

City of Cumming

Department of Utilities

Distribution and Collection Division



Manual of Technical Specifications & Construction Standard Details

For the City of Cumming

Wastewater Collection System

Within the Corporate City Limits and the City's Water and Sewer Service Area

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SECTION I: Introduction

The purpose of this Manual is to provide design criteria, material specifications, and installation procedures for sanitary sewers and connections of sizes six-inch (6") and larger. Sanitary sewers and connections of four-inch (4") and smaller shall be installed under the rules and regulations of the latest edition of the Local Plumbing Code. This Manual covers all sanitary sewers and connections within the boundaries of the City of Cumming Water and Sewer Service Area (see map Appendix "A").

This Manual is divided into three main Sections covering design, material and construction. The final Section provides Standard Construction Drawings.

When this Manual imposes more restrictive standards than are required by any statute, ordinance, or regulation applicable within the boundaries of the City of Cumming Water and Sewer Service Area, the requirements of this Manual shall govern. When the provisions of any other statute, ordinance or regulation require more restrictive standards than required by this Manual, the provisions of the more restrictive regulation shall apply.

The requirements of this Manual are subject to change without notice.

SECTION II: Abbreviations

<u>Item:</u>	<u>Definition:</u>	<u>Web Address:</u>
ANSI	American National Standards Institute	www.ansi.org
ASTM	American Society of Testing Materials	www.astm.org
AWWA	American Water Works Association	www.awwa.org
UL	Underwriter's Laboratories, Inc.	www.ul.com
NFPA	National Fire Protection Association	www.nfpa.org
AASHTO	American Association of State Highway and Transportation Officials	www.aashto.org
OSHA	Occupational Safety and Health Administration	www.osha.gov
GADOT	Georgia Department of Transportation	www.dot.state.ga.us
NSF	The Public Health and Safety Company	www.nsf.org
FCWS	Forsyth County Water System	www.forsythco.com
CCWS	City of Cumming Water System	www.cummingutilities.com
ppm	Parts Per Million or Milligrams Per Liter	
MSL	Mean Sea Level	
PVC	Polyvinyl Chloride	
MJ	Mechanical Joint	
DIP	Ductile Iron Pipe	
PSI	Pounds Per Square Inch	
GPM	Gallons Per Minute	
SJ	Slip Joint	

SECTION III: Design Criteria Index

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SECTION III: Design Criteria

1. TECHNICAL CODES:

A. In addition to these standards for Residential and Commercial Development in the City of Cumming, construction of all sewerage facilities in the City of Cumming shall conform to the following technical codes:

1. Southern Plumbing Code;
2. Southern Building Code;
3. City of Cumming's Cross-Connection Program;
4. Water Environment Federation (WEF) Manual for Design (MFD) No. 5, latest edition (for sewer design and construction); and
5. City of Cumming Sewer Use Ordinance.

B. Separate Sewers Required: Sanitary sewers shall not be designed to transport stormwater.

C. Design Period: Sewer systems should be designed for the estimated ultimate tributary population. Tributary population is considered to be all areas upstream of the discharge point of the system being designed. Sewers will be designed and installed to the uppermost and lowermost property lines of the development being served. Consideration should be given to the maximum anticipated capacity of institutions, industrial parks, etc.

2. DESIGN FACTORS:

A. General: In determining the required capacities of sanitary sewers, the following factors should be considered:

1. Maximum daily sewage flow based on accepted peak factors, as shown in Figure #4 of the Water Environment Federation (WEF) Manual for Design (MFD) No. 5. If this table is not used, a peak factor of 6.0 will be used.
2. Additional maximum sewage or waste flow from industrial plants.
3. Groundwater infiltration.
4. Topography of the area.
5. Depth of excavation.

New sewers for residential areas shall be designed on the basis of a daily flow of sewage of not

less than 250 gallons per residential unit per day.

B. Flows and Loadings: Design flows and loadings shall be as listed in Table JT-1 taken from the Rules of the Georgia Department of Human Resources, Public Health, Manual For On Site Sewage Management Systems. (Table JT-1 is contained on pages 9 - 11).

3. DETAILS OF DESIGN AND CONSTRUCTION:

A. Size: No sewer shall be less than 8" in diameter. No exceptions.

B. All sewers installed in the street shall be sufficiently deep to provide six (6) feet of cover at the inlet end of all service laterals at the street right-of-way, and over any part of the collector sewer or service lateral within the street right-of-way.

C. Road Crossings: Road crossings (except for interior subdivision streets) shall be steel cased. PVC pipe that is installed underneath pavement shall have a minimum of 6 feet of cover.

D. Sewer Slopes: All sewers shall be so designed and constructed to give mean velocities, when flowing full, of not less than 2.0 feet per second. The following are the minimum slopes which should be provided; however, slopes greater than these are desirable.

