

## **ENGINEERING STANDARDS**

CRESTVIEW WATER AND SANITATION DISTRICT  
ADAMS COUNTY, COLORADO



**CRESTVIEW WATER & SANITATION DISTRICT**

**DISTRICT OFFICE:**  
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## **1 WATER SYSTEM SPECIFICATIONS**

### **1.1 Purpose and General Requirements**

This publication is to provide information to all Engineers, Contractors, Builders, Developers and other interested persons or firms, on the District requirements with respect to design and construction of water systems within the District. This publication presents technical specifications for the design and installation of water mains and should be used in conjunction with the District Rules and Regulations by any firm or individual planning to design or construct water systems within the District. In all cases in these specifications where reference is made to "District's Engineer," the "District's Engineer" shall mean any representative of the Consulting Engineering firm or other individual designated by the District to provide inspection of the water system construction.

### **1.2 Engineering Standards**

1.2.1 All water line design and construction shall adhere to the latest version of:

1. Denver Water Engineering Standards
2. Denver Water Capital Projects Construction Standards

1.2.2 Erosion control and all roadway trenching, patching, and paving shall adhere to the latest version of Adam's County Development Standards and Regulations, or the City of Westminster's Standards and Specifications for Public Improvements, whichever is applicable.

### **1.3 Design Requirements**

1.3.1 All Preliminary and Final Plats will show CWSD existing and proposed easements.

1.3.2 All water lines shall either be within public ROW or exclusive Crestview Water and Sanitation District easements.

1.3.3 All water mains twelve inches (12") in diameter and larger shall be profiled on the construction plans. All water mains of any size that are not under a designed street shall also be profiled on the construction plans.

1.3.4 At water and sanitary sewer crossing, the water line shall not have a joint within 6 feet of the outside dimension of the sewer pipe if within one and one-half feet (1 ½') of the sewer and/or below the sewer.

1.3.5 Water mains shall be located a minimum distance of five feet (5') from the lip edge of the gutter pan, unless prior approval has been obtained.

1.3.6 Fire hydrants shall be installed and spaced in accordance with the applicable Fire District.

1.3.7 Concrete paving adjacent to or behind fire hydrants shall be a minimum of three feet (3') from the hydrant.



#### **1.4 Water Mains in Easements**

- 1.4.1 In areas where water mains are to be placed in easements, all water mains shall be located within exclusive easements shown on the contract drawings and on recorded plats. All water main easements shall be exclusive and must be a minimum of thirty feet (30') in width for single District utility or fifty feet (50') for dual District utilities. No water line shall be located less than ten feet (10') from the edge of an easement. Fire hydrants must have an easement envelope around them measuring five feet (5') behind the hydrant and ten feet (10') to the sides.
- 1.4.2 For any proposed easement, provide to the District for review, easement agreement, exhibit, and legal description.
- 1.4.3 Markers: In areas where water lines are placed in unpaved easements, all manholes and valves shall be identified with a three-inch (3") steel marker post, offset as directed by the District's Engineer and painted yellow, with the distance to the manhole or valve and the appropriate identifying initials stenciled in black.
- 1.4.4 Paved surfaces in easements shall be asphalt or pervious material. Concrete pavement over the water main alignment is not allowed.

#### **1.5 Material Specifications**

- 1.5.1 Squeegee bedding shall be used. On-site material is not acceptable without the approval of the District's Engineer. Unstable soil conditions may necessitate the use of materials other than squeegee. Examples would be 2-inch or larger rock plus filter fabric, approved by District's Engineer.
- 1.5.2 Foster adaptors are to be used for gate valves at tees and crosses where possible in intersections. Refer to the Foster adaptor issues/warnings.
- 1.5.3 Cast iron valve box riser rings are not allowed. See Denver Water Specifications in regard to valve boxes.
- 1.5.4 Tracer wire is to be direct bury ten-gauge solid single strand copper wire UL listed, TYPE UF. All tracer wire is to be taped to the top of the pipe in four (4) places with twenty-foot (20') length with two inch (2") wide PVC tape. Tape will go all the way around the pipe. Refer to Sheet 37 of the Denver Water Standard Drawings.
- 1.5.5 Controlled Low Slump Material (CLSM) shall not be used unless specifically approved by the District.
- 1.5.6 Foam board used for pipe to ground insulation shall be closed cell polystyrene "Blue Board" sheets as designed or directed by the District.



## 1.6 Construction Requirements

- 1.6.1 A pre-construction meeting must be arranged by the Contractor and held prior to the start of any work. The District, District's Engineer, Contractor, Developer, Adams County, City of Westminster and Denver Water must be represented at this meeting, which will be held at the District office.
- 1.6.2 All Contractors must notify the District at least 48 hours prior to start of construction.
- 1.6.3 The District working hours are from 7:00 a.m. to 4:00 p.m. Monday through Friday. Any construction work that requires District personnel or a District Representative to be on site on weekends, holidays, or before 7:00 a.m. or after 4:00 p.m. Monday through Friday will be considered overtime work.
- 1.6.4 Contractor (Developer) is to provide the District with two (2) copies of all changes or addenda as soon as change is made, and before change can be constructed.
- 1.6.5 All new installations requiring meters two inches (2") in diameter and smaller shall be purchased from the District. The cost of the meter shall be included in the tap fees.
- 1.6.6 No work shall be backfilled (including bedding material above the spring line of the pipe) until the construction has been inspected and approved for backfilling by the District's Engineer or authorized inspector, unless prior authorization has been obtained.
- 1.6.7 All bolting shall be tightened in an evenly, alternating manner per the manufacturer's specifications. Refer to Denver Water Engineering Standards.
- 1.6.8 All attachments to the water lines, not limited to saddles, bell joint restraints, shall be tightened with a calibrated torque wrench per the manufacture's specifications, in the presence of the District Engineer. All brass and bronze fittings shall be tightened with a smooth jaw pipe wrench, per the manufactures' specifications.
- 1.6.9 Care shall be taken when using air impact wrenches to ensure bolts are tightened evenly, and the gland is equidistant from the fitting. All bolting with air impacted wrenches shall obtain a snug tight fit and final torque verified by manual methods per the manufacturer's specifications.
- 1.6.10 When draining an existing water line, the sump and pumps will be adequate to keep the water level of the sump below the water lines so that it does not come into contact with the service water line. The sump should be a minimum of two feet (2') below the bottom of the pipe. Rock should then be installed to one foot (1') below the bottom of the pipe. The District will make every effort to ensure a complete shutdown of the existing system for tie-ins. However, it should be expected that existing valves do not seal and provisions should be made by the Contractor for leaking control valves.
- 1.6.11 Compaction at Manholes and Valves: The Contractor shall give special emphasis to the backfill around all manholes, appurtenances, water services, valves and structures. The backfill shall be placed in horizontal layers not exceeding two feet (2') in depth and shall be adequately moistened and thoroughly tamped with air or vibrator plate or jumping jack compactor. At a



minimum, two (2) density tests will be at every foot at a manhole and one (1) density test at valves. All compaction will be initially observed by the District.

- 1.6.12 Settlement: The Contractor will be responsible for repairing or complete replacement of any deterioration or settlement of the pipe trenches and associated street surfaces. Notification of the required repairs will be issued by the District. All costs of repairs and all liability, as a result of surface deterioration or settlement, shall be the responsibility of the CONTRACTOR. The Warranty Period (2 years after Initial Acceptance) shall be extended for the full period for the entire project to cover future settlement deterioration until the Project as a whole shows no signs of settlement deterioration.
- 1.6.13 Water line pipes shall not be seated beyond the black reference line to cause bottoming out in the bell of the pipe.
- 1.6.14 Full lengths of pipe or maximum pipe lengths are to be used to minimize the number of joints. No short lengths of pipes are to be connected along an alignment in lieu of a longer or full length of pipe.
- 1.6.15 Pipe deflections: Waterline deflections for curves shall be deflected through the joint of the pipes and not by bending the length of pipe. The joint shall not be assembled where as it has been bottomed out beyond the black reference line of the pipe. All pipe deflections shall be below manufacturers' recommendations.
- 1.6.16 Cast iron rings are not allowed for raising valve boxes to final grade. Valve box tops should be screwed up or down to match existing asphalt. If an adjustable riser must be used, a slip type adjustable riser, also known as an internal valve box riser, for 6850/60 Series valve boxes may be used with prior approval.
- 1.6.17 Utility locates during construction shall be performed by the Contractor or representative of the Owner until initial acceptance is issued.

## 1.7 Water Line Inspection

- 1.7.1 Inspection of Material. All material deemed unacceptable by the District Inspector or its authorized representative shall be removed from the jobsite.
- 1.7.2 An initial inspection of all valve boxes will be done before the pressure test, when the valves are checked to make sure they are fully open or closed as needed. Any defective valve box or valve box not centered on the operating nut of the valve, that prevents the valve from being operated and are crucial to the pressure test, will be repaired before the pressure test can begin. A second valve box inspection will be done at the contractor or developer's request sometime after final paving. The warranty period cannot begin until all valve boxes have been accepted.
- 1.7.3 Tie-ins: Where a connection or tie in between new and existing water lines is less than 50 feet and is impractical to perform the high chlorine, pressure and clear water test, the Contractor will be allowed to complete the tie-in of the lines under the following conditions. All piping and fittings are to be cleaned and washed out with a high chlorine solution (500ppm) with clean buckets and mops, all fit up and bolting of fittings are to be performed in full view and inspected



to the satisfaction of the District Observer. The District will determine the best method of flushing the line after the tie-in has been completed. The Contractor is to provide all of the equipment for flushing and for dechlorinating of any discharges during flushing procedures. The Contractor is also to provide necessary traffic control and protection of property during flushing. The necessary velocity at which the line is to be flushed will be determined by the District.

**1.8 Pipeline Testing After Installation**

- 1.8.1 Chlorination: All mains, extensions and private pipe shall be chlorinated in accordance with ANSI/AWWA C651, "Disinfecting Water Mains" and Denver Water Engineering Standards.
- 1.8.2 High chlorine sampling shall be done before and after the twenty-four (24) hour period at multiple locations including the supply side of the water line.
- 1.8.3 The chlorination of the pipelines shall be done prior to the hydrostatic testing.
- 1.8.4 Chlorine tablets shall be attached to the top of the pipe with small amounts of approved adhesive applied to each individual chlorine tablet.
- 1.8.5 Flushing: All flushing shall be done by the District. Multiple flushing may be required to flush out water and/or water that has sat idle or is at a dead end for five (5) days. The Contractor shall provide all chemicals (Sodium Thiosulfate), equipment and a water truck to discharge the chlorinated water into for de-chlorination and any line flushing requirements. The Contractor shall abide by all County and State Standards. The District will determine the best method for flushing the line. The District will operate all valves, fire hydrants and/or blow-off assemblies used to flush the line. The District will use the chart in Table 1 to determine the flow required to obtain 2.5 ft./sec. The District will also determine how much water will need to be flushed from the line at the required velocity to exchange the water in the pipeline three (3) times. High velocity flushing is to be done after the pressure test and before the clear water test, if practical. The Contractor is to provide necessary traffic control if required and also protection of property. The Contractor is also responsible for any valves, hydrants, and/or blow-off assemblies to be accessible and in good working order.

**Table 1: Flow Required for Various Flushing Velocities**

Pipe Size (in.)	Pipe Area (sq. ft.)	Flow Required (gpm) for Given Velocity		
		1 ft./sec/	2.5 ft./sec/	5 ft./sec
2	0.02	10	25	50
4	0.09	40	100	200
6	0.20	90	220	440
8	0.35	155	390	780
10	0.55	245	610	1220
12	0.79	350	880	1760
14	1.07	480	1200	2400

- 1.8.6 The District will not allow a high chlorinated solution (over 10 ppm) in a water line to sit for more than thirty (30) hours, specifically over the weekend. The District will not begin to flush any line on Fridays after 12:00 p.m. unless approved. Therefore, the high chlorine twenty-four (24) hour





test period has to be started before 12:00 p.m. on Thursday of the week, if prior approval has been obtained to flush on Friday afternoon.

- 1.8.7 All valves and discharges from the water lines shall be operated by the District.
- 1.8.8 All costs associated with chlorination and flushing shall be at the Contractors' expense.
- 1.8.9 All traffic control and protection of property will be the Contractor's responsibility.

### **1.9 Hydrostatic Pressure Test**

- 1.9.1 The water main shall be pressure tested in accordance with Denver Water Engineering Standards.
- 1.9.2 Maximum length of pipe that can be tested is two thousand linear feet (2,000 LF).
- 1.9.3 Air Removal Before Test: Before applying the specified test pressure, all air shall be expelled from the pipe. The Contractor shall coordinate and receive approval with the District their construction sequence for water line phasing and testing. If permanent air vents are not located at all high points, the Contractor shall install corporation cocks with prior approval from the District, at such points as the air can be expelled as the line is filling with water.
- 1.9.4 Equipment: The Contractor shall supply all pressure test equipment in clean and working order specifically designed for water line pressure testing.
- 1.9.5 Procedure: The pressure test shall be witnessed by the District and Denver Water.
- 1.9.6 The Contractor shall ensure that a satisfactory test is completed and shall employ all methods necessary to pass the test, including disconnection from existing water mains and use of a temporary plug, if necessary.
- 1.9.7 If the pressure test fails and the water line requires re-chlorination, Contractor shall coordinate with Denver Water to chlorinate pipe.

### **1.10 Clearwater Testing**

- 1.10.1 The Contractor shall use an approved sampling company for testing by Colorado Department Pubic Health and Environment.
- 1.10.2 Procedure: Once a Contractor has passed the high chlorine test and hydrostatic test, it is imperative that the lines are thoroughly flushed. Hydrants/blow-offs should be opened completely starting at the one closest to the source water and progressing to the end of the line. Chlorine residual test will be performed at the time of the bacteriological test and the chlorine residual must be within 0.2mg/l of the source water. If the chlorine residual is higher than the source water, the line has not been adequately flushed and the test fails. If the bacteriological test fails, re-chlorination of the water mains may be required. The Contactor shall coordinate with Denver Water for re-chlorination of mains. Flushing water will need to be metered and disposed of properly.



### **1.11 Responsibility of the Contractor**

- 1.11.1 The Contractor shall be responsible for notifying the District, Denver Water, District's Engineer and the County if applicable at least forty-eight (48) hours prior to start of any construction. If work is suspended for any period of time after initial start-up, the Contractor must notify the District forty-eight (48) hours prior to re-start. The contractor is also responsible for notifying Adams County Communications (ACCOM) at 303-288-1535 at least forty-eight (48) hours in advance of any fire hydrants being out of service and for notifying ADCOM when hydrant(s) are put back into service.
- 1.11.2 At all points of connection of new water mains to existing mains, the Contractor will be responsible for excavating and verifying location of the existing lines prior to installation of any new construction. If it is necessary to shut down any portions of the existing water system to make such connection, the Contractor will be responsible for notifying all District customers in writing each day to be affected by water outage at least forty-eight (48) hours prior to such outage. All existing water main valves shall be operated only by the District. The duration of water outage to the District customers shall be minimized and if directed by the District's Engineer, the Contractor shall provide temporary water supply to customers.
- 1.11.3 The Contractor shall assume full responsibility and expense for the protection of all public and private property, roads, curb, gutter, sidewalk, pedestrian ramps, cross pans, curb cuts, driveway cuts, structures, water mains, sewers, utilities, utility appurtenances etc., both above and below ground, at or near the site or sites of the work, being performed under the contract, or which are in any manner affected by the prosecution of the work or the transportation of men and materials in connection therewith.
- 1.11.4 The location of existing utilities shown on the drawings is based on the best available information, but is not to be construed as exact. During the design phase of the project the existing utilities were identified from existing plans and visible surface appurtenances. However, not all existing utilities were marked, and it will be the Contractor's responsibility to verify and protect all existing utilities during construction. If additional utilities are discovered during the construction that are not identified on the plans, this will not constitute a Change Order, and the Contractor shall include all costs for locating, crossing, and protecting all existing utilities for such work in the bid price.
- 1.11.5 The Contractor shall ensure that all residents have access from the street to their property each night. When access to a resident's property cannot be maintained during normal working hours (weekdays), the Contractor must personally notify the affected residents twenty-four (24) hours in advance of the closure. Emergency access shall not be blocked at any time for any reason.
- 1.11.6 The Contractor shall submit a Water Line Schedule of Construction Phases to sequence construction, line abandonment, waterline testing, water service reconnections, and temporary, if applicable, and permanent paving. This shall be submitted to the District's Engineer for review and approval, prior to construction.
- 1.11.7 The Contractor shall make his own provisions to apply all water necessary for backfill compaction, line flushing, testing, or any other purpose during construction. Water can be



obtained from the District at no charge, for District projects. The Contractor will provide a deposit for a hydrant meter. The deposit will be returned when the hydrant meter is returned to the District in satisfactory working condition. The Contractor will pay current applicable District construction water permit fees.

