Water and Sewer Utility Design Standards
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Chapter 4

(4.4.12) Construction Drawing Plan View

(4.4.12.1) The construction drawings shall be prepared with adequate information to describe the proposed water and sewer mains. The information provided shall include but not be limited to the following:

(4.4.12.1.1) Water Mains

A. Plans shall address all issues listed in the Site Plan Requirements located in Appendix B of this manual

B. Plans shall address all applicable issues listed in the Supplemental Site Plan Check List for Water and Sewer Main Extensions located in Appendix C of this manual

C. Alignment and stationing

D. Pipe size

E. Pipe material

F. Horizontal location/separations

G. Water main appurtenances

H. Special views; enlarged plan views or detailed dimensional layouts

(4.4.12.1.2) Sanitary Sewer Mains

A. Plans shall address all issues listed in the Site Plan Requirements located in Appendix B of this manual

B. Plans shall address all applicable issues listed in the Supplemental Site Plan Check List for Water and Sewer Main Extensions located in Appendix C of this manual

C. Alignment and stationing

D. Pipe size

E. Pipe material

F. Manhole labels, top elevations, invert elevations (in, out, and drop connections), city block map designations for existing manholes

G. Horizontal location/separations

H. Special views; enlarged plan views or detailed dimensional layouts

(4.4.13) Corrosion Control

(4.4.13.1) All buried water systems and ferrous sewer pipes shall be field wrapped in polyethylene encasement. The encasement shall include all buried pipe, valves, fittings, hydrant bases and copper water service lines within 3 feet of the main. Encasement shall be installed, protected and repaired per Ductile Iron Pipe Research Association (DIPRA) Polyethylene Encasement Installation Guide and manufacturer's installation instructions. Polyethylene encasement materials shall be per the City's Product Manual. Construction drawings shall clearly specify corrosion control design.

(4.4.13.2) Polyethylene encasement may be waived where the soils are determined to be non-aggressive. Non-aggressive soils are defined as those having a resistivity of greater than 1,800 ohm-cm as measured by a water-saturated soil box. The soil along the entire length of the pipeline must be tested at intervals not to exceed 100 feet. A minimum of 2 samples must be collected for every pipeline.

(4.4.13.2.1) Pipelines installed in coal cinders or organic soils shall be polyethylene encased regardless of resistivity. Organic soils are defined as being dark gray or black with a sulfur or earthy smell. Determination shall be made by the City Utility Inspector.

(4.4.13.2.2) Imported fill material will assume the characteristics of the surrounding native material. Resistivity and cinder and organic soil determinations are to be based on existing soils in the location of the proposed pipeline, and at the depth of the proposed pipeline.

(4.4.13.2.3) Where two consecutive soil samples indicate non-aggressive soils, polyethylene encasement may be waived between the two samples. Construction drawings shall clearly denote the limits of polyethylene encasement.

4.5 Design Criteria and Profile Requirements for Construction Drawings: Water And Sewer Main Extensions

(4.5.1) Cover Depth - All water mains shall have a minimum cover of three feet and a maximum cover of eight feet, measured from the top of pipe to the proposed finished grade directly above the water main.

(4.5.2) Conflicts With Utilities Shall Be Shown In Profile And:

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Chapter 7

2. Adequate structural support for the sewers to prevent excessive deflection of the joints and the settling on and breaking of the water line; and

3. That the length of the water and sewer lines be centered at the point of the crossing so that joints shall be equidistant and separated as far as possible.

(7.2.2.3) No water pipes shall pass through or come in contact with any part of a sewer manhole.

(7.2.3) General

(7.2.3.1) Minimum cover for new water pipe installation shall be three (3) feet.

(7.2.3.2) Existing water pipe shall be lowered or raised when proposed grading shall alter cover over the pipe to less than two and one-half (2 ½) feet or to greater than eight (8) feet.

(7.2.3.3) Maximum cover for water pipe shall be eight (8) feet.