Table 2-1 Minimum Slope in Feet For Sewer Lines

Sewer Size	Minimum Slope in Feet Per 100 Feet
8"	0.50
10"	0.29
12"	0.22
14"	0.17
15"	0.15
16"	0.14
18"	0.12
21"	0.10
24"	0.08
27"	0.07
30"	0.06
36"	0.05

E. Ductile Iron Pipes Required Under Certain Conditions:

Ductile iron sanitary sewers shall be used under the following circumstances:

1. When the proposed sewer line is under less than 4 feet of cover.
2. When the proposed sewer line crosses a storm sewer with less than 2 feet of clearance.

3. When the proposed sewer line passes laterally within 1 foot of a storm sewer.
4. When the proposed sewer line is under a fill of 16 feet or more.
5. When proposed sewer line is to be placed in swampy or unstable soil conditions where proper bedding is difficult to construct.
6. When the sewer slope is greater than 20%.
7. **Concrete Encasement:** Concrete encasement is required when sewer lines cross creeks with less than 3 feet of original stream bed cover, or cross within 1 foot of other utilities. The encasement shall extend 8 inches beyond the pipe in all directions.

F. Drop Manholes: An outside drop at the manhole shall be provided wherever the drop is greater than 2 feet. See Standard Construction Drawing S-6.

G. Minimum Angle: Minimum angle between influent and effluent sanitary sewer lines at a manhole shall be 90°.

H. Maximum Distance Between Manholes: The maximum distance between two manholes shall be 400 feet.

I. Sewer Easements: A minimum twenty foot (20') permanent sanitary sewer easement shall be used on all lines. All sewer easements shall be grassed. Rip-rap shall be placed where required to control erosion.

J. Sand and Oil/Grease Interceptors:

1. **Sizing:** All grease interceptors required in this section shall be sized according to the following formulas. No single grease interceptor shall be smaller than 1000 gallons or larger than 3000 gallons. In certain cases, multiple grease interceptors may be utilized.

Formula for Restaurants:

$(S) \times (GS) \times (HR/12) \times (LF) =$ Grease Interceptor Capacity, in gallons where: S = Numbers of seats in dining area, GS = Gallons of wastewater per seat (use 15 gallons per seat); HR = Numbers of hours open; LF = Loading Factor = 2.0 for Interstate freeways, 1.5 for other freeways, 1.25 for recreational areas, 1.0 for other highways.

Formula for Hospitals, Schools, Nursing Homes, Other Types of Commercial Kitchens with Varied Seating Capacities:

(M) x (GM) X (SC) X (LF) = Grease Interceptor Capacity, in gallons where M = Meals per day; GM, Gallons of Wastewater per meal (Use 5 gallons per meal); LF = Loading factor – 1.0 with dishwashing or 0.5 without dishwashing; SC = storage capacity factor – 1.0 for Public sewer, 2.5 for on-site septic disposal

2. All sand and oil/grease interceptors used in conjunction with facilities other than eating establishments shall have a capacity that will provide not less than ten (10) minutes nor more than thirty (30) minutes retention time at the peak eight (8) hour flow rate. Flow through velocities shall not exceed one foot per second at the peak eight (8) hour flow rate. At a minimum, interceptors shall be 1000 gallons, concrete, and in-ground.

**ADOPTED FROM TABLE JT-1
GEORGIA DEPARTMENT OF HUMAN RESOURCES**

<u>FACILITY</u>	<u>GPD*</u>
Airport (Also R.R. & Bus Terminal)-----	5/Passenger
No Food Service-----	+10/Employee
Assembly Hall (Also Stadium, Racetrack, Ball Park)-----	5/Seat
Bar/Lounge, Tavern (No Food Service)-----	30/Seat
Barber Shop-----	100/Chair
	+20/Employee
Bath House for Swimming Pool-----	10/Swimmer
Beauty Salon-----	150/Chair
	+20/Employee
Boarding House**-----	75/Resident
Bowing Alley (No Food Service)-----	75/Lane
	+20/Employee
Car Wash (Non-Recycling)-----	75/Car
Church (No Kitchen)-----	5/Sanctuary Seat
(With Kitchen)-----	7/Sanctuary Seat
Bath House for Travel Trailer Park, Campground**	
(With Independent Sewer Connections)-----	50/Space
(Without Independent Sewer Connections)-----	100/Space
Construction Camp**-----	60/Person
(With Use of Chemical Toilets)-----	40/Person
Cottage/Lodge (Vacation)-----	50/Bed
Country Club (No Food Service)-----	25/Member
Dance Hall (No Food Service)-----	5/Person
Day Camp-----	20/Person
Day Care Center (No Meals)-----	15/Person
(With Meals)-----	20/Person
Dental Office (Continuous Water)-----	250/Chair
(Demand Water)-----	100/Chair
	+20/Employee
Department Store-----	40/Employee
Dump Station for Travel Trailers-----	50/Vehicle
Fairground (Use Average Attendance)-----	5/Person
Fitness Center/Spa-----	50/Person
†Food Service**	
Restaurants, less than 24 hrs/day-----	50/Seat
Restaurants, 24 hrs.-----	75/Seat
Restaurants on Interstates-----	100/Seat
Drive-In Restaurant-----	50/Space