- 1.11.8 Due to the age of the existing waterline, the Contractor shall account for water from tie-ins to the existing waterlines, leaking adjacent waterlines, and leaky valves that cannot be completely closed. All pumping shall be done from a sump pit filled with three-quarters inch ( $\frac{3}{4}$ " ) stone and not directly discharged into the storm system. The sump should be a minimum of two feet (2') below the bottom of the pipe. Rock should then be installed one foot (1') below the bottom of the pipe. The District will make every effort to ensure a complete shutdown of the existing system for tie-ins. It is expected, however, that existing valves do not seal, and provisions should be made by the Contractor for leaking contact valves.
- 1.11.9 All excavations at the end of the day shall be backfilled and compacted. The subgrade shall be protected per the County standards.
- 1.11.10 All piping material and appurtenances shall be stored off the ground and protected from dirt and the weather. No pipe shall be installed with dirt or debris in the line.

#### 1.12 Water Services

- 1.12.1 Tapping Saddles: Ford Stainless Steel Saddles, Style FS 313 or AY McDonald 8403 sizing for standard C900 PVC pipe, or approved equal, will be allowed. Metallic water mains will require Ford style 202B tapping saddles, or approved equal.
- 1.12.2 The contact area on the water main for the saddle shall be washed with a high chlorine solution (500ppm).
- 1.12.3 All water service reconnections and/or tie-ins shall be visually inspected for leaks after the service has set under line pressure for three (3) minutes. If leaks are discovered, the Contractor shall make the necessary repairs and the process is restarted. Pipe dope shall not be used on any connections.
- 1.12.4 The Contractor shall be responsible for flushing water through the outside faucet of the property once the water service connection is completed. All clogged or restricted pipes in the residence shall be the responsibility of the Contractor. Larger service lines serving non-residential properties, such as a school or business, that have a backflow preventer may need to have the meter pulled (on an existing service), or have provisions made for high velocity flushing through the service line or corp on a new line, to eliminate all shavings or debris that may affect the customers' facilities. The Contractor is also responsible for damages to any and all other customers' facilities damaged by debris entering the service line from any service line repairs or re-connects.
- 1.12.5 Meter pit domes and covers shall be manufactured by the Ford Meter Box Company for  $\frac{3}{4}$ " meters, and Castings Incorporated for 1" meters. The hole in the lid is to be offset to allow installation of the meter reading device. They are the only acceptable meter pit dome allowed by the District.



- 1.12.6 Only plastic meter pits and riser rings will be allowed, unless otherwise approved. Adjustment of all meter pits, curb stop boxes, and meter yokes to final grade, as determined by the District, is the responsibility of the Contractor.

**1.13 Warranty and Acceptance**

- 1.13.1 During the last two (2) months of the two (2) year warranty period, the District will reinspect the project and advise the Developer or Contractor of any deficiencies and irregularities, if any, which the Developer or Contractor shall correct. A letter of final acceptance will be issued upon the Developer or Contractor's completion of the remedial measures.
- 1.13.2 A valve box inspection will need to be completed prior to the beginning of the warranty period. Valve boxes need to be free of defect and centered on the operating nut of the valve.
- 1.13.3 Final Acceptance of the lines will not be granted until all tests are successful and all items listed for correction by the District's Engineer have been accomplished.



**1.14 Water System Details**

- General Water Line Notes
- Valve Arrangement at Fire Hydrant Lateral

1. ALL MATERIAL AND WORKMANSHIP SHALL BE IN CONFORMANCE WITH CRESTVIEW WATER AND SANITATION DISTRICT STANDARDS AND DENVER WATER ENGINEERING STANDARDS, AND DENVER WATER CAPITAL PROJECTS CONSTRUCTION STANDARDS, LATEST EDITION.
2. ALL FIRE HYDRANT CONNECTIONS TO BE NATIONAL STANDARD THREADS TO MEET FIRE DEPARTMENT REQUIREMENTS. ALL FIRE HYDRANT CONNECTIONS SHALL CONFORM TO THE FOLLOWING REQUIREMENTS: 4 THREADS PER INCH FOR STEAMER CONNECTIONS AND 7 1/2 THREADS PER INCH FOR THE 2 1/2" CONNECTOR. FIRE HYDRANT – USE MUELLER COMPANY CENTURION MODEL A-423 NST, OPEN RIGHT, COLOR RED.
3. DUCTILE IRON PIPE IS TO BE USED FOR ALL FIRE HYDRANT ASSEMBLIES AND 3" AND GREATER FIRE SERVICE LINES. ALL JOINTS TO BE RESTRAINED.
4. ALL BUTTERFLY VALVES SHALL BE MUELLER LINESEAL XP II (CLASS 250) WITH A 21" EXTENSION OPERATING SHAFT AND SHALL BE LOCATED IN A WATERPROOF 60" DIAMETER PRECAST MANHOLE ASSEMBLE WITH PRECAST OR CORE DRILLED PENETRATIONS.
5. ALL VALVES 12 INCHES AND UNDER SHALL BE RESILIENT SEAT GATE VALVES – OPEN RIGHT. MUELLER, AMERICAN FLOW CONTROL, OR U.S. PIPE ONLY.
6. VALVE BOXES SHALL BE TYLER SCREW TYPE "C" CAST IRON VALVE BOX ASSEMBLY, SERIES 6860 WITH NO. 160 OVAL BASE OR APPROVED EQUAL.
7. TRACER WIRE SHALL BE DIRECT BURY 10 GAUGE SOLID SINGLE STRAND COPPER WIRE WITH DIRECT BURY TEST STATION BOXES AT EACH FIRE HYDRANT.
8. ALUMINUM FOIL WARNING TAPE SHALL BE USED ON ALL WATER LINES. TAPE MUST BE BLUE IN COLOR. TAPE TO BE INSTALLED 2' BELOW FINISHED GRADE.
9. THE CONTRACTOR SHALL NOTIFY AND SCHEDULE DENVER WATER TO THE PRE-CONSTRUCTION MEETING.
10. PIPE BEDDING SHALL BE SQUEEGEE WITH 12" ABOVE THE PIPE AND 6" BELOW THE BOTTOM AND AROUND THE PIPE. UNSTABLE SOIL CONDITIONS: 2" CRUSHED ROCK AND FILTER FABRIC WILL BE USED UNDER THE PIPE BEDDING TO PROVIDE ADEQUATE SUPPORT. DO NOT BACKFILL WITH ROCKS GREATER THAN 4".
11. ALL SERVICE LINE APPURTENANCES SHALL BE FORD OR MUELLER BRASS OR BRONZE PRODUCTS. SETTERS SHALL BE FORD OR AY McDONALD.
12. ALL WATER SERVICE LINES 3/4 TO 2 INCH WILL BE TYPE "K" COPPER PIPING.
13. METER PITS SHALL BE 24 INCHES I.D. AND BE MADE OF PRE-CAST CONCRETE RINGS. LID SHALL BE 1" TO 2" ABOVE FINAL GRADE.
14. SERVICE SADDLES FOR PVC PIPE SHALL BE FORD STAINLESS STEEL SADDLES, STYLE FS-313 OR AY McDONALD STYLE 8403.



CRESTVIEW WATER & SANITATION DISTRICT

## GENERAL WATER NOTES

Scale: <b>NONE</b>	Date: <b>DECEMBER 2014</b>
Revised: <b>APRIL 2023</b>	Detail:

15. SERVICE SADDLES FOR DIP PIPE SHALL BE FORD BRASS SADDLES, STYLE 202BS DOUBLE BAND.
16. NO METER PITS, CURB STOP VALVES, CONTROL VALVES, FIRE HYDRANTS ARE ALLOWED TO BE IN CONCRETE DRIVEWAYS OR SIDEWALKS, UNLESS OTHERWISE APPROVED BY CRESTVIEW.
17. CORPORATION VALVES FOR COPPER SERVICE LINES SHALL BE BALL TYPE AWWA/CC TAPER THREADS INLET BY FLARE COPPER OUTLET CONNECTIONS, MUELLER 300 OR FORD FB-600 SERIES.
18. CURB STOP VALVES FOR COPPER SERVICE LINES SHALL BE BALL TYPE, FORD B-44 SERIES WITH GRIP JOINT OR FLARE CONNECTIONS OR MUELLER 300 SERIES WITH FLARE ONLY FITTINGS.
19. COUPLINGS FOR COPPER SERVICE LINES SHALL BE FORD C-44 SERIES OR AY McDONALD, WITH GRIP JOINT CONNECTIONS.
20. CURB STOP BOXES FOR 3/4" AND 1" SERVICES SHALL BE CAST IRON, BUFFALO TYPE, TYLER 6500 SERIES WITH 2 1/2" DIAMETER SHAFT. CURB STOP BOXES FOR 1 1/2" AND 2" SERVICES SHALL HAVE 4 1/4" DIAMETER SHAFT.
21. ALL PIPE DEFLECTIONS TO BE WITHIN DENVER WATER AND MANUFACTURERS RECOMMENDATIONS AND OBSERVED IN THE FIELD DURING CONSTRUCTION. A MINIMUM 10' PIPE LENGTH IS REQUIRED FOR ALL DEFLECTIONS.
22. THE MINIMUM HORIZONTAL DISTANCE BETWEEN EXISTING AND PROPOSED PIPE IS 3.0' INSIDE TO INSIDE UNLESS APPROVED BY CRESTVIEW.
23. FOR ALL VALVES TO BE ABANDONED: CLOSE VALVE, REMOVE AND DISPOSE OF VALVE BOX AND COVER, FILL HOLE WITH APPROVED MATERIAL AND PAVE TO THE EXISTING DEPTH OF ROADWAY.
24. ALL NEWER FITTINGS/APPURTENANCES DESIGNATED TO BE REPLACED WILL BE RETURNED TO THE DISTRICT. CONTRACTOR TO COORDINATE WITH CRESTVIEW.
25. FOR ALL PIPING TO BE ABANDONED, AT A MINIMUM, UNLESS NOTED OTHERWISE ON THE PLANS, ALL ENDS ARE TO BE CAPPED WITH CONCRETE. ABANDONED WATERLINES ABOVE OR BELOW THE NEW WATERLINE AND/OR CONFLICTS WITH CLEARANCES SHALL BE REMOVED (18" BEYOND OD) AND CAPPED WITH CONCRETE. ACTIVE WATERLINES WILL REQUIRE PLUGS/CI CAPS AND THRUST BLOCKS. THIS CAN BE DEPENDENT ON THE CONSTRUCTION SEQUENCING AND/OR AS DIRECTED BY CRESTVIEW. THE COST OF THIS WILL BE INCLUDED IN THE INSTALLATION OF THE WATERLINE.
26. NO PERMANENT OR TEMPORARY THRUST BLOCKS ALLOWED AGAINST NEW OR EXISTING PIPE.
27. ALL MANHOLE/VAULT EXTERIOR JOINTS SHALL BE WRAPPED IN 12-INCH WIDE CONSEAL CS 212 OR APPROVED EQUIVALENT.



CRESTVIEW WATER & SANITATION DISTRICT

## GENERAL WATER NOTES

Scale: **NONE**

Date: **DECEMBER 2014**

Revised: **APRIL 2023**

Detail:

28. MANHOLE/VAULT BARREL SECTIONS WILL REQUIRE AN EXTERIOR COATING OF BITUMINOUS WATERPROOFING OR APPROVED EQUIVALENT.
29. MUELLER H-13000 SERIES BRONZE SADDLES SHALL BE USED FOR ALL 1-1/2" AND 2" PVC SERVICES.
30. ALL WATER MAIN TESTING SHALL BE WITNESSED BY A REPRESENTATIVE OF CRESTVIEW. A MINIMUM OF 24 HOURS ADVANCED NOTICE IS REQUIRED PRIOR TO TESTING.



CRESTVIEW WATER & SANITATION DISTRICT

## GENERAL WATER NOTES

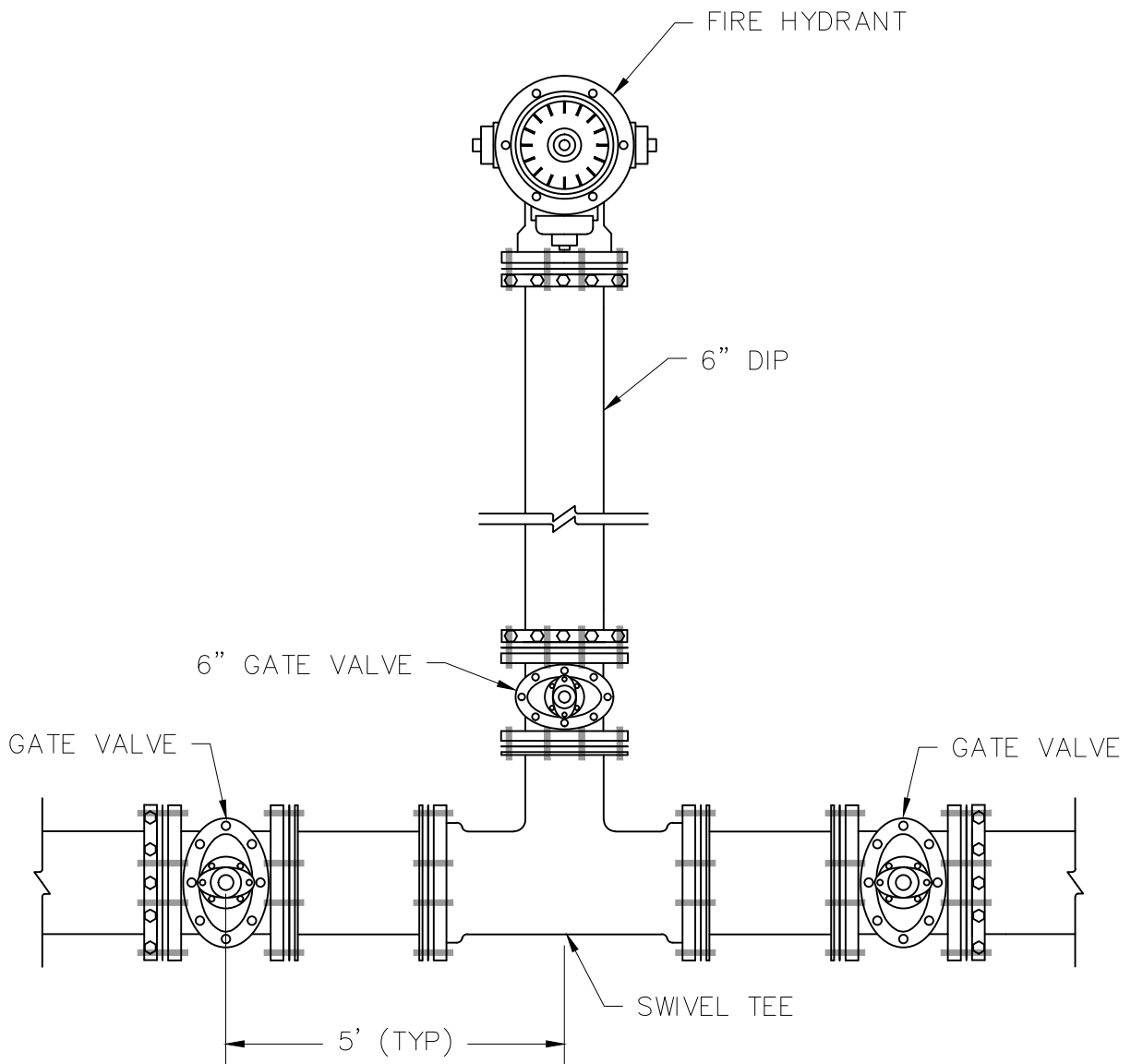
Scale: *NONE*

Date: *DECEMBER 2014*

Revised: *APRIL 2023*

Detail:





**NOTES:**

1. ARRANGEMENT AND NUMBER OF VALVES AS SHOWN ON THE CONSTRUCTION PLANS.
2. ALL JOINTS SHALL HAVE A MECHANICAL JOINT RESTRAINT DEVICE.

S:\Crestview Standards\CrestLogo0rkpdf.jpg

**VALVE ARRANGEMENT AT  
FIRE HYDRANT LATERAL**

Scale: **NONE**

Date: **MARCH 2013**

Revised: **DECEMBER 2022**

Detail:

## 2 SANITARY SEWER SYSTEM SPECIFICATIONS

### 2.1 Purpose and General Requirements

This publication is to provide information to all Engineers, Contractors, Builders, Developers and other interested persons or firms, on the District requirements with respect to design and construction of sanitary sewer systems within the District. This publication presents technical specifications for the design and installation of sanitary mains and should be used in conjunction with the District Rules and Regulations by any firm or individual planning to design or construct sanitary systems within the District. In all cases in these specifications where reference is made to "District's Engineer," the "District's Engineer" shall mean any representative of the Consulting Engineering firm or other individual designated by the District to provide inspection of the sanitary sewer system construction.

### 2.2 Engineering Standards

2.2.1 All sanitary sewer line design and construction shall adhere to the latest version:

1. City and County of Denver Department of Public Works:
  - a. Sanitary Design and Technical Criteria Manual
  - b. Storm Drainage and Sanitary Sewer Construction Details and Technical Specifications
  - c. Wastewater Standard Detail Drawings

2. Metro Wastewater Reclamation District Rules and Regulations

2.2.2 Erosion control and all roadway trenching, patching, and paving shall adhere to the latest version of Adam's County Development Standards and Regulations, or the City of Westminster's Standards and Specifications for Public Improvements, whichever is applicable.

### 2.3 Design Requirements

2.3.1 All Preliminary and Final Plats will show CWSD existing and proposed easements.

2.3.2 All sanitary sewer lines shall either be within public ROW or exclusive Crestview Water and Sanitation District easements.

