break away flange and shall have a five and one half (5-1/2) to six (6) foot bury. Hydrants shall be equipped with five and one quarter (5-1/4) main valve opening and shall have drain ports. Hydrants shall be supplied with two, 2-1/2 inch hose nozzles and one, 4-1/2 inch pumper nozzle.

4. All hydrants shall be finished by the contractor with:

- a) Paint - Benjamin Moore Company
- b) Primer - Rust Inhibitive Special Yellow
Stock # 65163-6525B
- c) Finish - Impervo Sun Yellow
Stock # 13312-51-R20-1055

- 5. After a thorough cleaning, all exterior surfaces of hydrant above grade shall be given one shop coat of rust inhibitive primer compatible with the final field coatings. Primer and finish paint shall be applied in accordance with the manufacturer's instructions.
- 6. Ferrous surfaces below grade shall be given a shop coat of grease or other suitable rust resistant coating.
- 7. All hydrants shall be staked for location and grade in accordance with the approved plan and profile drawings, and when installed shall stand plumb.

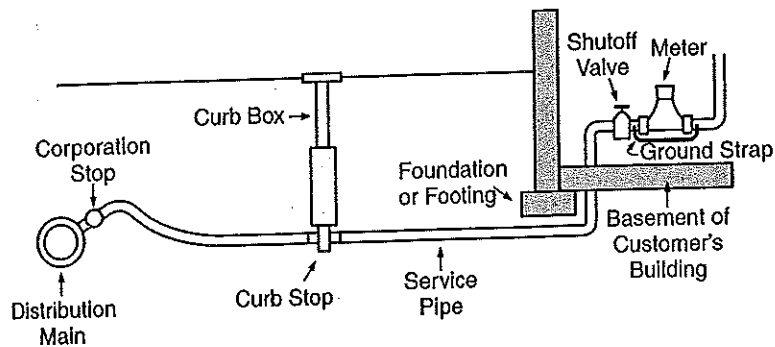
R. SERVICE CONNECTIONS



NOT TO SCALE

DIAGRAM 12

Typical Service Connection



NOT TO SCALE

DIAGRAM 13

1. For new taps, a plan shall be prepared and submitted to the MVD.
2. During any tapping operation an MVD inspector is to be on-site with a minimum of 48 hours notice given to the MVD prior to the start of work. Property corners shall be clearly marked so measurements of taps and curb boxes can be made at the time of tapping.
3. A minimum size tap for any potable water service is one inch (1").
4. Shoring or sloping of the tapping holes shall be the responsibility of the contractor and must be in accordance with the latest OSHA guidelines.
5. Barricading of tapping holes in the responsibility of the contractor and set-up is to be in accordance with NHDOT guidelines.

6. Where an existing water service is to be abandoned, the property owner shall be totally responsible, at his expense, to have the old corporation stop excavated. The MVD shall then shut off the old stop at no cost to the owner. The property owner shall then be responsible for any backfilling, compaction and surface restoration.
7. Where an existing corporation stop is to be relocated, the contractor shall pay for an inspection fee and shall be responsible for all excavating, backfill, compaction and restoration. The MVD will shut off the old corporation at no cost to the owner.
8. Water service line ditches must enter the lot as near to ninety degrees (90°) to the street as is practical.
9. Water service lines shall not be less than ten feet (10') apart horizontally from the building sewer.
10. From the main to the curb valve, the water service pipe shall be plastic water line.
11. The MVD will require pre-approval and a 24 hour notice before any tunneling or direction boring service connections will start.
12. All service lines shall be between five feet (5') and seven feet (7') in depth.

