

CHAPTER EIGHT

SANITARY SEWER SYSTEM STANDARDS

TABLE OF CONTENTS

CHAPTER EIGHT - SANITARY SEWER SYSTEM STANDARDS	3
Section 8.01 General Information.....	3
A. Compliance	3
B. New Development	3
C. Town Utility System Ownership.....	3
Section 8.02 Sewer Demand Calculation.....	3
A. Single-Family and Multi-Family.....	3
B. Commercial.....	4
Sewer Demand Calculations	4
Section 8.03 Hydraulic Guidelines	5
A. Design Flow	5
B. Hydraulic Capacity	5
C. System Velocity Criteria.....	7
Section 8.04 Sewer System Modeling.....	7
A. General	7
B. Phasing.....	8
C. Modeling Scenarios.....	8
Section 8.04 Sanitary Sewer System Design and Layout	8
A. General	8
B. Main sizing (Diameter).....	8
C. Alignment (Horizontal)	8
D. Alignment (Vertical).....	9
E. Slope	9
F. Future Connections.....	10
G. Casing Pipe Installation.....	10
H. Groundwater Barriers	11
Section 8.07 Manholes	11
A. Location	11
B. Manhole Spacing	11
C. Manhole Inverts.....	11
D. Manhole Sizing and Depth.....	11
E. Manhole Access	12
F. Connections to Existing Manholes.....	12

G. Inside Drop Manhole 12

H. Manhole Grade (Riser) Ring Placement..... 12

Section 8.08 Sanitary Sewer Service Lines 13

A. General 13

B. Service Taps 13

C. Service Connection Location..... 14

D. Service Line Cleanouts 14

Section 8.09 Lift Stations 15

A. General 15

B. Lift Station Telemetry 15

C. Lift Station Siting..... 15

Section 8.10 Force Mains 16

Section 8.11 Underdrains..... 16

A. Underdrains 16

B. Subdrains 17

Section 8.12 Sand/Oil and Grease Interceptors 18

LIST OF EQUATIONS

Equation 8-1..... 7

LIST OF TABLES

Table 8-1: FORECAST AVERAGE DAY DEMAND BY DEVELOPMENT TYPE 8

Table 8-2: SERVICE and COLLECTION MAIN 10

CHAPTER EIGHT - SANITARY SEWER SYSTEM STANDARDS

Section 8.01 General Information

A. Compliance

1. All additions or modifications to the Town of Johnstown sanitary sewer collection system shall be designed in accordance with the criteria set forth in this Chapter, other applicable Sections of the STANDARDS, and applicable provisions of the Town's Municipal Code.
2. The criteria set forth by these Standards is not intended to be inclusive of all situations and the Design Professional may be required to use additional engineering judgment to meet the overall design intent for constructability and long-term operations and maintenance.
3. Additional criteria may be established by the Town for the overall performance of the sewer collection system.
4. These STANDARDS apply to pipe sizes up to and including 12 inches in diameter. Design requirements for pipe sizes larger than 12 inches shall be as determined on a project-by-project basis by the Town.

B. New Development

1. Development projects are required to provide an analysis of the existing collection sanitary sewer system capacity and the condition of the sewer main and appurtenances in the vicinity of the project. (reference Utility Report Requirements in Chapter 5).
 - i. The sanitary sewer collection system design shall include consideration for providing adequate service capacity for the entire potential service area tributary to the outfall point.
 - ii. Depending on a development's location, consideration of upstream and offsite flow contributions may be required by the Town to ensure proper sizing and adequate capacity of the sanitary sewer collection mains within and in proximity to the development. This will be determined by the Town on a case-by-case basis.
 - iii. All developments must extend sanitary sewer mains to the boundary of their development for use by adjacent properties.
2. All improvements to the sanitary system shall be planned and designed to provide adequate service for a design horizon of 50 years.

C. Town Utility System Ownership

1. The utility system consists of the Town's (Public) sewer collection system (and water distribution system) includes all pipes and appurtenant facilities of these systems under the complete control of the Town up to the point where the customer's (Private) system begins.
2. The Town's sewer collection system includes the network of conduits used for the collection, transport and treatment of wastewater to the Town's Wastewater Treatment Plant(s).
 - i. Treatment and collection facilities are owned and operated by the Town of Johnstown. The collection facilities include all components of the facilities utilized in the collection, transport, and treatment of the wastewater.
 - ii. The customer portion of the system shall include those parts of the facilities upstream of the connection to the public main (tap), including any on-site sewer and/or building leads. The customer system is private, and is the customer's responsibility. Refer to Standard Detail 413.

Section 8.02 Sewer Demand Calculation

A. Single-Family and Multi-Family

1. Sewer demand for single-family or multi-family units shall be calculated for the Town of Johnstown based on Table 8-1 Forecast Average Day Demand By Development Type.