FACILITY**GPD***

Carry-out Only; Food Stands-----	50/100ft ² Floor Space
-----	+20/Employee
Banquet Rooms-----	Add 5/Seat
Single-Service Only-----	Subtract 10/Seat
Funeral Home-----	300/Embalmng
-----	+100/Staff Member
-----	+5/Sanctuary Seat
-----	(no kitchen)
-----	+7/Sanctuary Seat
-----	(w / kitchen)
Grocery Store-----	200/1000ft ² Floor Space
Hospital-----	300/Bed
-----	+100/ Staff Person
Hotel/Motel** -----	100/Room
Motel with Kitchenette-----	150/Room
†Institution -----	100/Bed
Laundry, Self-Service-----	500/Machine
Marina (Pumpout Facilities)-----	30/Slip
†Meat Market-----	50/100ft ² Floor Space
Medical Offices-----	200/Exam Room
Migrant Labor Camp**-----	50/Bed
Nursing Home/Personal Care Home-----	----- 150/Bed
-----	+100/Resident Staff
Picnic Park-----	10/Person
†Prison/Jail-----	----- 125/Bed
-----	+20/Employee
Resident Camps** (With Food Service)-----	60/Person
(Without Food Service)-----	50/Person
Residential Units, Apartments, Condos, Town Homes, Houses-----	250 GPD Per Unit
Resort**-----	75/Person
Rest Area-----	Determined after
-----	consultation with
-----	GA DOT
Retail Stores, Convenience Stores (Freestanding)-----	Larger of 400/restroom or
-----	100/commode or urinal
Rooming House** (No Meals)-----	60/Bed
Schools (Day, Toilets Only)-----	12/Person
† (Day, Toilets & Cafeteria)-----	16/Person
† (Day, Toilets, Cafeteria, Gym)-----	20/Person
Boarding-----	100/Person
Service Station	
Interstate Location-----	3000 Minimum
24 Hour Operation-----	325/Commode or Urinal
<24 Hour Operation-----	250/Commode or Urinal

<u>FACILITY</u>	<u>GPD*</u>
Shopping Center/Mall (No Food Service or Laundering Service)---- Space	100/1000ft ² Enclosed
Theaters (Indoor)-----	5/Seat
(Drive-In)-----	10/Space
Travel Trailer Park**	
With Independent Water & Sewage Connections-----	100/Space
Veterinary Office/Animal Hospital**-----	100/Run
	+10/Cage
	+20/Employee
Warehouse Space-----	50/1000sqft
Warehouse Office-----	100/1000sqft
Workers Including Factory, Office, School, Commercial and Construction (Without Showers and Industrial Waste)-----	25/Person
With Showers and No Industrial Waste-----	35/Person
With Kitchen Add-----	--- +5/Person

*GPD: means gallons per day

**Add 500/machine if washing machines installed.

†Operations with BOD₅ and TSS greater than 200 mg/L require pretreatment to reduce BOD₅ and TSS to 200 mg/L or below.

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SECTION IV General Material Specifications:

1. PIPE MATERIALS:

A. Polyvinyl Chloride (PVC) Pipe:

1. PVC sewer pipe and fittings shall be plastic gravity sewer pipe with integral wall bell and spigot joints for the conveyance of domestic sewage. Pipe and fittings shall meet extra strength minimum of SDR 26 of the requirements of ASTM D3034-73 for 4" through 15" and ASTM F679 for 18" through 27". Minimum wall thickness shall be as follows:

Pipe Diameter	Minimum Wall Thickness
4"	0.120"
6"	0.180"
8"	0.240"
10"	0.300"
12"	0.360"
15"	0.437"
18"	0.536"
21"	0.632"
24"	0.711"
27"	0.801"

2. Each length of pipe shall be marked with the manufacturer's name, trade name, nominal size, class, hydrostatic test pressure, manufacturer's standard symbol to signify it was tested, and date of manufacture. Each rubber ring shall be marked with the manufacturer's identification, the size, the year of manufacture and the classes of pipe with which it can be used.

3. Under no circumstances shall PVC pipe ever be installed above ground.

B. Ductile Iron Pipe (DIP): Ductile iron pipe and fittings shall conform to the requirements of ANSI A21.51 (centrifugally cast in metal or sand lined molds). Pipe shall be thickness Class 50 for 8" diameter pipes and smaller, and Class 51 for 10" diameter pipes and larger. The pipe shall be lined with cement-mortar lining in accordance with ANSI A21.4, or approved equal. The lining shall have a minimum thickness of 1/16 inch. The exterior of the pipe shall be seal coated with an approved bituminous seal coat in accordance with ANSI A21.4.