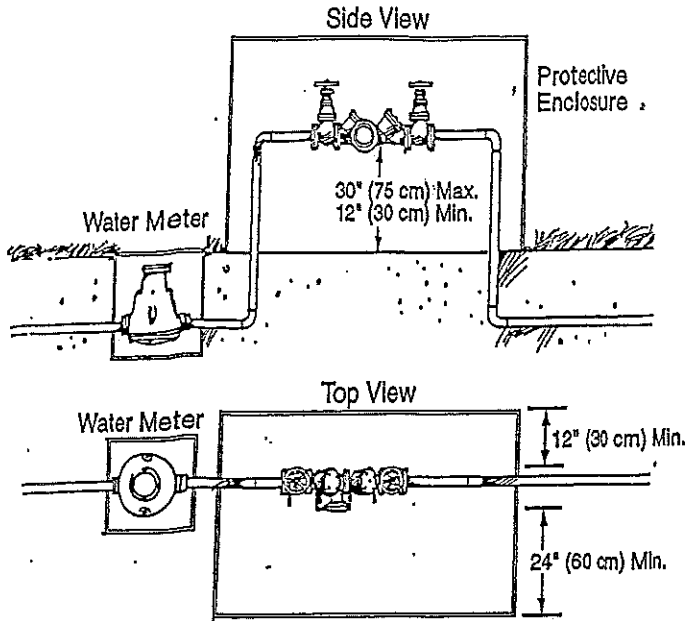
S. CURBS



DIAGRAM 14

1. Water service lines shall only be connected by compression type fittings.
2. All service lines shall be a minimum of three-fourths inch (3/4") in diameter.
3. All fire services shall meet the same requirements as domestic water service lines and all residential fire suppression installations must have their plans pre-approved by the MFD.
4. All fire services over one (1) inch must be a separate line from the domestic line.
5. Regardless of size, all service lines must have a curb stop or a secondary valve and shall be installed plumb, with a curb box centered over the valve and installed plumb.
6. The curb stop boxes shall be installed on the property line closest to the public right-of-way and shall have no permanent structures or landscaping within a three foot (3') radius. Curb stops shall be at a depth between five feet (5') and seven feet (7') at finished grade and shall not reside in driveways.
7. After a one year period past installation and upon the MVD approval, the MVD will assume responsibility for the curb valve box.
8. Where multiple curb valves/boxes are to be installed in close proximity, the Contractor shall affix permanent locator tags to the lids.
9. All curb valve boxes shall be on the "Arched Base" pattern with a one inch (1") diameter upper section. The lid is to contain a threaded brass pentagon head plug.
10. Service boxes for 2" valves will require one (1) service box with 4-1/2" to 5-1/2" bury depth, one (1) service box rod (stem) – 24" length, and one (1) service box foot piece.

