SECTION S900 - GENERAL WATER PROVISIONS

S900 GENERAL

These general water provisions apply to all specifications for work on water system, and by reference is part of each section of those specifications.

S900-2 MATERIALS

Materials and product manufacturer shall be in accordance with the current City of Rochester Water Bureau's Approved Products List or approved equivalent.

S900-2.01 Hardware

Hardware is to be made of blue fluorocarbon coated, cold formed, high strength, low-alloy steel in accordance with ANSI/AWWA C111/A21.11.

S900-2.02 Warning Tape

Warning tape is to be 3-inch wide blue colored direct burial detectable metallic-lamination tape designed to locate and warn excavators of existing buried water pipes. Warning tape is to be marked in bold readable lettering "**CAUTION WATER LINE BURIED BELOW**".

S900-2.03 Material Certification

Manufacturers and suppliers certifications are to be furnished to Project Manager stating that materials furnished have passed acceptance tests listed in appropriate specification.

Water pipe, fittings and appurtenances that come into contact with drinking water are to be certified by an ANSI approved third-party North American certification program or laboratory for conformance with American National Standards Institute/National Sanitation Foundation (ANSI/NSF) Standard 61 for health effects and also ANSI/NSF Standard 61-Annex G or ANSI/NSF Standard 372 for "lead free" lead content requirements.

S900-2.04 Thrust Restraint

Concrete for thrust blocks is to be Class K in conformance with requirements of Section S504 Portland Cement Concrete, and can be either central, transit or truck mixed. With prior approval of Project Manager, an on-site mixed concrete can be used in lieu of Class K mix. Use of dry unmixed cement for constructing thrust blocks is prohibited.

Push-on joints and mechanical joints may require restraint by utilizing restraining devices as described in the Materials Section of S901, Water Main Pipe and Fittings. Restraining device is to be installed according to manufacturer's instructions. See Standard Detail for length of water pipe, including all pipe joints within the given length, required to be restrained.

Tie rods and clamps may be used in lieu of restraining device and are subject to approval of Project Manager prior to their use in water work. Tie rods, clamps and hardware are to be in conformance with requirements of Section S900-2.01.

Number and diameter of tie rods to be used for restrained joints shall be as shown in the following table:

NUMBER OF TIE RODS REQUIRED FOR JOINT RESTRAINT						
Water Pipe Size (inches)	Domestic System Rod Diameter			Holly System Rod Diameter		
	5/8 inch	3/4 inch	1 inch	5/8 inch	3/4 inch	1 inch
4	2	-	-	2	-	-
6	-	2	-	-	2	-
8	-	2	-	-	2	-
10	-	2	-	-	2	-
12	-	2	-	-	4	-
16	-	4	2	-	4	2
20	-	4	2	-	6	4

Prior to backfilling, uncoated tie rods, clamps and any components made of metal used for restrained joints are to receive hand brushed application of an approved bitumastic coating specifically manufactured for underground use or wax tape coating system.

S900-2.05 Bedding and Backfill Materials

Sand material is to be used for embedment around water pipe and fittings and is to be in conformance with requirements of Section S203 Excavation and Embankment. Use of select granular backfill (water) or locally excavated materials for purpose of embedment around water pipe and fittings is prohibited. Only an approved sand material is to be used for purpose of embedding water pipe and fittings.

Select granular backfill (water) material to be used as backfill above sand embedment course is to be in conformance with requirements of Section S203 Excavation and Embankment.

In lieu of select granular backfill (water) material, locally excavated material that is determined suitable for use by Project Manager can be used as backfill above sand embedment course.

Suitable locally excavated material consists of hard durable materials and soil that is free of clay, frozen, organic and other extraneous materials, and stones that are dimensionally greater than 3 inch in diameter.

S900-2.06 Controlled Density Fill Material

Controlled density fill material is to have a compressive strength of 50 to 100 pounds per square inch, and must not contain fly ash or other pozzolan containing materials.

S900-2.07 Surface Restoration Materials

Following materials are to be used:

- Subbase material Type 1 and Type 2 in conformance with requirements of NYSDOT Section 304 Subbase Course
- Hot Mix Asphalt 37.5 F9 Base Course HMA, 19 F9 Binder Course HMA and 9.5 F2 Top Course HMA, 80 Series Compaction, in conformance with requirements of NYSDOT Section 402 Hot Mix Asphalt (HMA) Pavements
- Concrete foundation for pavement, Class C or Class F, in conformance with requirements of NYSDOT Section 503 Portland Cement Concrete Foundation for Pavement
- Concrete and asphalt concrete sidewalk and driveway in conformance with requirements of Section S608 Sidewalk and Driveway
- Curb in conformance with requirements of Section S609 Curb
- Seeding in conformance with requirements of Section S610 Landscape
- Topsoil in conformance with requirements of Section S613 Topsoil
- Concrete gutter in conformance with requirements of Section R624 Concrete Gutter

S900-3 CONSTRUCTION DETAILS

S900-3.01 General

Work on water system is to be coordinated with Bureau of Water. Location and disposition of water services must be verified before beginning any water system related work.

