

**SECTION 7****7. SANITARY SEWER STANDARDS****7.01 General**

Sanitary sewerage refers to wastewater derived from domestic, commercial and industrial pretreated waste to which storm, surface, and ground water are not intentionally admitted. Pretreatment will follow all the requirements as set forth by the City of Castle Rock.

Any extension of the City's sanitary sewer system must be approved by the City of Castle Rock and must conform to the current City of Castle Rock Comprehensive (Master) Sanitary Sewer Plan, Cowlitz County Health Department, Department of Ecology (DOE), and Department of Health (DOH) requirements.

Maintenance of a private sewer, building, or side sewer will be the responsibility of the property owner. Maintenance of the lateral to and including the point of connection to the sewer main will be the responsibility of the property owner.

**A. Sanitary Sewer/Water Main Crossings**

The Contractor will maintain a minimum of 18 inches of vertical separation between sanitary sewers and water mains. The minimum cover for water main of 36 inches may be reduced to 30 inches upon approval by the City to provide for as much vertical separation as possible. If the minimum vertical separation is not met, then standards for water-sewer separation shown on drawing CRO28SS will apply.

The longest standard length of water pipe will be installed so that the joints will fall equidistant from any sewer crossing. In some cases where minimum separation cannot be maintained, it may be necessary to utilize water main rated pipe for the sewer line, or to encase the water pipe and/or sewer service in pipe or concrete. No concrete will be installed unless specifically directed by the City.

**B. Staking**

All surveying and staking will be performed by an engineering or surveying firm capable of performing such work and possessing the appropriate business licenses. The engineer or surveyor directing such work will be licensed by the State of Washington.

A preconstruction meeting will be held with the City prior to commencing staking. All construction staking will be inspected by the City prior to construction and staking will be maintained throughout the construction.

The minimum staking of sewer lines will be as follows:

- a. Centerline alignment must be staked with cuts and/or fills to flowline at 25 feet and 50 feet from the manhole or structure, and every 50 feet from there on, unless more frequent staking is required for construction at the discretion of the City Inspector.
  - b. Manholes must be staked with hubs to include invert elevations of all pipes and top of rim elevations to finished grade.
  - c. Location of valves and fixtures will be staked for force mains.
- C. Trench Excavation
- a. Clearing and grubbing where required will be performed within the easement or public right-of-way as permitted by the City and/or governing agencies. Debris resulting from the clearing and grubbing will be disposed of by the owner or Contractor in accordance with the terms of all applicable permits.
  - b. Trenches will be excavated to the line and depth designated by the City to provide a minimum of 36 inches of cover over the pipe. Except for unusual circumstances where approved by the City, the trench sides will be excavated vertically and the trench width will be excavated only to such widths as are necessary for adequate working space as allowed by the governing agency. All necessary shoring operations will be performed to ensure that the excavation can be carried out in accordance with Washington Industrial Safety and Health Administration (WISHA) and the Occupational Safety and Health Administration (OSHA) Safety Standards. The trench will be kept free of water until joining is complete. Surface water will be diverted so as not to enter the trench. The Contractor will maintain sufficient pumping equipment on the job to ensure that these provisions are carried out.
  - c. The Contractor will perform all excavation of every description and whatever substance encountered and boulders, rocks, roots, and other obstructions will be entirely removed or cut out to the width of the trench and to a depth 6 inches below the sewer grade. Where materials are removed from below the sewer grade, the trench will be backfilled to grade with material satisfactory to the City and thoroughly compacted.
  - d. Trenching and shoring operations will not proceed more than 100 feet in advance of pipe laying without approval of the City, and will be in conformance with Washington

Industrial Safety and Health Administration (WISHA) and Occupational Safety and Health Administration (OSHA) Safety Standard.

- e. The bottom of the trench will be finished to grade with hand tools in such a manner that the pipe will have bearing along the entire length of the barrel. The bell holes will be excavated with hand tools to sufficient size to make up the joint.
- f. The Contractor will maintain the presence of a “competent person” as defined by the Washington State Department of Labor and Industries when any trench excavation and backfill work is being done at the project site.

#### D. Backfilling

Backfilling will not commence until the pipe installation has been inspected and approved by the City.

Backfilling and surface restoration will closely follow installation of pipe so that not more than 100 feet is left exposed during construction hours without approval of the City.