B. Commercial

1. Sewer demand for commercial use shall be calculated for the Town of Johnstown based on Table 8-1 Forecast Average Day Demand By Development Type.

TABLE 8-1: FORECAST AVERAGE DAY DEMAND BY DEVELOPMENT TYPE	
TYPE OF DEVELOPMENT	AVERAGE DAILY DEMAND (GPD)
Residential	80 gallons per capita per day
Average Persons per single-family unit	2.75
Average Persons per multi-family unit	2.75
Non-Residential	Per 1000 square foot of use
Office	200
Hotels/Motel	350
Restaurant	500
Bar and Lounges	300
Neighborhood Store	200
Department Store	200
Laundry and Dry Cleaning	1,000
Bank	300
Nursing Home	350
Warehouse (non-industrial)	25
Car Wash with water reuse	1,500
Automobile sales/service/repair	115
Grocery Store	430
Religious	300
Hospital	380
School w/showers (per student)	36
Schools w/o showers (per student)	12
Infiltration	100 gallons per inch diameter per mile
NOTE: Industrial uses shall be calculated based on type of industry when the type of industrial use is determined.	

Sewer Demand Calculations

1. Sewer demand calculations shall be included in the Utility Report, and summarized on the Town's Water and Wastewater Worksheet.
2. The peak flow shall be determined using average-day forecasts adjusted by a peaking factor and including the allowed and any system infiltration or inflow.
3. The tabulation in Table 8-1 provides the wastewater discharge forecasting for average-day conditions and can be applied to compute the wastewater flows associated with the distinct types of land use within the development for use in the Utility Report, as described in Chapter 5, Section 5.04.
 - i. The average day demand (ADD) presented on Table 8-1 represents the minimum demand to be used in determining forecast level design flows.
 - ii. Where proposed development is known (based on specific applications or use), and the anticipated wastewater loads exceed the minimum forecast demands, the greater volume shall be used to determine design flows.
4. Average-day demand forecasts shall include the ultimate area, population density, existing wastewater flow, anticipated industrial discharge, and any allowed infiltration/inflow, which produces the greatest wastewater flow rates. Residential sewage contribution shall be based on 80-gpcd average flows.

5. Minimum residential population density shall be figured on a basis of 2.75 persons per house, the average density identified by the Town's Comprehensive Plan of plan six (6) houses per acre and, 70% of total land area developed as residential, unless detailed analysis of the proposed service area indicates differently.
6. Estimates shall include allowances for a maximum infiltration of 100 gallons per day per inch diameter per mile of pipe.

Section 8.03 Hydraulic Guidelines

A. Design Flow

1. The sanitary sewer collection system design shall include consideration for providing service for the entire area tributary to the outfall point.
2. The peak flow shall be determined using average-day forecasts adjusted by a peaking factor see Section 8.03.4 and including the allowed and any system infiltration or inflow.
3. Flows shall be computed for initial and full build-out phases of the development and shall be assigned to the appropriate design points within the model to accurately reflect the geographical distribution of land use throughout the site.
4. Peaking factor shall be based on City of Denver peaking factors (PF) per Figure 1.

B. Hydraulic Capacity

1. The wastewater collection system shall be designed for gravity (open) flow conditions, using a Manning's roughness coefficient of 0.013 to account for various pipe materials and joints, service connections, and future interior pipe conditions.
2. No surcharging of sanitary sewer lines is allowed.
3. The sanitary sewer collection system shall be designed to carry peak wastewater flows plus infiltration/inflow in accordance with these DESIGN STANDARDS.
4. Sanitary sewer collection pipes shall be designed for a flow depth/pipe diameter (d/D) of no greater than 0.5 for the peak flow condition:

Where:

d=Depth of Flow

D=Diameter of Pipe

5. Sewer interceptors (pipes larger than 12-inch diameter) shall be designed for peak design flows no greater than a ratio of 0.7 of flow depth to pipe diameter (d/D).
6. The design depth of flow should be greater than two (2) inches.