Where existing water system is required to be shut down as approved by the Project Manager, Bureau of Water will close existing water valves needed to isolate that section of existing water system. Bureau of Water is to be notified minimum of 10 working days in advance of intent to do work that requires section of existing water system to be shut down, and again minimum of 2 working days in advance of when actual work is to begin. Water valves and hydrants are to be operated only by authorized Bureau of Water personnel.

Work is to be scheduled so as to maintain adequate level of water service, with interruptions being of minimum duration. Affected water service customer is to be notified by Contractor minimum of 24 hours in advance of any planned water service disruption. Temporary water service is to be provided to water service customer where water service is to be discontinued for more than 8 hours, or when indicated in Contract Documents. Method of providing temporary water service is to be in conformance with requirements of Section S916 Temporary Bypass.

Businesses and sensitive water service customers that require continuous water service for their basic operation are to receive a written notification by Contractor minimum of 72 hours in advance of planned water service disruption and be provided with temporary water supply when water system is shut down, or water shut shall be coordinated such that it occurs outside normal business operating hours.

Permit is required from Bureau of Water to use water from hydrants. Permit requires use of water meter and backflow preventer being supplied by Bureau of Water.

Bureau of Water dispatcher and Project Manager must be immediately notified when existing hydrant is put out of service. Dispatcher will inform Fire Department of out of service hydrant, and Contractor is to red tag out of service hydrant. Dispatcher must be notified when hydrant is placed back in service.

Contractor is to provide record information of all water service work to Bureau of Water Engineering Section. Record information is to be submitted in form of water service card. Blank water service card can be obtained from Bureau of Water Materials and Equipment Section. Water service card is to be submitted for approval to Bureau of Water Engineering Section with all required information completely filled in. Record information to be provided on each water service card includes street address, coordinate location of water service pipe and curb stop, sizes and type of material installed, and Contractor's and inspector's names.

Excavation is to be in conformance with requirements of Section R206 Trench and Culvert Excavation. Excavation for new water construction is to be only to sufficient length, width and depth needed to perform work in safe manner, to expose existing water pipe, and for proper installation of new water pipe and fittings.

Appropriate measures are to be taken to prevent extraneous material and ground water from contaminating water system. Ground water level is never to be less than 12 inches below invert of water pipe. To prevent contamination, open ends of water pipe that are left unattended are to be plugged with watertight plug, and wrapped in a double layer of polyethylene plastic and tightly taped or tied.

Prior to installation, water valves and hydrants are to be inspected, cleaned, lubricated and tested to insure they are in proper working order and bolts and nuts are torqued to manufacturer's specifications.

Prior to installation of any new water pipe and fittings, open end of existing water pipe is to be cleaned, removing all external dirt, scale and rust for minimum distance of 12 inches beyond end of new water pipe and fittings. Extraneous material that ends up inside water pipe must be removed via scouring by manipulating respective water valve.

Trenches located within existing pavement areas are to be surface finished with temporary pavement before end of work day. Temporary pavement is to be in conformance with requirements of Section S412 Temporary Pavement.

Extra caution is to be taken when working in vicinity of existing water pipe which is to remain in service. No vibratory equipment is to be used within 5 feet horizontally of existing cast iron, steel, asbestos cement and prestressed concrete cylinder water pipe.

Cut and open water pipe ends on abandoned water main and hydrant branch pipes are to be plugged with concrete. Concrete plug is to completely fill and seal end of abandoned water pipe to minimum depth of 12 inches. Abandoned water valves and curb stops are to be permanently closed and are to be left in shut position.

New water service taps may be installed during installation of water pipe as approved by the Project Manager.

S900-3.02 Installation

Water pipe and fittings are to be installed to required alignment and depth as required in Contract Documents and as approved by Project Manager. Alignment and depth of water pipe and fittings specified in Contract Documents is approximate only. Actual alignment and depth may be adjusted to meet field conditions at time of installation as approved by Project Engineer. Control points are to be carefully preserved.

Full depth pavement saw cutting is required for trenching in pavement areas that are located outside of full pavement reconstruction. All pavement saw cutting is to be done prior to commencing any water work, and is to be done in conformance with requirements of Section R622 Saw Cutting.

