
WATER DISTRIBUTION SYSTEM ENGINEERING DESIGN GUIDELINES



**City of Rochester, New York
Department of Environmental Services
Bureau of Water**

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1.1. PURPOSE

The purpose of this document is to establish guidelines for the design of twelve (12) inch diameter and smaller water distribution mains and appurtenances located within the incorporated limits of the City of Rochester. It is intended to be used by City staff and consulting engineers for all new construction, as well as replacement of and modifications to the existing water distribution system. For water mains that are greater than twelve (12) inches diameter, special design considerations may be required.

If an Engineer, due to unusual circumstances or special design considerations, finds it necessary to deviate from the design criteria included herein, he/she must submit a written request for a waiver to the Water Bureau's Managing Engineer. At a minimum, the request shall contain a narrative indicating the design objective and the justification for the request. It shall be signed and sealed by a New York State licensed and registered professional engineer. The Managing Engineer will be responsible for final approval or denial of the waiver request.

1.2. ABBREVIATIONS

| | |
|--------|--|
| AASHTO | American Association of State Highway & Transportation Officials |
| ANSI | American National Standards Institute |
| ASHRAE | American Society of Heating, Refrigerating & Air Cond. Engineers |
| AWWA | American Water Works Association |
| CAD | Computer-aided Drafting |
| CIP | Cast Iron Pipe |
| DES | City of Rochester's Department of Environmental Services |
| DIP | Ductile Iron Pipe |
| DIPRA | Ductile Iron Pipe Research Association |
| DR | Dimension Ratio |
| GIS | Geographic Information System |
| GPM | Gallons per Minute |
| HDPE | High Density Polyethylene |
| MCDPH | Monroe County Department of Public Health |
| MCWA | Monroe County Water Authority |
| MGD | Million Gallons per Day |
| NACE | National Association of Corrosion Engineers |
| NSF | National Sanitation Foundation |
| NFPA | National Fire Protection Association |
| NYSDOT | New York State Department of Transportation |
| OSHA | Occupational Safety and Health Administration |
| PE | Polyethylene |
| PSI | Pounds per Square Inch |
| PVC | Polyvinyl Chloride |
| PVCO | Molecular Oriented Polyvinyl Chloride |
| SBR | Styrene-butadiene Rubber |
| SEQR | State Environmental Quality Review |

1.3. DEFINITIONS

| | |
|-----------------------------|---|
| <u>City:</u> | City of Rochester, New York |
| <u>Combination Service:</u> | A water service, generally four (4) inches or larger, that has a single connection to a domestic water main and supplies water to an individual property for domestic/commercial/industrial use and fire-fighting/suppression purposes. |
| <u>Developer:</u> | An individual or company that subdivides property and extends public water to the subdivision and/or an individual or company which makes improvements to a property requiring water service. |
| <u>Engineer:</u> | A professional engineer, registered in the State of New York, who is responsible for the design of the project. |
| <u>Fire Service:</u> | A water service that is connected to either a domestic or Holly water main and supplies water to an individual property, solely for fire-fighting/suppression purposes. |
| <u>Health Department:</u> | Monroe County Department of Public Health (MCDPH) |
| <u>Inside Service:</u> | The portion of water service that is owned and maintained by the property owner, typically beginning at the curb valve or curb box and extending into the building. |
| <u>Outside Service:</u> | The portion of the water service that is maintained by the Water Bureau, typically beginning at the service connection or service tap at the water main and extending to the curb valve or curb box. |
| <u>Plumber:</u> | A plumber who is properly licensed and registered in the City of Rochester. |
| <u>Run Service:</u> | A water service pipe that was either installed for future use and never used, or was used at one time but is currently not being used and has not been abandoned at the tap. |
| <u>Water Bureau:</u> | City of Rochester Bureau of Water |

1.4. SUPPLEMENTARY DOCUMENTS

This document is to be used in conjunction with the following Standards, Codes, Details and Specifications:

- a. City of Rochester Public Works Construction Specifications, latest revisions
<https://www.cityofrochester.gov/Specifications/>

- b. City of Rochester Public Works Construction Documents, latest revisions <https://www.cityofrochester.gov/constructiondocuments/>
- c. Chapter 23 from the Code of the City of Rochester entitled *WATERWORKS*, latest revision <https://www.cityofrochester.gov/citycode/>
- d. Chapter 39 from the Code of the City of Rochester entitled *BUILDING CODE*, latest revision <https://www.cityofrochester.gov/citycode/>
- e. City of Rochester Water Specifications & Details, latest versions <https://www.cityofrochester.gov/waterdocuments/>
- f. Rochester Water Bureau Approved Products List, latest edition <https://www.cityofrochester.gov/waterdocuments/>
- g. *Recommended Standards for Water Works, latest edition, Policies for the Review and Approval of Plans and Specifications for Public Water Supplies* (a.k.a. Ten State Standards), Great Lakes-Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers and other helpful documents <https://www.monroecounty.gov/eh-publicwater>
- h. American Water Works Association (AWWA) Standards, latest edition <https://www.awwa.org/Publications/Standards>
- i. *Standard Specifications (US Customary)*, latest edition, New York State Department of Transportation <https://www.dot.ny.gov/main/business-center/engineering/specifications/updated-standard-specifications-us>
- j. CSX Transportation, *Design & Construction Standard Specifications – Pipelines Occupancies* <https://www.csx.com/index.cfm/library/files/customers/property-real-estate/permitting/pipeline-design-construction-specifications/>

Where specific design guidelines are not provided in this document, guidance shall be obtained from applicable industry standards, including, but not limited to Ten State Standards or AWWA Standards.

1.5. AUTHORITY

The Charter of the City of Rochester assigns responsibility for administering and managing the supply, treatment and distribution of water for the City to the Department of Environmental Services (DES) through its Water Enterprise (Bureau). Among the responsibilities assigned to the DES Commissioner is the duty to plan and supervise the distribution of water through the City and protect the water supply against contamination. The Water Bureau operates as a division within DES. By authority of Chapter 23 of the City of Rochester Municipal Code entitled “Waterworks”, the Director of Water is authorized to promulgate waterworks specifications, governing the materials, size and design of water services, meters, valves and other fittings and to amend these specifications from time to time.

1.6. WATER SYSTEM OVERVIEW

The City obtains its potable water from two sources. Its primary source is from Hemlock and Canadice Lakes, located approximately 28 miles south of the City. These lakes are often referred to as the City's "Upland Supply". Water withdrawn from these lakes is filtered and treated with chlorine and fluoride at the City's Hemlock Lake Water Filtration Plant and conveyed by gravity through a series of large diameter transmission mains (conduits) to a transmission reservoir located in the Town of Rush and then to two distributing reservoirs located within the City at Highland and Cobbs Hill Parks. The secondary water source for the City is Lake Ontario, via the Monroe County Water Authority's (MCWA) Shoremont Treatment Plant. MCWA water is conveyed directly into the City's distribution system through a number of metered interconnections between the MCWA and City water systems.

The oldest water mains in the distribution system were installed in 1873. In general, the material used for distribution water mains installed between 1873 and 1960 was cast iron pipe. Between 1960 and 1972 both cast iron and ductile iron water mains were installed. Water mains installed between the early 1970's and 2005 were ductile iron. From 2005 to the present, PVC, PVCO and DIP water mains have been installed. Beginning in the mid-1950's cast and ductile iron water mains were installed with a factory applied cement mortar lining. For several decades, the Water Bureau has undertaken an annual program to clean and line its unlined cast iron water mains with a field applied cement mortar lining. The program initially focused on larger diameter unlined water mains. Consequently, most cast iron water mains larger than eight (8) inches diameter have a cement lining. The Bureau is currently lining six (6) inch and eight (8) inch diameter cast iron water mains.

1.6.1. Domestic Distribution System

The domestic distribution system includes approximately 600 miles of water mains ranging in size from 1 inch to 48 inches in diameter. The domestic system not only provides potable water for domestic usage, but also for industrial and fire protection purposes.

The domestic system is generally divided into three major pressure zones; the Charlotte Zone, City Main Zone (East & West) and the Rush Zone (Southwest, West and East). There are also a number of smaller isolated zones. Exhibit A is a map showing the locations of the domestic distribution system pressure zones. The Charlotte and City Main Zones are primarily supplied from Highland and Cobbs Hill Reservoirs, but can also receive a supplemental supply through several connections with MCWA. The Rush Zones include the higher elevation areas located in the southern portion of the City that primarily are supplied from connections to the City's water transmission conduits downstream of the Rush Reservoir. Pressures in the Rush Zones are subject to fluctuations, primarily depending on the Highland and Cobbs Hill Reservoir inlet valve positions and system hydraulic demands.

Operating pressures in the domestic system vary, depending on the geographic location within the system, regardless of the pressure zone. With pressures as low as 35 PSI, the area in the vicinity of the intersection of Brooks Avenue and Thurston Road generally has the lowest pressures in the system. Pressures within the area bounded by Lake Avenue, the Genesee River, Boxart Street and Burley Road can generally exceed 120 PSI. Exhibit B is a map showing the general operating pressure ranges within the City domestic distribution system.

1.6.2. Holly Fire Protection System

The Holly system is located within the City's Central Business District and several outlying industrial and commercial areas. It is used almost exclusively for fire protection purposes and is non-potable. The Holly system consists of a pump station (located on Mill Street near Platt Street) and approximately 22 miles of water mains ranging in size from 6 inches to 20 inches in diameter. The pumps draw water from a large wet well and discharge this water into the Holly system mains. The wet well is supplied via connection to the domestic system. Operating pressures in the Holly system generally range between 100 and 110 PSI.

2.1. GENERAL PLANNING AND DESIGN

There are many factors that need to be considered when planning and designing a new water main or water service, including the selection of appropriate material, location, hydraulic demands, fire protection needs, available system pressures, soil corrosivity, proximity of adjacent utilities, depth to bedrock and potential for soil contamination.

2.1.1. Standard Specifications, Details and Approved Products List

A list of standard specifications and details for water system improvements can be found in Appendix C and Appendix D, respectively. The Bureau's Engineering Division also maintains a list of products that have been approved for use by the Water Bureau, commonly referred to as the Water Bureau's Approved Products List. The specifications, details and approved products list are updated periodically and are available at <https://www.cityofrochester.gov/waterdocuments/>

2.1.2. Water Bureau Records

The Water Bureau maintains records of its water distribution system dating back to 1873. Beginning in the 1990's, record maps were gradually transferred over from Mylar to a digital GIS based mapping system. Currently, when a water main improvement is made within the City right-of-way, Water Bureau inspectors record information in a field book. Information recorded includes: pipe material and diameter, depth of cover, type and size of valve, horizontal location of feature, date of installation, etc. Field book information is then entered into GIS by the Bureau's Maps and Records Division. Field books are also scanned. Water service records are currently available in both GIS based format and "mainframe" based format. Other available records include: hydrant flow tests, hydraulic coefficient tests and main break history. Electronic or paper copies of Water Bureau records are available at no charge by calling the Bureau's Maps and Records Division at 428-7562.

2.1.3. Water Main Evaluation Report

For street reconstruction and rehabilitation projects, the Water Bureau's Engineering Division should be solicited during the planning phase to evaluate the condition of its existing water facilities located within the project area and recommend proposed improvements that should be incorporated into the project. In response to this solicitation, the Bureau will prepare a Water Main Evaluation Report. An example of one such report is included in Appendix C. Factors that are considered when evaluating an existing water main include but are not limited to, scope of project and whether the existing surface elevations will be lowered, number of recorded main breaks, depth of cover over the main and available fire flows. The following table provides general guidelines used by the Bureau when it develops its water main improvement recommendation for a street improvement project. Recommendations for specific projects may vary.

| Scope of Street Work | Existing Water Main | Typical Water System Improvement Recommendation |
|-----------------------|--|--|
| Reconstruction | Unlined cast iron pipe | Either replace with new main, hydrants and services or consider rehabilitating the main prior to reconstruction, depending on; main break history, fire flow data and requirements and if adequate cover will be maintained. If main is retained and rehabilitated prior to reconstruction, scope of water system work may include replacement of lead, lead lined and galvanized services, replacement of hydrant branches and valve boxes and possibly cathodic protection of existing mains and copper services. |
| Reconstruction | Cement lined cast or ductile iron pipe or PVC/PVCO pipe. | Maintain existing main unless there has been a history of main breaks, insufficient fire flow or if surface will be lowered such that insufficient depth of cover will be provided. Scope of water system work may include replacement of lead, lead lined and galvanized services, replacement of unlined hydrant branches and replacement of valve boxes and possibly cathodic protection of existing cast or ductile iron mains and copper services |
| Milling & Resurfacing | Unlined cast iron pipe | Either replace with new main, hydrants and services or consider rehabilitating the main prior to resurfacing, depending on; main break history, fire flow data and requirements and if adequate cover will be maintained. If main is retained and rehabilitated prior to resurfacing, scope of water system work to consider may include replacement of lead, lead lined and galvanized services, replacement of hydrant branches and valve boxes, adjustment of valve boxes and possibly cathodic protection of existing mains and copper services. |
| Milling & Resurfacing | Cement lined cast or ductile iron pipe or PVC/PVCO pipe. | Maintain existing main unless there has been a history of main breaks, insufficient fire flow or if surface will be lowered such that insufficient depth of cover will be provided. Scope of water system work to consider may include replacement of lead, lead lined and galvanized services, replacement of unlined hydrant branches, adjustment or replacement of valve boxes and possibly cathodic protection of existing cast or ductile iron mains and copper services |

2.1.4. Subsurface Investigations

Subsurface borings or test pits are recommended when new water mains are proposed in order to determine geotechnical parameters such as type of soils, groundwater levels and depth to bedrock. Additional subsurface parameters that may need to be tested include soil corrosivity and various contaminants that may affect the integrity of water mains and appurtenances. The Engineer should consider making use of available geotechnical records, including Monroe County Pure Waters Rock Maps, results of nearby tests and Water Bureau field notes. It is recommended that borings or test pits be located in close proximity to the

proposed water main alignment. Horizontal spacing between borings or test pits should be determined by the Engineer, and depends on the length of proposed water main and other known field conditions. It is recommended that the minimum depth of borings or test pits be extended to a maximum depth of eight (8) feet below the surface or two (2) feet below the lowest anticipated invert elevation of the proposed water main.