2.3.3 In addition to the City and County of Denver Department of Public Works Sanitary Sewer Design and Technical Criteria Manual for Sanitary Sewer Study Requirements, flow monitoring may be required to establish the proper sizing for outfall lines.

2.3.4 The sewer's hydraulic capacity shall be such that the sewer is flowing at no more the 50% of the full depth at the calculated future peak flow rate.

2.3.5 Sanitary sewer lines are to be a minimum distance of five feet (5') from lip of gutter pan and 10' apart from any water main. For new developments, no parallel lines to existing lines will be allowed. The Developer will upsize the existing line at their expense.



2.3.6 The sanitary sewer services lines that are one hundred feet (100') or longer will be required to install two-way clean-outs.

2.3.7 Six-inch (6") service lines and larger shall require connection to the main with a manhole.

## **2.4 Sanitary Sewers in Easements**

2.4.1 In areas where sanitary sewer lines are placed in easements, all sanitary lines shall be located within the exclusive easements shown on the Contract Drawings and/or recorded plats. All sanitary exclusive easements widths shall adhere to the City and County of Denver Department of Public Works Sanitary Sewer Design Technical Criteria Manual. No sewer shall be located less than ten feet (10') from the edge of the easement. District's Engineer reserves the right to require additional easement and/or more than ten feet (10') to the edge of the easement, depending on the depth of the sewer.

2.4.2 For any proposed easement, provide to the District for review easement agreement, exhibit, and legal description.

2.4.3 Markers: In areas where sewer lines are placed in non-paved easements, all manholes and force main valves shall be identified with four-inch (4") steel marker post or three-inch (3") carsonite marker post, offset as directed by the District's Engineer and painted yellow, with the distance to the manhole or valve and the appropriate identifying initials stenciled in black.

## **2.5 Material Specifications**

2.5.1 Bedding shall be ¾" crushed rock. On-site material is not acceptable without approval of District's Engineer. Unstable soil conditions may necessitate the use of additional bedding materials. Examples would be 2-inch or larger rock plus filter fabric, approved by District's Engineer. No work shall be backfilled until the construction has been observed and approved for backfilling by District's Engineer.

## **2.6 Construction Requirements**

2.6.1 A pre-construction meeting must be arranged by the Contractor and held prior to the start of any work. The District, District's Engineer, Contractor, Developer and Adams County or the City of Westminster, if applicable, must be represented at this meeting, which will be held at the District office.

2.6.2 All contractors must notify the District at least 48 hours prior to start of construction.

2.6.3 The District working hours are from 7:00 a.m. to 4:00 p.m. Monday through Friday. Any construction work that requires District personnel or a District Representative to be on site on weekends, holidays, or before 7:00 a.m. or after 4:00 p.m. Monday through Friday will be considered overtime work.

2.6.4 Contractor (Developer) is to provide the District with two (2) copies of all changes or addenda as soon as change is made, and before change can be constructed.



- 2.6.5 All pipe to manhole connections shall be water tight flexible connections made with gasketed NPC Kor-N-Seal boots, manufactured by Trelleborg Pipe Seals Milford, Inc. With express permission of the District, cast-in-place A-Lok X-cel connections manufactured by A-Lox Products, Inc., can be used. For the connections to remain flexible, grouting shall be in compliance with manufacturer's recommendation.
- 2.6.6 Precast Manhole joints shall be water proof and constructed with a mastic strip equaling in three-quarter inch by one and one-half inch ( $\frac{3}{4}'' \times 1\frac{1}{2}''$ ) widths and continuously placed with no gaps or separations.
- 2.6.7 All manholes shall be plumb within one-eighth inch ( $\frac{1}{8}''$ ) per one foot (1').
- 2.6.8 Compaction at Manholes: The Contractor shall give special emphasis to the backfill around all manholes, appurtenances and structures. The backfill shall be placed in horizontal layers not exceeding 24-inches in depth and shall be adequately moistened and thoroughly tamped with air or vibrator plate or jumping jack compactor. At a minimum, 2 density tests will be taken at every two feet at a manhole. All compaction will be initially observer by the District.
- 2.6.9 Settlement: The Contractor will be responsible for repairing or complete replacement of any deterioration or settlement of the pipe trenches and associated street surfaces. Notification of the required repairs will be issued by the District. All costs of repairs and all liability, as a result of surface deterioration or settlement, shall be the responsibility of the CONTRACTOR. The Warranty Period shall be extended for the full period for the entire project to cover future settlement deterioration until the Project as a whole shows no signs of settlement deterioration
- 2.6.10 Sanitary sewer pipes shall not be seated beyond the black reference line to cause bottoming out in the bell of the pipe.
- 2.6.11 Full lengths of pipe or maximum pipe lengths are to be used to minimize the number of joints. No short lengths of pipes are to be connected along an alignment in lieu of a longer or full length of pipe.
- 2.6.12 At water and sanitary sewer crossing, the sanitary line shall not have a joint within six feet (6') of the outside dimension of the water pipe if within one and one-half vertical feet (1.5') of the water and/or above the water line.
- 2.7 Safety Precautions**
- 2.7.1 All excavations shall be performed, protected and supported as required for safety and in the manner set forth in the operation rules, orders and regulations prescribed by the OSHA Federal Register.
- 2.8 Tests and Inspection**
- 2.8.1 Inspection of Material: All material deemed unacceptable by the District or its authorized representative shall be removed from the jobsite.

**2.9 Low Pressure Air Test**

- 2.9.1 Low pressure air tests in accordance with the latest version of UNI-BELL, UNI B-6 Specification, shall be used for testing of sewer lines. Tests shall be performed with suitable equipment specifically designed for air testing sewers.
- 2.9.2 Flush and clean the sewer line prior to testing, thus serving to wet the pipe surface as well as clean out any debris. Plug the line at each manhole and all service connections with suitable test plugs. As a safety precaution, pressurizing equipment may include a regulator or relief valve set at ten (10) psi maximum to avoid over pressurizing and damaging an otherwise acceptable line.
- 2.9.3 Add air slowly until the internal air pressure of the sewer line is raised to four (4) psi gauge. At least two (2) minutes shall be allowed for the air temperature to stabilize before readings are taken and the timing started.
- 2.9.4 When the pressure has stabilized between 4.0 psig and 3.5 psig, commence the test to determine the amount of time for pressure to drop by 0.5 psig. The test shall pass if the pipe pressure does not drop by more than 0.5 psig from the initial pressure reading within the time requirement listed in Table II.
- 2.9.5 Refer to Uni Bell, UNI-B-6 Specifications for testing when groundwater is present.

**2.10 Vacuum Testing Manholes**

The District reserves the right to require a vacuum test on all new manholes installed, particularly in areas where the groundwater level is high or where there are questions regarding the integrity of the new barrel sections. All manholes shall be vacuum tested in accordance with ASTM C1244. All lift holes and any pipes entering the manhole shall be plugged prior to a vacuum being drawn and the drop over a specified time determined. The test head shall be placed at the top of the manhole in accordance with the manufacturer's recommendations. A vacuum of ten inches (10") of mercury shall be drawn on the manhole, the valve on the vacuum line of the test head closed, and the vacuum pump shut off. The time shall be measured for the vacuum to drop to nine inches (9") of mercury. The manhole shall pass if the time for the vacuum reading to drop from ten inches (10") of mercury to nine inches (9") of mercury meets or exceeds the values indicated below.



Depth (Feet)	Diameter (Inches)								
	30	33	36	42	48	54	60	68	72
	<b>Time (Seconds)</b>								
<= 8	11	12	14	17	20	23	28	29	33
10	14	15	18	21	25	29	33	38	41
12	17	18	21	25	30	35	39	43	49
14	20	21	25	30	35	41	46	51	57
16	22	24	30	34	40	46	52	58	57
18	25	27	32	38	45	52	59	65	73
20	28	30	35	42	50	63	65	72	81
22	31	33	39	46	55	64	72	79	89
24	33	38	42	51	59	64	78	87	97
26	36	38	46	55	64	75	85	94	105
28	39	42	49	59	69	81	91	101	113
30	42	45	53	63	74	87	98	108	121

### 2.11 Video Inspection

- 2.11.1 Upon completion of the sanitary sewer work and prior to any testing, the lines shall be thoroughly flushed and jetted to remove any debris, dirt, or other foreign matter. The lowest manhole (or manholes) within the project shall be plugged with a watertight plug on the downstream outlet of the manhole and all water, silt and debris shall be pumped from within this manhole and disposed of properly.
- 2.11.2 After cleaning the new sanitary sewer, the Contractor shall perform and supply the District with a copy of the PACP TV inspection. TV inspections shall be performed by a PACP certified inspector and use an approved PACP scoring version. During the inspection, Contractor will dump water down the sanitary main, maintaining a small stream of water. The maximum dip or sag shall not exceed three-eighths inches (3/8") or an increase in water level of ten percent (10%). The Contractor will pump water out of the downstream manhole and dispose the water at a District-approved manhole.
- 2.11.3 Following TV inspections, Contractor will make any necessary repairs that have been identified. The sanitary sewer main will then be re-cleaned and a new TV inspection performed. If the TV inspections are determined to be acceptable by the District, the work will be eligible for initial acceptance.
- 2.11.4 Any infiltration in the line sanitary sewer main or manhole must be repaired by the Contractor.

### 2.12 Responsibility of the Contractor

- 2.12.1 The Contractor shall be responsible for notifying the District, District's Engineer, and the County, if applicable, at least forty-eight (48) hours prior to start of any construction and /or testing. If work is suspended for any period of time after initial start-up, the Contractor must notify the District's Engineer forty-eight (48) hours prior to re-start.



- 2.12.2 At all points of connection of new sanitary sewer mains to existing mains, the Contractor will be responsible for excavating and verifying location of the existing lines prior to installation of any new construction. If it is necessary to shut down any portions of the existing sanitary sewer system to make such connection, the Contractor will meet with the District to discuss. In the event bypass pumping is selected by the District, the Contractor will provide a completed "Proposed By-Pass Pumping Questionnaire" along with the proposed technical specifications for sanitary sewer bypass pumping to the District. No construction will take place until these documents are reviewed and written approvals are received from the District.
- 2.12.3 The Contractor shall assume full responsibility and expense for the protection of all public and private property, roads, curb, gutter, sidewalk, pedestrian ramps, cross pans, curb cuts, driveway cuts, structures, water mains, sewers, utilities, utility appurtenances etc., both above and below ground, at or near the site or sites of the work, being performed under the contract, or which are in any manner affected by the prosecution of the work or the transportation of men and materials in connection therewith.
- 2.12.4 The location of existing utilities shown on the drawings is based on the best available information but is not to be construed as exact. During the design phase of the project the existing utilities were identified from existing plans and visible surface appurtenances. However, not all existing utilities were marked and it will be the Contractor's responsibility to verify and protect all existing utilities during construction. If additional utilities are discovered during the construction that are not identified on the plans this will not constitute a Change Order and the Contractor shall include all costs for locating, crossing, and protecting all existing utilities for such work in the bid price.
- 2.12.5 The Contractor shall insure that all residents have access from the Street to their property each night. When access to a resident's property cannot be maintained during normal working hours (weekdays), the Contractor must personally notify the affected residents twenty-four (24) hours in advance of the closure. Emergency access shall not be blocked at any time for any reason.
- 2.12.6 The Contractor shall submit a Sanitary Sewer Line Schedule of Construction Phases to sequence construction, line abandonment, testing, sanitary sewer service reconnections, and temporary, if applicable, and permanent paving. This shall be submitted to the District's Engineer for review and approval, prior to construction.
- 2.12.7 The Contractor shall make his own provisions to apply all water necessary for backfill compaction, line flushing and video, and any other purpose during construction. Water can be obtained from the District at no charge for District projects. The Contractor will provide a deposit for a hydrant meter. The deposit will be returned when the hydrant meter is returned to the District in satisfactory working condition. The Contractor will pay current applicable District construction water permit fees.
- 2.12.8 All excavations at the end of the day shall be backfilled and compacted. The subgrade shall be protected per the County standards.
- 2.12.9 All piping material and appurtenances shall be storied off the ground and protected from dirt and the weather. No pipe shall be installed with dirt or debris in the line.



**2.13 Proposed Sanitary Sewer By-Pass Pumping Questionnaire**  
(Attach a separate sheet if needed)  
**CRESTVIEW WATER AND SANITATION DISTRICT**

**Q1: Staging area for pumps?**

**A1:** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Q2: Sewer plugging method and types of plugs?**

**A2:** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Q3: Number, size, material of suction piping?**

**A3:** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Q4: Number, size, material of discharge piping?**

**A4:** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Q5: Bypass pump sizes, capacities, and number of each size to be provided onsite including all primary, secondary, and spare pumping units?**

**A5:** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Q6: Calculations of static lift, friction losses and flow velocity (pump curve)?**

**A6:** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Q7: Thrust block and restraint sizes and locations?**

**A7:** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Q8: Method of noise control for pumps and additional equipment if in residential area?**

**A8:** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_





**Q9: Sections showing suction and discharge pipe depth, embedment, fill and special backfill (if buried bypass line is utilized)?**

**A9:** \_\_\_\_\_

\_\_\_\_\_

**Q10: Calculations for selection of bypass pump size including expected peak flow?**

**A10:** \_\_\_\_\_

\_\_\_\_\_

**Q11: Schedule for installation and maintenance of bypass pumping locations?**

**A11:** \_\_\_\_\_

\_\_\_\_\_

**Q12: Contractors plan for providing continuous pumping operation and staff qualification?**

**A12:** \_\_\_\_\_

\_\_\_\_\_

**Q13: Emergency plan for adverse weather?**

**A13:** \_\_\_\_\_

\_\_\_\_\_

**Q14: Provide system working and test pressures. Test pressures shall be 50psi above working pressure. The District shall be notified and present for pipe testing.**

**A14:** \_\_\_\_\_

\_\_\_\_\_

**Q15: Provide emergency plan should all pumps fail.**

**A15:** \_\_\_\_\_

\_\_\_\_\_

**Q16: Provide Sanitary Sewer Bypass Technical Specifications.**

**A16:** \_\_\_\_\_

\_\_\_\_\_



**Air Test, Based on Formulas from UNI-B-6-g8, Table II**  
**Specification Time (Min: Sec) Required for 0.5 PSIG Pressure Drop when Testing One Pipe Diameter Only**

Length (Feet)	Pipe Diameter (Inches)													
	4	6	8	10	12	15	18	21	24	27	30	33	36	42
25	1:53	2:50	3:47	4:43	5:40	7:05	8:30	9:55	11:24	12:45	14:10	15:35	17:00	19:54
50	1:53	2:50	3:47	4:43	5:40	7:05	8:30	9:55	11:24	12:45	14:10	15:35	17:00	19:54
75	1:53	2:50	3:47	4:43	5:40	7:05	8:30	9:55	11:24	12:45	14:10	16:10	19:14	27:10
100	1:53	2:50	3:47	4:43	5:40	7:05	8:30	9:55	11:24	14:25	17:48	21:33	25:39	34:54
125	1:53	2:50	3:47	4:43	5:40	7:05	8:30	10:54	14:15	18:02	22:15	26:56	32:03	43:38
150	1:53	2:50	3:47	4:43	5:40	7:05	9:37	13:05	17:06	21:38	26:43	32:19	38:28	52:21
175	1:53	2:50	3:47	4:43	5:40	7:47	11:13	15:16	19:57	25:14	31:09	37:42	44:52	61:05
200	1:53	2:50	3:47	4:43	5:42	8:54	12:49	17:27	22:48	28:51	35:37	43:04	51:17	69:49
225	1:53	2:50	3:47	4:43	6:25	10:01	14:26	19:38	25:39	32:27	40:04	48:28	57:42	78:32
250	1:53	2:50	3:47	4:57	7:08	11:08	16:01	21:49	28:30	36:04	44:31	53:52	64:06	87:15
275	1:53	2:50	3:47	5:25	7:50	12:14	17:38	24:00	31:21	39:40	48:58	59:15	70:31	95:59
300	1:53	2:50	3:48	5:56	8:33	13:21	19:14	26:11	34:11	43:16	53:25	64:38	76:55	104:42
350	1:53	2:50	4:26	6:55	9:58	15:35	22:26	30:32	39:53	50:30	62:19	75:24	89:44	122:10
400	1:53	2:51	5:04	7:54	11:24	17:48	25:38	34:54	45:35	57:42	71:13	86:10	102:34	139:37
450	1:53	3:12	5:42	8:54	12:50	20:02	28:51	39:16	51:17	64:54	80:07	96:57	115:23	157:04



## **2.14 Warranty and Acceptance**

- 2.14.1 During the last two (2) months of the two (2) year warranty period, the District will reinspect the project and advise the Developer or Contractor of any deficiencies and irregularities, if any, which the Developer or Contractor shall correct. A letter of final acceptance will be issued upon the Developer or Contractor's completion of the remedial measures.
- 2.14.2 Any manholes that are leaking, visually unacceptable, cracked or fail the test shall be reworked or replaced and retested. The Contractor shall bear cost of this additional work and inspection by the District's Engineer. The District's Engineer reserves the right to inspect the sealed manholes during the warranty period. Any leakage or defects in the work found by this inspection shall be corrected by the Contractor within an agreed-upon time at no additional cost to the District.
- 2.14.3 Test for Leakage and Infiltration after Construction.
- 2.14.3.1 It is the intent of the sewer specifications that the completed sewer pipes of all types, along with the manholes and other appurtenances shall be watertight.
- 2.14.3.2 Each section of sewer between two successive manholes shall be tested for leakage and/or infiltration. These tests shall be performed subsequent to acceptance of compaction test results by the District's Engineer.
- 2.14.3.3 Even though a section may have previously passed the leakage or infiltration test, each section of sewer may be tested subsequent to the last backfill compacting operation in connection therewith, where, in the opinion of the District's Engineer, heavy compaction equipment or any of the operations of the Contractor or others may have damaged or affected the required watertight integrity and alignment, deflection or bends/sags of the pipe, structure and appurtenances. The Contractor shall furnish all materials required for the tests. Tests shall be made in the presence of the District's Engineer.
- 2.14.3.4 If the leakage and/or infiltration rate as shown by the tests specified herein is greater than the amount specified, the pipe joints shall be repaired or, if necessary, the pipe shall be removed and re-laid by the Contractor. The sewer will not be considered acceptable until the leakage and/or infiltration rate, alignment, deflections or bends/sags as determined by test, is less than the allowable.
- 2.14.3.5 The Contractor may at his option air test or water test for leakage except where (a) in the opinion of the District's Engineer excessive groundwater is encountered, then the infiltration test shall be made, or (b) where the difference in elevation between the invert of the upper structure and the invert of the lower structure is more than 10 feet, then the air test shall be made.
- 2.14.4 Test for Infiltration.
- 2.14.4.1 If, in the construction of a section of the sewer between structures, excessive groundwater is encountered, the test for leakage in conjunction with the other tests shall be used. The end of the sewer at the upper structure shall be closed sufficiently



to prevent the entrance of water, and pumping of groundwater shall be discontinued for at least three days after which the section shall be tested for infiltration. The infiltration shall not exceed 0.004 gallons per hour, per inch of diameter, per 100 feet of main-line sewer being tested and does not include the length of house laterals entering that section. Where any infiltration in excess of this amount is discovered before completion and acceptance of the sewer, the sewer shall be immediately uncovered and the amount of infiltration reduced to a quantity within the specified amount of infiltration before the sewer is accepted, at the expense of the Contractor. Should, however, the infiltration be less than the specified amount, the Contractor shall stop any individual leaks that may be observed when ordered to do so by the District’s Engineer. The Contractor shall furnish all labor and materials for making the tests required.