(7.2.4) Corrosion Control

(7.2.4.1) All buried water systems and ferrous sewer pipes shall be field wrapped in polyethylene encasement. The encasement shall include all buried pipe, valves, fittings, hydrant bases and copper water service lines within 3 feet of the main. Encasement shall be installed, protected and repaired per Ductile Iron Pipe Research Association (DIPRA) Polyethylene Encasement Installation Guide and manufacturer's installation instructions. Polyethylene encasement materials shall be per the City's Product Manual.

(7.2.4.2) Exceptions to polyethylene encasement are defined in Chapter 4, Section 4.4.13 of the DCSM.

7.3 Water and Sewer Main Testing

(7.3.1) The City of Harrisonburg has established a protocol for testing and disinfection of mains, which shall be the responsibility of the Contractor to ascertain "on-site" approval by the Office of Community Development Inspection personnel. The protocol includes:

(7.3.1.1) Hydrostatic testing of all water mains

(7.3.1.2) Disinfection and Bacteriological sampling of all water mains

(7.3.1.3) Flushing of new water mains

(7.3.1.4) Final Inspection Operations test for all watermain valves and hydrants

(7.3.1.~~4~~5) Low Pressure Air Test of sanitary sewer pipe

(7.3.1.~~5~~6) PVC Sewer requires pulling of 5% mandrel

(7.3.1.~~6~~7) Exfiltration or Air Vacuum testing of manholes

The applicable charts and specifications may be found following this section.

FLUSHING AND DISINFECTION OF WATER MAINS

A. ALL WATER MAINS SHALL BE DISINFECTED PRIOR TO BEING PLACED IN OPERATION.

B. PRIOR TO DISINFECTION, ALL WATER MAINS SHALL BE FLUSHED. EACH MAIN SHALL BE FILLED WITH POTABLE WATER TO ELIMINATE AIR POCKETS AND FLUSHED TO REMOVE PARTICULATES. THE FLUSHING VELOCITY IN THE MAIN SHALL NOT BE LESS THAN ***3.0 FT/SEC***. ALL VALVES AND HYDRANTS SHALL BE OPERATED DURING THIS OPERATION.

C. METHODS OF CHLORINE APPLICATION:

1. CONTINUOUS FEED METHOD - POTABLE WATER SHALL BE INTRODUCED INTO THE MAIN AT A CONSTANT FLOW RATE. CHLORINE SHALL BE ADDED AT A CONSTANT RATE TO THIS FLOW SO THAT THE CHLORINE CONCENTRATION IN THE WATER IN THE MAIN IS AT LEAST 50 MG/L. THE CHLORINATED WATER SHALL REMAIN IN THE MAIN AT LEAST 24 HOURS, AFTER WHICH THE CHLORINE CONCENTRATION IN THE WATER SHALL BE AT LEAST 10 MG/L. ALL VALVES AND APPURTENANCES SHALL BE OPERATED WHILE THE CHLONINATED WATER REMAINS IN THE WATER MAIN.
2. SLUG METHOD - POTABLE WATER SHALL BE INTRODUCED INTO THE MAIN AT A CONSTANT FLOW RATE. THE WATER SHALL RECEIVE A CHLORINE DOSAGE WHICH WILL RESULT IN A CHLORINE CONCENTRATION OF 100 MG/L IN A "SLUG" OF THE WATER. THE CHLORINE SHALL BE ADDED LONG ENOUGH TO ENSURE THAT ALL PORTIONS OF THE MAIN ARE EXPOSED TO THE 100 MG/L CHLORINE SOLUTION FOR AT LEAST 3 HOURS. THE CHLORINE RESIDUAL SHALL BE CHECKED AT REGULAR INTERVALS NOT TO EXCEED 2,000 FEET TO ENSURE THAT ADEQUATE RESIDUAL IS MAINTAINED. AS THE CHLORINATED WATER PASSES VALVES AND APPURTENANCES, THEY SHALL BE OPERATED TO ENSURE DISINFECTION OF THESE APPURTENANCES.
3. TABLET METHOD - THIS METHOD SHALL NOT BE USED IF NON-POTABLE WATER OR FOREIGN MATERIALS HAVE ENTERED THE MAIN OR IF THE WATER TEMPERATURE IS BELOW 41F. THE TABLETS SHALL BE PLACED IN EACH SECTION AND IN ALL APPURTENANCES. ENOUGH TABLETS SHALL BE USED TO ENSURE THAT A CHLORINE CONCENTRATION OF 25 MG/L IS PROVIDED IN THE WATER. THEY SHALL BE ATTACHED BY AN ADHESIVE TO THE TOP OF THE PIPE SECTIONS AND CRUSHED OR RUBBED IN ALL APPURTENANCES. THE ADHESIVE SHALL BE ACCEPTABLE TO THE DIVISION. THE VELOCITY OF THE POTABLE WATER IN THE MAIN SHALL BE LESS THAN 1 FT / SEC. THE WATER SHALL THEN REMAIN IN CONTACT WITH THE PIPE FOR 24 HOURS. ALL VALVES AND APPURTENANCES SHALL BE OPERATED WHILE THE CHLORINATED WATER IS IN THE WATERMAIN..

