



SPOTSYLVANIA COUNTY
DEPARTMENT OF UTILITIES
WATER AND SANITARY SEWER
DESIGN AND CONSTRUCTION STANDARDS

Recommended by: Ben Loveday, P.E.
Director of Utilities

A handwritten signature in blue ink that reads "Ben Loveday".

Signature

Effective Date: 10/23/2018

Contents

1. General.....	8
1.1 Definitions.....	8
1.2 Intent.....	10
1.3 Spotsylvania County Water/Sewer Master Plan.....	10
1.4 Submittals Overview.....	11
1.4.1 Plan Review and Permitting for Water and Sewer Lines in VDOT Maintained Right-of-Way.....	12
1.5 Service to Surrounding Areas.....	12
1.6 Off-Site Facilities.....	13
1.7 Easements.....	13
1.8 Contacting Property Owner.....	13
1.9 Access and Inspection.....	14
1.10 Contractor Requirements.....	14
1.11 Utility Department Water and Sanitary Sewer System Acceptance Requirements.....	15
1.12 Record Drawings.....	16
1.13 Water and Sewer Lines in VDOT Roadways – New Construction.....	18
2. Design Standards.....	20
2.1 Construction Drawings.....	20
2.2 Water System.....	21
2.2.1 Water Main Location.....	21
2.2.2 Depth of Water Mains.....	22
2.2.3 Surface Water Crossings.....	23
2.2.3.1 Above Water Crossing.....	23
2.2.3.2 Under Water Crossing.....	23
2.2.4 Water Main Appurtenances.....	24
2.2.4.1 General.....	24
2.2.4.2 Hydrants.....	24
2.2.4.3 Valves.....	24
2.2.4.4 Tapping Sleeves.....	25
2.2.4.5 Specialties.....	25
2.2.4.6 Apparatus and Procedures for Flushing, Draining, and Air Release.....	25
2.2.5 Fire Department Connections.....	26
2.2.6 Structural Design.....	26
2.2.6.1 Special Structures.....	26
2.2.6.2 Pipe.....	26
2.2.6.2.1 Zinc Coated Ductile Iron Pipe.....	26
2.2.6.2.2 Poly Vinyl Chloride (PVC) Pipe.....	27
2.2.6.3 Corrosion.....	27
2.2.6.4 Thrust Restraint.....	27
2.2.7 Hydraulic Design for Water Mains.....	28

2.2.7.1	General.....	28
2.2.7.2	Demand Criteria.....	29
2.2.7.3	Fire Flow Calculations.....	31
2.2.7.4	Dead-End Mains.....	31
2.2.7.5	Multiple Supply Points.....	31
2.2.7.6	Meters.....	31
2.2.7.7	Pressure Reducing Valves.....	31
2.2.8	Cross-Connection Control Program.....	32
2.2.9	Water Pumping Stations.....	32
2.2.10	Automated Water Meter Infrastructure.....	32
2.3	Sanitary Sewerage.....	32
2.3.1	Sanitary Sewer Location.....	32
2.3.2	Depth of Sanitary Sewer Lines.....	35
2.3.3	Sanitary Sewer Manholes.....	36
2.3.4	Sewer Service Connections.....	37
2.3.5	Sewer Structural Design.....	37
2.3.6	Hydraulic Design for Sanitary Sewers.....	38
2.3.7	Sewage Pump Stations and Force Mains.....	41
2.3.8	Grease Interceptors.....	42
3.	Construction Standards.....	44
3.1	General Requirements.....	44
3.1.1	General.....	44
3.1.2	Laws and Regulations.....	45
3.1.3	Materials and Workmanship.....	45
3.1.4	No Deviation by the Contractor from Approved Plans and Specifications.....	45
3.1.5	Use of Water.....	46
3.1.6	Clean Up and Restoration.....	46
3.2	Trenching, Backfilling and Compaction.....	46
3.2.1	General.....	46
3.2.1.1	Quality Assurance.....	46
3.2.1.2	Safety.....	46
3.2.1.3	Job Conditions.....	46
3.2.2	Products.....	47
3.2.2.1	Soil Materials.....	47
3.2.3	Execution.....	48
3.2.3.1	Inspection.....	48
3.2.3.2	Excavation.....	48
3.2.3.3	Hardpan Excavation.....	50
3.2.3.4	Rock Excavation.....	50
3.2.3.5	Blasting.....	50
3.2.3.6	Backfill for Trenches.....	51