2. JOINT MATERIALS:

A. Joints Between DIP: Ductile iron pipe shall be of the bell and spigot type with push-on joints, conforming to ANSI Specification A21.11 or mechanical joints.

B. Joints Between PVC: PVC pipe shall be joined with a rubber gasket or PVC ring which is designed to prevent inflow and ex-flow. Mechanical compression joints shall be molded

plastic or similar material (with or without the use of rubber or elastic plastic compression rings) as described in ASTM C425 for polyvinyl chloride (slip joint). Precast joints or rubber push-type gaskets for compression joint sealing (ASTM D3312 or F477) are all acceptable. (PVC pipe shall not be joined by a solvent cement joint in which the pipe spigot wedges into the tapered socket and the surfaces fuse together.)

C. Joints Between Sewer Pipes of Different Materials: Transition joints between sewer pipes of different materials shall be accomplished by the use of adapters made especially for that purpose. **NOTE: Transition of piping materials between manholes is prohibited without the express consent of the City of Cumming Department of Utilities.**

3. PRECAST CONCRETE MANHOLES:

A. Precast concrete manholes shall consist of precast reinforced concrete sections with eccentric, (or flat slab for shallow manholes) top section and a base section conforming with the typical manhole details as shown on the Standard Construction Drawings S-5, S-7, S-8 and S-9.

B. Precast manhole sections shall be manufactured, tested, and marked in accordance with the latest provisions of ASTM C478.

C. Joints of the manhole sections shall be of the tongue-and-groove type. Sections shall be joined using O-ring rubber gaskets, flexible plastic gaskets conforming to the applicable provisions of ASTM C443, latest revision, or an approved bituminous mastic joint material.

D. Handling: Each section of the precast manhole shall have not more than two holes for the purpose of handling and laying. These holes shall be sealed with cement mortar using one part Portland cement to two parts clean sand, meeting ASTM C144, latest revision. Holes shall be sealed from the outside prior to backfilling the manhole.

E. Manhole steps conforming to the applicable provisions of ASTM C478, latest edition, such as aluminum 14967 as manufactured by Alcoa, or Plastic Step manufactured by M.A. Industries, Inc., or equal, shall be factory built into the precast sections.

F. Holes in precast bases to receive sewer pipe shall be precast at the factory at the required locations and heights. Knocking out of holes in the field will not be permitted. All manholes shall have Kor-N-Seal (or equal) rubber boots for all pipe entries/exits. Stainless steel bands shall be tightened with a torque wrench in accordance with the manufacturer's recommendations.

G. Manhole bases and inverts shall be constructed of 2500 psi concrete in accordance with details on Standard Construction Drawings S-5, S-7, S-8 and S-9, and inverts shall have the same cross-section as the invert of the sewers which they connect. The manhole base and invert shall be carefully formed to the required size and grade by gradual and even changes in sections. Changes in direction of flow through the sewer shall be made to a true curve with as large a radius as the size of the manhole will permit. Brick used in inverts shall be in accordance with this Manual, Subsection 5 BRICK.

H. **Foundation:** The manhole base shall be set upon a 6 inch (minimum thickness) mat of #57 crushed stone.

I. **Mortar for brickwork** that is required to complete the precast concrete manhole shall be constructed using 1 part Portland cement to 2 parts clean sand, meeting ASTM C144, thoroughly mixed to a workable plastic mixture. Brickwork shall be constructed in a neat and workmanlike manner. Cement mortar shall be used to grout interior exposed brick joints and faces. Brick used in manholes shall be in accordance with this Manual, Subsection 5 BRICK.

J. **The cast iron frame for the manhole cover** shall be set at the required elevation and properly anchored to the masonry. Frames and covers shall be Vulcan VM-3MOD, or equal. (See Standard Construction Drawing S-12.) Where manholes are constructed in paved areas, the top surface of the frame and cover shall be tilted to conform to the exact slope, crown and grade of the existing adjacent pavement. Manholes on all outfall sewers shall have bolt-down, watertight lids and shall be 18 inches above grade.



McGard Locking Device

All bolt-down sewer manhole access covers shall have at least one manhole locking device as per McGard LLC USA 3875 California Road, Orchard Park, New York 14127-4198. McGard manhole cover locks prevent unauthorized access and protect against vandalism and tampering. The access cover lock must have a codification groove that is milled into the top of the access cover lock, which can therefore only be installed or removed using the corresponding key. The access cover lock must be constructed of special high quality alloy and hardened to at least 60 Rockwell (HRC).