CITY AND COUNTY OF DENVER
DEPARTMENT OF PUBLIC WORKS

SECTION 2: SANITARY PLANNING CRITERIA

FIGURE 2.04.1 - PEAK FLOW FACTOR GRAPH

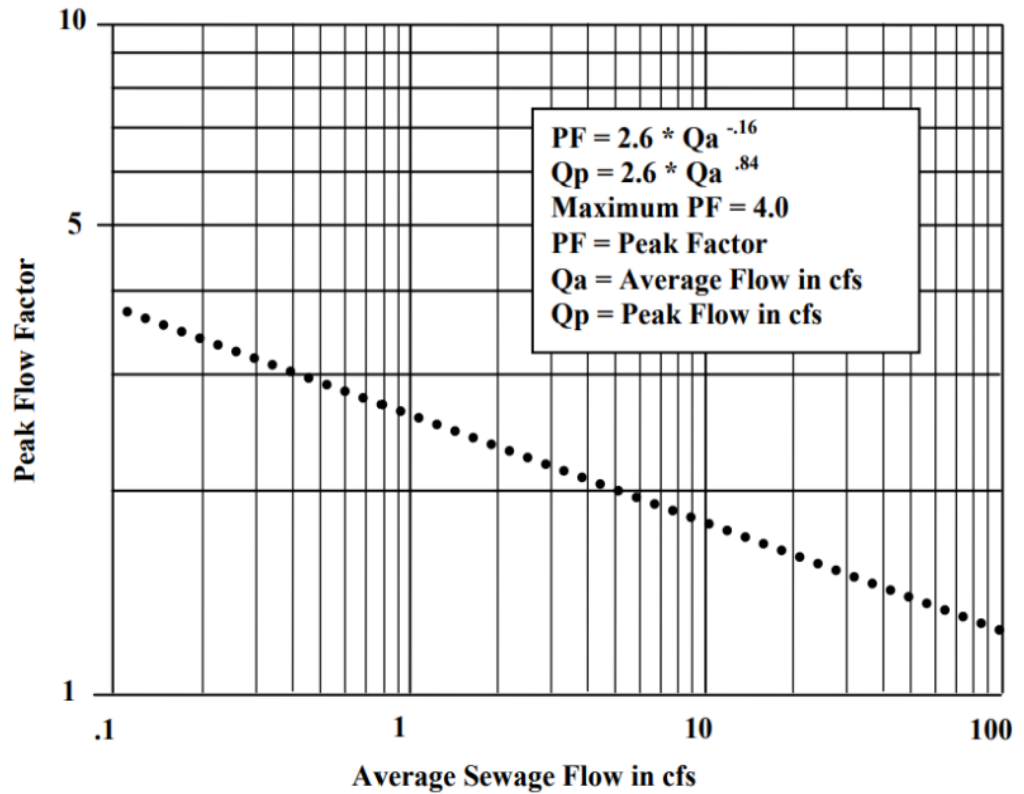


FIGURE 1 PEAKING FACTOR

C. System Velocity Criteria

1. Sanitary sewer grades shall be designed to produce flow characteristics as close to optimum as is physically and economically feasible.
 - i. Pipes shall be sized using Manning's Equation. Refer to Equation 8-1.
 - ii. Computation of velocity of flow shall be based on a coefficient of roughness "n" in the Manning formula of 0.013.
2. Wastewater systems shall be designed to provide a minimum velocity of two feet per second (2 fps) at the Peak Design Flow.
3. The maximum velocity shall not exceed feet per second (10 fps), and must be verified with a slope calculation.
4. Drops of less than 18" at manholes can be provided to break steep slopes to limit the velocities in conformance with this criterion.
5. Where actual flow is well below normal flows for several years, the minimum velocity shall be achieved by suitable grades at the partial design flow rate.
6. Care shall be taken to design invert elevations at manholes in such a manner that the energy gradient is consistently falling in the direction of the flow.

EQUATION 8-1

$$Q = \frac{1.486AR^{2/3} \sqrt{S}}{n}$$

Where:

Q=Flow

n=Manning's Coefficient of Roughness
0.013 for all pipe materials

A=Area of Flow (ft²)

R=Hydraulic Radius (A/P)

P =Wetted Perimeter

S=Slope of pipe (ft/ft)

Section 8.04 Sewer System Modeling

A. General

1. A scientific sewer system model will be required for all new subdivision and site development projects. Anticipated primary collection lines and connections to the existing system shall be represented in the model.
 - i. Both a digital copy and a PDF copy of the model, with input and output files along with a copy of the proposed sewer system plans, must be provided to the Town for review.
 - ii. The Town may update the Town's sewer system model with the development's modeling information to confirm the developments modeling results and/or to evaluate the overall Town sewer system's response to the proposed development system demands.
 - iii. The sewer system model must be provided in a format that can be easily imported and integrated into the Town's overall system model.
2. Submittal of GIS shapefiles, as noted in Chapter 5, Section 5.04 may be acceptable, and will be considered on a case-by-case basis.
3. This modeling may be waived by the Town, if:
 - i. It is adequately demonstrated that the wastewater system is consistent with the Sewer Master Plan, and
 - ii. It has been determined by prior analysis (in the Sewer Master Plan, or via an approved Utility Report of an adjacent development), that existing adjacent wastewater infrastructure is adequate to support the development without modifications.
4. The design professional shall evaluate any additional downstream sewer segments as directed by the Town, the Town will determine the need for the system to be further evaluated based on review of the Preliminary or Final Utility Report.
5. The model schematic must be included in the Utility Report, and must match the system design represented on the Construction Improvement Drawings.