D. FINAL FLUSHING - AFTER THE REQUIRED RETENTION PERIOD, THE CHLORINATED WATER SHALL BE FLUSHED FROM THE MAIN USING POTABLE WATER.

E. TESTING - AFTER THE MAINS HAVE BEEN FLUSHED, THE WATER MAINS SHALL BE TESTED AS OUTLINED BELOW:

1. BEFORE APPROVING A MAIN FOR RELEASE, THE CITY UTILITY INSPECTOR SHALL TAKE AN INITIAL SET OF SAMPLES AND RE-SAMPLE AGAIN AFTER A MINIMUM OF ***16 HOURS*** USING THE SAMPLING SITE PROCEDURES OUTLINED. BOTH SETS OF SAMPLES MUST PASS FOR THE MAIN TO BE APPROVED FOR RELEASE.
2. BEFORE APPROVING A MAIN FOR RELEASE, THE MAIN SHALL SIT FOR A MINIMUM OF 16 HOURS WITHOUT ANY WATER USE. USING THE SAMPLING SITE PROCEDURES OUTLINED AND WITHOUT FLUSHING THE MAIN, COLLECT TWO SETS OF SAMPLES A MINIMUM OF 15 MINUTES APART WHILE THE SAMPLING TAPS ARE LEFT RUNNING. BOTH SETS OF SAMPLES MUST PASS FOR THE MAIN TO BE APPROVED FOR RELEASE.
3. A SET OF SAMPLES INCLUDES ALL SAMPLES COLLECTED ALONG THE LENGTH OF THE PIPELINE. FOR NEW MAINS, SETS OF SAMPLES SHALL BE COLLECTED EVERY ***1,200 FEET*** OF THE NEW WATERMAIN, PLUS ONE SET FROM THE END OF THE LINE AND AT LEAST ONE FROM EACH BRANCH GREATER THAN ONE PIPE LENGTH .
4. EACH SAMPLE SHALL BE COLLECTED AND TESTED FOR BACTERIOLOGIC QUALITY AND SHALL SHOW THE ABSENCE OF COLIFORM ORGANISMS. TESTS SHALL BE PERFORMED BY A STATE HEALTH DEPARTMENT APPROVED LABORATORY.
5. SAMPLES FOR BACTERIOLOGICAL ANALYSIS SHALL BE COLLECTED IN STERILE BOTTLES TREATED WITH SODIUM THIOSULFATE. IF THE LABORATORY RESULTS INDICATE THE PRESENCE OF COLIFORM BACTERIA, THE SAMPLES ARE UNSATISFACTORY AND DISINFECTION SHALL BE REPEATED UNTIL THE SAMPLES ARE SATISFACTORY.
6. A SAMPLING TAP CONSISTS OF A CORPORATION STOP WITH METAL PIPE. THE CORPORATION STOP INLET SHALL BE MALE, 1 INCH IN SIZE, PURSUANT TO CHAPTER 7, SECTION 7.5. (UPON COLLECTION OF SAMPLING THE CONTRACTOR SHALL CONSTRUCT A PARTIAL WATER SERVICE, CHAPTER 7, DWG. 26, P. 46, OR MANUAL AIR RELEASE, DWG. 32, P. 52, COMPLETE AND READY FOR USE.)