Contractors shall ensure that ALL bolts and locking devices are properly installed before a project will be accepted by the City.

K. **Masonry work shall be allowed to set** for a period of not less than 24 hours. All loose or waste material shall be removed from the interior of the manhole. The manhole cover then shall be placed and the surface in the vicinity of the work cleaned off and left in a neat and orderly condition.

4. **CASINGS:**

A. **Steel casing pipe** shall be used for all cased piping where the carrier pipe is six inches (6") or greater in size.

B. **Yield Strength:** Steel casing pipe shall have a minimum yield strength of 35,000 psi and shall conform to the requirements of ASTM A139. It shall be fully coated on the exterior and interior with a coal tar coating. The casing pipe diameter shall be six to eight inches greater than the "bell" diameter of the carrier pipe. Minimum wall thickness shall be as follows:



Diameter (inches)	Thickness (inches)
Under 14	0.188
14	0.219
16	0.219
18	0.250
20	0.281
22	0.312
24	0.344
26	0.375
28	0.406
30	0.406
32	0.438
34	0.469
36	0.469
42	0.500
48	0.625
54	0.750

5. BRICK:

Brick for sewer manhole construction shall be hard No. 1 building brick manufactured from clay or shale. Brick shall be uniform standard commercial sizes with straight, parallel edges with square corners burned uniformly through, and uniform color with uniform abrasive resistance. All brick shall conform to the latest version of ASTM C32. Brick for manhole inverts shall be grade SM; brick for manhole construction shall be grade MM.

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SECTION V: Sewer System Excavation and Construction

1. TRENCH EXCAVATION:

A. OSHA Regulations: Trench excavation shall conform to OSHA regulations, 29 CFR Part 1926, Subpart P, Paragraphs 1926.650 through 1926.653, or the most current OSHA requirement.

B. Trenches shall be cut true to the lines and grades shown on the plans. The bottom of the trench shall be cut carefully to the required grade of the pipe except where bedding materials or cradles are shown in which case the excavation shall extend to the bottom of the bedding or cradles as shown on the plans. Minimum pipe cover shall be as shown on the approved plans.

C. Bell holes shall be excavated at proper intervals so the barrel of the pipe will rest for its entire length upon the bottom of the trench. Bell holes shall be large enough to permit proper installation of all joints in the pipe.

D. Inconvenience to Public: Pipe trenches shall not be excavated more than 100 feet in advance of pipe laying, and all work shall be performed to cause the least possible inconvenience to the public. Adequate temporary bridges or crossings shall be constructed and maintained where required to permit uninterrupted vehicular and pedestrian traffic.

E. Barricades and Lights: All excavations shall be adequately guarded with barricades and lights in compliance with all OSHA and Georgia Department of Transportation requirements so as to protect the public from hazard.

F. Shoring and Bracing: Excavations adjacent to existing or proposed buildings and structures, or in paved streets or alleys shall be sheeted, shored and braced adequately to prevent undermining or subsequent settlement of such structures or pavements. Underpinning of adjacent structures shall be done when necessary to maintain structures in safe condition. The contractor shall also provide bracing and shoring when required to prevent damage to existing utilities, trees, or private property which are specifically required to remain.

1. Timber: Timber for shoring, sheeting, or bracing shall be sound and free of large or loose knots and in good condition. Size and spacing shall be in accordance with OSHA regulations. Remove bracing and sheeting in units when backfill reaches the point necessary to protect the pipe and adjacent property. Leave sheeting in place when in the opinion of the City it cannot be safely removed. Cut off sheeting left in place at least two feet below the surface.

2. Steel Sheet Piling: Continuous lock-joint steel sheet piling may be substituted for timber sheeting when approved by the City. Steel piling may be removed, without cutting, provided the rate of removal is kept in pace with the tamping and backfilling operations to assure complete filling of the void created by the withdrawal of the piling. Complete withdrawal of the piling in advance of the tamping and backfilling will not be permitted. Piling, where directed to be left in place by the City for reasons of safety, will be cut off where directed.

G. Disturbed Public Property: Streets, sidewalks, parkways, and other public property disturbed in the course of the work shall be restored to as near as original condition as possible in a manner satisfactory to the City.

H. Wet Conditions: Whenever water is present in the trench, it shall be removed in a manner satisfactory to the City and enough backfill shall be placed on the pipe to prevent floating. Any pipe that has floated shall be removed from the trench and relaid later during dry conditions. No pipe shall be laid in wet trench conditions that preclude proper bedding, or on frozen trench bottom, or when, in the opinion of the City, the trench conditions or the weather are unsuitable for proper installation (See Section V.12 below for details on the Dewatering process).

2. ROCK EXCAVATION:

A. Drilling and blasting operations shall be conducted with due regard for the safety of persons and property in the vicinity and in strict conformity with requirements of all ordinances, laws and regulations governing blasting and the use of explosives. Rock excavation near existing pipelines or other structures shall be conducted with the utmost care to avoid damage. Injury or damage to other structures and properties shall be promptly repaired to the satisfaction of the City and property owner.