2.1.5. Soil Corrosivity Testing

Several laboratory tests can be performed on soil samples to determine how corrosive the soil may be to metallic water main pipe and fittings. It is recommended that when subsurface investigations are undertaken, samples be collected from at least one or more boring or test pit locations, at or near the depth of the proposed water main, and sent to a laboratory to test for the following parameters:

- Soil resistivity (ohm-cm)
- pH
- Redox Potential
- Sulfides
- Moisture

These five parameters are tested as part of the DIPRA 10-Point Soil Evaluation Procedure and assigned points according to their contribution to corrosivity. Additional information on the 10-Point test can be found in the Appendix to ANSI/AWWA Standard C105/A21.5.

An additional parameter that is sometimes used in conjunction with the 10-Point Test to evaluate soil corrosivity is chloride concentration. High chloride concentrations (>500 mg/l) are an indication that soils may be corrosive. Tests currently approved to determine chloride concentrations in soils include: USEPA Method 9056 or USEPA Method 9252.

2.1.6. Environmental Site Review and Testing

An environmental site investigation should be conducted of the project area and its surroundings in order to determine if there is a potential for encountering contaminants. The presence of petroleum hydrocarbons and chlorinated solvents are of concern because they can permeate plastic water main or service pipe and SBR or EPDM rubber gaskets. Also, when contaminated soils are encountered, special provisions may be required for their handling, transportation and disposal. There is generally a high probability that contamination may be present in the vicinity of current and former gas stations and dry cleaning facilities.

It is recommended that during the planning phase, the Engineer review available records from the City's DES Environmental Quality Division, New York State Department of Environmental Conservation, Monroe County Planning Department, Monroe County Health Department, and others, to determine if there is a potential for encountering contaminated soils within the project area. If the potential does exist, then soil testing for petroleum hydrocarbons and/or

chlorinated solvents should be performed. Tests to be performed may include VOC's EPA 8260, VOC's EPA 8015, VOC's EPA 8015B, Volatile organics (TCL List) 624/8260, Volatile halogens (chlorinated) 624/8260, Volatile aromatics 624/8260, Volatile organics (CP-51 List) 8260, Volatile organics (CP-51 & TCL lists) 8260, CP-51 list SVOCs Base neutrals 8270/625, Gasoline range organics (GRO) 8015, Diesel range organics (DRO) 8015 or Petroleum hydrocarbons 310.33.

2.1.7. SEQR Review

Chapter 48 Environmental Review of the City Code (<https://www.ecode360.com/RO0104>) is known as the Environmental Review Ordinance. Its purpose is to incorporate consideration of environmental factors into the decision making process of City government at the earliest possible time. It is the intent of Chapter 48 to supplement and not to replace New York State Environmental Quality Review (SEQR) Regulations.

The Developer and/or Engineer shall be responsible to perform an environmental review of the project, in accordance with Chapter 48.

2.1.8. Hydraulics

When designing a new water main or service, existing and projected hydraulic demands for water use and fire protection are significant factors in determining the size of a new water main or service. Additionally, water quality considerations also factor into the determination of water main sizes. Due to the complexity of the City's water distribution system, it is the responsibility of the Water Bureau's Design Engineering Division to determine the size of a new or replacement water main.

The Developer's Engineer will be responsible for determining the size of a new water service to a new building or confirming that existing water services will satisfy the hydraulic demand of a building that is undergoing renovation. Determining factors will include: number of plumbing fixtures, anticipated occupancy and fire protection requirements. Determination of water service sizes must be in conformance with all applicable local, regional and national codes.

The Water Bureau regularly performs hydrant flow tests and periodically performs pipe coefficient tests on water mains within the distribution system. Records of these hydraulic tests are available by calling The Water Bureau's Maps & Records Division at 428-7562 or 428-6133. If a new flow test is required to assist the Engineer in designing a water service, a flow test can also be requested by calling the Bureau's Maps & Records Division.

2.1.9. Utility As-Built Records

The Engineer is responsible for obtaining as-built records from other utilities located within the project area. Other utilities include: sewer, gas, electric, telephone, cable television, fiber-optic communication lines, steam, street lighting, etc.

Dig Safely New York is an organization that promotes an easier, safer digging environment serving the entire state of New York, excluding New York City and Long Island. It provides a message handling service for member utility/facility owners and operators and maintains an up to date list of member agencies having facilities located within the City of Rochester. This list is available through their website, <http://www.digsafelynewyork.com/> or by calling 811. Not all utilities are members of Dig Safely New York.

Dig Safely New York allows designers to submit Survey and Design Requests, whereby Dig Safely New York will identify affected member companies, inform them of the design request and provide the caller with contact telephone numbers. It is the responsibility of the Engineer to contact all Dig Safely New York member utilities located within the project area, as well as any non-member utilities, in order to obtain the best information available to locate underground utilities during the planning and design of a project. As-built records should be used in conjunction with field survey data and utility stakeout information to try to determine the most precise information regarding the location of all underground utilities within the project area. Additionally, if there is a potential that the installation of a new water main may conflict with an existing utility, and there is no accurate information available on the depth of this utility, consideration should be given to excavating a test pit to confirm the depth of this utility.

2.1.10. NSF/ANSI Standards 61, 61-Annex G and 372

NSF/ANSI Standard 61 Drinking Water System Components - Health Effects is the standard that establishes minimum health effects requirements for materials, components, products, or systems that contact drinking water, drinking water treatment chemicals, or both. The standard covers many items, including, but not limited to: pipes, fittings, valves, linings, etc. Annex G of this standard lead content and performance-based requirements.

NSF/ANSI Standard 372 Technical Requirements establishes a standardized methodology for the determination and verification of product compliance to minimize lead contaminants

The Water Bureau requires that products that will come in contact with potable water be certified by an accredited independent third party North American laboratory to be in compliance with NSF/ANSI Standard 61 (including Annex G) and/or NSF/ANSI Standard 372.

2.2. WATER MAINS AND FITTINGS**2.2.1. General**

New water mains and appurtenances must be located within the street right-of-way. Under special circumstances, with prior approval of the Water Bureau, water mains may be located outside of the right-of-way within easements that are dedicated to the City specifically for water main installation, maintenance and replacement.

New water mains should be located underneath the street pavement, at least 4 feet from the face of the curb (use proposed curb line if pavement will be narrowed or widened). Water mains shall be designed with a minimum depth of cover of 4.5 feet for domestic mains and 5.0 feet for Holly mains, as measured from the existing surface, or if the existing surface elevation will change, from the proposed finished grade elevation.

When a new water main is to be installed adjacent and parallel to an existing water main, and the existing main is to remain in service during construction, a minimum horizontal separation (exterior pipe wall of old water main to exterior pipe wall of new water main) of at least two (2) feet should be provided. If it becomes necessary to install a new water main closer than two (2) feet from an existing water main, temporary bypass pipe may be required to provide continual service to water customers during construction. Temporary bypass may also be required in situations where it becomes necessary to install the new water main in the same location as the existing water main due to conflicts with other utilities, shallow depth of bedrock or narrow right-of-way.

2.2.2. Separation from Other Utilities

In situations where new water mains and new sewers are to be installed in parallel, a minimum horizontal separation of 10 feet should be provided between the water main and the sewer.

In situations where a new water main is to be installed parallel to an existing sewer which is to be maintained, and the water main will be located above the sewer (invert of water main is six (6) inches or more above the top of the sewer), the minimum horizontal separation between the water main and sewer should be 3 feet. If the water main is located below the sewer, then either a minimum vertical separation of 18-inches (measured between the outside walls of both pipes) should be provided between the water main and sewer or the water main or sewer should be encased or sleeved. In all cases, the water main shall be kept as far as horizontally possible from the sewer.

For perpendicular crossings of existing sewers, it is preferable that the water main cross over the sewer. When a water main crosses over a sewer, a minimum vertical separation of six inches shall be provided. If it becomes necessary to install the water main below an existing sewer, then either a minimum vertical separation of 18-inches should be provided between the water

main and sewer or the water main or sewer should be encased or sleeved. Additionally, one full length of water main pipe should be centered over or under the sewer so that water main joints will be located as far away as possible from the sewer.

The following table lists desired lateral separations between new water mains and other utilities.

| UTILITY | LATERAL SEPARATION FROM WATER MAIN |
|------------------------|------------------------------------|
| Gas Main | 3 Ft. |
| Electrical Conduit | 3 Ft. |
| Electrical Manhole | 2 Ft. |
| Telephone Conduit | 3 Ft. |
| Telephone Manhole | 2 Ft. |
| Cable TV Conduit | 3 Ft. |
| Street Light Conduit | 3 Ft. |
| Traffic Signal Conduit | 3 Ft. |
| Road Underdrain | 2 Ft. |
| Steam Line | 3 Ft. |

When a water main crosses another utility, a minimum vertical separation of six (6) inches shall be provided above or below the water main. When there is an extreme conflict between a new water main and an existing utility, it may be necessary for the utility to relocate its facilities.

2.2.3. Water Main Pipe

The Water Bureau will determine the material to be used and diameter of the proposed water main for all projects. Standard pipe diameters used for distribution system water mains with fire hydrants connected shall be 6, 8 or 12 inches diameter. In special situations, water mains smaller than 6 inches diameter might be considered if fire hydrants are not to be connected.

For buried domestic water mains, pipe shall be push-on joint PVC Pressure Class 305, PVCO Pressure Class 235 or Class 52 DIP with a double thickness cement mortar lining. The use of PVC and PVCO for domestic water mains is allowed up to a maximum diameter of thirty inches. PVC or PVCO pipe should be used when a water main will be located within 300 feet of another utility that is protected with an impressed current cathodic protection system. PVC and PVCO pipe may not be used when the water main will be installed within 300 feet of a site that is known to or has the potential to be contaminated with petroleum hydrocarbons or chlorinated solvents or if the normal operating pressure will exceed 100 PSI. PVC and PVCO pipe may not be used when the new water main is less than 3 feet from a steam line. The use of HDPE DR9 pipe or Class 56 DIP may be specified for domestic water mains in certain special situations, with prior approval of the Water Bureau.

Buried Holly water mains shall be push-on joint Class 56 DIP with a double thickness cement mortar lining or PVC Pressure Class 305.

Warning tape is required on all buried water main. Additionally, tracer wire is required on all buried non-metallic water main.

Push-on joint gaskets for buried pipe and mechanical joint gaskets for valves and fittings shall be SBR rubber unless the water main will be installed within 300 feet of a site that is known to or has the potential to be contaminated with petroleum hydrocarbons or chlorinated solvents. In these situations, DIP or PVC must be used for the water main material and push-on and mechanical joint gaskets shall be nitrile rubber (Buna-N). Locations where nitrile rubber gaskets are required should be clearly identified on the drawings. In locations where high concentrations of contaminants exist, consideration may need to be given to specifying the use of Viton gaskets. In areas where new mains are installed through contaminated soils, impervious trench plugs (compacted clay soil) shall be installed at intervals within the trench surrounding the main and where the main transitions beyond the 300 feet limit.

The maximum deflection at pipe joints and the minimum radius for pipe laid along a curve shall be as recommended by the pipe manufacturer. When greater deflection or reduced radius is required, pipe fittings shall be used. Deflection in plastic pipe, other than at the joints, shall not be allowed.

Domestic and Holly water main pipe located in vaults shall be flanged joint Class 56 DIP with 1/8" thick synthetic rubber full face or ring type flange gaskets.

Unless otherwise required by the Water Bureau, all new DIP shall be encased with polyethylene tube encasement. When a new DIP water main or an existing CIP or DIP water main is located in corrosive soils, it may also be necessary to attach magnesium anodes and electrically bond fitting and pipe joints. The Water Bureau shall be consulted during design to determine if anodes and joint bonds will be required.

2.2.4. Pipe Fittings

Fittings include all horizontal and vertical bends, tees, crosses, offsets, reducers, anchor (swivel end) pipe, caps, plugs and sleeves. Bends are required at sudden changes in pipe alignment that exceed the allowable pipe joint deflection. Typical bends used are $11\frac{1}{4}^{\circ}$, $22\frac{1}{2}^{\circ}$ and 45° . The use of 90° bends should be avoided, if possible.