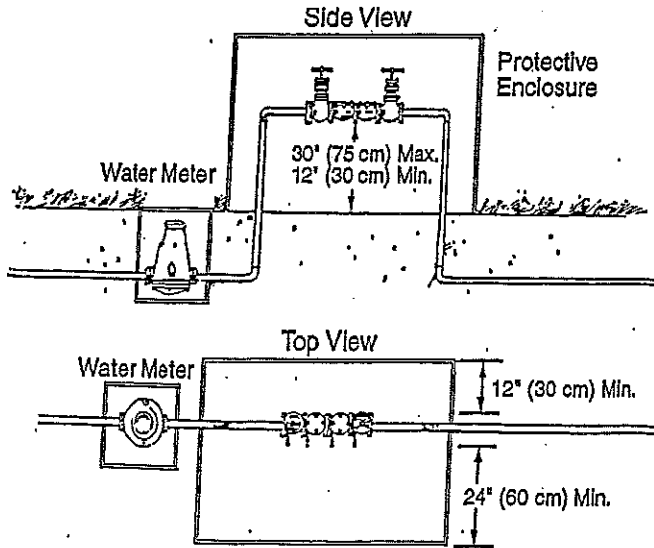
T. BACKFLOW DEVICES



Reduced-pressure (RP) device

DIAGRAM 15

NOT TO SCALE



Double check valve

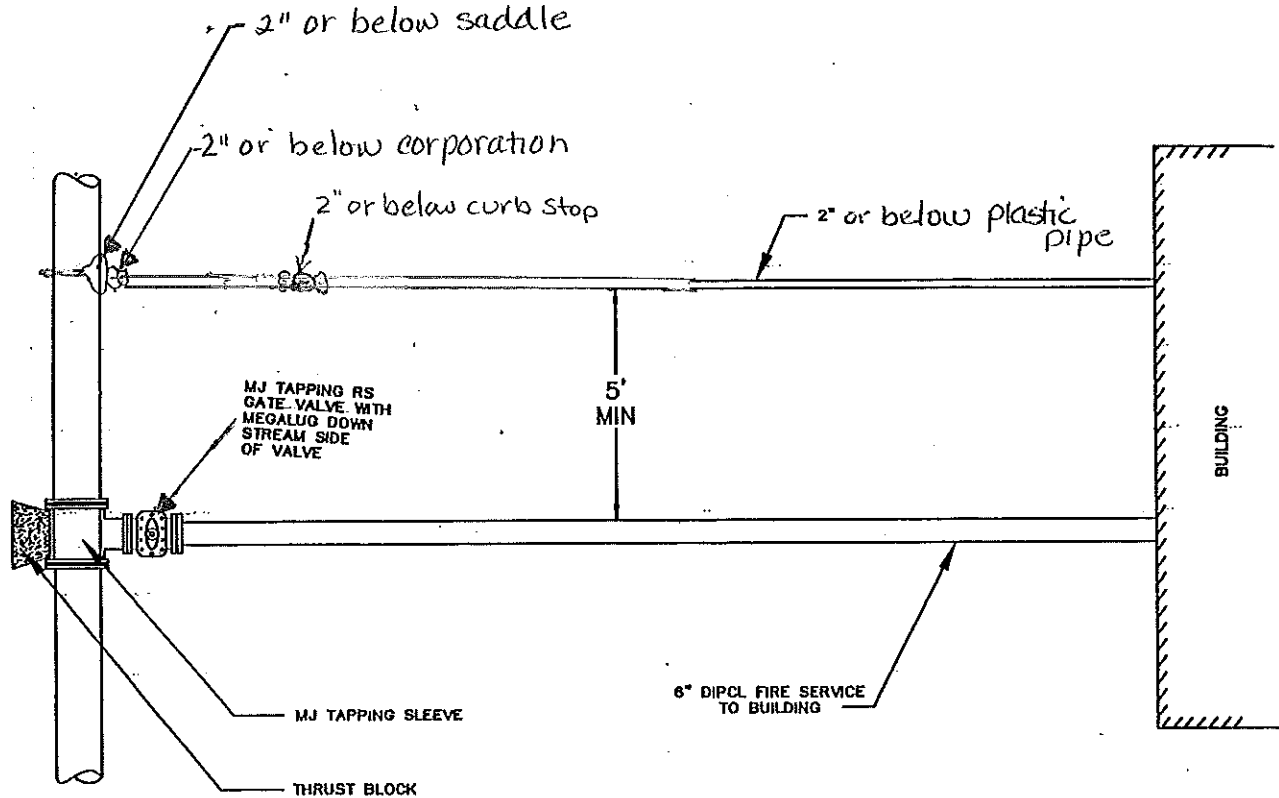
DIAGRAM 16

NOTE: Protective enclosures are not used by some agencies so any leaks or malfunctions can be easily observed.

1. All commercial water service installations shall include backflow prevention assemblies.
2. The type of device, based on the facility's degree of hazard, is determined by the MVD in accordance with the State of New Hampshire Department of Environmental Services Administrative Rules regarding cross-connection/backflow prevention (Env-Ws 364).

3. No water service line shall be activated until the backflow prevention measures have been satisfied. Meter bypasses are never to be installed so that the backflow device is bypassed.
4. A testable double check backflow device is the only type device acceptable for any underground installation and shall be installed just downstream (customer side) of the water meter. Where high hazard conditions exist, a reduced pressure backflow assembly shall be installed where the water service enters the inside of the building served. Reduced pressure assemblies shall be installed in a horizontal position only.

U. FIRE SERVICE



TYPICAL FIRE SERVICE WITH 2" DOMESTIC SERVICE

NOT TO SCALE

DIAGRAM 17

Motion for Separation of Fire and Domestic Service

All Fire Sprinkler Services over 1" in size are to be a distinct and separate service. That is, one (1) appropriate service line for Fire Sprinklers and a separate line to provide for Potable Water Service. All Fire Services for Industrial, Commercial, Mercantile and Residential are to be in accordance with The Merrimack Department of Fire Rescue Sprinkler Plan Conditions, NFPA 13 Standard for the Installation of Sprinkler Systems, NFPA 13D Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes, NFPA 13R Standard for the Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height. This policy to be effective immediately and in effect until rescinded by the Board of Commissioners."

MOTION PASSED BY BOC ON AUGUST 22, 2005 ON A VOTE OF 5-0-0

V. METER PITS

Note: Meter pit shall not be installed in a driveway or other traffic area.