Excavation limits for installation of water pipe and fittings are to be to required alignment and depth to provide for minimum cover over water pipe and fittings, as measured between finished grade and top of water pipe and fittings shall be (unless noted otherwise on plans):

- 4 feet 6 inches for domestic water pipe
- 5 feet for Holly system water pipe

Trench is to be de-watered, and kept free of water at all times.

Where trench bottom is determined to be unstable by Project Manager, unsuitable material is to be removed to width and depth as approved by Project Manager, and excavated area shall be backfilled with select granular backfill or subbase course material.

Rock that is encountered within bounds of required excavation, embedment and backfill limits, is to be removed.

Before installation interior of water pipe and fittings that cannot be normally disinfected shall be swabbed with 1- 5 percent minimum hypochlorite solution.

Where it is required to cut or remove section of existing water pipe, cut is to be made straight, smooth and perpendicular to centerline of existing water pipe. Prior to cutting of water pipe, pipe cutting equipment and methods are to be as approved by Project Manager.

S900-3.03 Bedding and Backfill

Water pipe and fittings are to be completely embedded within sand material, as measured from exterior limit of water pipe and fitting to minimum extent of:

- 12 inches on each side
- 6 inches below bottom
- 12 inches above top

Sand embedment material is to be installed and compacted in conformance with requirements of Section S203 Excavation and Embankment. Sand bedding is to provide solid bearing through entire length of water pipe and fittings. Timber blocking is not to be used without prior approval of Project Manager, and is to be removed prior to backfilling of trench.

Warning tape is to be placed in open trench 12 inches above water pipe that is 4 inch and larger. Warning tape is to run continuously above and along centerline of water pipe, with wording facing up.

Backfill under paved areas is to be select granular backfill (water), and is to be installed and compacted in conformance with requirements of Section S203 Excavation and Embankment, with following modifications:

- Lift thickness is not to exceed 12 inches
- Minimum density for all backfill materials is to be 95 percent of Standard Proctor Maximum Density

S900-3.04 Filling and Flushing

Water pipe is to be slowly filled with water of potable quality at maximum velocity of 1 foot per second while all air is expelled from water pipe. Precautions are to be taken to prevent entrapping air in water pipe. After filling, water pipe is to be flushed at blow-offs and dead-ends at minimum velocity of 3 feet per second. Minimum of three changes of potable water are to be used in flushing operation.

S900-3.05 Testing

A. General

A hydrostatic pressure test is to be conducted on the water main after all required pipe and fittings have been installed including hydrant branches up to the hydrant and water services four (4) inches in diameter and larger. The length of water pipe to be pressure tested will be as approved by the Project Manager. The test shall be conducted using equipment that is capable of accurately measuring the pressure within the pipe and the amount of water added to the pipe during the test. The pressure test is to be witnessed by the Project Manager.

The section of water pipe to be pressure tested shall be filled with water of potable quality and all air expelled. Temporary taps on the water pipe are to be made at high points and other locations along the pipe, as needed, to release air from the pipe or for other testing purposes. All temporary taps shall be permanently plugged after successful completion of the hydrostatic test.

The Contractor shall notify the Project Manager 24 hours in advance of beginning the hydrostatic pressure test. The Contractor shall furnish the pressure testing apparatus. The apparatus shall include a water pressure gauge and water meter that have been properly calibrated for the work. Calibration testing of the gauge and meter shall be performed by an ISO 17025-accredited laboratory. The pressure gauge shall have a maximum range of 0 to 300 pounds per square inch (p.s.i.), a 3-1/2 inch minimum diameter dial with a graduation of 2 p.s.i. or smaller, and a gauge accuracy of at least 0.50 per cent.

The testing apparatus shall be equipped with a second port being a 1/4 inch NPT female quick-connect fitting to accommodate a second pressure gauge by the Water Bureau when ordered by the Project Manager. The ports shall be plumbed so that the gauges are installed in the upright position. The allowable difference between the Contractor's pressure gauge and the Bureau's pressure gauge shall not exceed 10 p.s.i. at the specified test pressure.

B. General - Ductile Iron, Polyvinyl Chloride (PVC), Molecularly Oriented Polyvinyl Chloride (PVCO) Water Pipe

For the hydrostatic pressure test, water pressure is to be raised (based on elevation at lowest point of water pipe under test and corrected to gauge location) to minimum pressure of:

- 150 pounds per square inch gauge for domestic water main
- 250 pounds per square inch gauge for Holly water main

After all visible leaks have been stopped, full test-pressure is to be maintained for minimum of 1 continuous hour with zero (0) gallons allowable leakage for each section of water pipe being tested.