On PVC or PVCO water mains 8 inches diameter or less, fittings shall be bell and spigot type injection molded PVC with SBR gaskets. On 12" PVC or PVCO pipe and all sizes of DIP, fittings shall be mechanical joint ductile iron compact fittings or ductile iron or gray iron fittings. Iron fittings shall either have a fusion bonded epoxy coating and lining or shall have a double thickness cement mortar lining with asphalt coating and lining. Ductile iron fittings used on PVC or PVCO pipe shall have a nine (9) pound anode thermite welded to the fitting for cathodic

protection. When non-epoxy coated iron mechanical joint fittings are used on PVC or PVCO water mains, the fitting and glands are to be wrapped with a petrolatum/petroleum wax tape system. Mechanical joint gaskets on iron fittings shall be SBR, unless they will be located within 300 feet of a site that is known to or has the potential to be contaminated with petroleum hydrocarbons or chlorinated solvents. In these situations, nitrile rubber (Buna-N) gaskets are required and should be clearly identified on the drawings. In locations where high concentrations of contaminants are present, consideration may need to be given to specifying the use of Viton gaskets.

Tee bolts and nuts used on mechanical joint iron fittings and glands shall be blue fluorocarbon coated, cold formed, high strength, low alloy steel.

2.2.5. Thrust Restraint

Both concrete thrust blocking and mechanical thrust restraint devices are required at pipe bends, tees, caps and plugs. Additionally, mechanical thrust restraint devices are required at all reducers, valves, and on all pipe joints located within a minimum specified distance from a bend, tee, cap, plug, reducer and valve. Dimensions for thrust block sizes and minimum restrained joint distances from fittings and valves are found in the Water Bureau's Standard Drawings.

2.2.6. Connections to Existing Mains

When a new water main is being installed, it is necessary to make an initial connection to an existing water main in order to provide a source of water for flushing, pressure testing and disinfection purposes. The location of this initial connection (where the water main construction begins and where water will generally be supplied for filling and flushing the main) should be identified on the drawings. No other connections can be made until the new water main has been successfully tested. When selecting the initial connection location, the Engineer should consider maximizing flushing velocities and optimizing water quality for flushing and disinfection during construction. Consequently, initial connections to small diameter unlined cast iron water mains should be avoided whenever possible.

A new main line valve must be located on the new main immediately downstream of the initial connection location. This valve will be used to supply water to the new main for testing and will isolate the new main from the existing main to facilitate the pressure test.

When connecting a new water main to an existing cast iron water main, it is desirable to eliminate any fittings or short pieces of existing pipe that may not have been lined with cement mortar as part of the Water Bureau's water main cleaning and lining program. Water Bureau record maps and field notes should be reviewed to determine the precise location of unlined cast iron water mains within the project area.

When a connection is made to an existing water main that is parallel with and offset from the new water main, the connection shall be made using two - 45° bends, pipe and necessary fittings. When connecting new PVC/PVCO pipe to existing cast or ductile iron pipe, the use of ductile iron fittings is preferred.

When a connection is made to an existing water main that is perpendicular to the alignment of the new main, the connection can be made with a tapping sleeve and valve (if the existing main is the same diameter or larger than the new main) or by cutting in a new tee on the existing main. For the latter situation, the new tee should be made of similar material as the existing main (PVC tee for existing PVC or PVCO mains and DIP for existing CIP or DIP mains).

When connecting to an existing cast iron water main, it is likely that the outside diameter of the main might be slightly larger than the outside diameter of standard ductile iron water main pipe. Consequently, the contractor may need a dual purpose (duo) solid sleeve or tapping sleeve sized to accommodate oversized cast iron pipe in order to connect to the existing main.

When new ductile iron pipe and fittings are used to connect new PVC or PVCO water mains to existing cast or ductile iron water mains, appropriately sized anodes shall be thermite welded to each piece of pipe or fitting. In cases where several ductile iron fittings and short pieces of ductile iron pipe are used pipe and fitting joints may be bonded for electrical continuity and one appropriately sized anode thermite welded to the pipe/fitting assembly. The Water Bureau shall be consulted in all cases for determining sizes of anodes to be used.

2.2.7. Insertion Sleeves

An insertion sleeve is used to replace a fitting or valve that is cut out and removed from a water main. When installed on cast iron or ductile iron water mains, the insertion sleeve will consist of two mechanical joint solid sleeves with a short piece of DIP positioned between the sleeves. When installed on PVC or PVCO mains, the insertion sleeve will consist of two PVC slip couplings (at least one without an internal stop) and a short piece of PVC or PVCO pipe positioned between the two couplings. The sleeves or couplings are attached to the cut ends of the existing water main after the fitting or valve is removed. Because older cast iron pipe may have a larger outside diameter than ductile iron pipe, the use of dual purpose solid sleeves may be required when installing an insertion sleeve on cast iron pipe.

2.3. MAIN LINE VALVES

2.3.1. General

New main line valves 12-inches diameter and smaller are to be vertical type, open right, resilient seat gate valves.

Main line valves shall be located along the water main, at intervals no greater than 800 feet. Whenever possible, main line valves should be located such that no more than two fire hydrants are located between two main line valves. The number of main line valves required at an intersection of two water mains (normally at street intersections) should be determined by the distance to the next valve on either side of the intersection. When a smaller water main is connected to a larger water main at an intersection, a valve is normally required on the smaller water main. When the diameter of the larger water main is 24-inches or larger, the smaller water main shall have two valves (guard valve and operating valve) installed adjacent to each other near the intersection of the two mains. Whenever practical, main line valves shall be located along the projection of an intersecting street right-of-way line. Valves should not be located under stamped concrete or other specially treated crosswalks.

It is recommended that consideration be given to salvaging any existing resilient seat gate valves or any type of gate valve larger than 16-inches or larger located on a section of pipe that will be abandoned. The Engineer shall consult with the Water Bureau to determine if any existing valves located within the project area should be salvaged. Specification S902-Salvage Existing Water Valve applies to this work.

2.3.2. Gate Valves

New gate valves are to be installed on new water main pipe. Valves shall have mechanical joint ends which are to be restrained to the pipe on each end of the valve. If the length of pipe attached to a valve is less than 18 feet (one full pipe length), additional restraint is required on new pipe joints within 18 feet of the valve.

2.3.3. Tapping Sleeve and Valve

A tapping sleeve and valve is typically used in situations where it is desirable to connect a new water main (which is perpendicular to an existing water main) to an existing main without shutting down the existing main. The size of the tapping sleeve and valve can be no larger than the size of the main being tapped. If the existing water main can be shut down, a tapping sleeve and valve may still be specified or the existing main can be cut and a new tee (or cross, if the new main will extend perpendicular from both sides of the existing main) with valve(s) may be specified. A tapping sleeve and valve should not be used if an existing tee which will be removed is located within five (5) feet of the proposed tap.

A temporary tapping sleeve and valve is sometimes specified when replacing dead end water mains in order to facilitate testing and reduce service disruptions to water customers. After the new main has been tested, the temporary tapping sleeve and valve is typically removed, delivered to the Water Bureau and replaced with necessary fittings to permanently connect the new main to the existing main.

2.3.4. Valve Installation on Existing Water Main (Cutting-In Valve)

A new valve must sometimes be installed on an existing water main. When installing a new valve on an existing oversized CIP water main, the assembly consists of a special dual purpose cutting-in sleeve with one plain end (which is connected to a standard mechanical joint end of the cutting-in valve) and one oversized mechanical joint end (which accommodates direct connection to the cut end of oversized CIP) and a valve that has one standard sized mechanical joint end and one oversized mechanical joint end to permit a direct connection to oversized CIP. For cutting-in valves installed on DIP or standard size CIP, a standard mechanical joint gate valve, one short piece of ductile iron pipe and one solid sleeve may be used. For cutting-in valves installed on PVC or PVCO pipe, a standard mechanical joint gate valve, one short piece of PVC or PVCO pipe and a mechanical joint solid sleeve may be used.

2.3.5. Valve Boxes

Valve boxes must be installed on all new buried valves and removed from valves which are being abandoned. New valve box top sections should be installed on existing valves in pavement reconstruction areas. For milling and resurfacing projects, existing valve boxes should be adjusted to finished grade prior to placement of final pavement course or, if they are broken, should be replaced with new valve boxes. When a valve is abandoned, its valve box must be removed.

2.4. FIRE HYDRANTS

The maximum distance between fire hydrants should be 300 feet. In commercial and industrial areas, hydrant spacing should range between 200 and 250 feet. In areas served by both the domestic and Holly systems, the minimum distance between a domestic hydrant and a Holly hydrant should be 25 feet. It is preferable to locate hydrants near street intersections and at extensions of side lot lines between two adjacent properties, whenever possible. When an existing water main is to be retained, the location of existing hydrants must be reviewed and it may be necessary to relocate existing hydrants or install new hydrants to satisfy hydrant spacing criteria. Any existing non-breakaway hydrants should be replaced with new breakaway hydrants.

Fire hydrants should be located at least two (2) feet behind the face of the curb. The 4½" pumper nozzle shall face the street with the nozzle axis perpendicular to the curb. Hydrants should be located at least ten (10) feet from utility poles, street lights, trees, driveways and points of curvature of radius curb at street intersections and five (5) feet from underground utilities, including water services.

Hydrant branch pipe shall be six (6) inch diameter. All hydrant branch pipe and fittings shall be restrained between the connection to the main and the hydrant. Each hydrant branch shall have a gate valve (a.k.a. hydrant branch valve). The hydrant branch valve should be located as close to the connection to the water main as possible and should not be located closer than two (2) feet from the face of the curb. A minimum distance of four (4) feet should be provided between the hydrant branch valve and the hydrant, as

measured along the branch pipe. If necessary, a 90° anchoring bend may be used to extend the hydrant branch pipe parallel to the curb to achieve this.

When a new hydrant is installed on a water main that is 24-inches diameter or more, two hydrant branch valves must be provided.

Hydrants must be provided at the end of a dead end water main, downstream of any water services, to allow periodic flushing of the main. In order to facilitate flushing through the entire main and to minimize null flow zones, the use of 90° bends instead of a tee on dead end main hydrant branch piping should be considered.

When an existing water main is to be retained on a street that will be reconstructed, existing unlined hydrant branch piping should be replaced. The City does not normally clean and line hydrant branch pipe when a water main is cleaned and lined. Consequently, most hydrant branch piping on cleaned and lined water mains is not lined unless it was installed after the mid-1950's.

For aesthetic reasons, hydrant markers are not to be installed within the Central Business District (inside of the Inner Loop) or within special cultural districts (i.e. High Falls).

2.5. MISCELLANEOUS WATER MAIN APPURTENANCES

2.5.1. Disinfection/Sampling Taps

Temporary disinfection/sampling taps ($\frac{3}{4}$ -inch diameter or larger) must be installed on new water mains in order to facilitate the injection of super-chlorinated water for disinfection and collection of samples for Health Department water quality sampling and approval prior to placing the water main into service. Hydrants may not be used as sampling points. Copper service tubing must be used between the curb stop and the end of the disinfection/sampling tap in order to facilitate flaming during sample collection.

The location of disinfection/sampling taps must be shown on the plans. A disinfection/sampling tap must be installed on a new water main immediately downstream of the new gate valve located at the initial connection to the existing water main. This tap will be used to inject the chlorine solution during disinfection and for sample collection. Sampling taps are also required at the ends of new water main, including new side street branch mains. Additional sampling taps must be located along the new main at intervals not to exceed 1,000 feet.

Following successful testing, disinfection/sampling taps should either be removed and replaced with a plug or the tubing should be removed and the corporation stop closed and a threaded cap installed on the outlet. If a sampling tap is located at the same location as a new water service, the Water Bureau may approve its use as a new service pipe.

2.5.2. Tracer Wire

Tracer wire is required on all plastic water mains, hydrant branches and water services. Termination boxes for tracer wire on water mains should be installed adjacent to fire hydrants. When plastic water mains are connected to ductile or cast iron water mains, the tracer wire can either be terminated by thermite welding it to the iron main or it can be extended into a termination box located in the curb lawn area, near the point of connection. The location of proposed tracer wire termination boxes should be shown on the drawings.

2.5.3. Temporary Bypass

Temporary bypass is used when an existing water main must be shut down for an extended period of time. This generally occurs when a new water main is installed in the same location as the existing water main.

Bypass pipe is typically located along both sides of the street, generally adjacent to the curb. Two (2) inch diameter is the minimum size required for bypass pipe having no temporary hydrants. Four (4) inch minimum diameter is the minimum size required for bypass that has temporary hydrants. Temporary hydrants consist of a tee with a butterfly valve, 90° bend, 4½-inch National Standard threaded nozzle and nozzle cap. Bypass pipe should be designed such that temporary hydrants are located immediately adjacent to existing hydrants. Temporary service hoses are attached to the temporary bypass pipe and extended to the customer's building. In most cases, the hoses are run to the customer's basement, where the meter is removed and the service hose connected to the customer's service pipe on the downstream side of the meter. In some cases, the service hose may be connected to a hose bibb.

Bypass pipe should not be used between December and March because of freezing conditions. During the late fall or early spring, when the temperature periodically drops below freezing, it is necessary to maintain a continuous flow of water through the bypass pipe and service hoses in order to prevent the water in them from freezing.

2.5.4. Bell Joint Leak Clamps

Bell joint leak clamps are used to seal or prevent leaks in cast or ductile iron bell and spigot pipe joints. They should be installed when it is expected that work will be performed which will expose a caulked (lead) cast iron joint for more than 50% of its circumference.

2.5.5. Pitometer Taps

The Water Bureau uses a pitometer tap as an access port to insert a pitometer blade into a water main to measure flow velocities. The Water Bureau will determine whether or not a pitometer tap should be installed on a water main and will also determine the location of the tap.

2.5.6. Anodes

Galvanic anodes are sometimes required on metallic water mains and services in order to cathodically protect the pipe, thereby mitigating corrosion. There are several different types of galvanic anodes. The Water Bureau generally specifies the use of high-potential magnesium anodes, which come in a variety of sizes ranging between 5 and 48 pound ingots. The anodes are pre-packaged in a special backfill material.