B. Phasing

1. Sewer modeling shall be required for each proposed planned development phase of the system (as indicated on the Construction Drawings Phasing Plans), and for the full build-out scenario.
2. The modeling must demonstrate required parameters can be met for each interim phased condition.
3. If construction phasing changes during construction to differ from the phases modeled in the approved Utility Report, the Town must be notified immediately. An amended model and Utility Report may be required.

C. Modeling Scenarios

1. Average Daily Flow (ADF) in accordance with the assumptions for the initial phase of development build-out and for full build-out of the development.
2. Peak Design Flow (PDF) in accordance with the assumptions for initial and full build-out of the development.

Section 8.04 Sanitary Sewer System Design and Layout

A. General

1. All improvements proposed to the Town's public sewer utility system shall conform with the goals, policies, and standards adopted in the Town's Sewer Master Plan (as amended).
2. Developers are required to extend sewer main stub-outs to adjacent property line(s) to enable connections for future development(s). All stub-out shall have a terminal manhole.
3. In areas where the existing sewer main does not conform to these STANDARDS and/or does not meet the future needs of the Town or proposed development, the Town may require off-site improvements to existing Town infrastructure to bring the sewer main and/or appurtenances into compliance with Town STANDARDS.
4. Improvements to the Town's water distribution system shall be designed for a 50-year service life.
5. The following installations are prohibited:
 - i. Inverted Siphons
 - ii. Elevated Pipelines
 - iii. Outside Drop Manholes

B. Main sizing (Diameter)

1. The minimum pipe diameter for new or replacement public sewer mains in the Town of Johnstown is eight (8) inches.
2. These standards and specifications apply to pipe sizes up to and including 15 inches in diameter. Sizes larger than 15 inches shall be approved by the Town on a case-by-case basis.
3. Interceptors 24 inches or larger require review and approval by the Colorado Department of Health and Environment (CDPHE).

C. Alignment (Horizontal)

1. Sanitary sewer mains must be installed in a straight line between manholes. Curved alignment is not permitted.
2. Maximum change in alignment shall not exceed 90 degrees. See Standard Detail 408.

3. All sanitary sewer mains and appurtenances shall be installed in dedicated right-of-way or dedicated utility easements. Under no circumstances shall sanitary sewer mains or manholes be installed parallel to or directly below, any concrete such as sidewalks, trails, curbs, or gutters.
 - i. Where sanitary sewer mains and manholes cannot be located in public right-of-way, the facilities shall be located in utility easements that allow direct access by maintenance vehicles. Refer to Chapter 2, Section 2.02, and on Table 2-1: Minimum Easement Design Criteria for easement and to Section 8.07 maintenance access criteria.
4. Sanitary sewer mains designed within the street right-of-way shall be located in accordance with **Chapter 5**, and as shown in the Standard Details.
5. Sanitary sewer mains shall be located in public streets near the center of the south or west lane wherever possible.
6. Sanitary sewer mains shall be laid with a minimum separation of ten feet horizontally, edge-to-edge, from all water lines. Separation from other utilities shall be as outlined in Chapter 5, Section 5.05.
7. No permanent structures, (e.g., retaining walls, trees, light pedestals, sign foundations, power poles, mailboxes, sheds, buildings, private utilities, etc.), shall be within ten feet of main or the depth of the sanitary sewer, whichever is greater.
8. Sanitary sewer mains and manholes shall not be located in vehicle wheel paths.
9. Sanitary sewer mains shall not be closer than five feet (5') from the lip of the gutter pan.
10. Sanitary sewer lines and manholes shall not be located within detention pond areas, or in swale flowlines.

D. Alignment (Vertical)

1. Sanitary sewer mains shall be installed on a continuous straight grade between manholes. Grade changes are not permitted at any location other than at a manhole.
2. Sanitary sewer mains shall have a minimum cover of four (4) feet to finished ground.
3. Sanitary Sewer mains shall be designed to have a maximum depth of 25 feet.
4. Sanitary sewer mains shall be designed with enough depth to collect wastewater from all basements by gravity flow. When less than nine feet of elevation difference exists between the finished lot grade at the building line and the top of the sanitary sewer main, such conditions shall be clearly addressed in the required Utility Reports, with notes provided on the construction drawings indicating which lots are served by a "shallow sanitary sewer."
5. All sanitary sewer mains shall have a minimum of 18 inches vertical clearance (edge- to-edge) between any water or storm sewer crossings.

E. Slope

1. Table 8-2: Service and Collection Main Diameter and Slope Criteria shows the minimum and maximum slopes for typical diameter sewer line installations in the Town of Johnstown, based on pipe diameter.
2. The maximum grade for any sanitary sewer line shall be 5.0% .