Crushed surfacing top coarse per WSDOT Standard Specification Section 9-03.9(3) shall be used for pipe zone bedding and backfill. No native material will be used. Bedding and backfill material will be placed and compacted around and under the sewers by hand tools to a height of 6 inches above the top of the sewer. The remaining backfill will be compacted to 95 percent of the maximum density per ASTM D1557 in rights of way and easements, and 90 percent outside of rights of way and easements. Where governmental agencies other than the City have jurisdiction over roadways, the backfill and compaction will be done to the satisfaction of the agency having jurisdiction.

#### E. Street Patching and Restoration

Temporary restoration of trenches will be accomplished by using 2-inch HMA Class ½” PG 58H-22 or 2-inch medium-curing (MC-250) liquid asphalt (cold mix), U.P.M., 2-inch asphalt treated base (ATB), or steel plates.

ATB used for temporary restoration may be dumped directly into the trench, bladed, and rolled. After rolling, the trench must be filled flush with asphalt concrete pavement to provide a smooth riding surface.

Prior to beginning street trenching work, the Contractor will ensure that temporary patching material is stockpiled at the project site, both for completing and maintaining the temporary patching.

All temporary patches will be maintained by the Contractor and will be made permanent within 10 working days. Patches that are

not properly maintained will be identified and repaired by the City at the developers/Contractors/private utility's expense.

F. Pavement and Trench Restoration

See Section 4 – Street and Asphalt Concrete Paths and/or Bikeways Standards for pavement and trench restoration requirements.

G. Trench Backfill

All crushed surfacing materials will conform to Section 4-04 of the latest version of the WSDOT/APWA Standard Specifications. The subgrade will be compacted to 95 percent maximum density per ASTM D1557, as described in Section 2-03 of the latest version of the WSDOT/APWA Standard Specifications.

All granular backfill material will conform to Section 9-03.19 of the WSDOT/APWA Standard Specifications. The trench will be compacted to 95 percent maximum density per ASTM D1557, as described in Section 2-03 of the WSDOT/APWA Standard Specifications.

If the existing material is determined by the City to be suitable for backfill, the Contractor may use the native material outside the roadway prism except that the top 8 inches of trench will be crushed surfacing per WSDOT Standard Specification Section 9-03.9(3). All trench backfill materials below the roadway base and subbase level will be compacted to 95 percent density per ASTM D1557.

When trench width is 18 inches or less and is within the traveled way, trench will be backfilled with control density fill (CDF) or Controlled Low-Strength Material (CLSM) per WSDOT/APWA Standard Specification Section 2-09.3(1)E.

Backfill compaction and placement will be performed in compliance with WSDOT/APWA Standard Specifications. Replacement of the asphalt concrete or Portland cement concrete pavement will conform to the latest version of the WSDOT/APWA Standard Specifications.

H. Testing

Prior to acceptance and approval of construction, the following tests will apply to each type of construction.

a. Gravity Sewer

1. After the pipes have been cleaned, the gravity sewer pipe will be subject to a low pressure air test per the current WSDOT/APWA Specifications Section 7-17. The Contractor will furnish all equipment and personnel for conducting the test under the observation of the City inspector. The testing

equipment will be subject to the approval of the City.

The Contractor will make an air test for his own purposes prior to notifying the City to witness the test. The air test for acceptance will be made after the trench is backfilled and compacted and the roadway section is completed to subgrade.

All wyes, tees, and end of side sewer stubs will be plugged with flexible joint caps, or acceptable alternates, securely fastened to withstand the internal test pressures. Such plugs or caps will be readily removable and their removal will provide a socket suitable for making a flexible jointed lateral connection or extension.

2. Testing of the sewer main will include a television inspection by the Contractor and witnessed by the City. Television inspection will be done after the air test has passed, the manhole has been channeled, and before the roadway is paved. Immediately prior to a television inspection, enough water will be run down the pipeline so it comes out the lower manhole and the line is flushed clean. Contractor shall provide the City with an electronic copy of the television inspection.

Acceptance of the line will be made after the television inspection video has been reviewed and approved by the City. Any tap to an existing system needs to be televised as well.