The number of anodes required depends on a variety of factors, including the size and length of the water main, the design life of the anode and the resistivity of the native soil. During design, the Engineer may be required to furnish soil corrosivity test results. The Water Bureau should be consulted to help determine when anodes are required, and the number and size of anodes required.

2.5.7. Joint Bonds

There are times when it may be desirable, for corrosion mitigation purposes, to electrically bond two or more lengths of push-on or mechanical joint CIP or DIP. This is generally done using short sections of wire with the ends of the wire thermite welded to each adjacent pipe or fitting at pipe or fitting joints. Typically, two (2) joint bond wires are required per push-on joint and three (3) joint bond wires per mechanical joint.

During design of new ductile iron water mains, the Water Bureau should be consulted to determine when and where joint bonding is required.

2.5.8. Cathodic Protection Test Stations

Test stations are installed at certain locations along cathodically protected water main, fittings and services in order to determine the effectiveness and life of the anode. A test station typically includes one or more galvanic anodes, a permanent reference cell and a test box with a terminal board. Lead wires from the anode, reference cell and the structure being protected will be extended into the test box where the wires are terminated.

During design, the Water Bureau should be consulted to determine the location of proposed test stations. Generally, no more than two test stations will be required on a project. The location of proposed test stations should be shown on the drawings. Anode lead wire(s) at test stations must not be attached directly to the pipe section or fitting. All anode lead wires must be extended up through the test station box.

2.5.9. Polyethylene Tube Encasement

Unless otherwise required by the Water Bureau, all DIP shall be encased with polyethylene tube encasement.

2.5.10. Petrolatum/Petroleum Wax Tape System

When non-epoxy coated cast or ductile iron fittings are installed on plastic water main, a tightly bonded corrosion protective petrolatum or petroleum wax tape coating system is required. This tape system may also be applied to hardware (nuts, bolts, threaded rods) that are not fluorocarbon coated or stainless steel

2.5.11. Impervious Clay Water Main Trench Plugs

When petroleum hydrocarbon or chlorinated solvent contamination is present, consideration should be given to installing impervious clay trench plugs at intervals along the water main trench. These plugs will mitigate the potential for contaminants being conveyed through the porous sand bedding and backfill that surrounds the water main. Trench plugs should also be installed at the 300 feet contamination transition limit.

2.5.12. Water Mains Crossing Under Railroads and State Highways

When a water main crosses underneath a railroad or state highway, the water main must be installed in a steel casing pipe, in accordance with the requirements of the railroad or NYSDOT. Water main material at crossings shall be DIP, Class 56 with a double thickness of cement mortar lining, or PVC Pressure Class 305, unless otherwise approved by the Water Bureau.

Eight (8) inch minimum width stainless steel casing spacers with risers, PVC liner and ultra high molecular weight polyethylene runners are required to provide adequate clearance between the exterior of the water main and the interior of the casing pipe. Casing spacers are required at intervals not to exceed eight (8) feet unless shorter intervals are specified by the manufacturer.

The annular space between the water main and casing pipe shall be filled with sand or other approved material, to a level that is above the top of the water main. Brick and mortar shall be used to block up the void at each end of the casing pipe.

The Water Bureau shall be consulted during design to determine if a special pipe coating and/or anodes will be required on the water main and/or the casing pipe.

It may take several months to obtain permits/approvals from the railroad or NYSDOT. Consequently, required documents should be submitted to these agencies as early as possible during the design phase.

2.5.13. Water Mains on Bridges

Water main shall be DIP Class 56 with double thickness cement mortar lining. Pipe and fittings located on bridges shall have grooved ends in accordance with ANSI/AWWA C606.

Adjustable pipe roll supports shall be provided on the top and bottom of the pipe at each support. Supports shall be located such that every other length of pipe is supported by two (2) supports and intermediate pipe lengths supported by at least one (1) support. Pipe roll and sockets shall be cast iron, unless otherwise approved by the Water Bureau. Steel roll rods, threaded hanger rods and nuts and pipe covering protection saddles shall be hot-dip galvanized. Adjustable pipe rolls and protection saddles shall be sized to accommodate the outside diameter of the pipe plus the thickness of the insulation.

Pipe insulation shall be 1.8 pound density polystyrene having a K factor of 0.26 and molded to fit the pipe diameter. Minimum thickness of insulation shall be three (3) inches. Two (2) inch wide fiberglass reinforced strapping tape shall be used to hold the insulation in place prior to placement of the jacket.

The Water Bureau shall be consulted during design to determine if heat tape between the pipe and insulation will be required.

Pipe insulation jacket shall be type 316 stainless steel, 16 gauge (0.060-inches). Stainless steel end caps shall be provided over the ends of the insulation at the expansion joints. Stainless steel pop rivets shall be used and shall meet the requirements of ASHRAE. Caulk used to seal joints shall be ultraviolet resistant silicone, construction grade gray, in accordance with ASTM C-920. Lap tape used between all stainless steel laps shall be 1/16-inch gray vinyl duct tape manufactured for this type of installation.

Pipe casing through bridge abutment walls shall be galvanized steel pipe having a minimum wall thickness of 0.375 inches. The casing pipe shall be sized to accommodate the outside diameter of the pipe, fittings and insulation. The annular space between the pipe jacket and the casing shall be filled with a caulking compound in accordance with NYSDOT 705-06 to a minimum depth of six (6) inches.

Buried water main behind bridge abutment walls shall be DIP Class 56 with double thickness cement mortar lining and restrained push-on or mechanical joints.

2.5.14. Insulation for Shallow Water Mains

In situations where a short section of non-dead ended water main must be installed with less than the required minimum depth of cover, the pipe may need to be insulated. The Water Bureau shall be consulted to determine whether or not insulation is required. Water services should not be located within the section of shallow water main. When insulation is required, a product similar to Owens Corning Foamglas® insulation with appropriate adhesives, sealant and jacketing for buried pipeline applications may be considered.

2.6. WATER SERVICES

2.6.1. General

Permits are required for all new water services. Water services are to be installed perpendicular to the water main. When replacing an existing service with a new service, the renewed service should be of the same nominal inside diameter as the existing service (unless a smaller or larger service is required to satisfy hydraulic demands or unless the existing service is less than $\frac{3}{4}$ -inch inside diameter). The renewed service should be located as close as possible to the existing service, except that an attempt should be made to provide reasonable separation from existing utility laterals, poles, trees, and hydrants. When a new water service is to be installed where no service previously existed, the horizontal and vertical separations from existing utilities listed in Section 2.2.2 of this document shall apply, except that new water services may be laid on a bench or solid ledge excavated in the side of the same trench excavated for a new sanitary or stormwater building lateral, provided that the water service has at least 4.5 feet of cover and is at least 18-inches above the lateral. If the water service is less than 18-inches above the sanitary or stormwater lateral, a minimum horizontal separation of 10-feet must be maintained between the water service and the lateral. The provisions of *Chapter 39 of the City Code, Building Code* shall apply for buried water services installed on private property, outside of public streets and easements except that all parts and materials used shall be as listed in the Water Bureau's Approved Products List.

All water meters are to be purchased from and maintained by the Water Bureau. When the distance between the street right-of-way line and the point where the service enters the building exceeds 100 feet, or if there is no acceptable location for the meter inside the building being served, or there is no reasonable access for reading, inspecting and maintain the water meter, the Water Bureau may require that the meter be installed in a meter pit or meter vault located on the owner's property, as close as possible to the right-of-way line. The Water Bureau should be consulted during design to determine the meter location. No connections to the service are permitted between the water main and the meter.

When an existing water main is to be retained, and a street will be rehabilitated or reconstructed, consideration should be given to replacing all active unlined cast iron, lead, lead-lined or galvanized water services with new services.

On a street reconstruction or rehabilitation project, when an existing water main is to be retained, run services within the project area should be abandoned. On subdivision or site development projects, existing run services to the parcel(s) must be abandoned. For run services four (4) inches or larger, this involves cutting out the service tee and installing an insertion sleeve on the main, plugging the cut end of service pipe with concrete, closing service valves that are to be abandoned and removing valve boxes from abandoned valves. For run services two (2) inches and smaller, this involves shutting the corporation stop at the main, disconnecting the service pipe from the corporation stop, closing the curb

stop and removing the curb box. Generally, run services can only be re-used if they are of the proper size, material (cement lined cast or ductile iron, copper or PE) and are in good operating condition.

Water services shall be designed with a minimum depth of cover of 4.5 feet for domestic services and 5.0 feet for Holly services, as measured from the existing surface, or if the existing surface elevation will change, from the proposed finished grade elevation.

Warning tape is required on all buried water service pipe. Additionally, tracer wire is required on all buried non-metallic water service pipe.

Water service connections are not allowed on water mains larger than 16-inches diameter without the authorization of the Director of the Water Bureau. Water services cannot be larger than the water main that the service is connected to.

2.6.2. Backflow Preventers

A reduced pressure zone backflow prevention device must be installed on any new domestic water service 1½-inch nominal inside diameter or larger (1½-inch copper tubing or 2-inch polyethylene tubing) or smaller sized domestic water services that are determined by the Water Bureau to be a health hazard. A backflow prevention plan submittal, prepared by a NYS Licensed Professional Engineer or Registered Architect, must be made to and approved by the Water Bureau and the Health Department. When an existing service that is less than 1½-inch is replaced with a new service larger than 1½-inch, it is suggested that the Bureau's Backflow Prevention Inspector be notified. Questions about backflow prevention devices and submittals should be directed to the Water Bureau's Backflow Prevention Inspector at (585) 428-6070 or backflow@cityofrochester.gov.

2.6.3. Water Services Four (4) Inches Diameter and Larger

2.6.3.1. General

Prior to the early 1970's, most water services four (4) inches diameter and larger were CIP. Beginning in the mid-1950's cast iron water services were installed with a factory applied cement mortar lining. Between 1970 and 2005 cement lined DIP was used. From 2005 to the present, PVC, PVCO and cement lined DIP water services have been installed.

When the distance between the water main and the street curb which the service will pass underneath exceeds six (6) feet, two gate valves shall be provided on the service. One valve shall be located as close as possible to the water main. This valve is commonly referred to as the guard valve. The other valve, commonly referred to as the curb valve, shall be located approximately two (2) to three (3) feet behind the curb. When the distance between the water main and the curb is six (6) feet

or less, only one service valve is required and should be located as close to the main as possible.

All fire services are to be equipped with a Water Bureau approved detector check valve and a Water Bureau furnished bypass meter. Combination services must be approved by the Water Bureau. Both the domestic and fire supply piping must have individual metering, valves and backflow prevention devices.

2.6.3.2. Service Pipe, Fittings, Thrust Restraint and Connections

Applicable design standards for new water service pipe four (4) inches diameter or larger, including fittings, thrust restraint and connections to existing service pipe, insertion sleeves and tapping sleeve and valve shall be as found in Sections 2.2.3, 2.2.4, 2.2.5, 2.2.6, 2.2.7 and 2.3.3 of this document.

2.6.3.3. Service Valves

Applicable design standards for new valves installed on new water services four (4) inches diameter or larger services shall be as found in Section 2.3.

2.6.3.4. Miscellaneous Service Appurtenances

Unless otherwise required by the Water Bureau, all new DIP services shall be encased with polyethylene tube encasement. When a new DIP water service or an existing CIP or DIP water service is located in corrosive soils, it may be necessary to attach magnesium anodes and electrically bond fitting and pipe joints located within the street right-of-way. The Water Bureau shall be consulted during design to determine if anodes and joint bonds will be required.

When non-epoxy coated cast or ductile iron fittings are installed on plastic water service pipe, a tightly bonded corrosion protective petrolatum or petroleum wax tape coating system is required.

2.6.3.5. Water Meters

There are several types of meters that may be installed on large water services. The selection of the appropriate type of meter is primarily dependent on the size of service and anticipated minimum, average and maximum flow rates, operating pressures and pressure losses. The Water Bureau should be consulted during design to assist the Engineer in selecting the appropriate type and size of meter.

Compound meters are generally used when domestic, commercial and/or industrial water usage is anticipated to occur over a very wide range of flow rates. Turbine (a.k.a. turbo) meters are generally suitable

when flow rates are continuously high and the minimum flow rate is generally greater than 20% of the maximum flow rating of the meter. A fire series meter is typically used when average domestic, commercial and/or industrial flow rates are generally low, but the service needs to be sized large enough to periodically pass high fire flow rates through the meter. Bypass meters shall be $\frac{5}{8}$ inch x $\frac{3}{4}$ inch positive displacement meters that are installed on a fire service or combination service to detect low flows that may pass around the check valve. Bypass meters are furnished by the Water Bureau.

2.6.4. Water Services Two (2) Inches Diameter and Smaller

2.6.4.1. General

Prior to 1920, most service pipe material used for small diameter water services was lead pipe. Between 1920 and 1930, galvanized and lead lined services were primarily installed. Between 1930 and 1970 galvanized and copper services were installed. Most small services installed between 1970 and 2005 were copper. From 2005 to the present, copper and PE services have been installed. The Engineer should review the Water Bureau's service records to obtain specific information relating to existing water services within a project area.

2.6.4.2. Service Pipe

Material used for new water services two (2) inches diameter or smaller shall be Type K copper, PE tubing (copper tube size) DR9 or cross-linked polyethylene (PEX) tubing. PE and PEX service tubing shall not be used in locations within 300 feet of sites that have a potential or are known to have been contaminated with petroleum hydrocarbons or chlorinated solvents. When services are installed at these locations, copper tubing must be used.