3.2.3.7 Backfill for Structures.....	53
3.2.3.8 Compaction.....	53
3.2.3.8.1 Compaction and Inspection for Public Utilities under Pavement in VDOT Maintained right-of-way – New Construction.....	53
3.2.3.8.2 Compaction and Inspection – Testing and Reporting Method	54
3.2.3.9 Construction in Public Streets, Roads and Alleys	55
3.2.3.10 Tracing Wire for all Water and Sewer Mains.....	58
3.2.3.11 Marking Tape for all Water and Sewer mains	58
3.2.3.12 Disposal of Waste Materials	58
3.3 Sanitary Sewer Systems	59
3.3.1 General.....	59
3.3.1.1 Requirements of Regulatory Agencies	59
3.3.2 Products	59
3.3.2.1 Sewer Pipe and Fittings.....	59
3.3.2.2 Sanitary Sewer Manholes:	60
3.3.2.3 Sewage Air/Vacuum Valves	61
3.3.2.4 Sewage Combination Air Release Valves.....	62
3.3.2.5 Sewage Air Release Valves.....	62
3.3.2.6 Sewage Plug Valves.....	63
3.3.3 Execution.....	65
3.3.3.1 Installation of Sanitary Sewer Systems.....	65
3.3.3.2 Testing of New Sanitary Sewer System (Non-Pressure).....	69
3.3.3.3 Video Inspection of Sanitary Sewer Lines.....	73
3.3.3.4 Pressure Testing Requirements for Sewer Force Mains.....	75
3.3.3.5 Tracing Wire and Locating Tape for Sewer Force Mains and Gravity Mains.....	75
3.3.3.6 Clean-Up.....	75
3.4 Water Distribution System	76
3.4.1 General.....	76
3.4.1.1 Requirements of Regulatory Agencies	76
3.4.2 Products	76
3.4.2.1 General.....	76
3.4.2.2 Water Pipe	76
3.4.2.3 Gate Valves and Tapping Valves	77
3.4.2.4 Butterfly Valves (16” – 72”)	79
3.4.2.5 Tapping Sleeves.....	80
3.4.2.5.1 Ductile Iron Tapping Sleeves.....	80
3.4.2.6 Double Check Assembly.....	80
3.4.2.7 Fire Hydrants.....	80
3.4.2.8 Check Valves	82
3.4.2.9 Water Service Assembly for 5/8” and 3/4” Water Meters.....	82
3.4.2.10 Water Service Setter for 1”, 1 ½” and 2” Water Meters	83
3.4.2.11 Valve Boxes	85

3.4.2.12 Air Release Valves	85
3.4.2.13 Air release Valve Manholes	86
3.4.2.14 Joint Restraint Systems	86
3.4.2.15 Cast Couplings.....	87
3.4.2.16 Casing Spacers.....	87
3.4.3 Execution.....	87
3.4.3.1 Installation of New Water Systems	87
3.4.3.2 Pressure Testing of Water Main	94
3.4.3.3 Disinfection	95
3.4.3.4 Supplemental Procedures for Disinfecting, Testing, And Flushing.....	98
3.4.3.5 Testing of Double Check Assembly.....	99
3.4.3.6 Abandonment of Water Service	100
3.4.3.7 Abandonment of Water Mains.....	100
3.4.3.8 Clean-Up.....	100
4. Approved materials and manufacturers list	101
4.1 Introduction	101
4.2 Evaluation Process	101
4.2.1 Product and Design Review Committee	101
4.2.2 Manufacturers and Products Submission Procedures	101
4.2.3 Design and Construction Submission Procedures	102
4.2.4 Design Changes	102
4.2.5 Withdrawal of Approval.....	102
4.2.6 Committee Recommendations	103
4.3 Water System.....	104
4.3.1 Water Pipe	104
4.3.1.1 Polyvinyl Chloride (PVC) 6" to 10"	104
4.3.1.2 Zinc Coated Ductile Iron (DIP).....	104
4.3.1.2.1 Push-On or Mechanical Joint	104
4.3.1.2.2 Push-On Restrained Joints	104
4.3.2 Fittings: (Bends, Crosses, Tees and Grade-Lok Offset Glands) Ductile Iron Only.....	105
4.3.3 Couplings (Transition or Straight) Non-Restrained.....	105
4.3.4 Water Valves	105
4.3.4.1 Resilient Seated Gate Valves	105
4.3.4.2 Butterfly Valves 14" and Greater.....	106
4.3.5 Fire Hydrants.....	106
4.3.6 Meter Setters Two Inches (2") (See Appropriate Standard Details).....	106
4.3.7 Corporation Stops: Three-quarter Inch (¾") through One Inch (1")	106
4.3.8 Compression Fittings.....	106
4.3.9 Tapping Sleeves.....	107
4.3.9.1 M. J. Cast Iron or Ductile Iron Sleeve.....	107
4.3.9.2 Resilient Seated Wedge Tapping Valves, AWWA C509	107