The City may televise the new line during periods of high groundwater within the first year after construction and acceptance of the line. Any conditions resulting in inflow and infiltration (I & I) will be considered a system failure that will be repaired by, and at the expense of, the Contractor.

3. A vacuum test of all manholes is required prior to acceptance. The structure will be tested in accordance with ASTM-C 1244. This test method covers procedures for testing cast in place or precast concrete manhole sections, using the vacuum test method to demonstrate the integrity of the installed materials and the construction procedures. Testing will be done in the following manner:
  - a. All lift holes and pipes entering into the manhole will be plugged, taking care to securely brace each plug from being drawn into the structure.

- b. The test head will be placed at the top portion of the structure in accordance with the manufacturers' recommendations.
- c. A vacuum of 10 inches of mercury will be drawn on the manhole, the valve on the vacuum line of the test head closed, and the vacuum pump shut off. With the valves closed, the time will be measured for the vacuum to drop by 1 inch to 9 inches. The manhole will pass the vacuum test if the time is greater than the time shown in TABLE-7.2, which gives allowable time loss in seconds (i.e., test section is acceptable if vacuum does not drop below 9 inches until after the times shown in the table have expired).

Depth (ft)	Diameter (inches)								
	30	33	38	42	48	54	60	66	72
	Time (seconds)								
8	11	12	14	17	20	23	26	29	33
10	14	15	18	21	25	29	33	36	41
12	17	18	21	25	30	35	39	43	49
14	20	21	25	30	35	41	48	51	57
16	22	24	29	34	40	46	52	58	67
18	25	27	32	38	45	52	59	65	73
20	28	30	35	42	50	53	65	72	81
22	31	33	39	46	55	64	72	79	89
24	33	36	42	51	59	64	78	87	97
26	36	39	46	55	64	75	85	94	105
28	39	42	49	59	89	81	91	101	113
30	42	45	53	63	74	87	98	108	121

- d. If the manhole fails the initial test, necessary repairs will be made by an approved method. The structure will then be retested until a satisfactory test is obtained.
- e. If the manhole joint is displaced during the vacuum test, the manhole will be disassembled, the seal replaced, the structure reassembled, and retested until compliance is obtained.
- f. Testing can be done either before or after backfill operations around the structure; however, if during backfill operations it is found that the structure has been disturbed and it is suspected that the integrity of the

- joint has been compromised, retesting will be required.
- g. All other requirements stipulated in Section 7-05 of the latest edition of the Washington State Department of Transportation Standard Specifications for Road, Bridge, and Municipal Construction, that has been adopted by the City, will also be adhered to for final acceptance of the manhole structure.
4. A mandrel test in accordance with Section 7-17.3(2)G of the WSDOT/APWA Standard Specifications will be performed by and at the expense of the Contractor on all sewers except laterals as defined in Chapter 2 of these standards when televising reveals a possible defect or belly in the pipe.
  5. Any time that testing reveals problems that lead to repairs by the Contractor, the City may require complete re-testing of the entire system that was repaired. This work will be required to ensure that the integrity of the system was not compromised during the repair work.
- b. Force Main
    1. Prior to road construction, the backfilled pressure line and service lines will be subjected to a hydrostatic pressure test. The pressure test shall be per Section 7-09.3(23) Hydrostatic Pressure Test in the WSDOT Standard Specifications for Road, Bridge, and Municipal Construction. The test shall be modified as follows: The hydrostatic pressure shall equal 100 psi in excess of operating pressure or in no case shall the test pressure be less than 150 psi. Any leaks or imperfections developing under said pressure will be remedied by the Contractor. The pressure test will be maintained while the entire installation is inspected.  
  
The Contractor will provide all necessary equipment and will perform all work connected with the tests. Tests will be made after all connections have been made and the lines have been backfilled, but prior to road construction. The Contractor will perform all tests to assure that the equipment to be used for the test is adequate and in good operating condition and the air in the line has

been released before requesting the City to witness the test.

2. A water test for all wet wells in accordance with the manhole water test for gravity sewer will be required.
3. Verification of operating parameters such as, pump operation, alarms, and an electrical inspection are required prior to acceptance of all lift stations.

#### I. General Notes

The General Notes on the following page(s) will be included on any plans dealing with sewage system design. In addition, the specific notes for gravity sewers will be included when these utilities are part of the project.