For sizing of new water service tubing, refer to the following table:

| Existing Water Service (nominal size) | Copper Water Service Tubing (nominal size) | PE and PEX Water Service Tubing (nominal size) |
|---------------------------------------|--|--|
| 1/2, 5/8 and 3/4 inch | 3/4 inch | 1 inch |
| 1 inch | 1 inch | 1-1/2 inch |
| 1-1/2 inch | 1-1/2 inch | 2 inch |
| 2 inch | 2 inch | N/A |

Fittings on copper services shall be flare type. Fittings on PE services shall be "Quick" compression type. Stainless steel inserts are required at all PE service fittings. Fittings on PEX services shall be as

recommended by pipe manufacturer and approved by Water Bureau. When an existing water service is to be replaced with a new service on an existing water main that is to be retained, the new service may be connected to the existing corporation stop if the corporation stop is a nominal size of at least $\frac{5}{8}$ -inch and is not leaking or damaged and the new service will be $\frac{3}{4}$ -inch copper or 1-inch PE.

When existing water services 2-inch diameter or less are to be replaced in areas where the normal operating pressure is 40 PSI or less, consideration should be given to increasing the nominal size of the service to the next largest size.

2.6.4.3. Service Appurtenances

Service saddles are required for all service connections to PVC and PVCO water mains. Saddle tap and corporation stop sizes for PE and PEX services on PVC/PVCO water mains shall conform to the following:

| PE Water Service Size | Saddle Tap Size | Corporation Stop Size |
|-----------------------|-----------------|----------------------------------|
| 1 inch | 1 inch | 1 inch |
| 1-1/2 inch | 1 inch | 1 inch (w/1" inlet x 1½" outlet) |
| 2 inch | 2 inch | 2 inch |

When a service saddle is required for services located within 300 feet of sites that have a potential or are known to have been contaminated with petroleum hydrocarbons or chlorinated solvents, nitrile gasketed service saddles must be used.

On DIP and CIP water mains, saddles shall be used when making a tap when the tap size exceeds the following:

| Water Pipe Size | Maximum Tap Size allowed without Service Saddle |
|-------------------|---|
| 4 to 6 inch | all taps require saddle |
| 8 to 10 inch | $\frac{3}{4}$ inch |
| 12 inch | 1 inch |
| 16 inch or larger | 1-1/2 inch |

Tracer wire is required on all PE services.

Curb stops and boxes are to be located behind the curb, approximately two (2) to three (3) feet from the face of the curb. When a new or replacement water service is located underneath a driveway, the service should be extended and the curb stop and box located in the

sidewalk behind the driveway apron.

In corrosive soils, it may be necessary to install magnesium anodes on copper services. The Water Bureau shall be consulted during design to determine if anodes will be required.

A dielectric insulator is required to be installed on the downstream side of all curb stops installed on new or extended copper water services.

2.6.4.4. Meters

Positive displacement meters are normally installed on water services two (2) inches or smaller. Typically, a $\frac{5}{8}$ " meter will be installed on a $\frac{3}{4}$ " water service. When a meter is to be located in a meter pit, the pit shall be located on the owner's property, as close as possible to the street right-of-way line. Special design of a meter pit is required when the meter pit will be located in a paved area.

3.1 GENERAL

It is recommended that the Engineer contact the Water Bureau's Engineering Division early during the planning or design phase to review the scope of the project and solicit initial comments and guidance from the Bureau. For large or complex projects, it is recommended that plans be submitted to the Bureau for review at several stages during the course of design (35% design, 75% design and advance final design). For small projects, plans may be submitted once during preliminary design and again at advance final design.

A precise planimetric or topographic field survey of the project area must be performed by the Engineer to locate visible features of the existing water system, such as valve boxes, fire hydrants and curb boxes, as well as visible features of other utilities and surface features. A map should then be prepared. The map scale will depend on the size of the project. In most cases, a map scale of 1" = 20' is recommended. The location of the existing water system can best be mapped by utilizing the field survey data in conjunction with Water Bureau records, including, GIS mapping, field notes and main line valve, hydrant branch valve and service valve records.

The depth of cover over existing water mains can vary significantly. In some areas, water main depths exceed ten feet. In other areas, particularly with large diameter mains, the depth of cover may be less than three feet. The most accurate way to determine the depth of cover over the water main at a specific location is to excavate a test pit. It is important to note that this will only determine the cover at the specific test pit location, as depth may vary considerably along the length of the main. Cover depth information may also be available in Water Bureau field notes. In some cases, field notes are over 100 years old and consequently depth information may no longer be accurate due to subsequent changes in surface elevations. Another method for determining the depth of cover of water mains at valves is to remove the valve box cover and measure the depth from the ground surface to the top of the operating nut. If the age, manufacturer and model number of the valve is known, dimensional information may be available that can then be used with the field measured depth to the operating nut to determine the depth of cover for the water main.

Valve boxes that are located on vertical gate valves coincide with the horizontal centerline of the water main. However, valve boxes on horizontal gate valves and butterfly valves are offset from the water main alignment. It should also be noted that some of the larger valves may have smaller bypass valves that are also offset from the centerline of the water main.

3.2 PLAN REQUIREMENTS

Final plans for water system improvements shall, where applicable, provide the following:

Cover Sheet – Required for public works projects only. The cover sheet should include:

- Project title
- Project Code Number (City sponsored projects only)
- Location Map
- NYS Professional Engineer's stamp and signature
- Name and address of design engineer/engineering firm
- Index of plans
- Areas designated for signatures and dates of signatures of the Director of the Water Bureau, City Engineer and Commissioner of Environmental Services.

Plan Sheets

- Existing planimetric features including, but not limited to: curbs, driveways, sidewalks, trees, shrubs, buildings, signs, fences, mailboxes, street right-of-way and easement lines.
- Existing water facilities, including water mains, services, hydrants, valve boxes, curb boxes, vaults, etc. When an existing curb box or valve box is shown on the plan, it should somehow be identified whether it was located during the field survey or plotted from record information.
- Existing utilities such as sewer, gas, electric, steam, cable TV, fiber optic communication lines, street lighting, traffic control, etc. When plotting underground utility vaults, the outside wall of the vault should be shown on the plans.
- Proposed water facilities, including water mains, bends and fittings, water services, fire hydrants, valves, curb boxes, meter vaults and pits, pitometer taps, cathodic protection test stations, tracer wire termination boxes, temporary bypass pipe and disinfection/sampling taps. Proposed water facilities should be depicted with a heavier line weight than existing water facilities. Bends and fittings should be labeled. The offset distance between the proposed water main and the nearest face of curb should be indicated. Connections to existing water mains should be labeled. Domestic and Holly water systems must be labeled if both are located within the project area. Examples of plan labeling have been included in Appendix G.
- Proposed utility locations
- Space designated for the stamp and signature of the design engineer
- Legend, north arrow, elevation datum, scale.
- Date plan was prepared and any revisions made.

Miscellaneous

- An existing and proposed road profile if existing pavement elevations will change.
- A water main profile, if there are proposed water main/sewer main crossings
- General water main and water service notes (refer to Appendix D).
- Water service disposition table (refer to Appendix H-3), including service address, stationing and offset direction from road centerline, size and material composition of existing and proposed services. If a service saddle is required, this should also be noted.
- Hydrant disposition table (refer to Appendix H-1), including stationing, offset distance and direction from road centerline and scope of proposed improvements.
- Valve disposition table (refer to Appendix H-2), including stationing, offset distance and direction from road centerline and scope of proposed improvements.
- Applicable water system detail drawings (to be confirmed by Water Bureau).
- When a contract proposal book is prepared for a City sponsored project, the Water Bureau shall be consulted to confirm which specifications need to be included in the project's contract proposal book.

3.3 PERMITS AND APPROVALS

New Water Service Permits are required from the Water Bureau for the installation of a completely new water service (domestic, fire or combination) or the renewal or replacement of an existing water service between the water main and the curb valve. Water service permits will be issued only to plumbers who are licensed by the City to perform the work. If any portion of a new or renewed water service is located on private property outside of the street right-of-way, an additional permit is required from the Permit Office of the City's NBD Bureau of Buildings and Zoning <https://www.cityofrochester.gov/buildingpermits/>

All new water services having a nominal inside diameter of 1½-inch or larger, all new subdivisions and all structures (regardless of service size) that have an irrigation or fire suppression system require the submittal of detailed construction plans to the Water Bureau for approval. At a minimum, these plans should include a site plan showing all existing and proposed planimetric features and utilities, including the proposed water service and appurtenances. Because services having a nominal inside diameter of 1½-inch or larger also require **Approval of a Backflow Prevention Device** from the Water Bureau and Monroe County Department of Public Health, the submittal should also include all documentation required for a Backflow Preventer approval submission. Visit <https://www.monroecounty.gov/eh-crossconnection> for more information. Water service permits shall not be issued until the submittal has been reviewed and approved by the Water Bureau and Health Department.

A **Water Service Renewal Permit** is required from the Permit Office of the City's DES Bureau of Architecture and Engineering if the existing water service to a property is being renewed or replaced within a city street right-of-way. Visit <https://www.cityofrochester.gov/streetpermits/> for more information.

A **Water Service Abandonment Permit** is required from the Permit Office of the City's DES Bureau of Architecture and Engineering if an existing active or run water service(s) to a property is to be disconnected from the water main and abandoned. This applies to the situation when a building is demolished or when a new water service is installed on a property. Visit <https://www.cityofrochester.gov/streetpermits/> for more information.

Hydrant Use Permits are issued by the Water Bureau when there is a temporary need for water at a specific location and no other source is readily available. Visit <https://www.cityofrochester.gov/article.aspx?id=8589936795> for more information.

A **City Right-of-Way Permit** is required for all work performed in the City's public right-of-way. The right-of-way includes the pavement, curbing and sidewalks; the area between the sidewalk and the curb; and, in most residential areas, a strip of land two feet wide extending from the sidewalk toward the residential property. Work that requires a permit includes street openings, new water mains or water services, water service renewals, water service abandonments, fire hydrant relocations. City Right-of-Way permit application forms are available at <https://www.cityofrochester.gov/ROWpermit/>

A **NYS DOT Utility Work Permit** is required whenever any water facility work is performed within a New York State Highway Right-of-Way. Visit <https://www.dot.ny.gov/divisions/operating/oom/transportation-systems/traffic-operations-section/highway-permits/utility-permits> for more information. The following is a list of State Highways located within the City of Rochester.

- Interstate 490
- Interstate 590
- Inner Loop
- West Ridge Road (NY 104)
- Lake Avenue (Lyell Ave. to Ridge Road)
- Expressway Ramps
- Lake Ontario Parkway
- Keeler Street Expressway (NY 104)
- Mount Read Boulevard
- Plymouth Avenue (within the Inner Loop)
- Bridges over Expressways

It is recommended that the plans and NYS DOT permit application be submitted to the NYS DOT during the preliminary design phase in order to allow sufficient time for NYS DOT review and approval.

An **Approval of Plans for Public Water Supply** is required from the Monroe County Department of Public Health for all new water main installations and water main replacements within the City. Visit <https://www.monroecounty.gov/eh-publicwater> for more information. It is recommended that plans be submitted to the Health Department during the preliminary design phase. The initial submittal to the Health Department should include the following:

- One (1) set of plans showing water facility work, including related notes, tables and details
- One completed Form DOH-348 – Application for Approval of Plans for Public Water Supply Improvement
<https://www.monroecounty.gov/files/health/eh/PublicWater/DOH348MCversion.pdf>

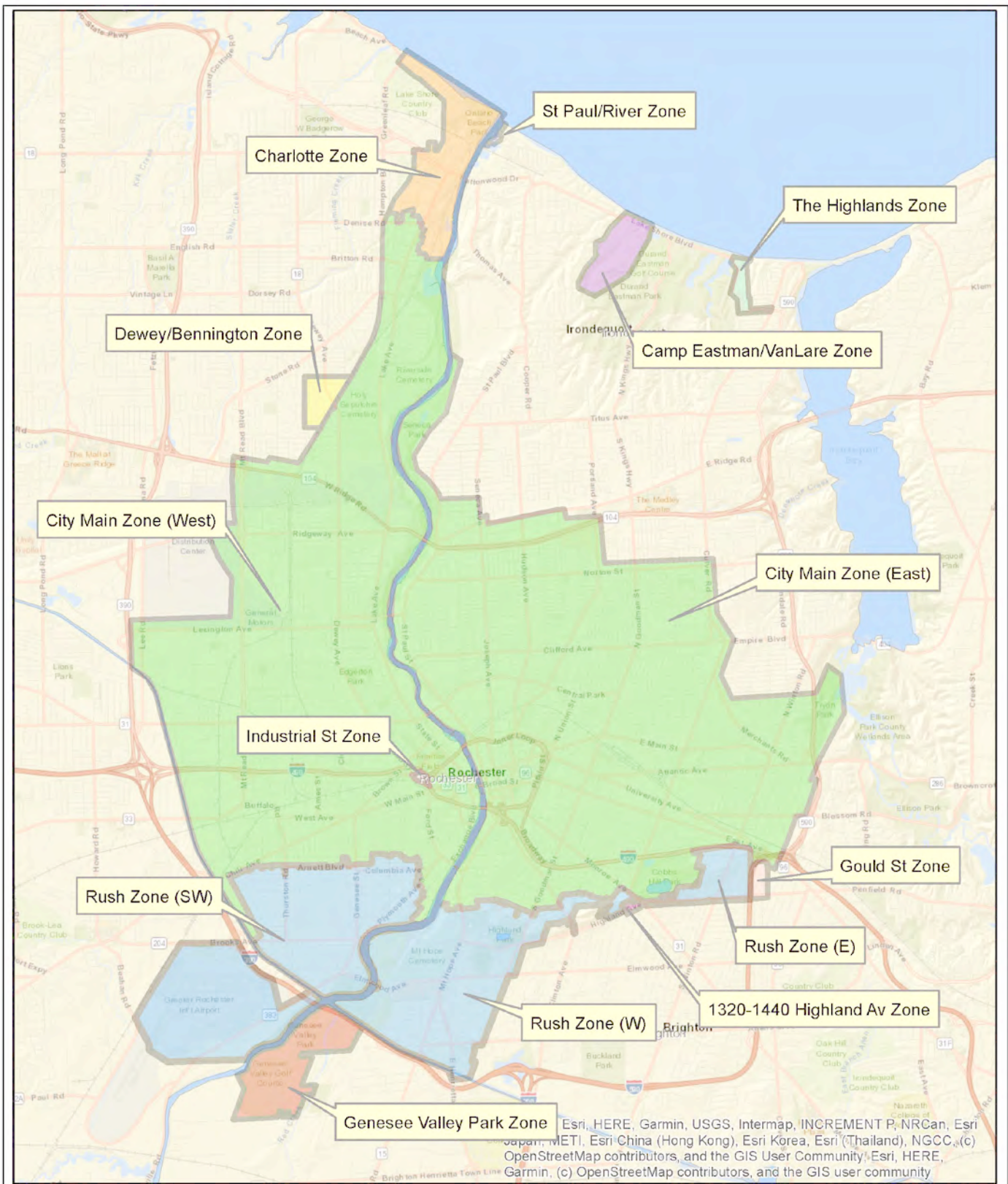
- One (1) blank City of Rochester Direct Claim Form