2.14.4.2 All tests must be completed before street or trench is resurfaced, unless otherwise directed by the District’s Engineer.

2.14.5 Tests for Alignment and Grade, and Damaged or Defective Pipe in Place

2.14.5.1 Pipe Deflection Testing. At least thirty (30) days after construction and flushing, all sanitary sewer systems constructed of PVC pipe shall be tested for vertical ring deflection using a deflectometer, properly sized “go, No-Go” Mandrel, or sewer ball. Maximum allowable vertical ring deflection is five percent (5%) of the pipe’s diameter. The following table outlines the acceptable Mandrel diameter for different sizes of PVC pipe.

Pipe Diameter (Inches)	5% Deflection Mandrel Dimensions Base Inside Diameter (Inches)	5% Deflection Mandrel
8	7.665	7.28
10	9.563	9.08
12	11.361	10.79
15	13.898	13.20
18	16.976	16.13
21	20.004	19.00
24	22.480	21.35
27	25.327	24.06

In areas where there are still some questions as to the condition of the sewer line, the District’s Engineer may require that pictures be taken of the interior of that part of the sewer line under question. After the pictures have been interpreted by the CONTRACTOR and the District’s Engineer, should the sewer line be interpreted to be defective, the cost of taking the pictures shall be borne by the CONTRACTOR. Should the sewer line be interpreted as being a good sewer line, the cost of taking the pictures shall be borne by the District. However, the District reserves the right to require pictures be taken of any curved line approved for installation. In all such cases, the pictures will be taken at the expense of the CONTRACTOR and will become the property of the District after interpretation.



2.14.6 Final Acceptance of the lines will not be granted until all tests are successful and all items listed for correction by the District's Engineer have been accomplished.



**2.15 Sanitary Sewer System Details**

- General Sanitary Sewer Notes
- Sanitary Sewer Manhole (CIP Base)
- Sanitary Sewer Manhole (Precast Base)
- Typical Trench
- Sanitary Sewer Wye Branch Connection Depth less than 12'
- Sanitary Sewer Wye Branch Connection Depth greater than 12'
- Sanitary Sewer Tapping
- Reference Post Typical Detail
- Two-Way Clean-Out Detail
- Sanitary Sewer Bore Casing Detail

1. ALL MATERIALS AND WORKMANSHIP FOR SANITARY SEWER CONSTRUCTION SHALL CONFORM TO THE CRESTVIEW WATER AND SANITATION DISTRICT STANDARDS AND THE LATEST CITY AND COUNTY OF DENVER, DEPARTMENT OF PUBLIC WORKS, STORM DRAINAGE AND SANITARY SEWER CONSTRUCTION DETAILS AND TECHNICAL SPECIFICATIONS, WASTEWATER MANAGEMENT DIVISION STANDARD DETAILS, LATEST ADAMS COUNTY DEVELOPMENT STANDARDS AND REGULATIONS, CDPHE AND ALL OTHER APPLICABLE AGENCIES.

2. ALL DIRECT BURY SANITARY SEWER MAINS SHALL BE PVC, ASTM D-3034, SDR35 OR APPROVED EQUAL.

3. SANITARY SEWER LINES SHALL BE 10 FEET FROM WATER LINES EXCEPT WHEN CROSSING EACH OTHER. FOR SANITARY SEWER LINES WHICH CROSS LESS THAN 1½ FEET VERTICALLY FROM WATER LINES, THE CLOSEST SANITARY SEWER JOINT SHALL BE A MINIMUM OF 6 FEET FROM THE CROSSING.

4. ALL MANHOLES SHALL BE WATER TIGHT WET PRECAST CONCRETE, A MINIMUM OF 48 INCH IN DIAMETER WITH CONCENTRIC CONE, 24 INCH CAST IRON RING (8" DEPTH) AND COVER, UNLESS OTHERWISE SPECIFIED. CONCRETE ADJUSTMENT RINGS SHALL BE USED FOR ADJUSTMENT TO MATCH FINAL PAVEMENT ELEVATIONS AND SET IN FLEXIBLE BUTYL RUBBER CAULKING TO OBTAIN A WATER TIGHT SEAL. CONCRETE ADJUSTMENT RINGS SHALL BE 4" MINIMUM IN DEPTH TO ELIMINATE MULTIPLE JOINTS.

5. THE CONTRACTOR TO VERIFY THE HORIZONTAL AND VERTICAL LOCATION OF ALL TIE IN POINTS AND PROVIDE THE DATA TO THE DISTRICT ENGINEER PRIOR TO CONSTRUCTION .

6. SANITARY SEWER SERVICES SHALL BE SEWER WYES. SEWER SERVICE WYES FOR EACH UNIT SHALL BE STAKED BY A SURVEY CREW, AND FURNISHED AND INSTALLED BY THE CONTRACTOR. THE CONTRACTOR SHALL FURNISH TO THE ENGINEER "AS RECORD" LOCATION OF WYES.

7. PIPE BEDDING SHALL BE CLASS "B" AND SHALL CONFORM TO ASTM C-33 OR D-448 GRADATION NO. 6 OR NO. 67. BEDDING DEPTH SHALL BE 12" UNDER AND AROUND THE SIDES OF THE PIPE AND 12" OVER THE PIPE. CONSOLIDATION IN PIPE ZONE SHALL BE BY HAND TAMPING.

8. AT LEAST 5 DAYS PRIOR TO THE START OF CONSTRUCTION, A PRE-CONSTRUCTION MEETING WILL BE HELD AT THE CRESTVIEW OFFICE AND ATTENDED BY THE CONTRACTOR AND REPRESENTATIVES OF THE OTHER APPROVING AGENCIES. IT WILL BE THE RESPONSIBILITY OF THE CONTRACTOR TO CONTACT THE DISTRICT ENGINEER TO SCHEDULE THIS MEETING.

9. THE CONTRACTOR WILL IDENTIFY THE HORIZONTAL AND VERTICAL LOCATION OF ALL EXISTING UTILITIES PRIOR TO CONSTRUCTION. THE CONTRACTOR WILL REPORT ANY DISCREPANCIES TO THE ENGINEER IMMEDIATELY AND PRIOR TO CONSTRUCTION.



CRESTVIEW WATER & SANITATION DISTRICT

## GENERAL SANITARY SEWER NOTES

Scale: **NONE**

Date: **DECEMBER 2014**

Revised: **APRIL 2023**

Detail:

10. THE CONTRACTOR SHALL HAVE IN THEIR POSSESSION AT ALL TIMES ONE SIGNED COPY OF PLANS APPROVED BY CRESTVIEW. THESE PLANS WILL ALSO INCLUDE ALL ADDENDUMS OR REVISIONS WHICH HAVE BEEN REVIEWED AND APPROVED BY CRESTVIEW.

11. ALL SANITARY SEWER LINES SHALL BE TESTED IN ACCORDANCE WITH THE LATEST CRESTVIEW AND THE LATEST CITY AND COUNTY OF DENVER STANDARDS AND SPECIFICATIONS PRIOR TO INITIAL ACCEPTANCE OR ANY CONNECTION TO AN EXISTING SANITARY SEWER LINE. THE MAXIMUM "BELLY" ON LOW SPOTS IN THE NEW SANITARY SEWER MAIN SHALL NOT EXCEED  $\frac{3}{8}$  INCHES OR 10% INCREASE IN WATER LEVEL.

12. PRIOR TO START OF WORK WHERE THE NEW SANITARY SEWER MAIN IS TO BE CONNECTED INTO EXISTING CRESTVIEW SEWER SYSTEMS, EXISTING MANHOLES UPSTREAM AND DOWNSTREAM OF PROJECT, AND NEW MANHOLES ADDED DURING CONSTRUCTION SHALL BE PLUGGED WITH A MECHANICAL PLUG ON THE INLET AND OUTLET SIDE BY THE CONTRACTOR. THESE PLUGS SHALL REMAIN IN PLACE UNTIL INITIAL ACCEPTANCE BY CRESTVIEW. ITS PURPOSE SHALL BE TO PREVENT MUD, WATER OR OTHER MATERIALS FROM ENTERING THE EXISTING SANITARY SEWER LINE DURING CONSTRUCTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PUMPING AND CLEANING THESE MANHOLES AND REMOVING THE PLUGS WHEN SO INSTRUCTED BY CRESTVIEW.

13. PRIOR TO THE INITIAL AND FINAL ACCEPTANCE WALK-THROUGHS, THE CONTRACTOR/DEVELOPER SHALL JET CLEAN THE ENTIRE NEW SANITARY SEWER SYSTEM. AFTER CLEANING THE SANITARY SEWER MAIN, THE CONTRACTOR WILL DUMP CLEAN WATER DOWN THE SEWER MAIN PRIOR TO AND DURING THE VIDEO INSPECTION. THE CONTRACTOR WILL VIDEO THE SANITARY SEWER AND SUBMIT TO CRESTVIEW FOR REVIEW. CRESTVIEW WILL VIDEO THE SANITARY SEWERS BEFORE FINAL ACCEPTANCE BY THE DISTRICT.

14. ABANDONING PROCEDURES:

FOR SANITARY SEWER MAINS TO BE ABANDONED – PLACE MECHANICAL PLUG IN THE PIPE AND FILL 5' OF ABANDONED SEWER LINES WITH CONTROLLED LOW SLUMP MATERIAL (CLSM).

FOR SANITARY SEWER MANHOLES TO BE ABANDONED – REMOVE CAST IRON COVER, RIM, CONCRETE ADJUSTMENT RINGS, AND CONE. FILL LOWER 1/3 OF MANHOLE WITH CLSM AND REMAINDER OF MANHOLE WITH CLEAN BACKFILL. SALVAGE MANHOLE COVER AND AND METAL GRADE RINGS AND COORDINATE DELIVERY WITH CRESTVIEW PERSONNEL.

15. ALUMINUM FOIL WARNING TAPE SHALL BE USED FOR ALL NEW DIRECT BURY SANITARY SEWER MAINS. THE TAPE WILL BE INSTALLED 4' ABOVE THE SANITARY SEWER PIPE. TAPE MUST BE GREEN IN COLOR.

16. FERNCO STRONGBACK RC SERIES PIPE COUPLINGS WILL BE REQUIRED FOR PIPE AND LATERAL SERVICES.



CRESTVIEW WATER & SANITATION DISTRICT

## GENERAL SANITARY SEWER NOTES

Scale: **NONE**

Date: **DECEMBER 2014**

Revised: **APRIL 2023**

Detail:



17. DURAN RELINER WILL BE REQUIRED FOR INSIDE DROP MANHOLES. STAINLESS STEEL BOLTS WILL BE REQUIRED.

18. IF SEWAGE BYPASS PUMPING IS NECESSARY, THE CONTRACTOR WILL SUPPLY AND MONITOR THE PUMP DURING THE ENTIRE PUMPING PERIOD. A BACK-UP PUMP WILL BE ONSITE FOR USE IF NECESSARY. BYPASS HOSE SHALL BE PROTECTED FROM TRAFFIC DAMAGE USING APPROVED APPARATUS. FOR ALL SEWAGE BYPASS PUMPING, THE CONTRACTOR WILL HAVE CONTINUOUS ON SITE MONITORING OF PUMPING OPERATIONS.

19. SHOULD TRENCH DEWATERING BECOME NECESSARY, THE CONTRACTOR WILL OBTAIN ALL REQUIRED PERMITS AND SUPPLY THE PUMPS REQUIRED.

20. THE OPENING OR CHANNEL IN THE MH MUST BE NO LESS THAN THE DIAMETER OF THE PIPE, AND NO LESS THAN THE MH DIAMETER MINUS 4 INCHES IN LENGTH TO ACCOMMODATE EQUIPMENT NECESSARY TO MAINTAIN THE SEWER LINE.

21. ALL MANHOLE AND SANITARY SEWER MAIN TESTING SHALL BE WITNESSED BY A REPRESENTATIVE OF CRESTVIEW. A MINIMUM OF 48 HOURS ADVANCED NOTICE IS REQUIRED PRIOR TO TESTING.

22. ALL MANHOLE/VAULT EXTERIOR JOINTS SHALL BE WRAPPED IN 12-INCH WIDE CONSEAL CS 212 OR APPROVED EQUIVALENT.

23. MANHOLE/VAULT BARREL SECTIONS WILL REQUIRE AN EXTERIOR COATING OF BITUMINOUS WATERPROOFING OR APPROVED EQUIVALENT.

24. ALL PRECAST CONCRETE SHALL BE WET CAST 5,000 PSI MINIMUM STRENGTH.



CRESTVIEW WATER & SANITATION DISTRICT

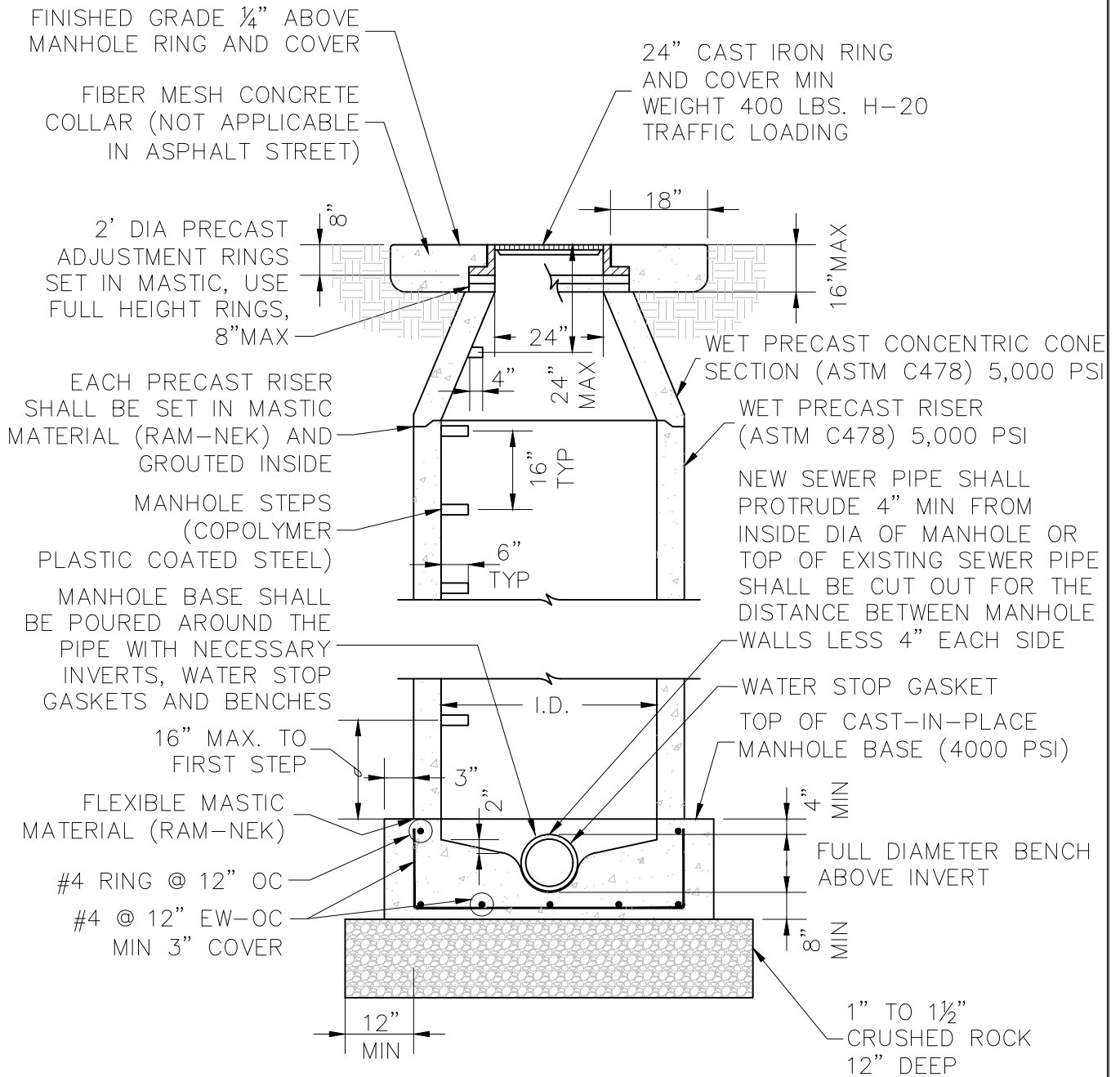
## GENERAL SANITARY SEWER NOTES

Scale: *NONE*

Date: *DECEMBER 2014*

Revised: *APRIL 2023*

Detail:



**NOTE:**


1. MANHOLE/VAULT EXTERIOR JOINTS SHALL BE WRAPPED IN 12" WIDE CONSEAL JOINT WRAP CS 212.

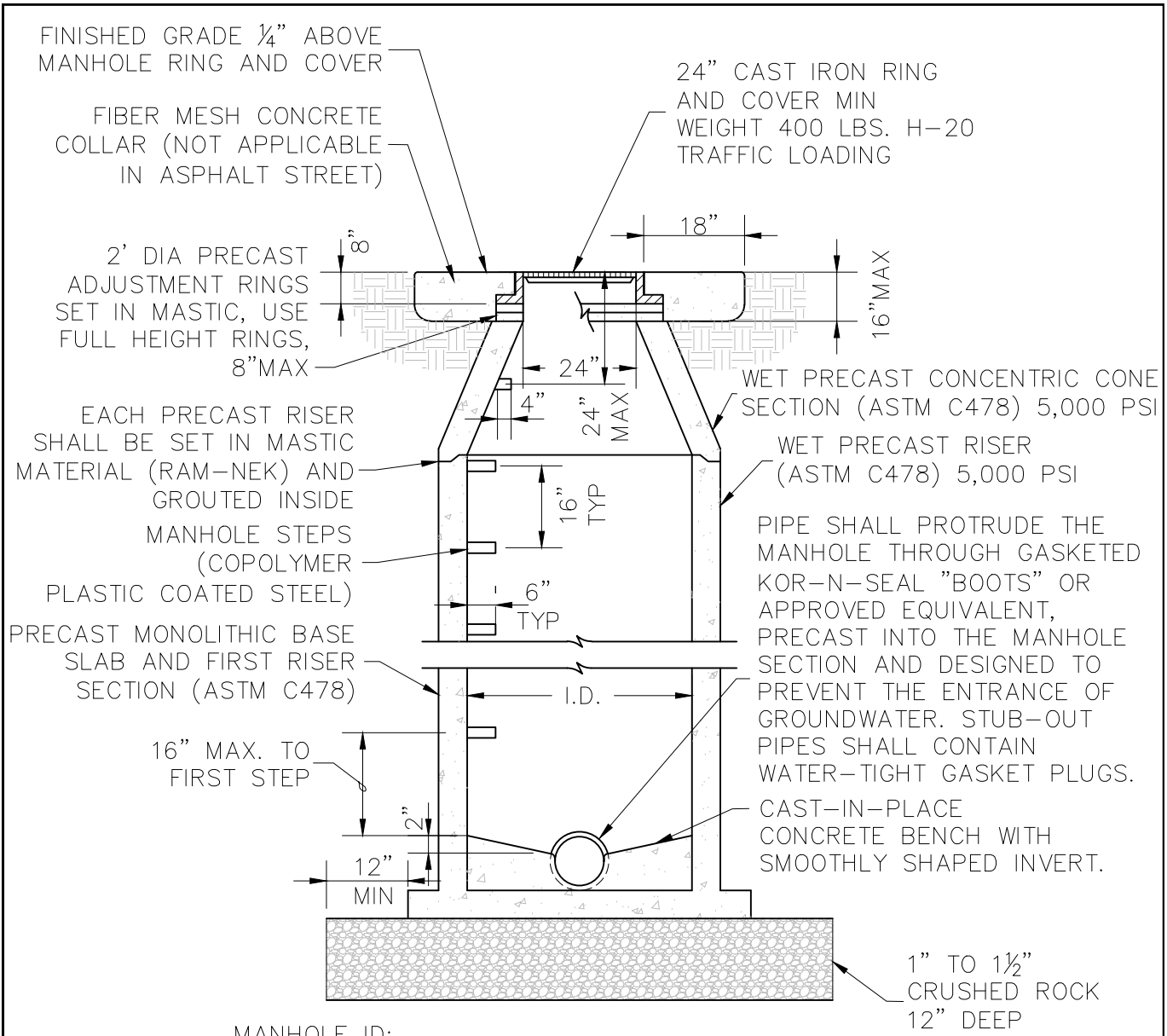
2. ALL PRECAST CONCRETE SHALL BE WET CAST 5,000 PSI MINIMUM STRENGTH. (DRY PRECAST SECTIONS ARE NOT ALLOWED)

3. MANHOLE/VAULT BARREL SECTIONS WILL REQUIRE AN EXTERIOR COATING OF TNEC SERIES 46-465 OR APPROVED EQUIVALENT IF GROUNDWATER IS ENCOUNTERED IN THE TRENCH.

**MANHOLE ID:**

ID = 4' FOR SEWER MAIN DIAMETERS < 15"  
 ID = 5' FOR SEWER MAIN DIAMETERS 15"-36"  
 ID = 6' FOR SEWER MAIN DIAMETERS 42"-48"


 <b>CRESTVIEW WATER &amp; SANITATION DISTRICT</b> <b>SANITARY SEWER</b> <b>MANHOLE (CIP BASE)</b>		
Scale:	<b>NONE</b>	Date: <b>DECEMBER 2014</b>
Revised:	<b>APRIL 2023</b>	Detail:

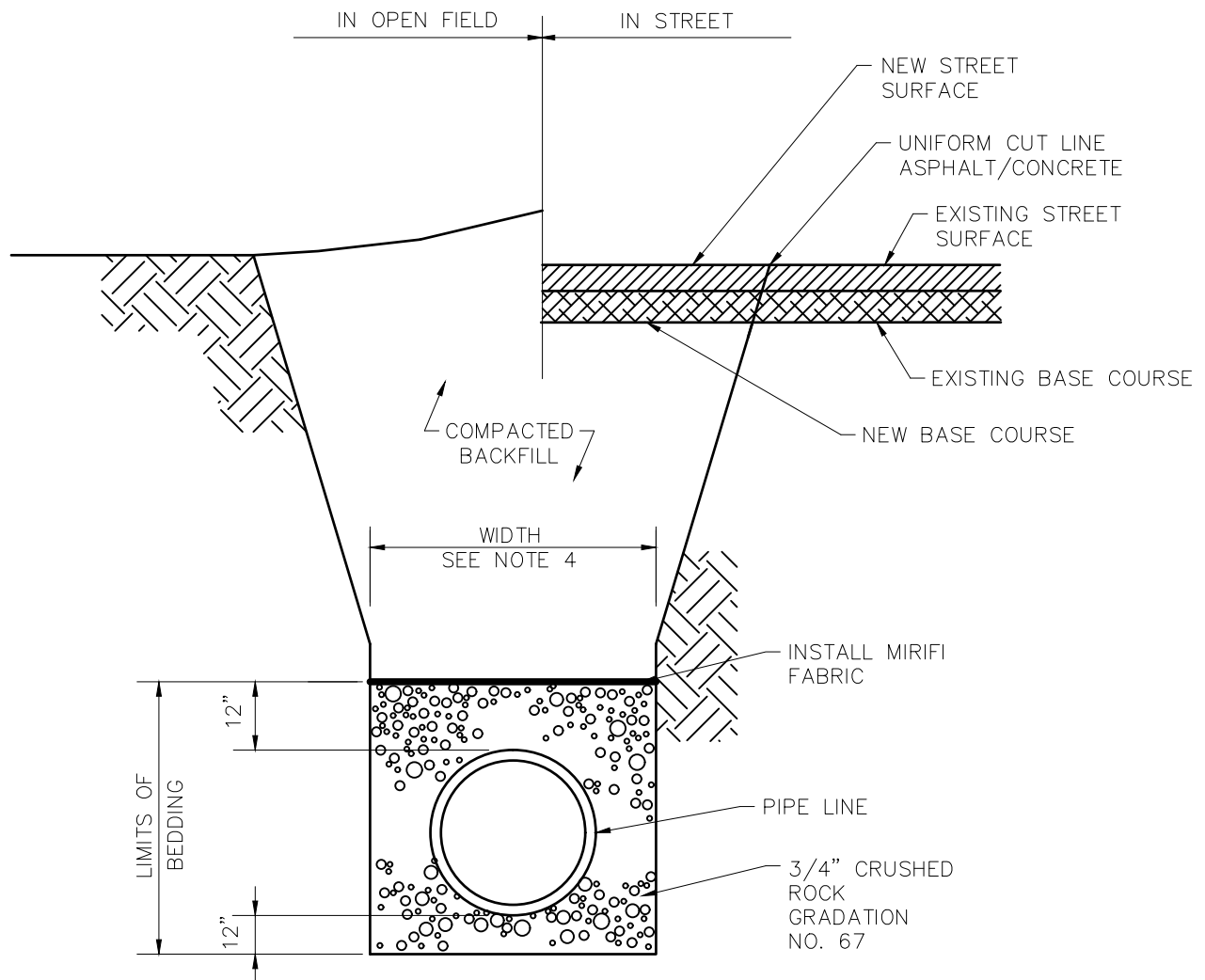


MANHOLE ID:  
 ID = 4' FOR SEWER MAIN DIAMETERS < 15"  
 ID = 5' FOR SEWER MAIN DIAMETERS 15"–36"  
 ID = 6' FOR SEWER MAIN DIAMETERS 42"–48"

**NOTE:**

1. MANHOLE/VAULT EXTERIOR JOINTS SHALL BE WRAPPED IN 12" WIDE CONSEAL JOINT WRAP CS 212.
2. ALL PRECAST CONCRETE SHALL BE WET CAST 5,000 PSI MINIMUM STRENGTH. (DRY PRECAST SECTIONS ARE NOT ALLOWED)
3. MANHOLE/VAULT BARREL SECTIONS WILL REQUIRE AN EXTERIOR COATING OF TNEMEC SERIES 46–465 OR APPROVED EQUIVALENT IF GROUNDWATER IS ENCOUNTERED IN THE TRENCH.


 <b>CRESTVIEW WATER &amp; SANITATION DISTRICT</b>	
<b>SANITARY SEWER          MANHOLE (PRECAST BASE)</b>	
Scale: <b>NONE</b>	Date: <b>DECEMBER 2014</b>
Revised: <b>MARCH 2018</b>	Detail:

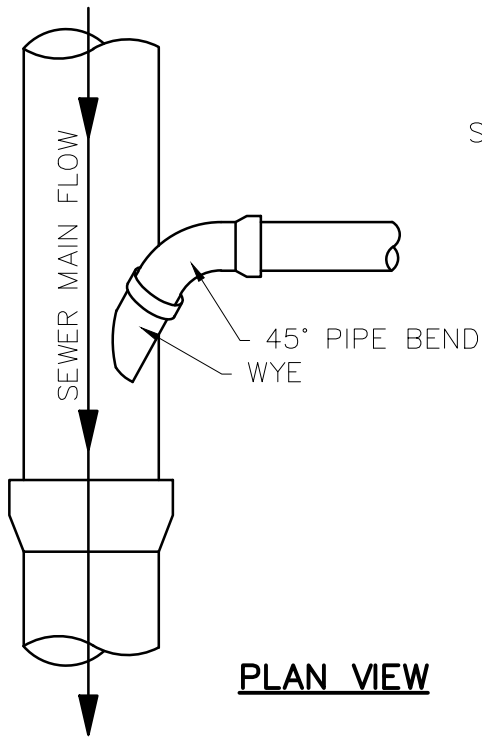


**TYPICAL TRENCH SECTION**

**NOTES:**

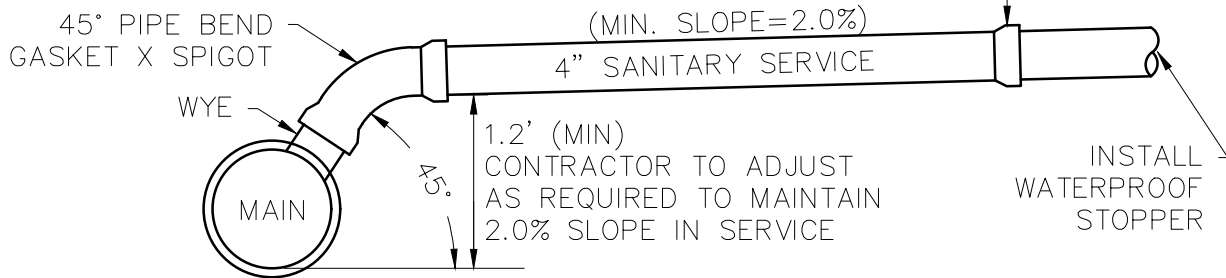
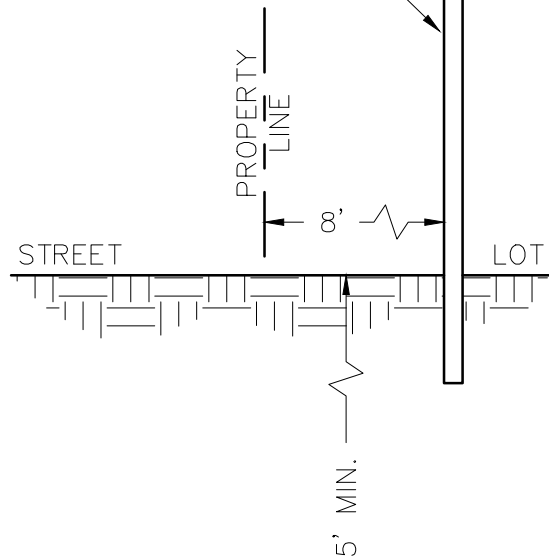
1. TRENCH TO BE BRACED OR SHEETED AS NECESSARY FOR THE SAFETY OF THE WORKMEN AND PROTECTION OF OTHER UTILITIES IN ACCORDANCE WITH APPLICABLE LOCAL, STATE AND FEDERAL SAFETY REGULATIONS.
2. PIPE SHALL BE BEDDED FROM 12" BELOW THE BOTTOM OF THE PIPE TO 12" ABOVE THE TOP OF THE PIPE.
3. TRENCH WIDTH SHALL NOT BE MORE THAN 36" NOR LESS THAN 24" WIDER THAN THE OUTSIDE DIAMETER OF THE PIPE.
4. SHOULD THE TRENCH BE EXCAVATED WIDER THAN ALLOWED, A CONCRETE CRADLE SHALL BE PLACED WITH 2500 P.S.I. CONCRETE FROM TRENCH BOTTOM TO PIPE SPRINGLINE.
5. COMPACTION SHALL BE AS FOLLOWS: PIPE ZONE BEDDING 12" UNDER AND 12" OVER PIPE WILL REQUIRE 90% S.P.D. TRENCH ZONE ABOVE BEDDING MATERIALS, FULL TRENCH SECTION IN ROADWAY OR STREET R.O.W. LIMITS WILL REQUIRE 95% S.P.D. TRENCH ZONE ABOVE BEDDING MATERIALS, OUTSIDE OF STREET R.O.W. WILL REQUIRE 90% S.P.D.