#### **GENERAL NOTES (SANITARY SEWER MAIN INSTALLATION) (TO BE PRESENT ON ALL SUBMITTALS)**

1. All workmanship and materials will be in accordance with City of Castle Rock standards and the most current copy of the State of Washington Standard Specifications for Road, Bridge and Municipal Construction (WSDOT/APWA).
2. City of Castle Rock horizontal datum, NAD83/2011 and vertical datum, NAVD88 will be used for all control. A list of benchmarks is available from Cowlitz County.
3. All approvals and permits required by the City of Castle Rock will be obtained by the Contractor prior to the start of construction.
4. If construction is to take place in the County right-of-way, the Contractor will notify the County and obtain all the required approvals and permits.
5. A preconstruction meeting will be held with the City of Castle Rock prior to the start of construction.
6. The City of Castle Rock Construction Inspector will be notified a minimum of 48 hours (two working days) in advance of a tap connection to an existing main. The inspector will be present at the time of the tap.
7. The Contractor will be fully responsible for the location and protection of all existing utilities. The Contractor will verify all utility locations prior to construction by calling the Underground Locate Line at 811 a minimum of 48 hours (two working days) prior to any excavation.



8. All sewer mains will be field staked for grades and alignment by a licensed engineering or surveying firm qualified to perform such work. Staking will be maintained throughout construction.

9. All pipe and services will be installed with continuous tracer tape installed 12" to 18" under the proposed finished subgrade. The marker will be 3 inches wide, plastic non-biodegradable, metal core or backing marked sewer that can be detected by a standard metal detector. The tracer tape shall indicate, "CAUTION BURIED SEWER LINE" or similar and be green in color.

Tracer tape will be Terra Tape "D" or approved equal. The tape and wire will be furnished and installed by the Contractor.

10. All sewer pipe and laterals shall include tracer wire. The tracer wire for sewer laterals shall be connected to the sewer main line tracer wire.

The wire shall be attached to the lines at 10-foot intervals and shall be brought to the surface at all manholes and cleanouts. Tracer wire material shall be rated for underground feeder cable, 12 gauge, soft drawn, insulated 60 MIL PVC, rated for 600V and shall be green in color.

Joining ends of tracer wire for mains shall only be spliced underground at existing connections into existing tracer wire, connections at main bore locations, and approved location per the City. Connections shall be made with an approved direct bury wire nut that is rated for underground installation. At locations where locate main wire is tested and found to be damaged and instead of replacing the entire locate wire underground, the Contractor can request to repair line with a splice underground. Direct bury wire nuts shall be Dryconn Direct Bury Wire Nut manufactured by King Innovation, DBY-6 or DBR-6 as manufactured by 3M, or approved equal.

Joining tracer wire from side services, cleanouts, or other small branches to main; connections shall be made with direct bury lug designed to not cut the metal wire of the main tracer wire. These connections shall be used at all side service connections and branches. Direct bury lug connections shall be Dryconn Direct Bury Lug as manufactured by King Innovation, Dryconn 3-way Direct Bury Lug as manufactured by Copperhead, or approved equal.

11. Bedding of the sewer main and compaction of the backfill material will be required in accordance with the above mentioned specification (See General Note 1).

12. All manholes or cleanouts outside the paved area will be installed in accordance with standard plans CRO03SS and CRO06SS.
13. When temporary street patches are allowed by the City, cold mix asphalt will be placed and compacted to a maximum depth of two inches. Contractor will be responsible for maintenance as required by the City.
14. Erosion control measures conforming to the requirements of the City of Castle Rock & Cowlitz County will be taken by the Contractor during construction to prevent erosion and siltation of existing and proposed storm drainage facilities and roadways.
15. Provide traffic control plan(s) in accordance with the Manual on Uniform Traffic Control Devices (MUTCD) as required.
16. It will be the responsibility of the Contractor to have a copy of the approved construction plans on site at all times.
17. Any changes to the design will first be reviewed and approved by the developer's project engineer and the City of Castle Rock.
18. After backfilling, but prior to paving, all mains and appurtenances will be tested, inspected and approved by the City of Castle Rock Construction Inspector. Approval does not constitute final acceptance of the sewer line. The Contractor will retain the responsibility to repair all deficiencies and failures revealed during all required testing for acceptance and through the duration of the warranty. It will be the Contractor's responsibility to notify the City of Castle Rock for the required inspections. Any main or appurtenance backfilled prior to inspection will be re-excavated for inspection.