F. Future Connections

1. Where a connection is required for a future sewer main extension the following conditions for acceptance:
 - i. Phasing must be clearly shown on the development’s Master Utility Plan.
 - ii. A terminal manhole must be located at either the phase line or subsequent next manhole in the adjoining phase.
 - iii. A stub out for future phasing may be made by providing a block out in the terminal manhole for future lines.
 - iv. The inverts in the terminal manhole shall be called out for all current/proposed pipes entering and exiting the manhole.

Table 8-2: SERVICE and COLLECTION MAIN DIAMETER AND SLOPE CRITERIA			
	PIPE DIAMETER (Inches)	MINIMUM SLOPE (Percentage %)	MAXIMUM SLOPE (Percentage %)
Service	4	2.0	5
	6	1.0	5
Main	8	0.40	5
	10	0.28	5
	12	0.22	5
	15	0.15	5
	18	0.12	5

G. Casing Pipe Installation

1. When a sanitary sewer main passes under a State roadway or an arterial as directed by the Town, railroad, navigable waterway, drainageway or irrigation ditch, the main shall be located within a steel casing pipe using casing spacers, and boring may be bored by the jurisdictional entity (e.g. Weld County or Larimer County if under a county road).
2. The carrier pipe shall be sleeved, sealed, and fully restrained within the casing pipe in accordance with Standard Detail 113, and shall have a minimum of five (5) feet of cover to the top of the casing. The casing pipe shall extend the entire width of the right-of-way or easement of the crossing structure, the entire width of the 100-year floodplain, or as directed by the Town or jurisdictional entity.
3. Manholes shall be located near each right-of-way or easement line, just beyond the ends of the casing pipe. In the event the roadway, railroad, navigable waterway, drainageway, irrigation ditch or other such crossing is widened, the casing pipe shall be extended to the newly defined full width of the right-of-way, easement or crossing structure, or otherwise the sanitary sewer main and casing pipe shall be realigned and rebored to span the full width of the newly widened crossing.
4. Casing pipe shall be cathodically protected and installed with a test station.
 - i. The cathodic protection system shall be designed by competent technical personnel experienced with these types of systems, and shall be submitted to the Town for review and approval.

H. Groundwater Barriers

1. In areas where groundwater is encountered in the sewer pipe trench, or identified in the required Geotechnical Report and there is a possibility that groundwater may be diverted and follow the path of the new sewer pipe, groundwater barriers shall be constructed to prevent groundwater migration down sewer trenches.
2. Groundwater barriers shall be spaced at the center of the pipe segment between two manholes, refer to Standard Detail 109 for additional information and preferred locations.

Section 8.07 Manholes

A. Location

1. Manholes shall be located for access to sewer mains at the following locations:
 - i. All junctions of 6" or greater sanitary sewers.
 - ii. All points of change in alignment, grade or pipe size.
 - iii. The upstream terminus of the main.
 - iv. All points of industrial discharge (to facilitate observation and sampling for the Town's future pre-treatment program).
 - v. Commercial access points may be required on a case by case basis, based on use.
2. Manhole lids shall not be located in the wheel path of the travel lane.

B. Manhole Spacing

1. Maximum spacing between manholes shall be 400 feet

C. Manhole Inverts

1. The crown for different size pipe shall be at the same elevation, or the drop across the manhole between the incoming and outgoing invert flow shall be a minimum of 0.2 feet.
2. When a TEE invert is constructed, the invert coming into the straight through channel must be at least two tenths (0.2) of a foot higher than the out invert.
3. A one tenth (0.1) foot drop between the inverts may be used when the sewer flows straight through the manhole without any bends or branches.

D. Manhole Sizing and Depth

1. All manholes shall be precast
2. Manholes bases may be poured in place only with the prior approval of the Town. See Standard Detail 403.
3. A minimum clear distance of 1 foot is required between the outside edge of all pipe penetrations measured from the inside of manhole to maintain structural integrity of manhole.
4. Manhole size shall be based on pipe diameter as follows:
 - i. Manholes for sanitary sewers up to 18 inches (18") in diameter shall have an inside diameter not less than four feet.
 - ii. Manholes for sanitary sewers 18 inches (18") to 36 inches (36") shall have an inside diameter of not less than five feet (5').
 - iii. Town approval is required for manholes sizing on sanitary sewer main 36 inches (36") and larger.
 - iv. All manhole deeper than 15' must be 5' minimum diameter with an intermediate landing. Refer to Standard Detail 407.h.