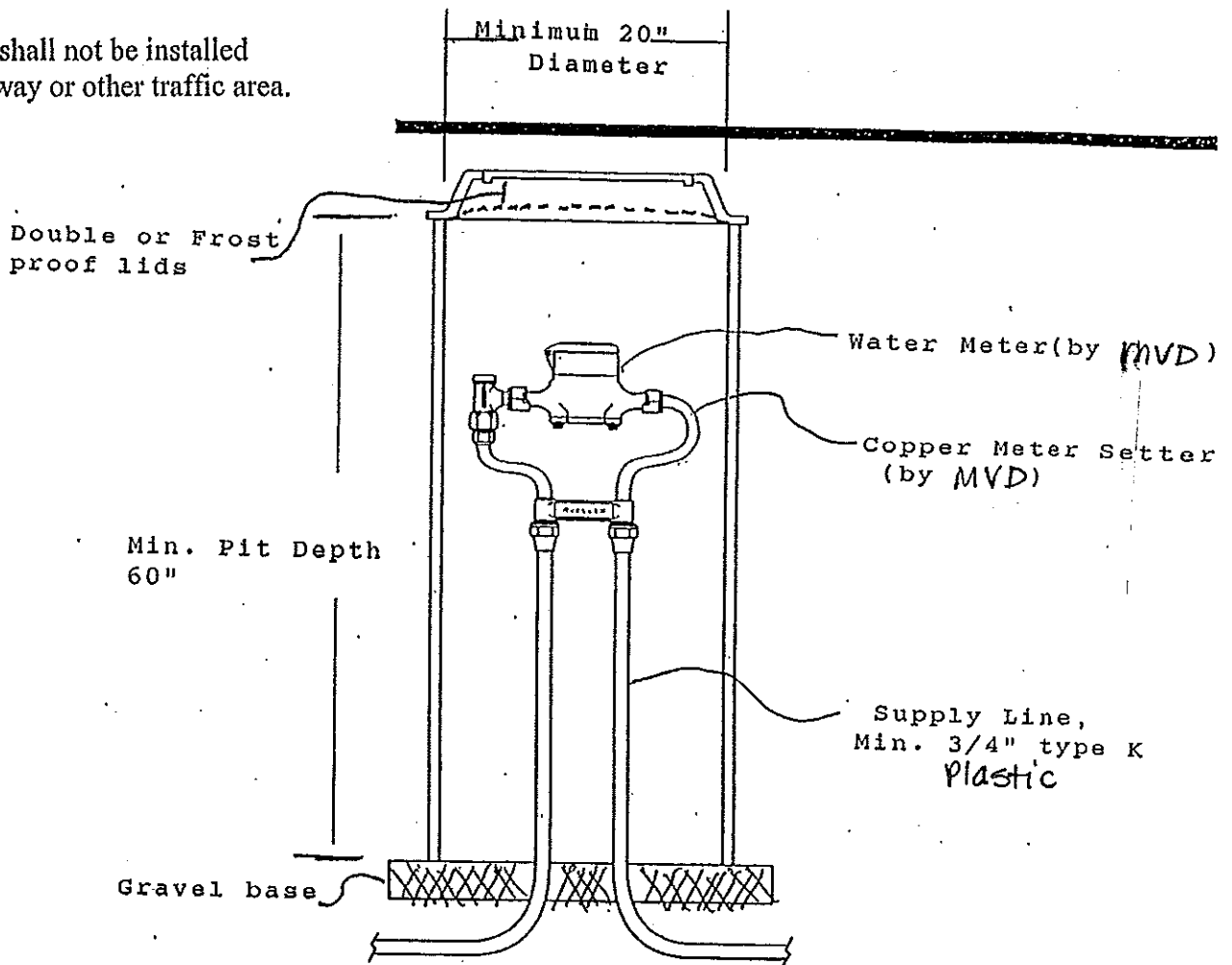


DIAGRAM 18

NOT TO SCALE

1. All meter pits shall be plastic in construction and 60 inches (60") deep. Meter pits shall be installed and maintained by the property owner and at a location approved by the MVD. The meter setter shall be installed so that the center of the meter is fifteen (15) to twenty (20) inches below the top of the meter lid.
2. All vaults shall be accessible by vehicle.
3. Meter vaults for water meters 1-1/2" and larger must be large enough to accommodate the meter, the inlet and outlet valve, pressure regulating valve and backflow assembly (if required).
4. Backflow prevention and meter bypass requirements will be at the discretion of the MVD. When a bypass is installed with a meter, the pressure regulator valve and backflow assembly shall not be bypassed.
5. All pipes three inches (3") in diameter and larger shall be flanged only and shall be reversed anchored to the outside of the meter vault.
6. The maximum depth of a meter vault shall be seven feet, six inches (7'6"). The minimum depth shall be six feet (6').

W. SURFACE RESTORATION

1. For road surfaces, the contractor shall be responsible for obtaining any necessary permits from the TOM.
2. Any pavement removed shall meet the standards of the governing agency (TOM, MVD, or State of New Hampshire).
3. The contractor shall use sawing methods that will assure breaking of pavement along straight lines.
4. The contractor shall restore any sidewalks, curbing, gutters or other surface obstructions that were damaged or removed during the course of construction to the satisfaction of the MDPW and any other governing agency involved.
5. No permanent pavement shall be installed until, in the opinion of the MDPW and other governing agencies, the backfill is such that it can properly support the pavement.
6. For unpaved areas, the surface shall be restored to a condition of at least equal to its condition prior to construction.
7. Any damaged, removed or disturbed surfaces or property during construction shall be replaced or repaired at the expense of the contractor.