### **GRAVITY**

1. Gravity sewer mains will meet the following: PVC pipe conforming to ASTM D3034 SDR 35, or ASTM F679 with joints and gaskets conforming to ASTM 3212 and ASTM F 477.  
  
HDPE pipe may be used upon approval of the Public Works Director and shall PE4710 resin with a minimum SDR of 26.
2. Precast manholes will meet the requirements of ASTM C 478. Manholes will be Type 1 – 48 inches unless otherwise specified on the plans. Joints will be rubber gasketed conforming to ASTM C 443 and will be grouted from the

inside. Lift holes will be grouted from the outside and inside of the manhole. (See General Note 1.)

3. Side sewer services will be PVC, ASTM D3034 SDR 35 with flexible gasketed joints. Side sewer connections will be made by a tap to an existing main or a wye branch from a new main connected above the springline of the pipe. Side sewer services will be installed according to applicable standard detail(s).
4. All lines will be high velocity cleaned and subjected to a low pressure air test per current WSDOT/APWA Specifications after backfilling, but prior to paving (See General Note 1). Hydrant flushing of lines is not an acceptable cleaning method. Testing of the sanitary sewer main will include television inspecting of the main by and at the expense of the Contractor.

Immediately prior to television inspecting, enough water will be run down the line so it comes out the lower manhole and the line is flushed clean. Acceptance of the line will be made after the television inspection tape has been reviewed and approved by the inspector. A test of all manholes in accordance with Castle Rock standard is also required. Testing will take place after all underground utilities are installed and compaction of the roadway subgrade is completed.

## 7.02 Lift Stations

### A. General

All lift stations will be designed to serve the appropriate basin as identified in the Comprehensive Sewer Plan.

### B. Design Standards

The design of any lift station will conform to City standards, Department of Ecology's "Criteria of Sewage Works Design" and applicable standards as set forth herein. Each lift station will be evaluated for buoyancy resistance using site specific soil and groundwater information.

The following equipment and special modifications are standard requirements for all permanent wastewater pump stations and lift stations constructed within the City of Castle Rock. The following requirements are minimum standards and not all inclusive:

1. The proponent is required to provide the City of Castle Rock a fee simple site outside existing right-of-way for construction of the lift station. The site will have sufficient

- area with dimensions that allow for easy and safe access to the lift station.
2. A concrete slab 6 inches in depth, will surround the pump station wet wells and dry wells, with a minimum of two feet side exposure for all openings. The slab will be continuous between the wet well and the dry well, and will be installed at ground level as per detail CRO20SS.
  3. An access road, with easement, that will support 20,000-pound axle loads throughout the year, will be provided from the nearest public road to the station, to allow for maintenance of the station.
  4. The dry well will be vented with an exhaust fan to meet state safety standards.
  5. Wet well will be provided with a permanent, attached, full depth, internal galvanized access ladder, impervious to corrosion, and mounting socket for the City's portable hoist.
  6. Entry lid to the station wet well will be located closest to the access drive. The lift station will be accessible at all times to operations and maintenance equipment and vehicles.
  7. Entry lid to the station dry well will be constructed of aluminum with rust proof coating or fiberglass.
  8. Station entry access will be keyed to match all other city package stations. The Best Lock key system with single key operation of the mechanism will be supplied for all other lock points and padlocks, a blank tumbler will be supplied, and the City will key to the desired code.
  9. Dry wells will be provided with an automatic sump pump plumbed to the lift station wet well.
  10. Dry wells will be provided with dehumidifier equipment appropriately sized to remove moisture from the dry well.
  11. Safety guards will be provided for all exposed drive lines and couplings.
  12. Spare parts will be provided as recommended by the manufacturer, with a minimum of one spare impeller, one complete set of seals, filters, and one set of volute gaskets. Four complete sets of O&M manuals, and a list of the nearest dealers for spare parts and repair will be provided. All replacement parts will be readily available from distributor in the U.S.A.
  13. The pumps, motors, and wet well will be in compliance with current engineering practice. They will be fully