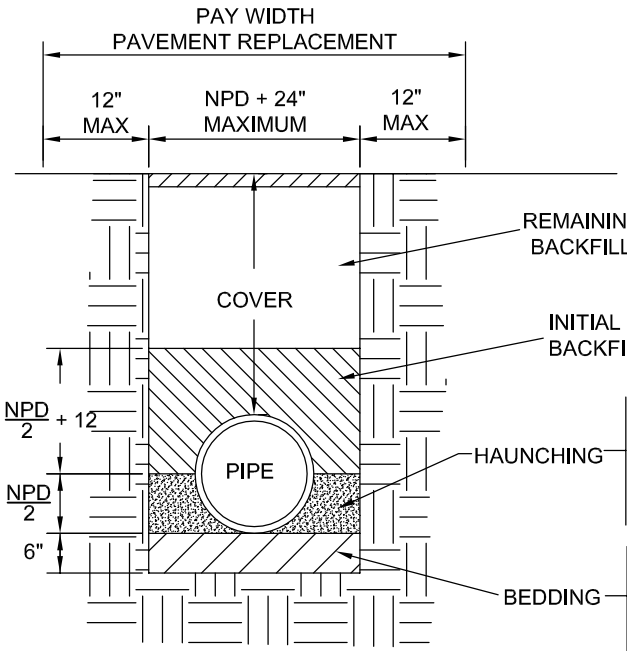
F. SAMPLES SHALL BE COLLECTED BY CITY PERSONNEL UPON PRIOR SCHEDULING BY THE CONTRACTOR WITH THE CITY UTILITY INSPECTOR. REPAIRS, CLEANING, DISINFECTING, FLUSHING, TESTING, OR SIMILAR OPERATIONAL ACTIONS SHALL BE IN ACCORDANCE WITH THE MOST CURRENT STANDARD ISSUED BY AWWA. (AWWA C-651)

NO.	DATE	DESCRIPTION	INIT.
1.	7/01/04	2004 D&CSM UPDATE	SDC
2.	6/07/16	2016 D&CSM UPDATE	DHG

FLUSHING AND DISINFECTION OF WATER MAINS

DWG. NO

PAGE T-7



PAYMENT REPLACEMENT PAY AREA AT MANHOLES = 8 FT DIAMETER CIRCLE

REMAINING BACKFILL — TOPSOIL IS NOT ALLOWED UNDER PAVEMENT, SIDEWALK, ROAD, OR BUILDING; NO STONE LARGER THAN 5" IN ANY DIMENSION; COMPACTED IN 24" MAXIMUM LIFTS

INITIAL BACKFILL — NO STONE LARGER THAN 1" IN ANY DIMENSION; COMPACTED IN 6" LIFTS

HAUNCHING — PLACE AND COMPACT UNDER PIPE TO PROVIDE SIDE SUPPORT. AVOID DISPLACEMENT OF PIPE FROM PROPER ALIGNMENT.

BEDDING — INSTALL & SHAPE TO PROVIDE CONTINUOUS PIPE SUPPORT AT HORIZONTAL & VERTICAL ALIGNMENT SHOWN ON PLANS; WHERE ROCK IS ENCOUNTERED IN THE TRENCH BOTTOM IT SHALL BE EXCAVATED TO A MINIMUM OF 6" BELOW THE PIPE.

NPD = NOMINAL PIPE DIAMETER

LAYING CONDITION	BEDDING	HAUNCHING	INITIAL BACKFILL	REMAINING BACKFILL
1	CONCRETE ENCASEMENT (SEE CITY STANDARD DETAIL)			
2	CRA #68	CRA #68	CRA #68	#21A AGGREGATE
3	CRA #68	CRA #68	CRA #68	LM (85% NO LOAD - 95% LIVE LOAD)
4	CRA #68	CRA #68	SLM (95%)	LM (85% NO LOAD - 95% LIVE LOAD)
5*	SH (95%)	(REFER TO LAYING CONDITION 6 OR 7)		
6*	CRA #68	CRA #68	SLM (95%)	LM (85% NO LOAD - 95% LIVE LOAD)
7*	CRA #68	CRA #68	SLM (95%)	#21A AGGREGATE

* CLAY CUTOFF DAMS ARE REQUIRED EVERY 400' OR AS DIRECTED BY THE CITY UTILITY INSPECTOR. CUTOFF DAM MUST BE FULL TRENCH DEPTH AND MINIMUM 2 FEET THICK.