X. WATER MAIN TESTING AND DISINFECTION

Pressure and Leakage Testing

1. All water main pipe and fire services shall be given pressure and leakage tests in sections of approved length. The owner shall furnish and install suitable temporary testing plugs or caps for the pipeline, pipe connections, and other similar equipment at their own expense.
2. The owner is responsible for the scheduling and cost of pressure and leakage tests. The MVD's inspector is to be notified at least 48 hours in advance of the scheduled testing.
3. All testing of pipe must be witnessed by the MVD's inspector. The MVD's inspector must have the written confirmation of the test results before the water pipe will be accepted.
4. The pipe to be tested shall be filled with water of approved quality and all air shall be expelled from the pipe. If hydrants or bleeders are not available at high points for releasing air, the owner shall make the necessary excavations and do the necessary backfilling, and the owner shall make the necessary taps at such points and shall plug said hole after completion of the test, with brass or bronze c.c. plugs.
5. If the section fails to pass the pressure test, the leakage test, or both, the owner/developer/contractor shall do everything necessary to locate, uncover, and repair or replace the defective pipe or fittings at their own expense.
6. All testing will be in accordance with the AWWA Specifications C600-87.
7. Testing shall be done with all valves closed to insure the integrity of the valves.
8. Hydrant valves are open to test hydrants at 6" to hydrant.
9. Tapping sleeve and tapping valve assemblies will be pressure tested with air prior to performing the tap. Air pressure during the test shall be at least 150 psi. While under pressure, the tapping sleeve and tapping valve assembly shall be sprayed liberally with a soap and water solution which will allow escaping air to be readily detected. **The contractor shall supply all material and equipment necessary for testing.**
10. The pipeline will be subjected to a hydrostatic pressure test that shall be of at least two (2) hour duration.
11. Each segregated section of pipeline will be slowly filled with water insuring that all air is expelled. Extreme care must be taken to insure all air is expelled from the pipeline during the filling of water pipe. The line shall stand full of water for twenty-four hours prior to testing to allow all air to escape. If necessary, tap the main at points of highest elevation so that air can be expelled as the pipe is filled with water. After successful completion of filling and air expulsion, but prior to testing, the corporation stops shall be removed and the taps tightly plugged.
12. The specified test pressure, measured at the point of lowest elevation, will then be applied by means of a pump connected to the pipe in a manner satisfactory to the MVD's inspector. If the elevation of the high point of the pipeline being tested is such that the pressure during testing will be below 85% of the required test pressure the MVD's inspector will require a separate test to be performed on this section of pipeline. In lieu of a separate test the test pressure measured at the lowest elevation may be increased, within the pressure rating of the pipeline material, such that resulting pressure at the highest point exceeds 85% of the required test pressure. The test pressure will not vary by more than ± 5 psi and the test will be of at least two-hour duration.
13. A leakage test will be conducted concurrently with the pressure test. Leakage is defined as the quantity of the water measured as make-up water (volumetrically in a container or meter) that must be supplied into the newly laid pipeline to maintain pressure within 5 psi of the test pressure after the air in the pipeline has been expelled and the pipe filled with water.
14. No water line shall be charged or pressurized without the approval of the MVD Inspector.
15. The contractor shall be held responsible for the repair of any service or main leaks up to one (1) year after the successful pressure testing and disinfection.

Disinfection

1. Heavy particulates generally contain bacteria and prevent even very high chlorine concentrations from contacting and killing such organisms. It is essential that the procedures of this section be observed to assure that a water main and its appurtenances are thoroughly clean for the final disinfection by chlorination.
2. **Contractor shall furnish chlorine liquid and injection equipment and/or calcium hypochlorite (HTH) as needed to complete the disinfection of all pipelines.**
3. Liquid chlorine contains 100% available chlorine and is packaged in steel containers usually of 100 lb, 150 lb, or 1 ton net chlorine weight. Liquid chlorine is to be furnished in accordance with AWWA B301-92.
4. Calcium hypochlorite is available in granular form or in approximately 5-g tablets, and contains approximately 65% available chlorine by weight. The material should be stored in a cool, dry, and dark environment to minimize its deterioration.
5. Calcium hypochlorite is to be furnished in accordance with AWWA B300-92.

Preparation

1. With the exception of the tablet method, all pipelines shall be pressure and leak tested, flushed, and cleaned of debris and dirt prior to application of the disinfectant. The tablet method requires the pipeline to be kept completely clean and dry during construction.

Continuous Feed Method

1. The continuous feed method consists of placing calcium hypochlorite granules in the main during construction (optional), completely filling the main to remove all air pockets, flushing the completed main to remove particulates, and filling the main with potable water chlorinated so that after a 24-hour holding period in the main there will be a free chlorine residual of not less than 10 mg/L.
2. Placing calcium hypochlorite granules. The purpose of this procedure is to provide a strong chlorine concentration in the first flow of flushing water that flows down the main. This procedure is recommended particularly where the type of pipe is such that this first flow of water will flow into annular spaces at pipe joints.
3. Preliminary flushing. Prior to being chlorinated, the main shall be filled to eliminate air pockets and shall be flushed to remove particulates. The flushing velocity in the main shall be not less than 2.5 fps unless the MVD's ENGINEER or inspector determines that conditions do not permit the required flow to be discharged to waste.