- compatible as an assembly, and will be engineered for the specific basin.
14. The station will be designed to have an isolation valve located in the discharge line between the station and the pumping bypass port, no less than 12 pipe diameters from the dry well.
  15. City water will be provided to the station for hose down and pump seal supply. An approved back flow prevention device will be provided on the water supply line outside the dry well to protect the public water system. The back flow device will be tested by a Washington State-certified backflow assembly tester, with the results forwarded to the Castle Rock Public Works Department Cross-Connection Program, prior to acceptance of the system. The back flow device will be covered by a hot box to prevent freezing.
  16. A 100 amp minimum 480/277 volt, 3 phase, 4 wire main service will be provided as per plans.
  17. All electrical equipment will be enclosed in a free-standing, vandal proof, all-weather enclosure NEMA 3R or better. (Refer to Standard Drawing CRO19SS.)
  18. A 100 amp minimum, 480-volt, 3 phase emergency power hookup will be provided. The transfer switch will be sized to accommodate the load with a 100-amp minimum. The receptacle will be Crouse-Hinds AREA-10314 or Appleton ADR-1033 4 wire 3 pole with male pins.
  19. The electrical equipment will include a 5-kVA minimum transformer in the dry well for the 120 volt single phase equipment.
  20. Wiring will be THHN stranded copper.
  21. Lift station telemetry will consist of a RUGID PLC, 12 volt isolated power supply, Metricom radio, and antenna cable with lightning arrestor and 6dB gain stick antenna to provide an adequate signal, which will be supplied and installed by the Contractor. Alarm and station status points will be as per attached list. The telemetry will be enclosed in a NEMA 1 enclosure within the electrical cabinet. Prior to ordering the above equipment, the Contractor will contact the City of Castle Rock's Department of Public Works, for complete ordering specifications for the above telemetry. Nominal lead time is 12 weeks.
  22. Pump control system will be of the solid state programmable logic controller (PLC) type, RUGID model 9 or approved equivalent. The system will possess a solid state liquid level sensing device of the 4-20ma analog design. The controller must be compatible with all

established City systems and will be accessible for ease of maintenance.

23. Pump motors will be 3 phase, 480 volt, and be provided with elapsed time meters.
24. Verification of operating parameters by City personnel, such as pump operation, alarms, and an electrical inspection is required prior to acceptance of all lift stations.
25. Wetwell Sizing Criteria:
  - a. Provide a holding period not to exceed 10 minutes for the design average flow per DOE Criteria for Sewage Works Design.
  - b. Provide for minimum of 45 seconds pump run time per pump cycle, and a maximum of ten pump cycles per hour.
26. Lift Station Emergency Storing Criteria

Option #1:

- a. Emergency storage will be provided for 2 hours of design average flow using a peaking factor of 2. This calculation is to be submitted with the system design and approved by the City Engineer.

Note: The 2-hour time was determined as an average response time by a City crew. The peaking factor was set at 2, as opposed to 3 or 4, due to typical emergency being caused by power outage.

- b. All volume above area basements and below the hydraulic gradient may be used as emergency storage, i.e., wetwell and manholes. This condition must be verified by calculation and submitted for approval by the City Engineer.
- c. Provide standby generator receptacle. Generator receptacle must be compatible with City's generator.

Option #2:

- a. Provide emergency power per DOE Criteria for Sewage Works Design.
27. The program for the pump controls will be furnished and installed by City of Castle Rock personnel. For assistance contact the Public Works Director at 274-7478.
28. Pump station design will be a self priming, wet well - dry well, as manufactured by Smith and Loveless, Paco, or Hydronix, and currently in use by the City of Castle Rock, or equal.

29. Plans and specifications must be submitted and approved in writing prior to ordering a package lift station.
30. Alarm and Station Status points:
- Wetwell level - Blue
  - Seal pressure - White with red stripe
  - Pump #1 run - Red with green stripe
  - Pump #2 run - Red with yellow stripe
  - Pump # 1 auto - White with green stripe
  - Pump #2 auto - White with yellow stripe
  - A/C power fail - Red
  - Generator run - Purple
  - Generator fail - White with black stripe
  - Low wetwell - White with blue stripe
  - High wetwell - Red with black stripe
  - Drywell flood - Pink
  - Intrusion - Brown
  - Fire - Orange
  - Pump # 1 call - Green
  - Pump #2 call - Yellow

The Contractor will supply and install all sensors for the above alarm points and connect them with the appropriate wire size and color to an alarm terminal strip. The alarm points terminated on the terminal strip will be identified by number and a label showing the number, and alarm will be provided adjacent to the terminal strip. From the terminal strip to the telemetry terminal strip, all points will be connected by a single multi conductor shielded cable encased in a single conduit. The following note will be added to all lift station plans:

Prior to ordering and wiring of telemetry components, the Contractor will contact the City of Castle Rock Public Works for approval of Telemetry Components.