E. Manhole Access

1. Manholes shall not be located in areas that are subject to flooding from surface runoff. If the possibility of surface runoff flooding cannot be avoided, a watertight lid as approved by the Town, shall be installed to prevent inflow. The lid shall be bolted to the frame and the frame shall be bolted manhole.
 - i. Ventilation design for gravity sewers shall be provided where water-tight appurtenances along continuous sections greater than 1,000 feet in length are placed.
2. Manholes shall be located in areas that allow direct access by maintenance vehicles when it is not feasible to locate the manhole in a public street. See Chapter 2, for maintenance access road easement and surface requirements.
 - i. Manholes shall not be located in access roads, wherever possible. If it is impossible to locate a manhole outside an access road, then the cover shall be at the grade of the access road and a 24" concrete collar shall be installed around the manhole ring and cover.
 - ii. All manholes located outside dedicated paved right-of-way shall be constructed with the manhole ring bolted to the manhole cone
 - iii. Marker posts in accordance with the Town's Standard Details shall be installed to mark the location of manholes outside of pavement.
3. All manhole lids shall be installed ¼" below finished street surface, refer to Standard Detail 401.

F. Connections to Existing Manholes

1. When designing new sanitary sewers to tie into existing manholes, the invert out elevation shall be stated on the plans.
2. When the existing sanitary sewer line is larger than the new connection, the crown of the new pipe shall be no lower than the highest crown of the existing line within the manhole.

G. Inside Drop Manhole

1. Manholes that contain a drop of 18-inches or greater ($\geq 18"$) shall be designated as inside drop manholes (See Detail 405), and shall conform to the following requirements:
 - i. Drop manholes shall be used to limit velocities in accordance with the requirements set forth in these Criteria, and to avoid site obstructions such as existing pipes, utilities or geologic features, but not to reduce the depth of excavation for other planned pipes.
 - ii. Drop manholes shall be provided for a sanitary sewer entering a manhole at an elevation 18-inches ($\geq 18"$) or more above the manhole invert and shall be made by means of an outside connection in accordance with Standard Detail 405.
 - ii. The maximum allowable drop shall not exceed 10'.

H. Manhole Grade (Riser) Ring Placement

1. Elevation of manhole or inlet can be raised using precast concrete or HDPE adjusting rings. Use of brick for adjustment of sanitary sewer manholes to grade is prohibited. Elevation of manhole or inlet can be lowered by removing existing masonry, adjusting rings or the top section of the barrel below the new elevation and then rebuilding or raising the elevation to the proper height.
 - i. A minimum of two (2) and a maximum of six (6) grade rings may be used for manhole adjustment.
2. Adjustment of grade rings may be used for final elevation adjustment of the manhole ring and cover.
3. Ring and cover shall be attached to the diameter adjustment flat top section or cone.
4. Refer to details and specifications for additional information.

Section 8.08 Sanitary Sewer Service Lines

A. General

1. All lots shall have separate sewer services without crossing any adjacent properties without an easement.
2. No compound services are permitted.
3. Each lot or separate building site shall have an individual tapping wye for service connections. See Standard Detail 413. Tapping Saddles are not permitted on new sewer main construction
4. Townhomes and duplexes shall provide separate single sanitary sewer service line for each unit under separate ownership.
5. Design flows for sanitary sewer services shall be in conformance with current International Plumbing Code (IPC), adopted by the Town.
6. The minimum allowable service line diameter is four inches (4").
7. Any building requiring larger than a four-inch (4") service shall be sized by the Design Professional, based on standard engineering practices.
8. All service line sizes will be subject to review and approval of the Town.
9. Services shall have a minimum cover of five feet (5'), and shall be a minimum of 18" vertically and a horizontal separation of five (5) feet minimum from potable water mains and adjacent services.
10. Location of all service lines shall be marked with an "S" stamped in curb head.
11. Sanitary sewer service lines shall be uniform in size from the tap at the public main to the building.
12. Any service connection to a sewer main 15 inch diameter or larger requires prior approval by the Town.
13. All service line sizes and locations shall be shown on the sanitary sewer Construction Drawings and locations require approval by the Town.
14. The services shall be constructed as shown on the CDs unless otherwise approved in writing by the Town.
15. The stationing, length and direction of the service line, and the pipe size and percent grade shall be shown on the CDs.

B. Service Taps

1. For new construction, all four inch service lines shall connect to sanitary sewer mains using an in-line manufactured wye in accordance with Standard Detail 412 and 413.
2. All services 6 inch and larger shall connect at a manhole.
3. No tee connections are allowed.
4. For new sewer taps on existing mains, where the sewer main does not have tracer wire, provide a ground from the tracer wire termination at the point of the new tap on the existing main. See Standard Detail 412.
5. When connecting to existing mains, service lines shall connect to the main with a sewer saddle approved by the Town, refer to the Approved Materials list in DESIGN STANDARDS Volume II.
6. All sanitary sewer service connections shall be made at the exact location required for proper alignment with the service line.
7. Service tees or tapping saddles on the main shall have a minimum five feet (5') separation.
8. Service taps shall not be made within five feet (5') of the outside diameter of a manhole.
9. Service taps shall not be made within 18 inches (18") of the bell or spigot of the sewer main.
10. Riser connections are prohibited at the main and within the right-of-way.