B. Excavation of Rock: Rock in trenches shall be excavated over the horizontal limits of excavation and to depths as follows:

Size of Pipeline	Depth of Excavation Below Bottom of Sewer Pipe (in)
4 and less	4
4 to 8	6
10 to 18	8
18 to 30	10
Over 30	12

The space below grade for pipe lines shall then be backfilled with #57 and smaller crushed rock, gravel, or other approved bedding material.

3. BACKFILLING TRENCHES:

A. General: Backfill material shall consist of fine, loose earth containing sufficient but

not excessive moisture content for thorough compaction. Material that is too dry for adequate compaction shall receive a prior admix of sufficient water to secure adequate moisture content. Material having excessive water content shall not be placed at any time. Backfill material shall be free of large clods, stones, vegetable matter, debris and other objectionable material.

B. Percentage of Maximum Density Requirements: Achieve not less than the following percentages of maximum density of soil material compacted at optimum moisture content, for each layer of soil material-in-place as determined by ASTM D698 (Standard Proctor) test procedures:

1. **Structures:** Under structures and within 10 feet outside of exterior walls, compact top 12 inches of subgrade and each layer of backfill or fill material to 98 percent of maximum density.
2. **Building Slabs and Steps:** Under and within five feet outside perimeter of slabs and steps, compact top 12 inches of subgrade and each layer of backfill or fill material to 98 percent of maximum density.
3. **Berms and Liquid Holding Fills:** Compact each layer of backfill or fill material to 98 percent of maximum dry density.
4. **Lawn or Unpaved Areas:** Compact each layer of backfill or fill material to 88 percent of maximum dry density.
5. **Walkways:** Under and within two feet horizontal distance of paved walks, compact top six inches of subgrade and each layer of backfill or fill material to 98 percent of maximum dry density.
6. **Pavements:** Under and within entire roadbed, compact top 12 inches of subgrade and each layer of backfill or fill material to 98 percent of maximum dry density.
7. **Spoil Areas:** Compact each layer of backfill or fill material to 88 percent of maximum dry density.

4. INSTALLATION OF SEWER PIPE:

A. Care of Materials: Pipe and accessories shall at all times be handled with care to avoid damage. Whether moved by hand, skidways or hoists, material shall not be dropped or bumped. The interior of all pipe shall be kept free from dirt and foreign matter at all times. Each joint of pipe shall be unloaded opposite or near the place where it is to be laid in the trench.

B. Damaged or Defective Materials: All such material that is defective in manufacture or has been damaged in transit or after delivery shall be removed from the job site.

C. Pipe Joints: Sewer pipes shall be joined by "push-on" joints using elastomeric

gaskets to affect the pressure seal. The ends of pipe to be jointed and the gaskets shall be cleaned immediately before assembly, and the assembly shall be made as recommended by the pipe manufacturer. Lubricant used must be non-toxic and supplied or approved for use by the pipe manufacturer. Sewer pipes shall be laid in the uphill direction with the bells pointing upgrade. Any variation from this procedure shall require approval from the City.

D. Plugging Pipe Ends: When pipe laying is not in progress, the open ends of installed pipe shall be plugged by approved means to prevent entrance of trench water into the line.

E. Ductile Iron Pipe: The following laying rules shall be followed for ductile iron pipe:

1. Standard ductile iron pipe laying conditions shall be per ANSI/AWWA C150/A21.50 and ANSI/AWWA C151/A21.51.
2. Ductile iron pipe laid in rock trenches shall have 6 inches of crushed stone under the pipe. See Standard Construction Drawing S-13.
3. Consult design manual when the depth of cover is greater than 25 feet on an 8-inch pipe, or 19 feet on a 10-inch or greater pipe diameter.

F. PVC Pipe: The following laying rules shall be followed for PVC pipe:

1. Bedding and primary backfill material shall consist of Class I or Class II soil (USCS Soil Classification System) placed in 6" layers. Where Class II soil is used, bedding primary backfill shall be compacted as specified in ASTM D2321.
2. By embedding PVC pipe in sand or graded gravel, no special compaction requirements will be necessary. However, the sand or gravel must extend from four inches below the pipe to the spring-line of the pipe and the material must be firmly placed under the pipe haunches. See Standard Construction Drawing S-13.
3. If PVC pipe is laid in a rock trench, than a minimum of 6 inches of crushed stone shall be placed under the pipe.

G. Bell Hole Requirements: Bell holes shall be provided of sufficient size to allow ample room for making the pipe joints properly. The bottom of the trench between bell holes shall be carefully graded so that the pipe barrel will rest on a solid foundation for its entire length as shown on the plans. Each joint shall be laid so that it will form a close concentric joint with adjoining pipe and in order to avoid sudden offsets or inequalities in the flow line.