PIPE TRENCH APPLICATIONS:

DUCTILE IRON WATER PIPE	LAYING CONDITION 6
DUCTILE IRON WATER PIPE IN EXISTING PAVEMENT	LAYING CONDITION 7
DUCTILE IRON WATER PIPE WITH ROCK UNDERCUT	LAYING CONDITION 5
DUCTILE IRON SEWER PIPE	LAYING CONDITION 4
DUCTILE IRON SEWER PIPE IN EXISTING PAVEMENT	LAYING CONDITION 2
PVC SEWER PIPE	LAYING CONDITION 3
PVC SEWER PIPE IN EXISTING PAVEMENT	LAYING CONDITION 2

NOTES:

A) COMPACTION SHOWN IN PARENTHESES SHALL BE DETERMINED BY ASTM D 698

B) MINIMUM SPECIFICATION: TRENCHES UNDER PAVEMENTS, SIDEWALKS, ROADS, & BUILDINGS SHALL BE COMPACTED TO 95% DENSITY AS DETERMINED BY ASTM D 698, 6 INCH MAXIMUM LIFTS.

C) IF NOT SPECIFIED OTHERWISE, MINIMUM COMPACTION SHALL BE BY ROLLING WITH EARTH-MOVING EQUIPMENT.

D) CRA SHALL BE VIBRATED USING A PLATE VIBRATOR OR SIMILAR EQUIPMENT TO REDUCE VOIDS AND LIMIT SETTLEMENT.