CSX Transportation owns and maintains several active mainline and spur railroad tracks within the City. All work activities within CSX property, including access for surveying and replacement of existing water facilities may require the execution of an agreement or permit, depending on the existing agreement verbiage. CSX permitting information can be found at <https://www.csx.com/index.cfm/customers/value-added-services/property-real-estate/permitting-utility-wireless-infrastructure-installations-and-rights-of-entry/> . It is recommended that the Engineer contact CSX early during the design phase to obtain all information related to permit submittal and design requirements.

APPENDICES

APPENDIX A

Pressure Zone Map



Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community; Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community



**City of Rochester Water Bureau
Domestic Distribution System
Pressure Zones**

November 2020

| | | |
|---|---|-------------|
| 0 | 1 | 1" = 7,000' |
| Water Distribution System Engineering Design Guidelines APPENDIX A | | |

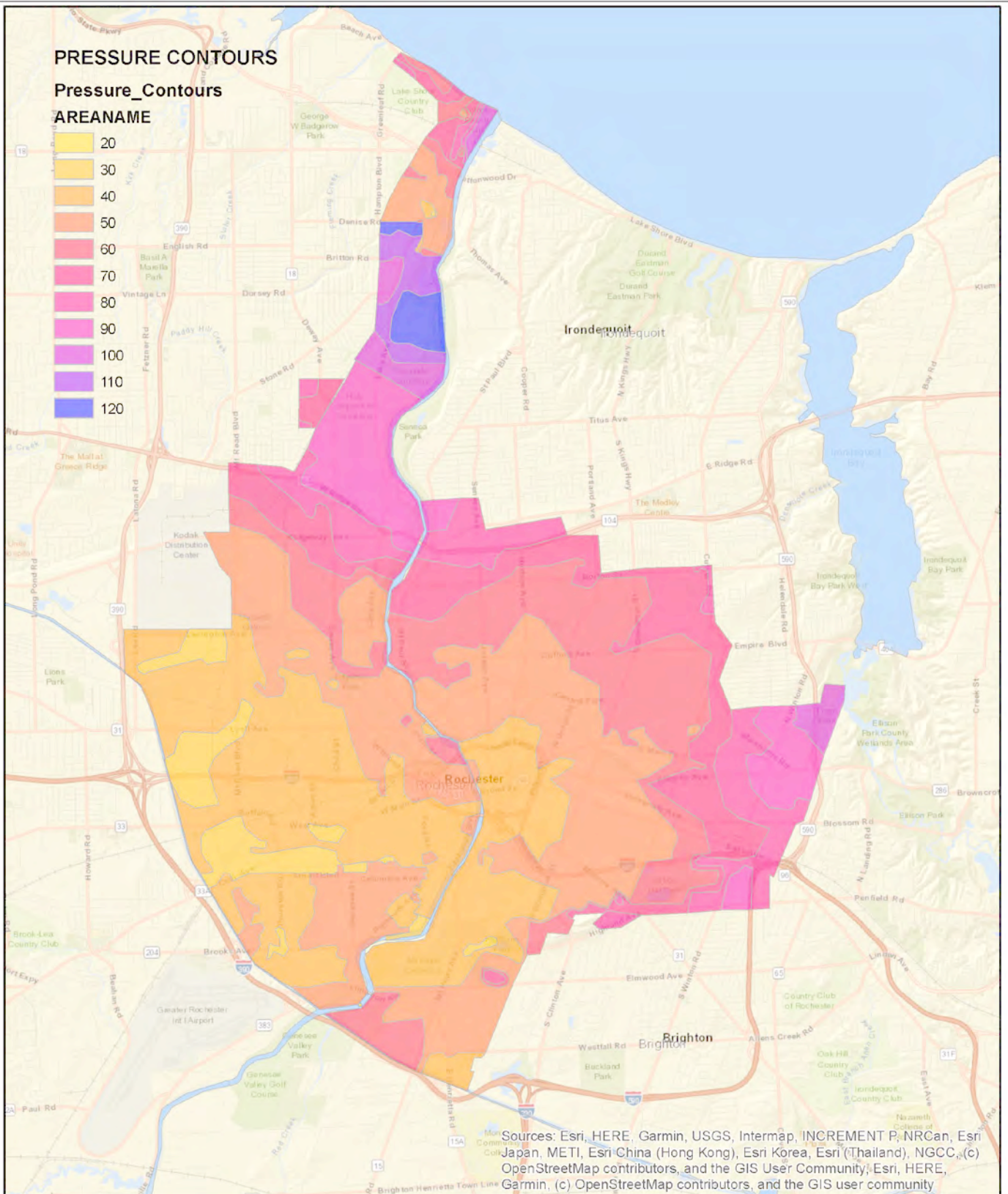
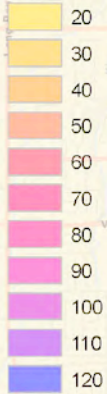
APPENDIX B

Pressure Range Map

PRESSURE CONTOURS

Pressure_Contours

AREANAME

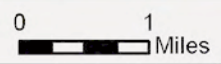


Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community; Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community



**City of Rochester Water Bureau
Domestic Distribution System
Pressure Ranges**

November 2020



1 " = 7,000 '

**Water Distribution System
Engineering Design Guidelines
APPENDIX B**

APPENDIX C

Water Main Evaluation Report – Example



To:
 From:
 Date:
 Project:

A. Existing Water Main and Appurtenances

| Project Limit From | Project Limit To | System (Domestic or Holly) | Length (ft.) | Dia. (in) | Main Material | Year Inst. | Cement Lining? (Date) | Hazen-Williams Coeff. (C) | # of Breaks | Test Flow (GPM @ 20 PSI) | App. Cover Depth Range (ft.) | Service Materials |
|--------------------|------------------|----------------------------|--------------|-----------|---------------|------------|-----------------------|---------------------------|-------------|--------------------------|------------------------------|-------------------|
| | | | | | | | | | | | | |
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System: D = Domestic, H = Holly
 Main Materials: CI = Cast Iron, DI = Ductile Iron, PVC = Polyvinyl Chloride, PCCP = Pre-stressed Concrete, AC = Asbestos Cement, S = Steel
 Service Materials: C= Copper, L = Lead, LL = Lead Lined, G = Galvanized, WI = Wrought Iron, PE = Polyethylene

Water Quality Problems? Yes No
 Description of Problem: Color Odor Taste Other _____

ISO Recommended Fire Flow (Check all that apply)

| ISO Zoning Code | Min. Recommended Fire Flow @ 20 PSI Residual |
|---|--|
| <input type="checkbox"/> ISO 1 - Single Family/Low Density (31-100 ft. apart) | 750 GPM |
| <input type="checkbox"/> ISO 2 - Single Family/Med. Density (11-30 ft. apart) | 1,000 GPM |
| <input type="checkbox"/> ISO 3 - Light Commercial (2-3 Stories) (10 ft. apart or less) | 1,500 GPM |
| <input type="checkbox"/> ISO 4 - Condos, Apts./Med. Density | 2,000 GPM |
| <input type="checkbox"/> ISO 5 - Condos, Apts., Wood Const.; High-Rise/Light Industrial | 3,000 GPM |
| <input type="checkbox"/> ISO 6 - Heavy Industrial-Many High-Rise/High Density | 4,000 GPM |

Does Existing System Satisfy ISO Recommendations? Yes No
 Adequate Hydrant Spacing (≤ 300 feet)? Yes No
 Hydrants Locked? Yes No
 Breakaway Hydrants? Yes No
 Proposed Development or Zoning Changes? Yes No
 Operating Pressure Range (p.s.i) Min. _____ Max. _____

Additional Description of Existing Water Main & Appurtenances

Bureau of Water - Water Main Evaluation Report (Continued)

B. Miscellaneous Information

| From | To | Scope of Proposed Street Work | Surface to be Lowered? | Depth to Rock (ft.) Range | Sewer Type and Size | Sewer Work? | Other Utility Work? | Distance Main to Curb? |
|------|----|-------------------------------|------------------------|---------------------------|---------------------|-------------|---------------------|------------------------|
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Soils Data:

| | | | | | |
|----------------|--|----------------------------|--|------------------|--|
| 10 Point DIPRA | | Resistivity Value (ohm-cm) | | Chloride (mg/kg) | |
|----------------|--|----------------------------|--|------------------|--|

Current or Former Gas Stations or Dry Cleaning Facilities Within Project Area?: Yes No Unknown

MCWA Water Mains in Project Area? Yes No

Other Miscellaneous Information

Additional Information Requested for Water System Design:

- | | |
|---|--|
| Soil Borings to Establish Depth to Rock <input type="checkbox"/> | Soil Tests for Petroleum Hydrocarbons <input type="checkbox"/> |
| DIPRA 10 Point Soil Tests (Inc. Resistivity) <input type="checkbox"/> | Environmental Review of Project Area <input type="checkbox"/> |
| Soil Tests for Resistivity Only <input type="checkbox"/> | |
| Soil Tests for Chloride Concentrations <input type="checkbox"/> | |

C. Recommended Water System Improvements:

| From | To | General Scope of Water System Improvements |
|------|----|--|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

Additional Description of Recommended Improvements

Bureau of Water - Water Main Evaluation Report (Continued)

Relevant Notes (check all that apply)

- Exercise caution when working in the vicinity of the existing water main to be retained.
- Vibratory compaction will not be allowed in the vicinity of the existing lead jointed cast iron water main to be retained.
- Bell joint leak clamps shall be installed at all existing cast iron water main joints that are exposed for more than 50% of their circumference.
- The Water Bureau will inspect the existing valves and sound the existing water main for leaks immediately prior to construction.
- The proposed road profile should not be lowered such that the depth of cover over the existing water main to be retained is less than _____ ft.
- In areas where there is potential to encounter petroleum hydrocarbons (i.e. existing and former gas stations and dry cleaning facilities), use ductile iron water main with Nitrile gaskets and copper water services.
- Consider installing the new water main in the same trench as the existing water main from _____ to _____. This will require the use of temporary bypass pipe and hoses.
- Where normal working pressures in the Project Area are less than 30 P.S.I., consider upsizing these services to the next largest size.
- Contact MCWA to determine the disposition of their water mains within the Project Area.
- Consider installing magnesium anodes on existing cast iron or ductile iron water mains to be retained.
- Other: _____

Present Value Construction Cost Estimate for Recommended Improvements:

Record Information:

| | | |
|---|------------------------------|-----------------------------|
| Map of Existing Water System Attached? | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| Copies of Water Service Records Attached? | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| Abandoned Water Main Mapping Available? | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| Additional Records Attached? | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| Description of Additional Records | _____ | |

| | | | |
|--------------|-------|-------|-------|
| Project: | _____ | Date: | _____ |
| Prepared By: | _____ | | |
| Title: | _____ | | |

NOTE: Contact Water Bureau for updated information if this report is older than one year.