H. Standing Water in Trench: Water shall not be allowed to run or stand in the trench before the trench has been backfilled. At no time shall the Contractor open up more trench than his available pumping facilities are able to dewater (See Section V.12 below for details on the Dewatering process).

I. **Trench Widths:**

1. Maximum permissible trench widths from bottom of trench to a point 12" above top of pipe shall be equal to the outside diameter of pipe barrel plus 16", except as noted otherwise.
2. If the trench walls collapse, or if the excavated trench width up to a point 12" above the top of sewer pipe is greater than the maximum permissible trench width as set forth in Paragraph A above, then the Contractor shall, at no additional cost to the Owner, lay and backfill the line as specified in ASTM D2321.

5. **CONNECTIONS:**

A. **Service Connections, Generally:**

1. **Stub-outs:** A sewer service stub-out with plugged stub shall be provided for every existing or proposed lot or building. See Standard Construction Drawings S-2 and S-3. All services shall be shown on the construction drawings. Wye branches of the same material as the collector sewer shall be installed on the collector sewer lines at the locations shown on the construction drawings for each service connection. A single service stub shall be provided for each residence being served. The service stub shall extend from the wye to the property line of the lot being served.
2. **Developer Responsibility:** The developer shall be responsible for serving all lots developed. On any lot where the service stub cannot be found, the developer shall install or be responsible for payment of the cost of installation of the service stub. Also, unless otherwise noted on the final plat, the service stub shall be low enough to serve the first ground level floor elevation, and where grades permit, it shall be low enough to serve the basement.
3. **New Construction:** For new construction, the builder shall be responsible for the location of the service line and checking its elevation prior to the pouring of the foundation, driveway or other appurtenance. The City will not be responsible for any house built too low to be served nor for any service covered by construction.
4. **Riser connections** shall be installed on service lines which are greater than nine feet deep.
5. **Service Stub Requirements:** Service stubs shall be laid in compacted or undisturbed soil from the main sewer to the property line. The slope shall be 2.0% or greater. All house or service lines not immediately connected to a service stub shall be located and marked in the same manner as described for plugged stubs,

below.

6. **Driveway and Parking Pads:** Driveways, parking pads, paving, etc. shall not at any time be installed over any portion a sanitary sewer lateral.

7. **Sewer Tap Approval and Inspection:** No plumber or Contractor will be allowed to make a tap onto City sewerage system without prior approval and without the tap being made in the presence of a City of Cumming Inspector.

B. Plugged Stubs:

1. **Plug Required:** All service lines extending from collector sewers must utilize a plugged, or capped stub at the termination point. (See Standard Construction Drawings S-2 and S-3.)

2. **Plug Type:** Service lines shall be plugged, or capped with an air-tight, removable plastic plug.

3. **Location on As-built Plan:** The precise location of each stub shall be indicated on the As-Built plans to the nearest foot.

C. Service Connections Where Plugged Stub Not Provided:

1. **Wye Branches:** Connections to existing sewer lines where no stub exists shall be made by removing a section of the sewer from the existing line and inserting, in the space, a wye branch of proper size, or by the construction of a manhole or other such method as approved by the City of Cumming.

2. **Coring Manholes:** Connections to existing manholes where no plugged stubs exist shall be made by neatly cutting a hole in the wall of the existing structure with a coring machine at or near its invert, inserting a Kor-N-Seal rubber boot. This work shall be done by a qualified Contractor with equipment approved by the Kor-N-Seal manufacturer.

3. All sewer connections for multiple or non-residential structures **Multiple or Non-residential Structures:** shall be made by the owner (applicant) at his expense.

6. HIGHWAY CONSTRUCTION:

A. State Highways: The Contractor shall be responsible for the coordinating and scheduling of all construction work in the State highway right-of-way with the City of Cumming and/or Georgia Department of Transportation, as appropriate.

B. Construction Standards: Work along and across Georgia State highway right-of-way shall conform to Georgia D.O.T. Standard Specifications for Construction of Roads and Bridges.

7. JACK AND BORE:

A. General Requirements: Jacks for forcing the casing pipe through the roadbed shall have a jacking head constructed in such a manner as to apply uniform pressure around the ring of the pipe. The pipe to be jacked shall be set on guides, braced together, to properly support the section of the pipe and direct it to the proper line and grade. In general, roadbed material shall be excavated just ahead of the pipe, the excavated material removed through the pipe, and the pipe then forced through the roadbed into the excavated space.

B. Impact on Structures: Where pipe is required to be installed under highways, streets or other facilities by jacking or boring methods, construction shall be done in a manner that will not interfere with the operation of the facility, and shall not weaken the roadbed or structure.