See Section 7.04, Pressure Sewer for additional information regarding force mains.

### **7.03 Pressure Sewer (Force Main)**

#### **A. General**

Low pressure systems, i.e., force mains may be considered for situations where high ground water table or topography make gravity sewer impractical.

#### **B. Design Standards**

The design of any sewer extension/connection will conform to City standards, Department of Ecology's "Criteria of Sewage Works Design," and any applicable standards as set forth herein.

The layout of extensions will provide for the future continuation of the existing system as determined by the City. In addition, main extensions will be extended to and across the side of the affected property fronting the main.

The system will be designed at full depth of flow on the basis of an average daily per capita flow as shown on the table in Section 7.02.B. A coefficient of friction of 120 will be used for the Hazen-Williams “C” value.

New sewer systems will be designed by methods in conjunction with the basis of per capita flow rates. Methods will include the use of peaking factors for the contributing area, allowances for future commercial and industrial areas, and modification of per capita flow rates based on specific data. Documentation of the alternative method used will be provided along with plans.

The applicable General Notes in section 7.02. will be included on any plans dealing with pressure sanitary sewer design.

C. Force Main

a. Material

Force mains up to 12 inches will be HDPE with a minimum SDR 17, ductile iron minimum pressure class 50 and PVC C900 with ductile iron fittings and gasketed joints. A more rigid pipe may be required where unlimited trench widths occur. All ductile iron pipe and fittings will be coated or PE lined and designed for use with corrosive materials. All force mains shall include tracer wire and locate tape as specified earlier this chapter.

b. Depth

Force mains will have a minimum 30 inches of cover to top of pipe. See Section 7.02.C for sanitary sewer/water main crossing requirements.

c. Velocity

The minimum velocity allowed is 3 feet per second (fps) at average Dry Weather Flow. Maximum velocity allowed will be 8 fps.

D. Surge Protection

PVC pipe is subject to fatigue failure due to cyclic surge pressures. Lift stations will be constructed to minimize rapid changes in velocities and a properly sized surge tank and “soft start and stop” pump controls, if required.

E. Air/Vacuum Valves



Air release valves and air/vacuum valves will be constructed as shown in Standard Drawing CRO08SS and located at the high points of the line within a manhole or approved vault that provides 18 inches of clearance on all sides between the assembly and the walls. Air release valves will be fitted with an activated carbon canister sewer guard to prevent the release of disagreeable odors to the surrounding area. Grades will be designed to minimize the need for air/vacuum valves when practical. Vehicular access to valve is required for maintenance.

F. Force Main Drain

Provisions to drain a force main to facilitate repairs or to temporarily remove force main from service will be provided. This may be accomplished through the use of a valved tee connected to a drain line at the low point of the line, with isolation plug valves on both sides of the tee along the main. A manhole will be set over the force main at the valved tee.

G. Thrust Blocking

Location of thrust blocking will be shown on plans. Thrust block concrete will be 3,000 psi at 28 days, poured against undisturbed earth. A plastic barrier will be placed between all thrust blocks and fittings.

See standard detail number CRO26SS and CRO27SS. Restraining joint systems may be allowed in lieu of thrust blocking when designed by a licensed engineer and approved by the City Engineer. Restraining joint brand, type, and size will be specified on the plans.