APPENDIX D

Water Main and Service Notes

WATER MAIN AND SERVICE NOTES

1. The water main and temporary bypass pipe shall be disinfected equal to AWWA Standard for Disinfecting Water Mains, designation C651, by using the continuous feed method. Following disinfection, the water main and bypass pipe shall be flushed until the chlorine concentration in the water leaving the main is no higher than that generally prevailing in the system. The interior of all water main pipe, valves, fittings and services four (4) inches and larger, including new hydrant branches connected to existing water mains, not receiving 24-hour chlorine disinfection contact time must be spray or swab disinfected with a minimum 1% - 5% solution of chlorine no more than 30-minutes prior to installation. Additionally, the exterior surfaces of existing pipe and fittings that new pipe and fittings will be connected to must be thoroughly cleaned and disinfected. The maximum distance between disinfection/sampling taps on new water main and bypass pipe shall be 1,000 feet. The sampling point(s) must be decontaminated by flaming. Fire hydrants are not acceptable sampling points. The Monroe County Department of Public Health (MCDPH) must receive at least 48-hour advance notification requesting sampling services. The Contractor shall call 585-753-5057 to arrange for sampling services and is responsible for paying all MCDPH sampling fees. Sampling will not be performed prior to receipt from a New York State licensed or registered design professional (engineer, architect or land surveyor with a special exemption under Section 7208(n) of the Education Law) certifying that the water supply improvements, testing and disinfection procedures were completed in accordance with the approved plans, reports, specifications and any approved amendments. The department will collect samples for free chlorine residual, total coliform, Escherichia coli (E. coli) and turbidity. The water main and bypass pipe shall not be placed into service until so authorized by the MCDPH.
2. Unless otherwise noted or shown on the approved plans, the minimum vertical separation between water mains and sewer pipe lines shall be 18-inches measured from the outside of the pipes at the point of crossing. One full standard laying length of water main shall be centered under or over the sewer so that both joints will be as far from the sewer as possible. In addition, when the water main passes under a sewer, adequate structural support (compacted selected fill) shall be provided for the sewer to prevent excessive deflection of joints and settling of the sewer on the water main. Unless otherwise noted or shown on the approved plans, the minimum horizontal separation between parallel water mains and sewer pipes (including manholes and vaults) shall be 10-feet measured from the outside of the pipes, manholes or vaults.
3. When installing fire hydrants, should ground water be encountered within seven (7) feet of finished grade, fire hydrant weep holes (drains) shall be plugged.
4. The new water main shall be pressure/leakage tested in accordance with the minimum requirements of the AWWA Standard C600 (latest revision) or in accordance with more stringent requirements imposed by the supplier of water. For City of Rochester water mains, pressure/leakage testing shall be performed in accordance with Subsection 3.05 of City of Rochester Water Bureau Specification S900 - General Water Provisions.
5. New water pipe and fittings are to be installed with a minimum depth of cover from proposed finished grade of 4.5 feet for domestic mains and services and 5.0 feet for Holly mains and services.

6. A permit is required from the Water Bureau to use water from hydrants. The permit requires the use of a water meter and a backflow preventer, which will be supplied by the Water Bureau. The Contractor must obtain permit prior to using hydrant. The permit fee includes a refundable deposit for the use of the water meter and backflow preventer.
7. Existing water valves and curb stops that are located on water mains and water services which are to be retained are to be adjusted to grade or replaced, as shown on the plans or as directed by the Project Manager.
8. Cut and open pipe ends on abandoned water mains and hydrant branch pipe are to be plugged with concrete. Concrete plug is to completely fill and seal end of abandoned water pipe to a minimum depth of 12 inches. Abandoned water valves and curb stops are to be permanently closed and are to be left in the shut position.
9. The Contractor shall exercise caution when working near water mains which are to be retained. No vibratory equipment is to be used within 5 horizontal feet of existing water mains.
10. Appropriate measures shall be taken to prevent extraneous material and ground water from contaminating the water system. The ground water level is never to be less than 12 inches below the invert of the water main. To prevent contamination, open ends of water pipe that are left unattended are to be plugged with water-tight plug and wrapped in double layer of polyethylene plastic and tightly taped or tied.
11. New gate valves require mechanical joint restraint within 18-feet along each side of valve.
12. Ductile iron pipe and fittings are to be installed with polyethylene encasement and magnesium anodes, as shown in contract documents and as directed by Project Manager.
13. Service saddles are required for connecting all polyethylene (PE) water service tubing to PVC/PVCO water mains.
14. Solid stainless steel internal stiffeners are required at ends of all PE service tubing fittings.
15. Tracer wire is to be installed along and above PVC/PVCO/HDPE water pipe and fittings and along and wrapped around PE water service tubing.

APPENDIX E

List of Waterworks Specifications

LIST OF WATERWORKS SPECIFICATIONS

Website: <https://www.cityofrochester.gov/article.aspx?id=8589945675>

| Specification Number | Title |
|----------------------|---|
| S900 | General Water Provisions |
| S901 | Water Main Pipe and Fittings |
| S902 | Salvage Existing Water Valve |
| S903 | Resilient Seat Gate Valve with Valve Box |
| S904 | Tapping Sleeve with Valve and Valve Box |
| S905 | Cutting-In Valve with Valve Box and Sleeve |
| S906 | Insertion Sleeve |
| S907 | Connect New Water Main to Existing Water Main |
| S908 | Cut and Plug Existing Water Main |
| S909 | Water Valve Box |
| S910 | Temporary Cut and Plug Existing Water Main |
| S911 | Pitometer Tap and Connection |
| S912 | Corporation Stop and Connection; Abandon Existing Water Service at Tap (2-Inch and Smaller) |
| S913 | Water Service (2-Inch and Smaller) |
| S914 | Curb Stop and Box |
| S915 | Relocate Water Service Meter |
| S916 | Temporary Bypass |
| S917 | Hydrant |
| S918 | Water Manhole |
| S919 | Abandon Existing Water Vault; Install Direct Burial Valve(s) |
| S920 | Water Meter Vault for Domestic Meters (3-Inch to 10-Inch) |
| S922 | Permanent Blow-Off Assembly |
| S923 | Bell Joint Leak Clamp |
| S924 | Water Meter Pit (2-Inch and Smaller) |
| S925 | Yard Hydrant |
| S926 | Abandon Existing Water Main at Railroad or Highway Crossing |
| S930 | Cleaning and Lining of Water Mains |
| S931 | Removal and Replacement or Reinstallation of Water Main Obstruction |
| S935 | Televising Water Mains |
| S962 | Joint Bond |
| S966 | Magnesium Anode |
| S968 | Cathodic Protection Test Station |

APPENDIX F

List of Waterworks Detail Drawings

LIST OF WATERWORKS DETAIL DRAWINGS

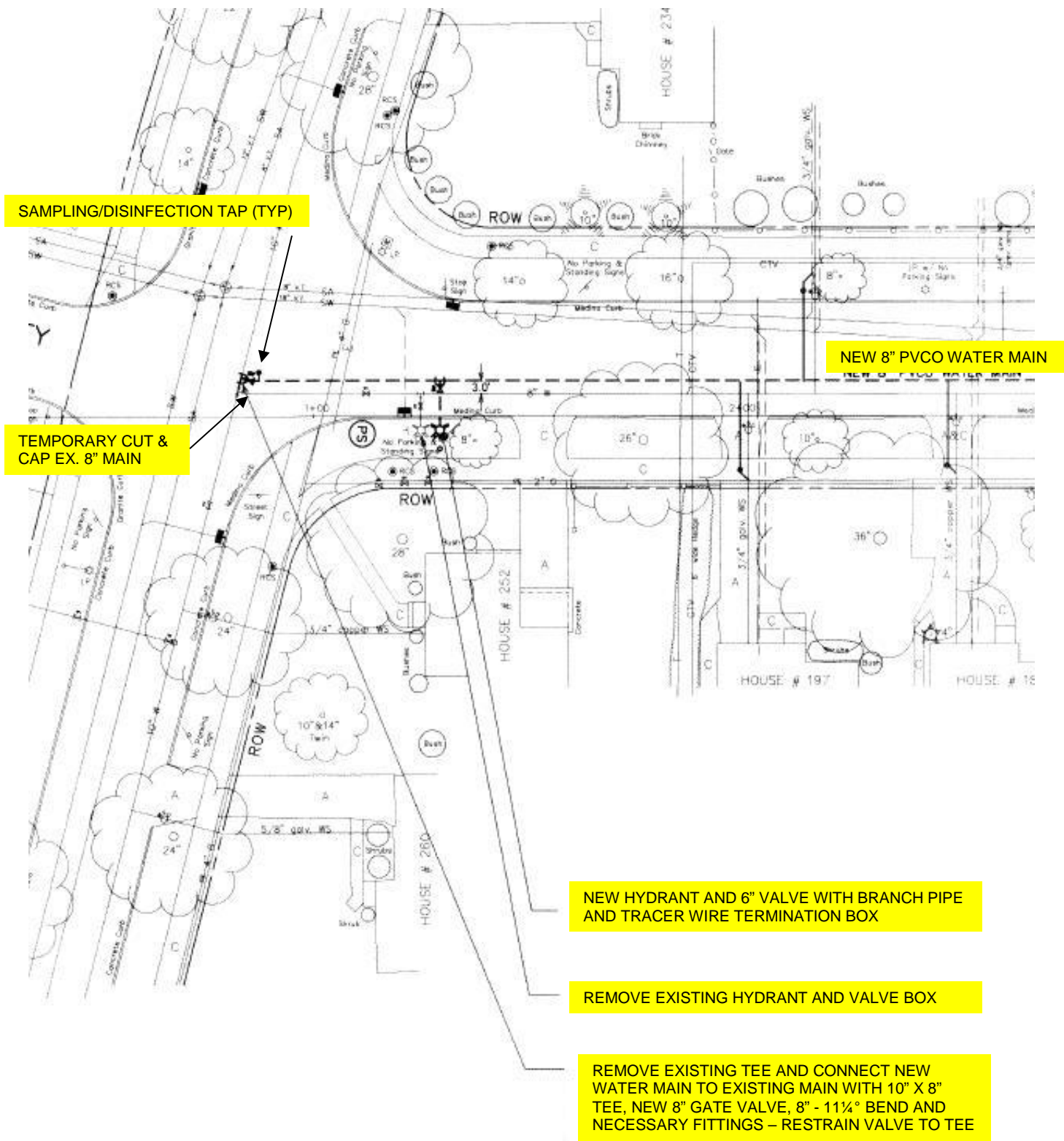
Website: <https://www.cityofrochester.gov/waterdetails/>

| Detail Number | Title |
|---------------|--|
| S900-1 | Water Trench Pavement Reconstruction |
| S900-2 | Water Trench Pavement Rehabilitation |
| S900-3 | Water Main Crossing Below Sewer |
| S900-4 | Horizontal Thrust Block Domestic System |
| S900-5 | Vertical Thrust Block Domestic System |
| S900-6 | Disinfection Sampling Tap |
| S900-7 | Water Main Pipe Restraint Domestic System |
| S900-8 | Water Main Pipe Restraint Holly System |
| S900-9 | Horizontal Thrust Block Holly System |
| S900-10 | Vertical Thrust Block Holly System |
| S900-11 | Replacement of 4 Inch and Larger Water Service on New Water Main |
| S901-8 | Plastic Water Main Tracer Wire Installation |
| S901-9 | Plastic Water Service Tracer Wire Installation |
| S901-10 | Plastic Water Main Tracer Wire End To End Splice Connection |
| S901-11 | Plastic Water Service Tracer Wire Tap Splice Connection |
| S901-12 | Impervious Clay Water Main Trench Plug |
| R905-1 | Cutting-In Valve Installation |
| S909-1 | Water Valve Box Adjustment or Replacement |
| S909-2 | Concrete Collar for Valve Box Within Roadway |
| S909-3 | Asphalt Restoration for Valve Box Within Roadway |
| S909-4 | Round Concrete Collar for Valve Box Within Roadway |
| S909-5 | Concrete Collar for Multiple Valve Boxes Within Roadway |
| S911-1 | Pitometer Tap |
| R913-1 | Water Service Pipe 2-Inch and Smaller |
| R913-2 | Existing Copper Water Service Pipe Extension 2-Inch and Smaller |
| R913-3 | Water Service Card |
| S913-4 | Water Service Card Notes |
| S916-1 | Bypass Pipe Crossing at Driveway, Sidewalk and Street |
| S916-2 | Bypass Pipe at Sidewalk Access Ramp |
| R917-1 | Hydrant and Valve with New Branch |
| R917-2 | Hydrant at Existing Branch |
| S920-2 | Water Meter Vault for Domestic Meter 3-Inch to 10-Inch |
| S920-3 | Water Meter Vault Dimensions and Notes |
| S922-1 | Permanent Blow-Off Assembly |
| S924-1 | Water Meter Pit 1-Inch and Smaller in Lawn Area |
| S924-2 | Water Meter Pit 1½-Inch and 2-Inch in Lawn Area |
| S925-1 | Yard Hydrant |
| S962-1 | Joint Bond for Metallic Water Main Pipe/Fitting |
| S966-1 | Anode at New Ductile Iron Water Main or Ductile Iron Fitting on New Plastic Water Main |
| S966-2 | Thermite Weld Details |
| S966-3 | Anode at New Copper Water Service on Plastic Water Main |
| S966-4 | Anode at New Water Service on Existing Cast/Ductile Water Main |
| S966-5 | Anode at Existing Ductile/Cast Iron Pipe Joint (Reconstruction) |
| S966-6 | Anode at Existing Ductile/Cast Iron Pipe Joint (Rehabilitation) |
| S966-7 | Anode at Insertion Sleeve and Cut-In Tee on Existing Iron Pipe |
| S966-8 | Anode at Existing Ductile/Cast Iron Pipe Joint (Double Anodes) |

| Detail Number | Title |
|----------------------|--|
| S966.9 | Anode at Tapping Sleeve and Valve on Existing Cast/Ductile Iron Water Main |
| S968-1 | Cathodic Protection Test Station for Metallic Pipe or Fitting (1 of 2) |
| S968-2 | Cathodic Protection Test Station for Metallic Pipe or Fitting (2 of 2) |
| S970-1 | New Water Service 2 Inch and Smaller |
| S970-2 | Indoor Installation of Water Meter 1 Inch and Smaller |
| S970-3 | Indoor Installation of Water Meter 1-1/2 Inch and 2 Inch |
| S970-4 | New Water Service 4 Inch and Larger on Existing Water Main |
| S970-5 | New Water Service 4 Inch and Larger on Existing Water Main Notes |
| S970-6 | Typical Indoor Installation of Domestic Water Meter 3 Inch to 10 Inch |
| S970-7 | Typical Water Meter Installation for Holly Fire Service 4 Inch and Larger |
| S970-8 | Typical Water Meter Installation for Domestic Fire Service 4 Inch and Larger |
| S970-9 | Typical Combination Fire and Domestic Service |
| S971-1 | Reduced Pressure Zone (RPZ) Backflow Prevention Device 2 Inch and Smaller |
| S971-2 | Reduced Pressure Zone (RPZ) Backflow Prevention Device 2-1/2 Inch and Larger |
| S971-3 | Reduced Pressure Zone (RPZ) Air Gap and Drain Line Installations |