C. Service Connection Location

1. Sanitary sewer services shall require ten feet (10') of separation from the water service.
2. Service lines shall not be installed in trenches with potable water service lines or other conduits. Service lines shall be constructed on the shortest and straightest route possible.
3. The service line shall be a minimum of five feet from the side-yard property line and shall not be constructed through or in front of any adjoining property without an easement.
4. All service lines extended to vacant lots shall be extended 15 feet into the lot, and a marker shall be provided per Standard Detail 412.h
5. All service lines six-inch (6") diameter and greater shall be connected at a manhole with the influent flow of the service line intersecting the main flow line of the sewer main at an angle no greater than ninety (90) degrees.
6. This service connection shall channel the flow through the manhole bench to the invert unless the difference in invert elevations is greater than eighteen inches (18").

D. Service Line Cleanouts

1. Cleanouts shall be installed on sanitary sewer service lines in accordance with the Town's Standard Details and in accordance with adopted building code.
2. Cleanouts shall be located at a maximum interval of 100 feet, at any horizontal deflection greater than 45 degrees, or change in grade, and five feet from the building.
3. Construction shall be such that no surface load will be transferred to the wye, bend, riser pipe or service line. The cleanout diameter shall match the nominal diameter of the service line, and the surrounding grading shall insure that surface water does not accumulate around the cleanout.
4. Cleanouts shall generally be located outside of paved areas. When located in paved areas, cleanouts shall have traffic rated covers.

Section 8.09 Lift Stations

A. General

1. Lift station designs shall satisfy all of the requirements of the Colorado Department of Public Health and Environment (CDPHE). The developer's engineer must prepare the "Application for Site Approval" for submittal to the CDPHE and provide copies of all communication/approval received from CDPHE in their review process.
 - i. Design, material, equipment, and construction of the facilities shall conform to all applicable local, State and Federal regulations, codes, and standards.
2. If it is determined that a lift station is required, the collection system to the lift station must combine as many basins as possible to increase the flows being lifted and to preempt the need for future lift stations within the same service area.
3. When allowed or stipulated by the Town, proposed lift station improvements may be staged over a period of time (e.g., the pumping capacity of a lift station may be staged to match development rather than initially installed for full build out capacity).
 - i. If allowed, staging must be fully discussed in the Utility Report, and clearly identified and detailed on the Construction Improvement Drawings (CD's).
4. All wastewater lift stations, flow measuring stations, and stand-alone grinder facilities shall have SCADA telemetry and all associated instrumentation installed or accounted for in conjunction with the initial construction of the facility.
5. Private lift stations are prohibited and shall only be allowed in those locations where there is no feasible way the development can be served by gravity extension of the Town's existing wastewater collection system.
 - i. Private lift stations must be submitted and reviewed through the Design Standard Exception Process outlined in Chapter 2, Section 2.05.

B. Lift Station Telemetry

1. All SCADA units shall be intelligent, and be capable of isolated automatic operation. All necessary communication hardware and software shall be included to transmit the control signals to the appropriate central computer via the Town's network.
2. The telemetry and instrumentation installation shall include all associated equipment such as power, radio connections, wireless network connections, phone connections, telemetry control programming, visible and audible signals, readouts and alarms, and all associated enclosures.
3. All telemetry elements, except antennas, shall be installed within a building or appropriate weather-proof enclosure.

C. Lift Station Siting

1. The lift station shall be so located that the proposed site will meet the requirements for sanitary protection of water quality, hydraulics of the system, and protection against the interruption of service by fire, flood, or any other hazards.
2. Lift station structures and the associated electrical and mechanical equipment shall be protected from physical damage by the 100-year flood, and shall remain fully operational and accessible during such an event. Local, State and Federal regulations pertaining to floodplain obstructions shall be satisfactorily accounted for in the design.
3. Grading shall be provided to protect the site by directing surface flows away from the facilities.

Section 8.10 Force Mains

1. Sanitary sewer force main separation distances and clearances to other utilities shall conform to those established for gravity sanitary sewers in [Section 8.06 and Chapter 5](#).
2. Sanitary sewer force mains shall be a minimum of four (4) inches in diameter.
3. At the design pumping rate (initial and ultimate), the velocity shall be at least three feet per second (3 FPS), but not more than seven feet per second (7 FPS).
4. Isolation valves shall be installed at intervals no greater than 1500 feet along force mains, and shall be full-port plug valves.
5. Combination air release and air/vacuum valves shall be located at force main high points, on pump discharge piping as close as possible to the check valve, and between isolation valves.
6. During the design, the engineer shall consider the economics of air valve installation against the installation of deeper force main piping. The evaluation shall take into account the installation and long-term maintenance costs of the air valves.
 - i. The valves shall be specifically designed for wastewater service and be sized per the manufacturer's recommendations.
 - ii. Air valves on force mains shall be contained in a vault and vented above ground.
 - iii. A manually controlled isolation valve suitable for wastewater service shall be installed between the force main and air valve
7. Force mains shall transition into the gravity sewer system at a dedicated manhole.
 - i. The connection of the force main to the manhole shall be made by connecting the forcemain to a short section of gravity main stubbed out from the manhole.
 - ii. The gravity stub shall be a size that is equal to or larger diameter pipe than the force main, and shall be installed at an elevation that will prevent wastewater from discharging back into the force main when the gravity system is flowing full.
 - iii. The manhole interior shall be coated for protection against hydrogen sulfide corrosion. The manhole and its opening shall be oversized to permit retrieval of cleaning pigs and ancillary equipment.
 - iv. The manhole at the discharge point shall not be an in-line gravity manhole.