Chlorinating the Main.

1. Water from the existing distribution system or other approved source of supply shall be made to flow at a constant, measured rate into the newly laid water main. In the absence of a meter, the rate may be approximated by means such as placing a pitot gauge in the discharge or measuring the time to fill a container of known volume.
2. At a point not more than 10 feet 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. To assure that this concentration is provided, measure the chlorine concentration at regular intervals in accordance with the procedures described in the current edition of the AWWA Standard Methods.

Slug Method

1. The slug method consists of placing calcium hypochlorite granules in the main during construction, completely filling the main to eliminate all air pockets, flushing the main to remove particulates, and slowly flowing through the main a slug of water dosed with chlorine to a concentration of 100 mg/L in order that all parts of the main and its appurtenances will be exposed to the highly chlorinated water for a period of not less than 3 hours.

Disposal of Heavily Chlorinated Water

1. After the applicable retention period, heavily chlorinated water should not remain in contact with pipe for more than 48 hours. 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 no higher than that generally prevailing in the system or is acceptable for domestic use. Contractor shall contact the MDPW to arrange for disposal of the heavily chlorinated water to the sanitary sewer.
2. If a sanitary sewer system is unavailable for disposal of the chlorinated water an alternative disposal site must be selected. A Groundwater Discharge Permit must be obtained by New Hampshire Department of Environmental Services – Source Water Protection Section in Concord, New Hampshire to discharge any chlorinated water into someplace other than a sanitary sewer system.

Y. WATER METERS

1. All water supplied by the MVD to a property must be metered. The only exception to this requirement is fire service lines.
2. All potable water meters and copper meter setters are owned, supplied and maintained by the MVD.
3. Meter setters are installed by the Contractor for horizontal placement of the meter.
4. Acceptable locations for 5/8 inch through 1-inch water meters shall be limited to outside water meter pits, basements, utility rooms or utility closets. Other locations may be acceptable if prior approval is given by the MVD.
5. **All selected water meter locations shall provide adequate protection against freezing.**
6. When inside plumbing is constructed of plastic or vinyl pipe, it shall not be used within three feet (3') of the meter setter with the exception of the plastic service line coming into the structure.
7. Meter locations shall be provided with outlet isolation valve installed by the contractor and shall provide a minimum clearance of twelve inches (12") around the meter.

Z. TERMS OF WARRANTY ON INSTALLATION

1. The owner/developer/contractor will be held responsible for the repair of any service or main leaks up to one (1) year after the successful acceptance.
2. The owner/developer/contractor will have the opportunity to make repairs at his cost under the directions of the MVD inspector, or any leaks will be repaired by the MVD and the cost of such repairs will be charged to the owner.
3. The owner/developer/contractor will be responsible for the repair or correction of trench settlement for a minimum period of one (1) year from the date of final acceptance of the contractor's work. See also page 15 "Trenching". MVD retains the right to repair the settlement and the cost of repairs will be charged to the owner.

RECORD DRAWINGS

1. **Upon final completion, inspection and acceptance of a partial section or entire project, RECORD DRAWINGS must be supplied to the MVD before water will be supplied and the record drawings deposit* is returned.**
2. **RECORD DRAWINGS** shall consist of reproducible copies of the original design plans approved by the MVD amended to reflect all design changes approved by the MVD during the construction phase of the project, to depict the actual locations of all constructed improvements and to reflect other pertinent information gained during the construction.
3. **RECORD DRAWINGS** are essential for the operation maintenance, repair, upgrade and replacement of the improvements and for their protection during work undertaken by other government entities and utilities having legal rights to occupy and excavate within the right-of-way.
4. **SUBMITTED RECORD DRAWINGS** shall contain at a minimum:
 - a) All information shown on the original design as approved by the MVD amended to reflect subsequent design changes approved during the construction phase.
 - b) Offset ties from power poles locating the water main in the R.O.W.
 - c) Swing ties at bends, tees and service connections, etc.
 - d) Service sizes and materials, i.e. 1-1/2" plastic.
 - e) Show where the main was installed over and under culverts, storm drains, wastewater, electric, telephone and gas as approved by the MVD inspector.
 - f) Show all installed curb locations and measurements.
 - g) Show insulated pipe areas.
 - h) Identification and location of all ledge locations. Ledge location should be clearly marked and identified.
 - i) Show areas where the main was installed deeper than 5'-6" and less than 5'-6".
 - j) Location of all other utilities sharing the right-of-way with the constructed water main and associated improvements. This shall be accomplished by updating the original design plans to reflect actual and additional information gain on other utilities during the construction phase.
 - k) Show location of all utilities
 - l) Include all utility design and layout
 - m) Date/Year of Installation
 - n) Contractor Name and Address
 - o) Type of pipe materials used.
 - p) Location of all valves
 - q) Hydrant/valve manufacturer
 - r) Stamped by a New Hampshire Surveyor or P.E. engaged by the owner/developer/contractor to observe and monitor construction of the improvements.
 - s) Electronic copy of record drawings compatible with MVD GIS system.
5. Deposit amount as of 1/1/06 is \$3,000 subject to change by the BOC "Schedule of Rates".