H. Force Main Termination

Hydrogen sulfide odors ( $H_2S$ ) and the buildup of sulfuric acid ( $H_2SO_4$ ) occur in the operation of a force main. To mitigate these conditions some type of control method(s) will be used. This may include chemical addition at the pump station and/or at or near the terminus. The outfall manhole (point of connection where force main discharges into gravity sewer) and the next downstream manhole on the gravity sewer will be lined with PVC to protect the system against corrosion. The PVC lining will be cast into the walls and floor of the manhole. No exposed concrete will be permitted. All work will be done in accordance with manufacturer's recommendations and must be approved by the City. If a new outfall manhole and subsequent downstream structures are installed as part of the new system design, the configuration will be approved by the City. In all other cases, the PVC liner will be installed in previously existing system manholes. The downstream gravity sewer line pipe connecting these manholes will also be protected from the affects of hydrogen sulfide. Epoxy coatings are acceptable upon approval of the Public

Works Director and shall be Raven 405 by Raven Lining Systems or approved equal. Coating shall be provided with a 5 year warranty and will be required to pass a high voltage spark test.

#### 7.04 Private Sewer Lines

##### A. General

Private Sewer - will be that portion of the system located on private property where no easements are granted to the City, including gravity laterals, building sewers, and sewer collection systems internal to single parcel developments; such as, apartment complexes, condominiums, townhouses, shopping centers, commercial office parks, mobile home parks, etc. It also includes the portion of the lateral between the property line and force main or gravity sewer. Private sewer systems shall be constructed to City Standards. Maintenance of private sewer will be the responsibility of the property owner(s).

##### B. Specifications for New or Replaced Private Sewer Lines

- a. Use approved sewer line materials such as Schedule 40 ABS plastic pipe or ASTM D3034 PVC pipe.
- b. Connect to the existing cast iron or ABS plastic house drain, which should be located at least 2 feet from the house with a mechanical joint coupling or other approved connection.
- c. When using bell end pipe, lay bell ends of pipe facing house.
- d. Pipe should ideally run at a uniform slope of 1/4 inch to 1 foot of fall (2%).
- e. Changes in direction of sewer line and cleanout risers should be made with Y's and 45 degrees bends or combo TYs. Do not use sanitary T's or short sweeps.
- f. A cleanout must be installed within 5 feet of the house, at the property line, every 100 feet, and at any changes in direction over 135 degrees. Cleanouts must be readily accessible by extending them to near finish grade and must flow in the same direction as the sewer.
- g. Call 274-8181 for the Building Inspector when piping is completed and before backfilling. Do not backfill with materials that could damage or break the piping.
- h. Special procedures for sewers replaced at the City's written request (Sewer Rehab. Areas or LIDs): The cleanout at the property line will be installed by the property owner. After a private sewer passes a visual inspection by the Building Department the pipe must be backfilled except for the cleanouts at the house and the property line.

- C. Sewer Hook-up Procedures
- a. Acceptable Materials
- ABS – 4 inch minimum diameter, sewer grade, Schedule 40 pipe
  - PVC – 4 inch minimum diameter, ASTM D3034 or equivalent per UPC
  - Other – UPC approved with IAPMO Logo
  - Grade of Sewer Pipe:
    - 1/4 inch per foot
    - 1/8 inch per foot when impractical conditions exist and permission is obtained from administrative authority prior to placement of sewer line
    - For terrain sloping greater than 1/4 inch per foot, stepping methods should be employed; contour grading of sewer slope is permitted providing approved and appropriate fittings are installed according to accepted plumbing practices without undue strains or bends placed on the sewer pipe
- b. Imbedment:
- Depth: minimum 12 inches from top of pipe to finish grade
  - Bed: shall be of approved materials – fine granular material (i.e., sand is preferred over coarse materials) – avoid sharp rocks
  - Water lines in same trench: water line must be 12 inches above sewer with a 12-inch offset
- c. Clean Outs Required:
- One at building – inside or outside at end of building drain and extended to grade
  - At intervals not exceeding 100' in straight runs
  - For each aggregate change in direction exceeding 135°
  - See standard plan CRO33SS (sewer diagram example)

## 7.05 Grinder Pump Stations

### A. General

Individual lots that cannot be served by gravity sewer service may be provided with Grinder Pump Systems, if approved by the City Engineer.

### B. Design Standards

Grinder pump systems shall be engineered positive displacement systems, Eone or equal. Lots served by grinder pumps must include a statement on the face of the plat indicating that operation and maintenance of the grinder pumps is the responsibility of the home owner.

C. Submittal Information

For grinder pump installations, the following information shall be submitted to the City for review: manufacturer and model of grinder pump, static, dynamic, and total head requirements, discharge velocity, power requirements, and the pump curve.