Section 8.11 Underdrains

A. Underdrains

1. Perforated underdrains are prohibited.
2. Connections from underdrains to the Town's wastewater collection system are specifically prohibited, as set forth in Section 8.02 of these STANDARDS.
 - i. Refer to [Chapter 6](#) for design criteria pertaining to allowable connections to the Town's storm drainage system.
2. Protecting Right-of-Way Improvements
 - i. Subdrains constructed for the purpose of protecting public right-of-way improvements may be installed only if other means are not possible, and must be maintained by a Metropolitan District or other viable private party.
 - ii. The maintenance schedule must be included in an Underdrain Report, which is required to be submitted as part of the Development Approval process.

B. Subdrains

1. Controlling Groundwater
 - i. Subdrains used for the purpose of controlling groundwater on private property may be constructed within public right-of-way if designed in accordance with these STANDARDS (See Standard Detail 400.01, 400.02 and Standard Detail 417).
 - ii. Refer to [Section 5.10](#), Utility Location Criteria, for allowable locations within the right-of-way.
 - iii. Refer to Appendix A, Soils Investigations for information on design criteria.
 - iv. Refer to Standard Detail 417 for additional information and preferred locations of cleanouts for serviceability.
2. All subdrains covered by these STANDARDS shall meet the following criteria:
 - i. The subdrain system shall be constructed of solid pipe in the ROW, perforated subdrains are not permitted in the Town of Johnstown. Refer to Volume II for Standard Specifications.
 - v. Demonstrate that subdrain has positive outfall for gravity drainage; prevent surcharging of subdrain.
 - vi. Demonstrate that the system has been designed in consideration of site-specific groundwater conditions, soil properties, topography, and layout of proposed development.
 - vii. Address maintenance aspects of recommended design.
 - viii. Demonstrate that the subdrain system maintains adequate flow capacity under peak hydraulic loading rates to keep groundwater below the invert of the sanitary sewer.
 - ix. Show that the system will neither receive groundwater inflow from additional upstream developments, nor transfer collected groundwater to downstream developments.
 - x. The system shall be shown to create no injury to existing water rights or others on their property in the project vicinity.
 - xi. The system shall incorporate provisions to allow monitoring of groundwater levels to confirm that it is functioning as designed, a regular maintenance schedule must be established, and shall be submitted to the Town as part of the Construction Improvement Plan approval process.
 - xii. The system shall be designed in consideration of seasonal high groundwater levels anticipated at the project site.
 - xiii. The system shall be designed such that clay cutoff walls are provided at boundaries of the development to preclude hydraulic communication with offsite utility trenches either upstream or downstream.
 - a. Clay cutoff walls shall be placed per Standard Detail 109.
 - b. The utility trench shall be lined with a filter fabric specifically selected in consideration of on-site soil conditions in order to minimize the invasion of fine soil particles into the bedding gravel.
 - xiv. Underdrain Pipe Diameter shall be:
 - a. Eight inches (8") minimum for mains.
 - b. Three inches (4") minimum for laterals (pipe diameter shall be different from the sewer lateral).
 - xv. The Design Professional needs to show in the design, that future tree roots will not negatively impact the subdrain (if applicable).

Section 8.12 Sand/Oil and Grease Interceptors

1. The size and location of sand/oil and grease interceptors (where needed) must be shown on the Utility Plan.
2. Sand/oil and grease interceptors shall be installed on service lines in accordance with the Town's Municipal Code and per the International Plumbing Code (IPC).
3. In approving a customer's plumbing or grease interceptor design, the Town does not accept liability for the failure of a system to adequately treat wastewater to achieve effluent quality requirements.
4. Sizing of sand/oil or grease interceptors is the responsibility of the Design Professional, based on the proposed use and manufacturer's recommendations, and must be sized per IPC standards.
 - i. Under no circumstances should the exterior grease interceptor capacity be less than 500 gallons.
5. Floor drains internal to covered parking structures and car washes, that collect drainage from rain and ice drippings from parked cars or water used to wash down internal floors, must meet IPC and MHFD standards.

END OF CHAPTER