 <b>CRESTVIEW WATER &amp; SANITATION DISTRICT</b>	
<b>TYPICAL TRENCH</b>	
Scale: <b>NONE</b>	Date: <b>APRIL 2023</b>
Revised: .	Detail:



**PLAN VIEW**


2"X4" TIMBER MARKER POST  
SET 5' DEEP, PAINTED GREEN

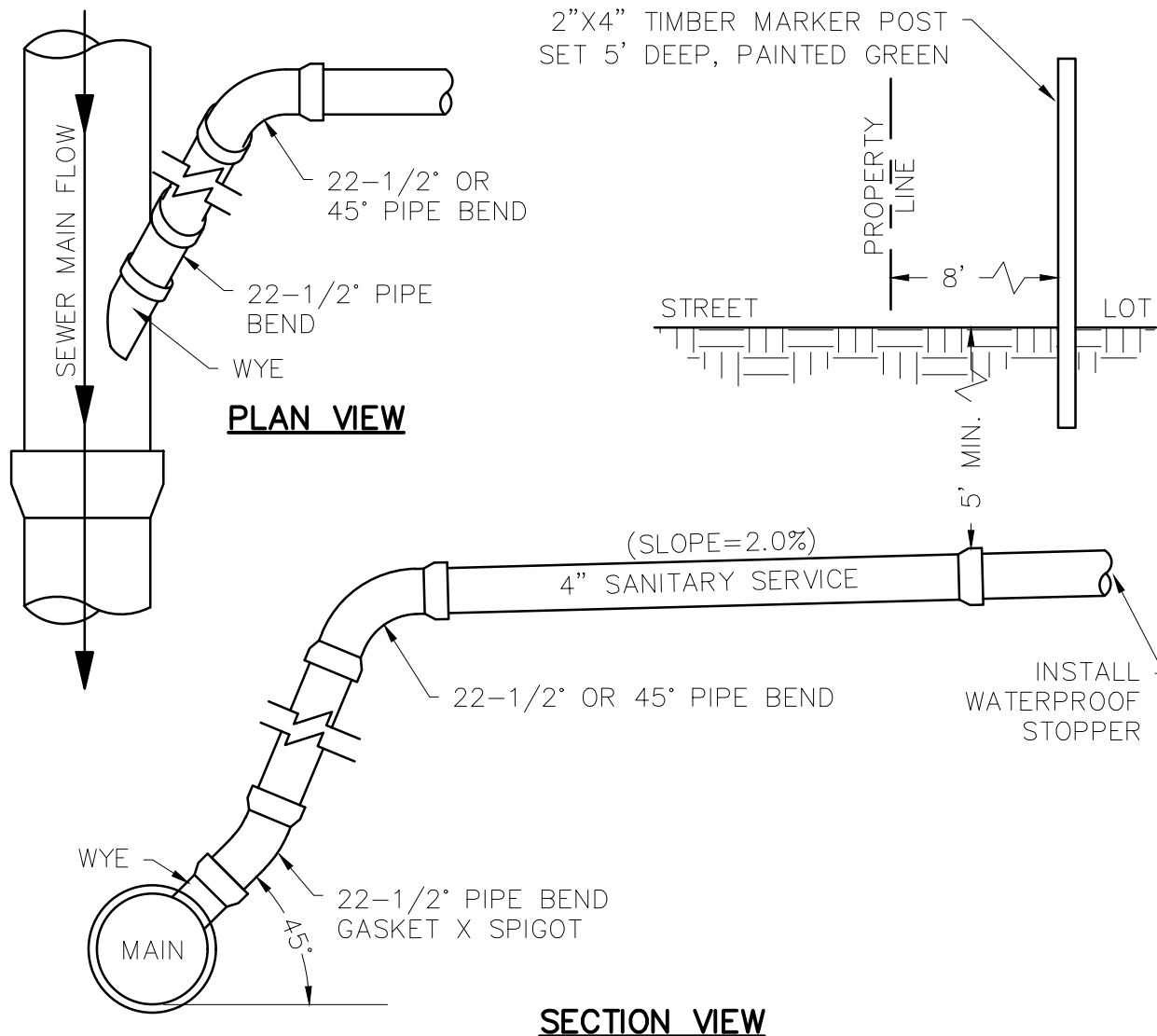


**SECTION VIEW**

**NOTES:**


- 1) SANITARY SEWER SERVICE TAPS SHALL BE LOCATED ON THE MAIN AT THE 2 O'CLOCK OR 10 O'CLOCK POSITION.
- 2) SANITARY SEWER SERVICE TAPS SHALL NOT BE MADE WITHIN 3 FEET OF A PIPE JOINT OR 5 FEET FROM EDGE OF MANHOLE BASE.
- 3) DEPTH OF BURY OF SANITARY SEWER SERVICE LINE AT ROW WILL BE AT THE DISCRETION OF THE DISTRICT AND TO BE DETERMINED ON A PROJECT BASIS AND DISCUSSED AT THE PRE-CONSTRUCTION MEETING.
- 4) MINIMUM DISTANCE BETWEEN TWO 45° BENDS IS 3 FEET.
- 5) SEWER SERVICE CONNECTIONS SHALL BE MADE USING "WYE" FITTINGS UNLESS OTHERWISE APPROVED BY DISTRICT ENGINEER & DISTRICT.
- 6) RISER SEGMENT SHALL BE EXTENDED AS NEEDED TO MAINTAIN THE 4" SANITARY SERVICE AT A SLOPE OF 2%-8%.

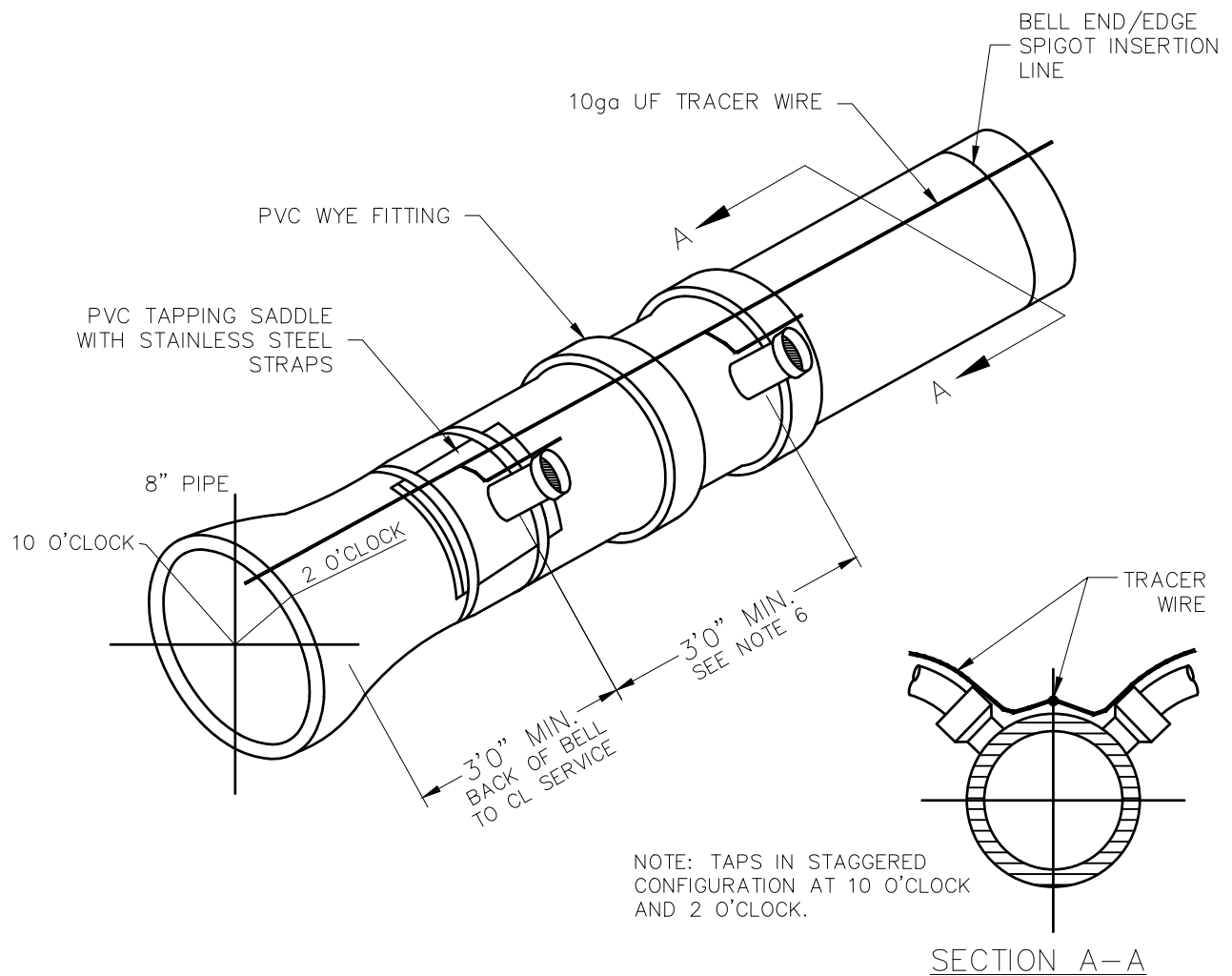
 <b>CRESTVIEW WATER &amp; SANITATION DISTRICT</b>	
<b>SANITARY SEWER WYE BRANCH CONNECTION FOR MAIN DEPTH LESS THAN 12'</b>	
Scale: <b>NONE</b>	Date: <b>JUNE 1, 2012</b>
Revised: <b>MARCH 2018</b>	Detail:



NOTES:

- 1) SANITARY SEWER SERVICE TAPS SHALL BE LOCATED ON THE MAIN AT THE 2 O'CLOCK OR 10 O'CLOCK POSITION.
- 2) SANITARY SEWER SERVICE TAPS SHALL NOT BE MADE WITHIN 3 FEET OF A PIPE JOINT OR 5 FEET FROM EDGE OF MANHOLE BASE.
- 3) DEPTH OF BURY OF SANITARY SEWER SERVICE LINE AT ROW WILL BE AT THE DISCRETION OF THE DISTRICT AND TO BE DETERMINED ON A PROJECT BASIS AND DISCUSSED AT THE PRE-CONSTRUCTION MEETING.
- 4) MINIMUM DISTANCE BETWEEN TWO 45° BENDS IS 3 FEET.
- 5) SEWER SERVICE CONNECTIONS SHALL BE MADE USING "WYE" FITTINGS UNLESS OTHERWISE APPROVED BY DISTRICT ENGINEER & DISTRICT.
- 6) RISER SEGMENT SHALL BE EXTENDED AS NEEDED TO MAINTAIN THE 4" SANITARY SERVICE AT A SLOPE OF 2%-8%.

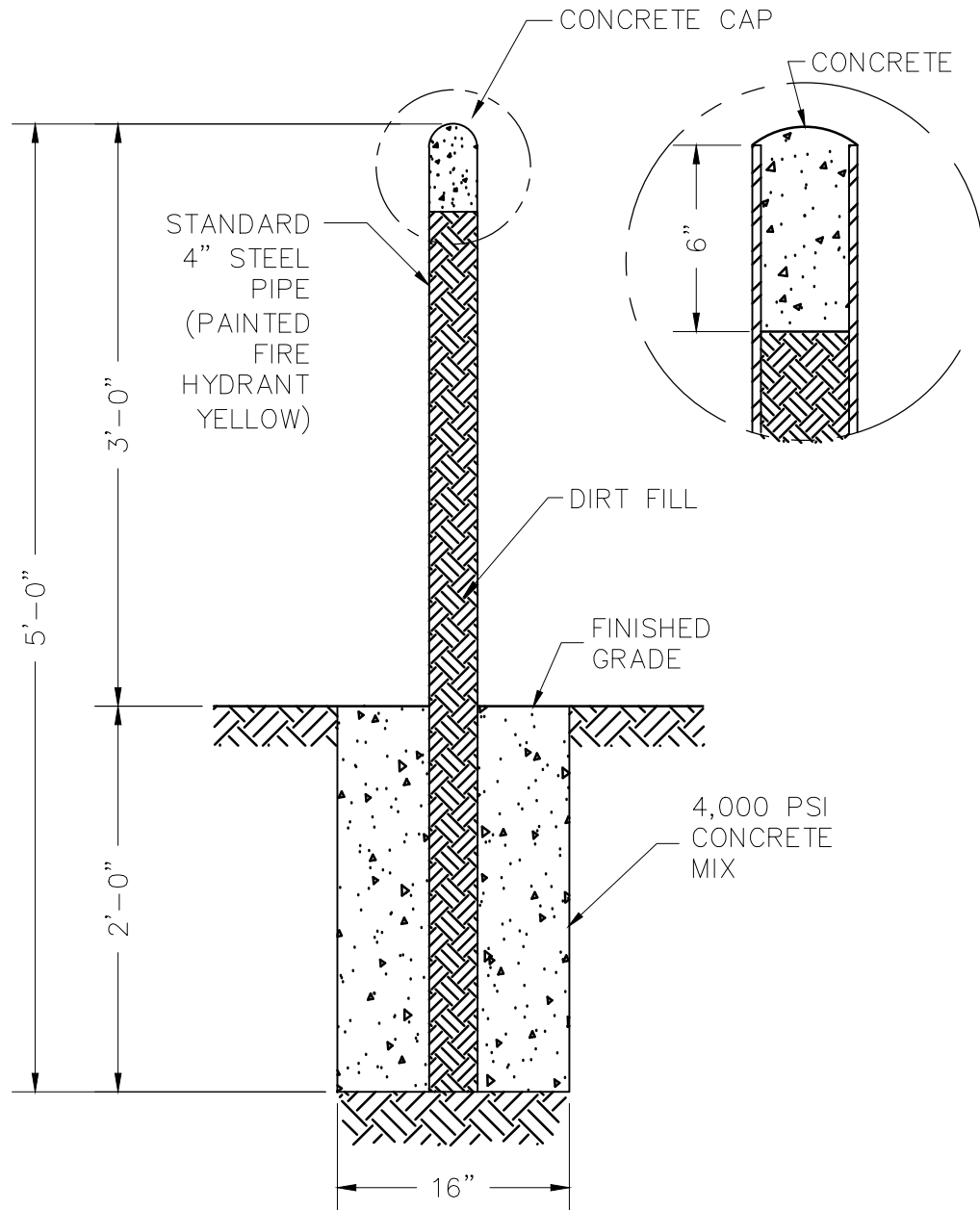
 <b>CRESTVIEW WATER &amp; SANITATION DISTRICT</b>	
<b>SANITARY SEWER WYE BRANCH CONNECTION FOR MAIN DEPTH GREATER THAN 12'</b>	
Scale: <b>NONE</b>	Date: <b>JUNE 1, 2012</b>
Revised: <b>MARCH 2018</b>	Detail:




SEWER

1. SEWER SERVICE CONNECTIONS SHALL BE POSITIONED AT EITHER THE 2 O'CLOCK OR THE 10 O'CLOCK POSITION ON THE CIRCUMFERENCE OF THE SEWER MAIN.
2. ON A NEW SANITARY MAIN, PVC WYE FITTINGS SHALL BE USED. WHEN TAPPING INTO AN EXISTING SANITARY MAIN, A PVC SADDLE CONNECTION WITH STAINLESS STEEL STRAPS AND APPROVED CORING METHOD SHALL BE USED.
3. THE MINIMUM DISTANCE FROM THE OUTSIDE OF A MANHOLE TO THE CL OF SERVICE CONNECTION SHALL BE 5 FEET FOR 6" & 8" PIPE. FOR PIPES LARGER THAN 8", THE MINIMUM DISTANCE BETWEEN THE OUTSIDE OF A MANHOLE AND WYE FITTING IS 5 FEET PLUS DIAMETER OF PIPE.
4. WHEN TAPPING INTO AN EXISTING SANITARY MAIN, A MAXIMUM OF 4 SEWER SERVICE CONNECTIONS SHALL BE ALLOWED PER 20-FOOT LENGTH OF PIPE.
5. IF USING AWWA C-900 CLASS 235, DR18 PIPE, USE AWWA C-900 CLASS 235 PVC GASKETED WYES FOR SERVICES, CONFORMING TO DR18 OR APPROVED EQUAL. IF USING SDR 26 PIPE, USE SDR 26 HEAVY WALL GASKETED FITTINGS.
6. THE MINIMUM DISTANCE BETWEEN SERVICE WYE FITTINGS SHALL BE 3 FEET FOR 6" & 8" PIPE. FOR PIPE LARGER THAN 8", THE MINIMUM DISTANCE BETWEEN WYE FITTINGS IS 3 FEET PLUS THE DIAMETER OF PIPE.