If section of water pipe should fail to pass pressure test, defective section of water pipe is to be uncovered and repaired. Continually repeat pressure test, making repairs as necessary, until entire length of water pipe passes required pressure test.

C. High Density Polyethylene Water Pipe

Pressure test is to be done in accordance with requirements of ASTM F 2164.

For initial expansion phase of pressure test, water pressure is to be raised gradually to minimum test pressure of 240 pounds per square inch (based on elevation at lowest point of water pipe in pressure test and corrected to gauge location) and maintain pressure for up to 4 hours. The test pressure shall not exceed that of lowest pressure rated component. Additional make-up water will be required to be added to maintain test pressure at hourly intervals for initial expansion phase.

Following initial expansion phase, actual test phase begins. For actual test, minimum test pressure shall be reduced 10 psi and monitored continuously for period of 1 hour without additional make-up water. There shall be no visible leakage and pressure loss during test phase shall not be more than 5 per cent different from test phase pressure for section of water pipe being tested.

Under no circumstances should total time water pipe is under continuous test pressure exceed 8 hours. If pressure test is not completed due to leakage, equipment failure or for any other reason within 8 hour time period, water pipe test section should be permitted to "relax" for continuous 8 hour period prior to performing any further pressure testing.

S900-3.06 Disinfection

Disinfection of water main/temporary bypass pipe is to be done in accordance with latest requirements of ANSI/AWWA C651. Disinfection is required for domestic and Holly water system mains.

After section of water main/temporary bypass pipe has been successfully pressure tested, section of water main/temporary bypass pipe shall be thoroughly flushed. Method of flushing will be as approved by Project Manager. Minimum flushing velocity is to be 2.5 feet per second.

Flows to produce minimum velocity of 2.5 feet per second shall be as shown in the following table:

FLOWS TO PRODUCE MINIMUM VELOCITY OF 2.5 FEET PER SECOND		
Water Pipe Size (inches)	**Flow in Gallons per Minute (gpm)**	**Hydrant Openings at 40 Pounds per Square Inch (psi) Residual Pressure**
4	100	one 2-1/2 inches
6	200	one 2-1/2 inches
8	400	one 2-1/2 inches
10	600	one 2-1/2 inches
12	900	two 2-1/2 inches
16	1,600	two 2-1/2 inches
20	2,500	one 4-1/2 inches

See Table 3 AWWA C651 for number and size of blow-off taps, if blow-off taps are required.

Upon completion of flushing operations, water main/temporary bypass pipe is to be disinfected with chlorine solution using continuous feed method. Strength of chlorine solution is to be such that a residual of at least 25 milligrams per liter of chlorine is to be retained in water main/temporary bypass pipe after 24 hour period. For HDPE water pipe, chlorine solution is not to exceed 12 percent active chlorine due to chemical attack and degradation of polyethylene. Disinfection is to be in accordance with requirements of New York State Department of Health and of ANSI/AWWA C651, except that tablet method will not be allowed.

Water pipe, fittings, valves, exterior pipe surfaces on existing water main (such as for tapping sleeves, cutting-in valves, insertion sleeves, connections to existing water main and service saddles) in addition to tools and equipment that are to be in contact with encapsulated system water which will be installed without standard 24 hour disinfection detention period are to be spray disinfected or swabbed with minimum 1 to 5 per cent solution of chlorine no more than 30 minutes prior to installation. Following disinfection, water main/temporary bypass pipe is to be flushed until chlorine concentration in water leaving water main/temporary bypass pipe is no more than that generally prevailing in existing water system.

Samples of water will be collected from water main/temporary bypass pipe by Monroe County Department of Public Health. Monroe County Department of Public Health requires minimum of 2 working days advance notification requesting such sampling services. Contractor is to call (585) 753-5057 to arrange for sampling service.

Monroe County Department of Public Health may refuse to collect samples of water if location of disinfection/sampling tap is determined to be improper. Hydrants are not acceptable sampling points. Monroe County Department of Health will not perform sampling until it is in receipt of certification from New York State licensed or registered design professional certifying that water improvements, testing and disinfection were completed in accordance with approved plans, reports, specifications and any amendments. Such design professional may be either an engineer, architect, or land surveyor with special exemption under Section 7208(n) of Education Law.

Prior to collecting samples of water, sampling points must be decontaminated by flaming. Monroe County Department of Public Health will collect samples of water for free chlorine residual, total coliform, Escherichia coli (E. coli) and turbidity. Water main/temporary bypass pipe must not be placed in service until so authorized by Monroe County Department of Health.

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