4.3.10	Air Release Valves	107
4.3.11	Precast Concrete Vaults	107
4.3.12	Water Meter Barrels/Vaults	107
4.3.13	Water Meter Barrel Frames and Covers	108
4.3.14	Valve Boxes	108
4.3.15	Copper Tubing, ASTM B88	109
4.3.16	Service Saddles.....	109
4.3.17	Pipe Restraints	109
4.3.18	Sampling Stations.....	109
4.3.19	Casing Spacers (Stainless Steel Only).....	109
4.3.20	Double Check, Double Detector Check and Reduced Pressure Principle Devices ..	110
4.3.21	Yoke Bars (Epoxy Coated Only).....	110
4.3.22	Yoke Angle Valve for Copper Service Line	110
4.3.23	Yoke Angle Double Check Valve for Copper Service Line	111
4.3.24	Waterline Marker.....	112
4.3.25	Backflow Preventer Box.....	112
4.4	Sanitary Sewer System.....	112
4.4.1	Gravity Sewer Pipe.....	112
4.4.1.1	Zinc Coated Ductile Iron (DIP).....	112
4.4.1.2	Polyvinyl Chloride (PVC) Pipe.....	112
4.4.2	Pressure Sewer Pipe.....	113
4.4.2.1	Zinc Coated Ductile Iron (DIP).....	113
4.4.2.2	Polyvinyl Chloride (PVC).....	113
4.4.2.3	High Density Polyethylene (HDPE).....	113
4.4.3	Manholes: Precast Concrete	113
4.4.4	Manhole Frames and Covers	114
4.4.4.1	Standard Solid Frame and Cover	114
4.4.4.2	Watertight Frame and Cover	114
4.4.5	Manhole Liners, HDPE.....	114
4.4.6	Gaskets and Flexible Manhole Connections	114
4.4.7	Internal Chimney Seals.....	115
4.4.8	Manhole Joint Seals	115
4.4.9	Manhole Joint Wrap (in addition to O-ring specified above)	115
4.4.10	Manhole Joint Sealers	115
4.4.11	Waterproof Manhole Inserts	115
4.4.12	Polyethylene Slope Adjusting Ring	115
4.4.13	Saddles	115
4.4.14	Manhole Steps	116
4.4.15	Cleanout Cover.....	116
4.4.16	Valves	116
4.4.16.1	Valves – Plug, Full Port.....	116
4.4.16.2	Valves – Swing Check	116

4.4.17 Backwater Valve or Manhole Vent	116
4.4.18 Sewage Combination Air/Vacuum Valve	116
4.4.19 Sanitary Sewer Marker.....	116
4.5 Water and Sanitary Sewer Systems	117
4.5.1 Modular Wall Seal.....	117
4.5.2 Vault Doors.....	117
4.5.3 Electrical Coating for Tracer Wire Connections.....	117
4.5.4 All Fitting and Utility Hardware	117
5. Appendices.....	118
5.1 Appendix A - Water Meter Sizing.....	118
5.2 Appendix B – Utilities Site Plan Checklist.....	120
5.3 Appendix C – Spotsylvania County Standard Water and Sewer Notes	124
5.4 Appendix D – Utilities Project Tracking - CONSTRUCTION	126
5.5 Appendix E – Contact Information Form	128
5.6 Appendix F – First Acceptance Request – RESIDENTIAL.....	129
5.7 Appendix G - First Acceptance Request – COMMERCIAL.....	130
5.8 Appendix H – Final Acceptance Request	131
5.9 Appendix I – Reimbursement Agreement	132