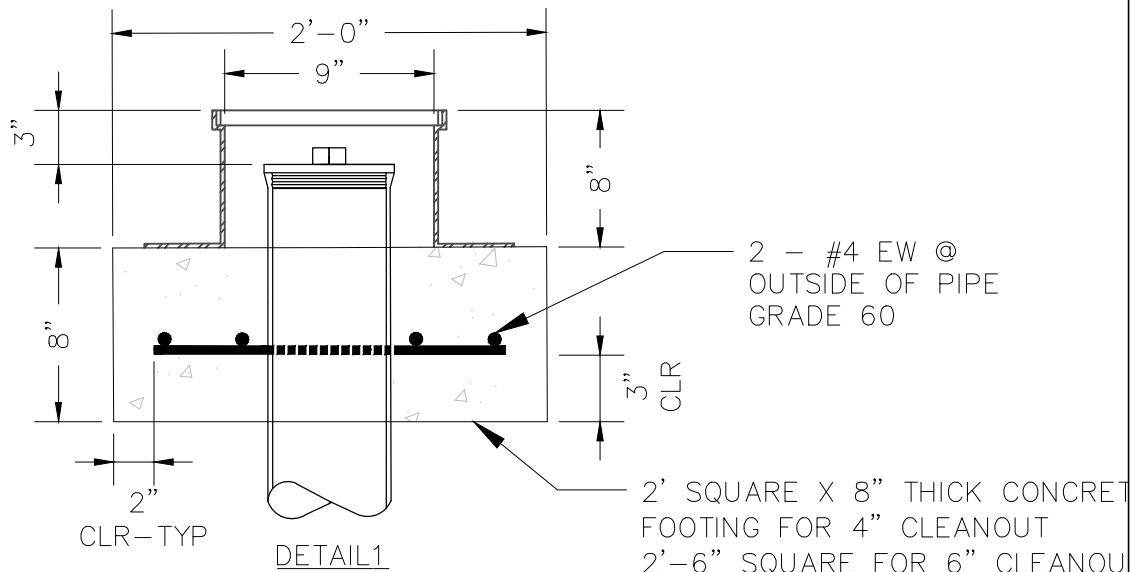
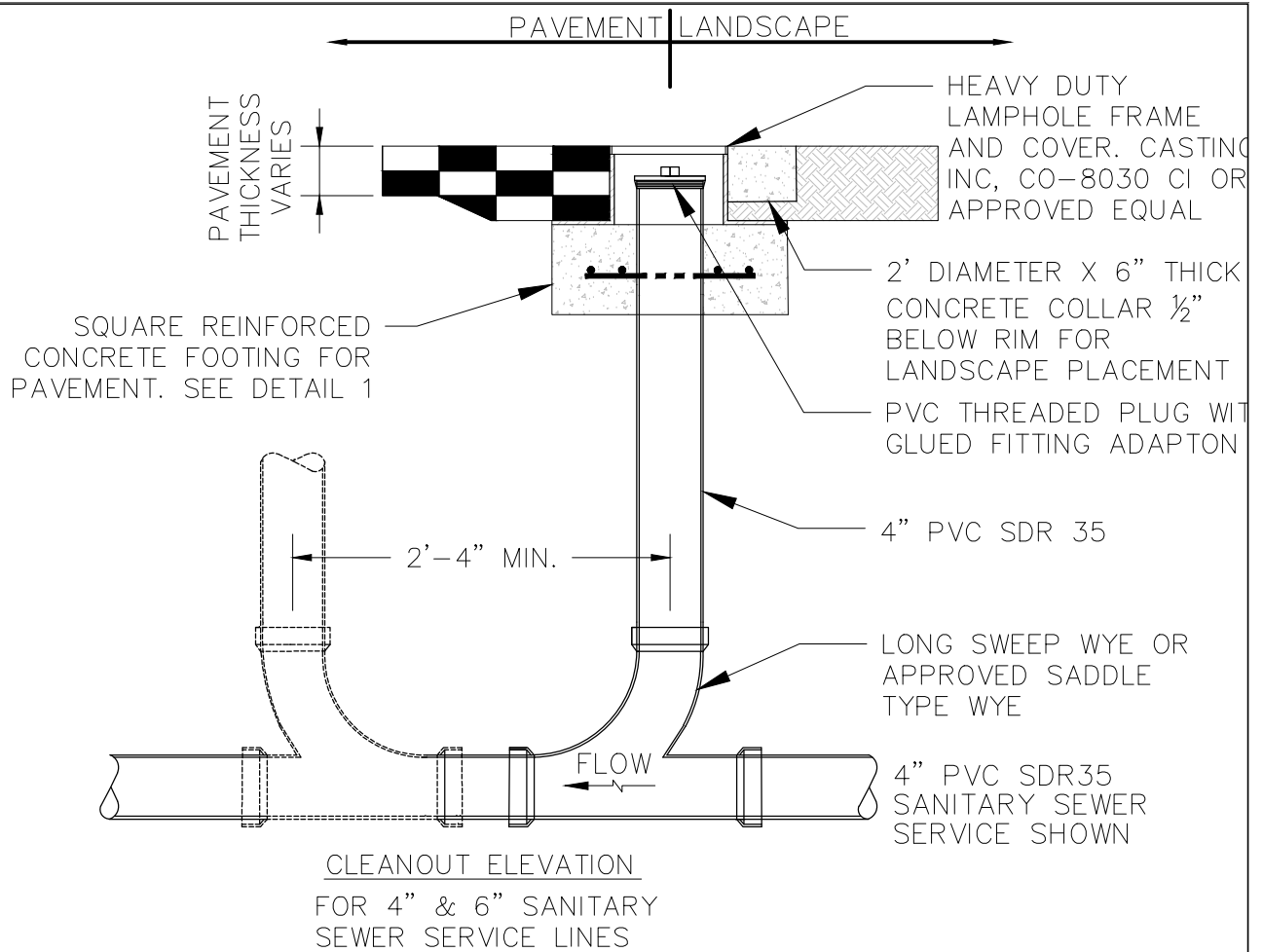
 <b>CRESTVIEW WATER &amp; SANITATION DISTRICT</b>	
<b>SANITARY SEWER TAPPING</b>	
Scale: <b>NONE</b>	Date: <b>APRIL 2023</b>
Revised: .	Detail:



NOTES:  
 THE DISTRICT MARKER POST STANDARD IS FLEXIBLE CARSONITE, COLOR-CODED BY UTILITY. THE DISTRICT SHALL BE CONTACTED TO DETERMINE WHERE, AND UNDER WHAT CONDITIONS, STEEL MARKER POSTS WILL BE REQUIRED IN LIEU OF CARSONITE.

 <b>CRESTVIEW WATER &amp; SANITATION DISTRICT</b>	
<b>REFERENCE POST          TYPICAL DETAIL</b>	
Scale: <b>NONE</b>	Date: <b>DECEMBER 2014</b>
Revised: <b>MARCH 2018</b>	Detail:





NOTES:

1. CLEANOUT PIPE DIAMETER TO MATCH SEWER SERVICE PIPE.
2. COVER AND RIM TO BE 1/4" LOWER THAN PAVEMENT.
3. OPTIONAL TWO WAY CLEANOUT AS SPECIFIED ON PLANS.



CRESTVIEW WATER & SANITATION DISTRICT

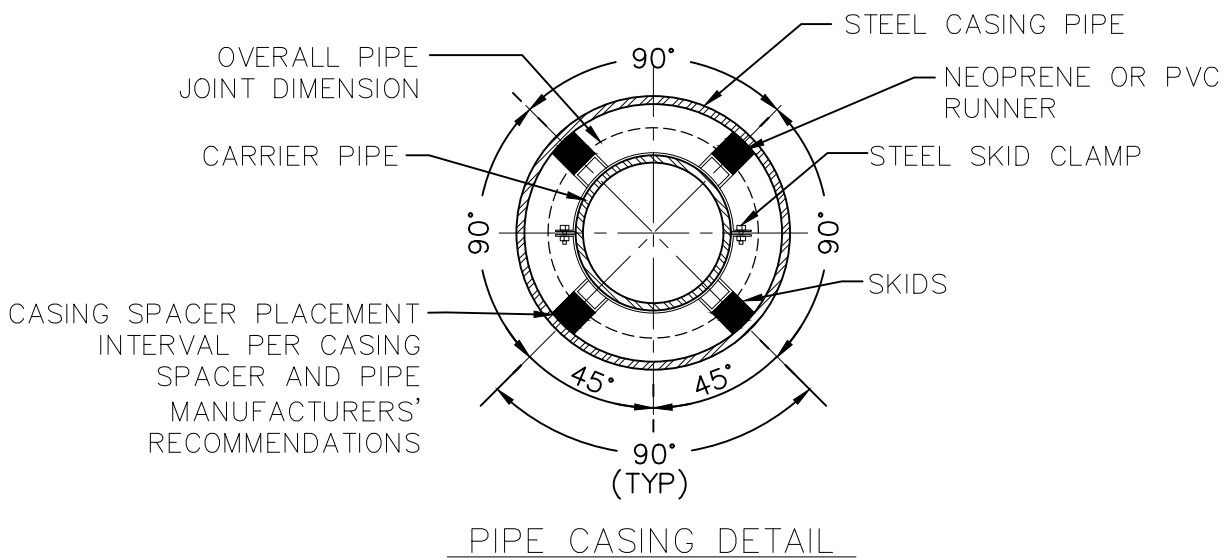
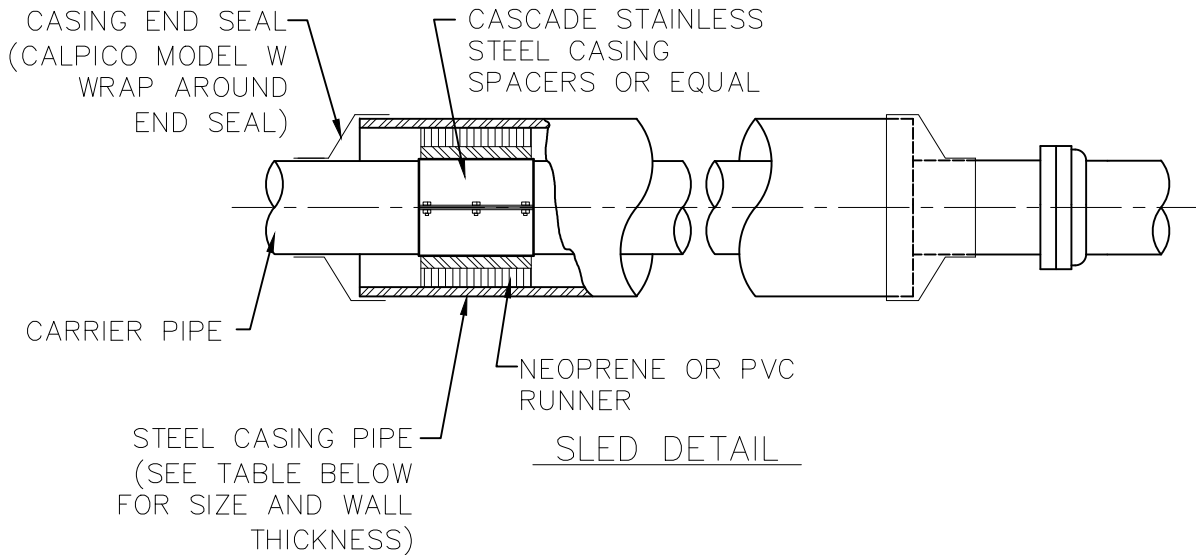
TWO-WAY CLEAN-OUT

Scale: **NONE**

Date: **DECEMBER 2014**

Revised: **MARCH 2018**

Detail:



CARRIER PIPE NOMINAL $\phi$	CASING PIPE	
	MIN OD	MIN WALL THICKNESS
4"	12"	0.25"
6"	16"	0.3125"
8"	18"	0.3125"
12"	24"	0.375"
18"	30"	0.500"
20"	36"	0.5625"
24"	36"	0.5625"



CRESTVIEW WATER & SANITATION DISTRICT

**SANITARY SEWER  
BORE CASING DETAIL**

Scale: **NONE**

Date: **DECEMBER 2014**

Revised: **MARCH 2018**

Detail:

### **3 WARRANTY SPECIFICATIONS**

#### **3.1 General**

This section shall establish policy and procedures for the process by which a Contractor and/or Developer can transfer ownership and maintenance of water and sanitary sewer mains to the Crestview Water and Sanitation District. The water and sanitary sewer mains must be eligible for acceptance by the District with respect to materials and workmanship as set forth in the water and sanitary sewer sections of this manual.

#### **3.2 Procedures**

There shall be no implied ownership of water and sanitary sewer mains constructed by any entity other than the Crestview Water and Sanitation Sewer District without strict adherence to the warranty procedures as outlined in this section.

Although the District may operate the system to provide service to the users, the costs and responsibility of maintenance and repair of the systems will remain with the Developer and/or the Contractor until the mains have been granted final acceptance.

#### **3.3 Responsibility**

It shall be the responsibility of the Developer and/or the Contractor to make all requests and notifications to initiate warranty procedures and perform any follow-up correspondence and communication to gain acceptances.

#### **3.4 Initial Acceptance Procedures**

- 3.4.1 Upon completion of paving Contractor and/or Developer notifies District's Engineer of requests for Initial Acceptance inspection.
- 3.4.2 Contractor and/or Developer submits final stamped and bound compaction reports to District's Engineer and the County.
- 3.4.3 Contractor and/or Developer submits electronic format as-built drawings to District's Engineer for review. District's Engineer compares as-builts against his field data makes revisions if necessary, and returns as-builts to Contractor or Developer. Changes are made and the as-builts are returned to the District.
- 3.4.4 Submit one (1) electronic copy with two (2) 22 x 34 and one (1) 11 x 17 prints.
- 3.4.5 District's Engineer conducts Initial Acceptance inspection with District personnel, Developer and/or Utility Contractor present. A punch list will be compiled by the District's Engineer of any deficient construction and transmitted to each party.
- 3.4.6 Developer and/or Contractor will make necessary modifications to the water and sanitary sewer systems and notify the District's Engineer to make a follow-up inspection.



- 3.4.7 District's Engineer will conduct a follow-up inspection with District personnel, Developer and/or Contractor to confirm modifications have been completed.
- 3.4.8 District's Engineer writes letter of recommendation to District Manager.
- 3.4.9 District will confirm that all fees owed to the District are current, as-builts are in their possession, and that they have received their copy of the compaction report.
- 3.4.10 District will notify the Developer or Contractor in writing that the initial acceptance period is in effect.
- 3.4.11 The Contractor or Developer is responsible for all repairs and maintenance of the water and/or sanitary sewer mains they have constructed for a period of two (2) years from the effective date of initial acceptance.
- 3.4.12 Prior to Initial Acceptance walk-through, the Contractor or Developer shall jet clean the entire sanitary sewer system and pump out at the plugged manhole.

### **3.5 Final Acceptance Procedures**

- 3.5.1 After approximately twenty-three (23) months have passed following the effective date of Initial Acceptance, the Developer and/or Contractor shall contact the District's Engineer to schedule a Final Acceptance walk-through inspection.
- 3.5.2 District's Engineer conducts Final Acceptance inspection with District Personnel, Developer, and/or Utility Contractor present. A punchlist of deficient items will be compiled by the District's Engineer and transmitted to each party.
- 3.5.3 Developer and/or Contractor will make necessary modifications to the items contained in the punchlist and notify the District's Engineer to make a follow-up inspection.
- 3.5.4 District's Engineer conducts follow-up inspection with District personnel, Developer and/or Contractor to confirm modifications have been completed.
- 3.5.5 District's Engineer writes letter of recommendation to District Manager.
- 3.5.6 If all outstanding issues have been satisfied the District will notify the Contractor and/or Developer in writing of the effective date of Final Acceptance.
- 3.5.7 The District will then have the responsibility of ownership and maintenance of the water and/or sewer mains from the effective date of Final Acceptance forward.

## 4 DISTRICT PLAN APPROVAL PROCEDURES

The purpose of this approval procedure check list is to familiarize all interested parties in the procedures followed by the District concerning District plan approvals.

### 4.1 General Utility Plans Check List

4.1.1 Cover Sheet. The following must be included on the Cover Sheet:

1. Name of Project
2. Vicinity and location Maps
3. P.E. Stamp and Signature
4. Sheet Index
5. Fire Department Signature Block (Water Lines)
6. Notification Block
7. Reviewed by Signature Block
8. District's Signature Block

4.1.2 Overall Utility (Water and/or Sewer)

1. Required Notes (See attached sheets for examples of General Notes, Water Main and Sanitary Sewer notes required by the District)
2. All Street Names
3. North Arrow and Scale (1"=100' Maximum)
4. Indicate individual sheet numbers for specific sections of lines to be shown on following sheets.
5. Lot and block number and front lot dimensions.
6. A list of quantities shown for both sewer and water.

4.1.3 Title Blocks

1. Title, Date, Sheet Number
2. Designed by, Drawn by, Checked by.

### 4.2 Water Plans

4.2.1 Overall Sheet

1. Water mains are generally located five feet (5') east or north of the street centerlines. Water mains shall be located a minimum of five feet (5') from the lip of the curb and gutter pan on street sides.
2. All water lines serving more than fifteen (15) lots must be looped.
3. Sheet numbers relating to specific plan and profile sheets should be shown.
4. "As-builts" must have all bend, and appurtenance locations stationed from the street centerline stationing. All pipe types and materials used must be indicated.



#### 4.2.2 Plan and Profile Sheet

1. The entire water main, diameter sizes 12" and above, must be profiled. Water mains, diameters less than 12", shall be profiled at utility crossings.
2. Where possible, plan should be located in line above profile.
3. Plan should include fire hydrants, valves, pipe lengths and size, and bend locations with thrust blocks.
4. Profile should indicate the location and depth of all bends and appurtenances.
5. Street names, lot and block numbers and North Arrows.
6. Match lines with sheet numbers on both plan and profile.
7. Distances from street centerline or property line of appurtenances that are located on curved streets. Centerline dimensions are preferred. All appurtenances are to be located by dimensions in two directions.
8. Plan scale: horizontal 1" = 50'
9. Sheet sizes shall be 22" x 34".

#### 4.3 Sanitary Sewer Plans

##### 4.3.1 Overall Sheet

1. All MH numbers, distances and sizes of lines, directional flow arrows.
2. Sewers are generally located five feet (5') south or west of street centerlines. On curved streets, manholes may be located on centerlines providing no portion of the sewer line crosses the street centerline. Design should attempt to minimize the number of manholes. The centerline of sanitary sewer shall be a minimum of five feet (5') from the lip of curb and gutter pan on the street sides.
3. Extra notes, such as tie-ins to the existing lines, and verification of existing inverts and compaction locations prior to start of new construction, should be shown.
4. Manholes sequencing should be logical and non-confusing. All subdivision manhole numbers must begin with the abbreviation of the subdivision and be approved by the district.
5. "As-builts" must have all wye locations, stationed from downstream manhole, and must indicate type of pipe and materials used.
6. Sheet numbers relating to specific plan and profile sheets should be shown.
7. Sewer Hydraulic data including Q, V, D, D, S, N, and peak flow factor at the point, or points where proposed sewer is tied into existing sewer. This should be based on Manning's Formula for flow in open conduits and flow generation per applicable jurisdictional agency.