ATTACHMENT

TOWN OF MERRIMACK ROAD BOND ESTIMATE FORM

Subdivision Name	Developer Name
Street Name	Engineer Name
Street Length	Street Construction Length

Clearing and grubbing (201)		LF @ \$			
Common roadway excavation (203)		CY @ \$			
Roadway rock excavation (203)		CY @ \$			
Common structure excavation (206)		CY @ \$			
Rock structure excavation (206)		CY @ \$			
Drainage Swales (grass) (206)		LF @ \$			
Drainage swale (rock lined)		LF @ \$			
Bank run gravel - 12" thick (304)		LF @ \$			
Crushed gravel - 6" thick (304)		LF @ \$			
Crushed gravel - 9" thick (304)		LF @ \$			
Sand (if required) 12" thick (304)		LF @ \$			
Hot bituminous pavement 2" binder (403)		LF @ \$			
Hot bituminous pavement 2 1/2" binder (403)		LF @ \$			
Hot bituminous pavement 1" wearing course (403)		LF @ \$			
Hot bituminous pavement 1 1/2" wearing course (403)		LF @ \$			
Driveway Aprons - 12' wide		EA @ \$			
STORM DRAIN (603)					
Concrete	12" diameter	LF @ \$			
	15" diameter	LF @ \$			
	18" diameter	LF @ \$			
	24" diameter	LF @ \$			
	30" diameter	LF @ \$			
HDPE	12" diameter	LF @ \$			
	15" diameter	LF @ \$			
	18" diameter	LF @ \$			
	24" diameter	LF @ \$			
Catch basins	4' diameter (604)	VF @ \$			
	5' diameter	VF @ \$			
Poly liners for Catch basins		EA @ \$			
Drain MH	4' diameter	VF @ \$			
	5' diameter	VF @ \$			
Headwalls	12" - 18" pipe	EA @ \$			
	24" - 30" pipe	EA @ \$			
6" Underdrain (605)		LF @ \$			
Flushing Basins		EA @ \$			
Retention / Detention Basins		EA @ \$			
Sanitary Sewer					
	8" PVC SDR 35 Main	LF @ \$			
	10" PVC SDR 35 Main	LF @ \$			
	6" House Service Incl. Cleanout	EA @ \$			
	4' diameter SMH	VF @ \$			
	Tie new sewer to existing SMH	EA @ \$			

Page Subtotal

\$

	Previous	Page Subtotal	\$
Sanitary Sewer			
8" PVC SDR 35 Main	LF @ \$		=
10" PVC SDR 35 Main	LF @ \$		=
6" House Service incl. Cleanout	EA @ \$		=
4' diameter SMH	VF @ \$		=
Tie new sewer to existing SMH	EA @ \$		=
Water			
Tapping Main	EA @ \$		=
" Main	LF @ \$		=
" Valve	EA @ \$		=
Hydrant incl. Lateral and Valve	EA @ \$		=
" Service incl. Tap and curbstop	EA @ \$		=
Test and chlorinate	LS @ \$		=
Utility conduits - elec. Phone, TV	LF @ \$		=
Beam guard rail (606)	LF @ \$		=
BGR terminal unit	EA @ \$		=
Cape Cod Berm (609)	LF @ \$		=
Straight granite curb	LF @ \$		=
Signs (street, stop, etc.)	LS @ \$		=
Thermoplastic pavement markings	LF @ \$		=
Traffic Signals	LS @ \$		=
Street lights	EA @ \$		=
Sidewalk incl. Crushed gravel base (608)			
2" bit. - 5' wide	LF @ \$		=
6" conc. - 5' wide	LF @ \$		=
Fabric for slope or channel stabilization	SY @ \$		=
Loam & turf establishment	SY @ \$		=
Silt Fence	LF @ \$		=
Silt Fence Removal	LF @ \$		=
Granite bounds	EA @ \$		=
As-Built Drawings	LF @ \$		=
		Subtotal (a)	
Contingencies (15% Subtotal (a))			
		Subtotal (b)	
Engineering (8% of Subtotal (b))			
Construction Supervision (7% of Subtotal (b))			
Escalation Adjustment: Current Cost x _____ years @ 6%		Current Cost	
		TOTAL BOND AMOUNT	

I hereby certify that, in addition to any work already completed, the following statement and itemized unit costs will complete all improvements required by the Merrimack Planning board for the subject street:

Public Works Director	Date	Planning Board Chairman	Date
Consultant Engineer	Date	Const. Services	Date

* Connotes applicable section of 'Standard Specifications for Road and Bridge Construction', State of New Hampshire Department of Public Works and Highway, 2004 edition.