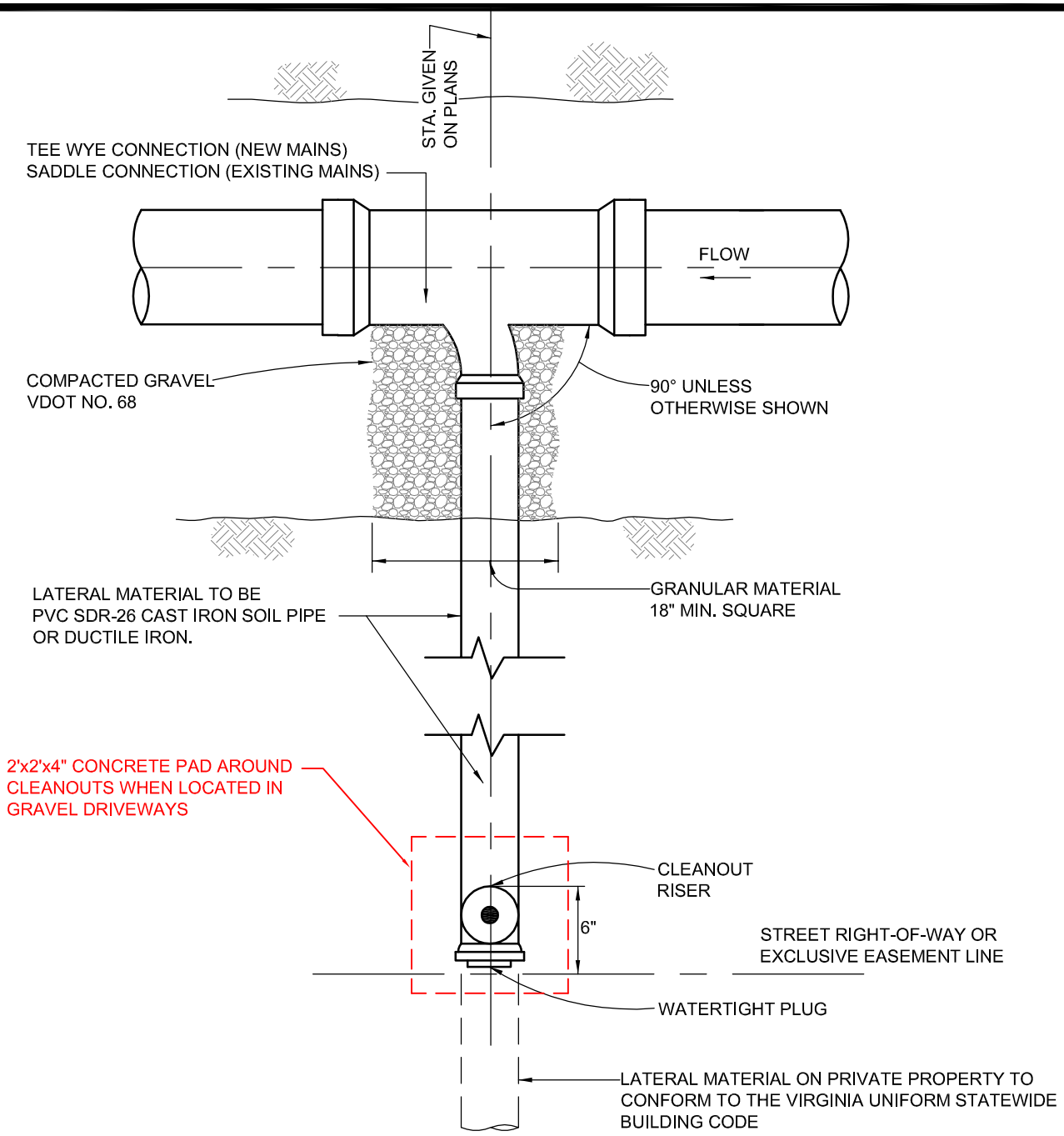
DESIGNATION	DESCRIPTION OF BACKFILL MATERIALS
CRA	COARSE AGGREGATE: VDOT SIZE AS SHOWN IN PARENTHESES
SLM	SELECT LOCAL MATERIAL: FREE OF DEBRIS, ROOTS, FROZEN MATERIALS, ORGANIC MATTER, STONES GREATER THAN 1" DIAMETER. UNIFIED SOILS CLASSIFICATION: ML/CL/MH/CH
LM	LOCAL MATERIALS: FREE OF STONES GREATER THAN 5" DIAMETER AND FOREIGN MATERIALS.
SH	WHERE USED AS BEDDING FOR ROCK UNDERCUT, USE MATERIAL WITH SOME PLASTIC TENDENCIES SUCH TO SEAL ROCK FISSURES, SUCH AS SHALE-CLAY MIX.

NOT TO SCALE

REVISIONS			
NO.	DATE	DESCRIPTION	INIT.
1.	7/01/04	2004 D&CSM UPDATE	SDC
2.	2/22/06	VDEQ REVIEW COMMENTS	DHG
3.	6/07/16	MOD. FOR POLYWRAP	DHG

PIPE TRENCH DETAIL

DWG. NO. 1



PLAN VIEW
(4" CONNECTION SHOWN)

NOTES:

1. UNLESS OTHERWISE APPROVED BY THE DIRECTOR, **NO** SIX INCH LATERALS WILL BE PERMITTED TO CONNECT TO SEWER MAINS, EXCEPT BY INSTALLATION OF A MANHOLE.
2. WHERE SIDEWALK IS TO BE CONSTRUCTED, THE CLEANOUT SHALL BE BETWEEN THE SIDEWALK AND RIGHT-OF-WAY LINE.
3. SEE CHAPTER 4 AND PUBLIC UTILITIES PRODUCT MANUAL.

NOT TO SCALE

REVISIONS			
NO.	DATE	DESCRIPTION	INIT.
1.	9/22/04	2004 D&CSM UPDATE	SDC
2.	6/07/16	CONC. IN DRIVEWAYS	DHG

SANITARY SEWER LATERAL PLAN

DWG. NO. 48

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