##### 4.3.2 Plan and Profile Sheet

1. Where possible, plan should be located in line above profile.
2. Plan should indicate manhole numbers, distances between manholes, size of pipe, grade, flow directions, and interior angles of sewer lines at manholes.
3. Profile should include manhole numbers, depth of cut on manholes, length and size of pipe, invert flow direction, and invert elevation.
4. Grade shall be calculated by dividing the difference between the outlet of the upstream manhole and the inlet of the downstream manhole (as shown) by the distance between



- centers of the two manholes.
- 5. Street names, lot and block numbers and North Arrows.
- 6. Match lines with sheet numbers on both plan and profile.
- 7. Distances from street centerline or property line of manholes that are located on curved streets. Centerline dimensions are preferred. All manholes are to be located by dimensions in two directions.
- 8. Plan scale: horizontal 1" = 50'
- 9. Sheet sizes shall be 22" x 34"

#### **4.4 District Acceptance Note**

- 4.4.1 Upon completion of sanitary sewer and water construction and testing, the Developer or Contractor shall contact the District for initial acceptance inspection. A punchlist will be provided to the Developer and Contractor upon completion of the initial walk-thru and Initial Acceptance will be issued following completion and acceptance of the work outlined in the punchlist.
- 4.4.2 The Contractor will be held responsible for the proper functioning of the lines for up to two (2) years from the date of initial acceptance of the lines by the District. Any malfunction during this period of guarantee shall be remedied by the Contractor to the satisfaction of the District's Engineer at no expense to the District.
- 4.4.3 The date of final acceptance will be indicated in the conditions of the Initial Acceptance Letter. The Developer shall be responsible for contacting the District for final inspection and final acceptance.
- 4.4.4 Provide approved PDP, Preliminary Plat, FDP, or Final Plat submittals.



## **5 DEVELOPMENT REVIEW – SUBMITTAL REQUIREMENTS**

- 5.1.1 All submittals shall conform to all the rules, regulations and engineering standards of the Crestview Water and Sanitation District (CWSD), Denver Water “Engineering Standards” and “Capital Projects Construction Standards”, the City and County of Denver, Department of Public Works, “Sanitary Sewer Design Technical Criteria Manual” and “Storm Drainage and Sanitary Sewer Construction Detail and Technical Specifications”, latest editions.
- 5.1.2 The applicant, contractor, and professional engineer associated with the plans shall be responsible for the adequacy and satisfactory performance of the designs and the installation of all items therein, and any failure or unsatisfactory performance of the system, so constructed, shall not be a cause for action against CWSD. CWSD does not perform engineering services for any person or entity in connection with its review of plans. Approval of plans by CWSD signifies only that the plans meet the minimum requirements of these Standards and Specifications based upon the information provided to CWSD and makes no finding, representation, or warranty that the system and associated components will perform any certain function.
- 5.1.3 Incomplete submittals will be returned, un-reviewed, to the applicant.
- 5.1.4 A completed response letter, in the CWSD format, will be provided with the 2nd and 3rd submittals.
- 5.1.5 Submit one (1) electronic copy, two (2) 22x34 hard copies and one (1) 11x17 hard copies.
- 5.1.6 The review fee includes three (3) submittals, the third of which is approval without any conditions. In the event that the applicant does not obtain approval by the third submittal, the applicant will be billed on a time and materials basis.
- 5.1.7 Substantial design changes will require re-reviews and additional review fees. Additional review fees will be billed on a time and materials basis.
- 5.1.8 Applicant will comply with all comments. Unless otherwise agreed upon by the CWSD, additional review fees will be billed on a time and materials basis.
- 5.1.9 Includes two (2) meetings.





6 FUNDS DEPOSIT AGREEMENT  
PART A

THIS COST AGREEMENT "Agreement" is made this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, by and between \_\_\_\_\_, ("Landowner") and the Crestview Water & Sanitation District (Crestview).

RECITALS:

- A. Landowner and Crestview have been discussing Landowner's request concerning the development of properties within Crestview's service area owned by Landowner ("the Property"), as described on Exhibit A, attached hereto.
- B. The parties recognize that Landowner's request will place an extraordinary burden on the resources of Crestview, and that this Agreement will facilitate Crestview's ability to evaluate and process Landowner's request in a timely fashion, and accordingly, the parties recognize that this Agreement will be mutually beneficial.
- C. The parties desire to provide for a method by which Landowner will help offset the burden placed on the resources of Crestview by Landowner's request.

NOW, THEREFORE, in consideration of the mutual covenants and conditions contained herein and for other good and valuable consideration, the parties do hereby stipulate and agree as follows:

- 1. **Consultant and Other Costs.** Crestview has retained, or will retain, the services of certain consultants to assist it in evaluating the Landowner's request and to assist it in negotiation, reviews, consultation, and advice. Crestview also will incur certain other related costs, including, but not limited to, in-house Planner salary costs, legal publication costs and administrative costs.
- 2. **Funds Deposit.** Landowner agrees to deposit with Crestview the sum of \$10,000.00 to be used to pay the costs provided for in paragraph 1 above as they become due, in accordance with the Funds Deposit Agreement attached hereto and incorporated herein as Exhibit B. If the deposit is depleted prior to the completion of the review, Landowner shall promptly deposit additional monies with Crestview in a mutually agreeable amount as determined by the parties in writing. The parties understand and agree that if such additional monies are not deposited, suspension or of work on the request may result until such time as the additional monies are deposited. Additionally, if a negative balance exists at any time and additional funds are not deposited within fifteen (15) days after written notice from Crestview, then a five percent (5%) penalty shall be added to such balance and such balance shall bear interest at the rate of one and one-half percent (1.5%) per month until paid. In addition, Crestview may file a lien against Landowner's property for any unpaid balance. If at any time negotiations on the request terminate by written notice by either party to the other, then within fifteen (15) days written demand by Landowner, any monies remaining on deposit with Crestview, after payment of the costs incurred by Crestview in accordance with the Funds Deposit Agreement, shall be refunded to Landowner.



3. **No Acquired Rights.** Landowner agrees that it does not acquire any rights by virtue of the negotiations or work on the matters contemplated herein, until and unless Crestview grants any and all approvals required by law. Any and all negotiations and work on Landowner's request concerning the Property shall be final only upon approval by the appropriate actions of the Board of Directors of the Crestview Water and Sanitation District and other governmental entities having jurisdiction, upon the completion of appropriate actions of Landowner, and upon expiration of any applicable time periods required for finality under law. At any time during or after negotiations, Landowner shall be entitled to copies of invoices provided by District's consultants provided for in paragraph 1 above.

4. **Miscellaneous.**

- (a) In the event of any litigation arising from this Agreement, the prevailing party shall be entitled to its reasonable attorneys' fees, expert witness fees and court costs.
- (b) This Agreement supersedes all prior negotiations between the parties concerning matters addressed herein.
- (c) This Agreement shall not be modified except in writing executed by each of the parties.
- (d) Each person executing this Agreement represents and warrants that he or she has been duly authorized by the party which he or she purports to represent to execute this Agreement, and has authority to bind said party to the terms and conditions of this Agreement.
- (e) All notices, requests, consents, demands and other communications hereunder shall be in writing and shall be deemed to have been given (a) when delivered by hand (with written confirmation of receipt); (b) when received by the addressee if sent by a nationally recognized overnight courier (receipt requested); (c) on the date sent by e-mail (with confirmation of transmission) if sent during normal business hours of the recipient, and on the next business day if sent after normal business hours of the recipient or (d) on the third day after the date mailed, by certified or registered mail, return receipt requested, postage prepaid. Such communications must be sent to the respective parties at the following addresses (or at such other address for a party as shall be specified in a notice given in accordance with this Section):

To Company:

\_\_\_\_\_

Attn.: \_\_\_\_\_

\_\_\_\_\_

E-mail: \_\_\_\_\_

To Crestview:

CRESTVIEW WATER & SANITATION DISTRICT  
Attn: Mitchell T. Terry, District Manager



PO Box 666  
Westminster, CO 80036-0666  
7145 Mariposa Street  
Denver, Colorado 80221  
E-mail: manager@crestviewwater.com

- (f) This Agreement may be executed in counterparts, each of which shall be deemed an original, but all of which together shall be deemed to be one and the same agreement. A signed copy of his Agreement delivered by facsimile, e-mail or other means of electronic transmission shall be deemed to have the same legal effect as delivery of an original signed copy of this Agreement.

This Agreement is executed effective the date first written above.

ATTEST:

CRESTVIEW WATER AND SANITATION DISTRICT

\_\_\_\_\_  
Secretary

\_\_\_\_\_  
Manager

LANDOWNER: \_\_\_\_\_

By: \_\_\_\_\_

Title: \_\_\_\_\_

STATE OF COLORADO )

) SS

COUNTY OF \_\_\_\_\_ )

The above and foregoing signature of \_\_\_\_\_ was subscribed under oath before me this \_\_\_\_ day of \_\_\_\_\_, 20\_\_.

Witness my hand and official seal.

\_\_\_\_\_  
Notary Public

My commission expires\_\_\_\_\_.



**EXHIBIT A**

6.1.1.1 PROPERTY DESCRIPTION



**FUNDS DEPOSITE AGREEMENT  
PART B**

THIS FUNDS DEPOSIT AGREEMENT (Agreement) is made this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_ by and between, \_\_\_\_\_, (Company) and CRESTVIEW WATER & SANITATION DISTRICT (Crestview).

1. Company hereby deposits with Crestview Water and Sanitation District "Crestview" the following which is to be held and disbursed by Crestview subject to the terms and conditions hereof:
2. Check written upon the account of Company in the amount of \$10,000.00, payable to "Crestview Water and Sanitation District," and such additional funds as may be deposited subsequently (all such funds are referred to herein as the "deposited funds").
  - A. The deposited funds shall be held and used subject to the following instructions:
    - i. Crestview shall deposit the funds in a specific account within Crestview's AR/AP program subject to the terms and requirements of these instructions.
    - ii. Crestview shall disburse monies from the deposited funds in payment of District costs and bills received from consultants.
    - iii. Crestview will provide the Company with copies of all invoices from consultants when monies are disbursed from said fund to consultants.
    - iv. Any amounts remaining in the deposited funds following completion or termination of the work shall be returned to Company within fifteen (15) days written demand by Company, but in no event later than thirty (30) days following completion or termination of the work, and all parties shall be relieved from any further liability with regards to this Agreement.
    - v. This Agreement may be altered, amended, modified, or revoked only in writing signed by all parties hereto. Crestview agrees to hold the deposited funds described above under the specific terms and conditions of this Agreement.
    - vi. This Agreement shall bind and inure to the benefit of the parties hereto, their heirs, personal representatives, successors, and assigns.
    - vii. This Agreement shall be construed and enforced in accordance with the laws of the State of Colorado.

This Agreement is executed effective the date first written above.



CRESTVIEW WATER & SANITATION DISTRICT

ATTEST:

By: \_\_\_\_\_  
Secretary/Treasurer

By: \_\_\_\_\_  
President

COMPANY:

\_\_\_\_\_

By: \_\_\_\_\_

By: \_\_\_\_\_

Email: \_\_\_\_\_

LANDOWNER CONTACT INFORMATION FOR ACCOUNT AND INVOICING

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Acknowledgment

STATE OF COLORADO        )  
  ) ss.  
COUNTY OF \_\_\_\_\_ )

The above and foregoing signature of \_\_\_\_\_,  
(company) \_\_\_\_\_, was acknowledged before me this \_\_\_\_ day of  
\_\_\_\_\_, 20\_\_.

Witness my hand and official seal.

\_\_\_\_\_  
Notary Public

My commission expires: \_\_\_\_\_

Attachments:  
Exhibit 1 – Property



## 7 AS-BUILT SUBMITTAL PROCEDURES

As-builts shall verify the location, size, type, class and elevation of all pipes (water, sanitary and storm) manholes, water service lines, fire lines, curb stop boxes, meter pits, valves, fire hydrants, sewer laterals, and infrastructure shown on the construction plans. This will include those improvements outside of public ROW and off-site improvements.

The drawings and electronics will be revised to show all As-Built horizontal locations to within one foot (1') and all vertical elevations to within 0.1'

### **Certification block for As-Built drawings:**

The responsible professional engineer, licensed in the State of Colorado, for the project shall state:

"I hereby affirm that the public improvements (name of subdivision or project) have been constructed in compliance with the construction plans approved by the District and revised as noted to reflect the "As-Built" conditions".

In addition, I hereby affirm that all the tracer wire installed as part of this project has been tested and are functioning properly.

\_\_\_\_\_  
Name, P.E.                      Date

This block shall appear on the cover sheet of each set of drawings

If the improvements for a project are constructed in phases, as-built drawings will be submitted at the completion of each phase.

Provide Northing, Easting and elevation for two (2) section corners adjacent to the site.

### **Hard copies**

- Prior to Final As-Builts, submit one (1) paper copy to the Crestview Water and Sanitation District
- After addressing redline comments and prior to Initial Acceptance, provide to the District:
  - Two (2) full size paper, two (2) half size paper sealed and signed sets for the District.

### **Electronics**

- Submittals may be emailed or submitted on portable drive or CD.
- All drawings are to be in AutoCAD.
- Provide PDF's of the entire plan set. Each PDF will be 22"x34". PDF each sheet individually. Name the PDF by using the drawing name and inserting the sheet number at the beginning.
- All PDF drawings must be to scale

### **Contents of the Electronic File**

- All information must be contained in two (2) folders; labeled "DRAWINGS" and "PDF's".



- The "DRAWINGS" folder shall include all AutoCAD drawings for the project.

**Initial Acceptance will not be granted until the CDs and AS-Builts are received by the District.**





**8 APPROVAL BLOCK**

ENGINEERING REVIEW  
CRESTVIEW WATER AND  
SANITATION DISTRICT

REVIEW IS FOR GENERAL COMPLIANCE WITH DISTRICT PRACTICES, POLICIES AND ENGINEERING STANDARDS. THE DISTRICT IS NOT RESPONSIBLE FOR THE CORRECTNESS OF DESIGN, DIMENSIONS, DETAILS, QUANTITIES OR DESIGN SAFETY.

- NO EXCEPTIONS TAKEN
- MAKE CORRECTIONS NOTED
- REJECTED-SEE CHECKLIST

\_\_\_\_\_

DISTRICT MANAGER                      DATE

THESE PLANS ARE VALID FOR ONE (1) YEAR AFTER THE DATE OF APPROVAL. RESUBMITTAL TO THE DISTRICT IS REQUIRED AFTER THAT TIME PERIOD.



**9 CERTIFICATE OF INITIAL ACCEPTANCE**

TO: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Date: \_\_\_\_\_  
Project No.: \_\_\_\_\_  
Project Title: \_\_\_\_\_

This is to advise you that an inspection of the referenced Work has been made and all work and material was found to be satisfactory. Therefore, the Work is considered to be complete in accordance with the approved plans, specifications, and contract documents.

The Two (2) Year Warranty Period shall begin as of \_\_\_\_\_.

**Crestview Water & Sanitation District**

By: \_\_\_\_\_  
Title: \_\_\_\_\_



**10 CERTIFICATE OF FINAL ACCEPTANCE**

TO: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Date: \_\_\_\_\_  
Project No.: \_\_\_\_\_  
Project Title: \_\_\_\_\_

This is to advise you that an inspection of the referenced Work has been made and all work and material was found to be satisfactory. Therefore, the Work is considered to be complete in accordance with the approved plans, specifications, and contract documents.

This project shall be accepted as of \_\_\_\_\_.

**Crestview Water & Sanitation District**

By: \_\_\_\_\_  
Title: \_\_\_\_\_



**11 DISTRICT AND PROPERTY OWNER AGREEMENT**

**Crestview Water and Sanitation District** (District) is currently replacing water main lines as part of the \_\_\_\_\_ project. The property owner at \_\_\_\_\_ (address) is experiencing \_\_\_\_\_ (description of issues) and believes that their service line was damaged during the waterline construction project.

The District or District Contractor will video the above address’s sewer service line and review the results with the property owner. If it is determined that the service line was damaged during the current construction project, the District or District Contractor will make the necessary repairs to the damaged area at no cost to the property owner.

If it is determined that the owner’s sewer service line was not damaged due to the current construction project, **the property owner agrees to pay for the District’s cost for videoing and realizes that the necessary repairs are at the cost of the property owner.** The cost for the videoing and any repairs will be paid for by the property owner at the time of the videoing.

*(Agreement must be signed prior to videoing service line)*

**Crestview Water and Sanitation District**

Printed Name: \_\_\_\_\_ Signature: \_\_\_\_\_  
Date: \_\_\_\_\_

**Property Owner – Authorizes agreement notes above**

Address: \_\_\_\_\_  
Printed Name: \_\_\_\_\_ Signature: \_\_\_\_\_  
Date: \_\_\_\_\_

**OUTCOME OF VIDEO REVIEW COMMENTS:**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

*(Check One)*

\_\_\_ Crestview Agrees to do Repairs: Signature: \_\_\_\_\_  
\_\_\_ Property Owner will pay for the video. Signature: \_\_\_\_\_



## **12 MISCELLANEOUS ITEMS**