- Notes:
- (1) The developer will be required to submit "as-built" information concerning the location of all utilities in the street and entrance to lots prior to the laying of the base coat of pavement.
 - (2) All lump sum items require detail backup.

**TOWN OF MERRIMACK
ROAD BOND ESTIMATE ITEMS AND UNIT PRICES**

Item	Unit	Unit Price	Comments	
Clearing and grubbing (201)	LF	\$ 8.00	Measured along c/l of road	
Common roadway excavation	CY	8.00	Submit calculations	
Roadway rock excavation (203)	CY	25.00	Submit calculations	
Common structure excavation (206)	CY	18.00	Add to drain and sewer cost over 5' deep	
Rock structure excavation (206)	CY	100.00	Add quantity below subgrade for all utilities	
Drainage swales (grass) (206)	LF	15.00		
Drainage swale (rock lined)	LF	40.00		
Bank run gravel - 12" thick (304)	LF	19.00		
Crushed gravel - 6" thick (304)	LF	12.00		
Crushed gravel - 9" thick (304)	LF	18.00		
Sand (If required) 12" thick (304)	LF	18.00		
Hot bit. Pave. 2" binder (403)	LF	17.20		
Hot bit. Pave. 2 1/2" binder (403)	LF	21.50		
Hot. Bit. Pave. 1" wearing course (403)	LF	8.00		
Hot bit. Pave. 1 1/2" wearing course (403)	LF	12.00		
Driveway aprons - 12' wide	EA	500.00		
Storm Drain (603)				
Concrete -	12" diameter	LF	40.00	
	15" diameter	LF	45.00	
	18" diameter	LF	50.00	
	24" diameter	LF	65.00	
	30" diameter	LF	80.00	
HDPE	12" diameter	LF	30.00	
	15" diameter	LF	35.00	
	18" diameter	LF	40.00	
	24" diameter	LF	55.00	
Catch basins 4' diameter (604)	VF	210.00	\$1,600.00 min.	
	5' diameter	VF	250.00	\$2,000.00 min.
Poly liners for CB's	EA	200.00		
Drain MH	4' diameter	VF	250.00	\$2,000.00 min.
	5' diameter	VF	300.00	\$2,500.00 min.
Headwalls	12" - 18" pipe	EA	1,000.00	
	24" - 30" pipe	EA	2,000.00	
6" Underdrain (605)	LF	20.00		
Flushing basins	EA	450.00		
Retention/detention basins	EA		Submit detailed calculations	
Sanitary Sewer				
8" PVC SDR 35 Main	LF	70.00		
10" PVC SDR 35 Main	LF	80.00		
6" house service incl. Cleanout	EA	1,275.00		
4' diameter SMH	VF	300.00	\$2,500.00 minimum	
Tie new sewer to exist. SMH	EA	1,500.00		

4/17/06

**TOWN OF MERRIMACK
ROAD BOND ESTIMATE ITEMS AND UNIT PRICES**

Item	Unit	Unit Price	Comments
Water			
Tapping main	EA		Provide itemized cost est. to MVD for review and approval.
" Main	LF		
" Valve	EA		
Hydrant Incl. Lateral and valve	EA		
" Service Incl. Tap and curbstop	EA		
Test and chlorinate	LS		
Utility conduits – elec., phone, TV	LF	60.00	
Beam guard rail (606)	LF	20.00	
BGR terminal unit	EA	2,500.00	
Cape Cod Berm (609)	LF	5.00	
Straight granite curb	LF	25.00	
Signs (street, stop, etc.)	LS		\$250.00 per intersection min.
Thermoplastic pavement markings	LF	2.00	\$500.00 per intersection min.
Traffic Signals	LS		To be agreed
Street lights	EA	1,500.00	
Sidewalk Incl. Cr. gravel base (608)			
2" blt. – 5' wide	LF	11.50	
6" conc. – 5' wide	LF	26.50	
Fabric for slope or channel stabil.	SY	2.00	
Loam and turf establishment	SY	4.00	
Silt Fence	LF	4.00	
Silt fence removal	LF	3.00	
Granite bounds	EA	350.00	
As-built drawings	LF	4.00	\$5,000.00 min.

4/17/06