APPENDIX G

Examples of Plan Labeling



**APPENDIX G-1:
TYPICAL LABELING FOR NEW PVC WATER MAIN AT INITIAL
CONNECTION TO EXISTING WATER MAIN**

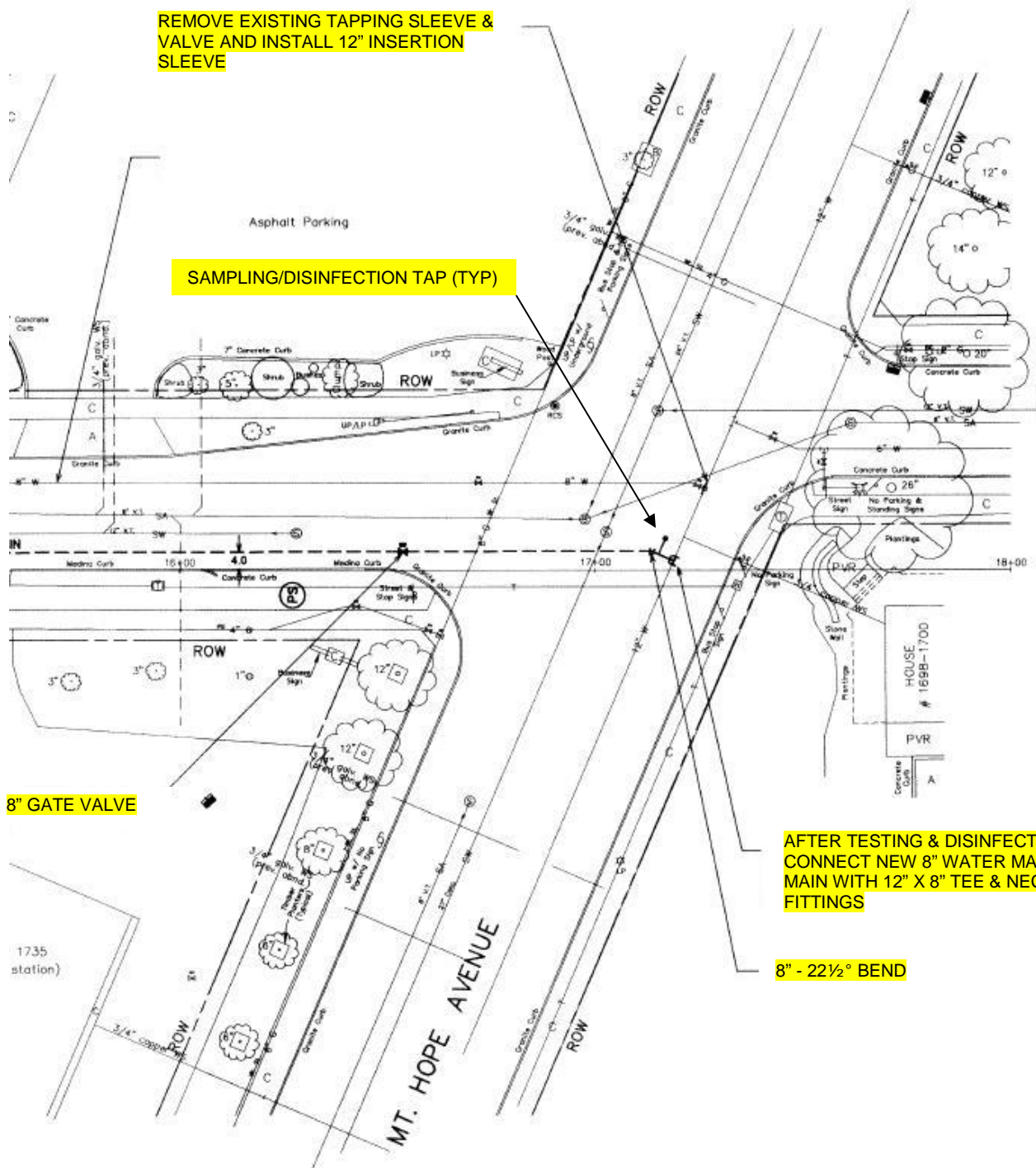
REMOVE EXISTING TAPPING SLEEVE & VALVE AND INSTALL 12" INSERTION SLEEVE

SAMPLING/DISINFECTION TAP (TYP)

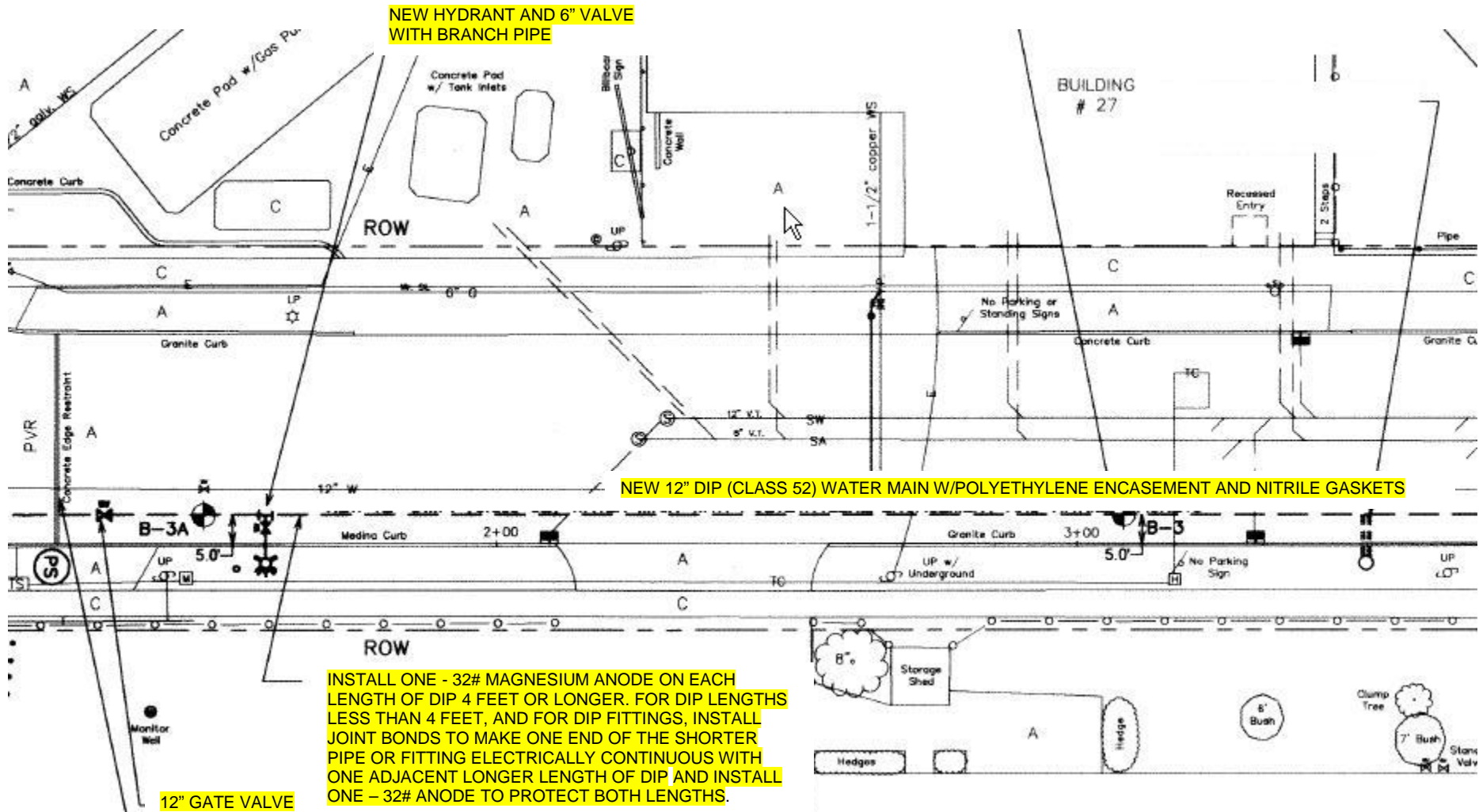
8" GATE VALVE

AFTER TESTING & DISINFECTION,
CONNECT NEW 8" WATER MAIN TO EX.
MAIN WITH 12" X 8" TEE & NECESSARY
FITTINGS

8" - 22½° BEND



APPENDIX G-2:
TYPICAL LABELING FOR NEW PVC-O WATER MAIN AT FINAL
CONNECTION TO EXISTING WATER MAIN



**APPENDIX G-3:
TYPICAL LABELING FOR NEW DIP WATER MAIN WITH ANODES IN
AREA POTENTIALLY CONTAMINATED BY PETROLEUM
HYDROCARBONS OR CHLORINATED SOLVENTS**

APPENDIX H

Examples of Water Feature Disposition Tables

**APPENDIX H-1:
TYPICAL HYDRANT DISPOSITION TABLE**

HYDRANT TABLE

| CENTERLINE STATION | OFFSET (FT.) | DISPOSITION | ITEM NO. |
|---------------------------|---------------------|---|-----------------------------------|
| 0+24 | 24 LT | REMOVE EXISTING HYDRANT & VALVE BOX | S917.05 |
| 1+22 | 14 RT | INSTALL NEW DOMESTIC HYDRANT, MARKER POST, 6" BRANCH PIPE, 6" GATE VALVE W/ VALVE BOX AND 8" X 6" TEE | S917.01, S903.0106, S917.06 |
| 2+36 | 15 RT | REMOVE EXISTING HOLLY HYDRANT AND INSTALL NEW HOLLY HYDRANT ON EXISTING BRANCH, NEW MARKER POST & REPLACE VALVE BOX TOP SECTION | S917.02, S909.14, S917.06 |

NOTES:

1. ADJUSTMENT OF EXISTING HYDRANTS, IF ANY, TO BE AS ORDERED BY PROJECT MANAGER
2. BRANCH PIPE AND TEE TO BE PAID UNDER APPROPRIATE S901 PIPE ITEMS

**APPENDIX H-2:
TYPICAL MAIN LINE VALVE DISPOSITION TABLE**

MAIN LINE VALVE TABLE

| CENTERLINE STATION | OFFSET (FT.) | DESCRIPTION | ITEM NO. |
|---------------------------|---------------------|---|-----------------|
| 0+24 | 5 LT | REMOVE VALVE BOX | S909.06 |
| 1+22 | 12 RT | NEW 8" GATE VALVE WITH VALVE BOX | S903.0108 |
| 3+99 | 12 RT | NEW 12" X 8" TAPPING SLEEVE & VALVE W/VALVE BOX | S904.031208 |

NOTES:

1. REMOVAL OF VALVE BOXES IN PAVEMENT RECONSTRUCTION AREAS SHALL BE PAID FOR UNDER APPROPRIATE S203 OR R206 ITEM

**APPENDIX H-3:
TYPICAL WATER SERVICE DISPOSITION TABLE**

WATER SERVICE TABLE

| CENTERLINE STATION AND OFFSET | ADDRESS | EXISTING SERVICE | DISPOSITION | ITEM NO. |
|--|----------------|-------------------------|---|---|
| 1+02 LT | 21 BIRCH ST | ½" GALVANIZED - RUN | ABANDON EXISTING SERVICE AT TAP | S912.06 |
| 2+01 LT | 27 BIRCH ST | ¾" LEAD | INSTALL NEW 1" POLYETHYLENE WATER SERVICE AT EXISTING TAP, CURB STOP AND BOX | S913.160100, S914.030100 |
| 2+70 LT | 29 BIRCH ST | ½" LEAD LINED | NEW 1" TAP AT WATER MAIN WITH ABANDONMENT OF EXISTING TAP, NEW 1" POLYETHYLENE WATER SERVICE, CURB STOP AND BOX | S912.090100, S913.0100, S914.030100 |
| 2+72 RT | 32 BIRCH ST | 1" COPPER | REPLACE CURB BOX | S914.1102 |
| 12+34 LT | 102 ASH ST | ½" GALVANIZED | INSTALL NEW ¾" SERVICE TAP, ¾" COPPER WATER SERVICE, CURB STOP AND BOX | S912.030075, S913.030075, S914.030075 |
| 17+00 RT | 151 ASH ST | 6" CIP | INSTALL NEW 6" PVCO WATER SERVICE, 8" X 6" TEE AND 2-6" VALVES | S901.130106, S903.0106 (2) |

NOTES:

1. PAYMENT FOR REMOVAL OF CURB BOX ON SERVICES TO BE ABANDONED AT TAP IS INCLUDED IN S912.04, S912.05 AND S912.06