C. Disposal of Excavated Materials and Use of Water: Excavated material will be placed near the top of the working pit and disposed of as required. The use of water or other fluids in connection with the boring operation will be permitted only to the extent necessary to lubricate cuttings. Jetting will not be permitted.

D. Diameter of Excavation: The diameter of the excavation shall conform to the outside diameter and circumference of the casing pipe as closely as practicable. Any voids which develop during the installation operation shall be pressure grouted.

E. Jacking Requirements: The pipe shall be jacked from the low or downstream end. At each end of the casing pipe, the void between the carrier pipe and casing shall be sealed with brick and mortar. Any pipe damaged in jacking operations shall be removed, and replaced by the Contractor at his expense.

F. Installation of Carrier Pipe: After the steel casing pipe has been installed, the carrier pipe shall be installed in the casing pipe. Care shall be exercised at all times to protect the coating and lining of this pipe and to maintain tight, full-seated joints in the carrier pipe. See Standard Construction Drawing S-12.

8. RELATIONSHIP TO WATER LINES:

The following clearances from water pipes shall be maintained:

- 1. Horizontal:** Ten feet horizontal distance between sewer and water main for parallel installation.
- 2. Vertical:** Eighteen inches vertical distance for water main and sewer crossings.
- 3. Parallel Installations:** The City may allow parallel installation of water line closer than ten feet to a sewer, provided that the water main is in a separate

trench or on an undisturbed earth shelf located on one side of the sewer and at an elevation so the bottom of the water main is at least 18 inches above the top of the sewer.

4. **Sewer and Water Main Crossings:** For sewer and water main crossings, the crossing shall be arranged so that the sewer joints will be equidistant and as far as possible from the water main joints. Where a water main crosses under a sewer, adequate structural support shall be provided for the sewer.
5. **Special Conditions:** When it is impossible to obtain proper horizontal and vertical separation as stipulated above, the sewer shall be constructed using ductile iron pipe of strength equal to water pipe, and shall be pressure tested to assure water-tightness prior to backfilling.

9. **REPLACEMENT OF PAVEMENT:**

A. **General:** Contractor shall fully restore and replace all pavement, curbs, gutters, sidewalks and other surface structures removed or disturbed, to a condition that is as near original condition as possible.

B. **Pavement Cuts:**

1. **Sawing:** All pavement cuts shall be made by sawing prior to excavation to eliminate uneven and ragged edges.
2. **Concrete Cap Required:** All Georgia D.O.T. and Forsyth County road cuts shall have an eight (8) inch thick concrete cap (3000 psi in 28 days) which shall extend not less than twelve (12) inches beyond the edges of the backfilled ditch. See Standard Construction Drawing S-16.
3. **Asphalt Patches:** Final asphalt patches shall match the existing pavement type, quality and thickness as closely as possible. Special care shall be exercised to match existing slopes and grades for a smooth transition.

C. **Pavement Replacement:** Where sewer lines are installed in existing paved streets parallel with the roadway, the streets in which the sewer lines are installed shall receive a full width asphalt repaving in accordance with Georgia D.O.T. specifications.

10. **LOCATION AND PROTECTION OF EXISTING UNDERGROUND UTILITIES:**

It is the responsibility of the Contractor to locate all underground utilities and to protect same. Utility lines or services damaged by the Contractor shall be repaired by the Contractor at the Contractor's own expense. Contractors must utilize the Utilities Protection Center's "Call Before-U-Dig" hotline at 1-800-282-7411.

11. TESTING:

A. Infiltration Testing: Infiltration of groundwater into sewer lines shall not exceed 25 gallons per inch of diameter, per 24-hour day, per mile of sewer.

B. Low Pressure Air Testing: All lines shall be air tested in the following manner after backfilling and tamping has been completed:

1. Test Preparation: All wyes, tees or end-of-side sewer stubs shall be plugged with flexible-joint caps, or acceptable alternate, securely fastened to withstand the internal test pressure. Prior to testing for acceptance, the pipe should be cleaned.

2. Test Procedure: The sewer segment being tested shall be pressurized to 3.5 psi. A short period of time (2-4 minutes) may be required to allow the pressure to stabilize. The pressure shall not decrease more than 0.5 psi (from 3.5 to 3.0 psi) during the time periods shown below:

Pipe Size (inches)	Time Period
4	1:53 min
6	2:50 min
8	3:47 min
10	4:43 min
12	5:40 min
15	7:06 min
18	8:30 min
21	9:55 min
24	11:20 min
27	12:45 min
30	14:10 min

3. Test Failure: If the pipe installation fails to meet the infiltration or air test requirements shown above, the Contractor shall determine, at his own expense, the source or sources of leakage, and he shall repair or replace all defective materials or workmanship. The completed pipe installation shall meet the requirements of these tests and the results of the air test shall be neatly tabulated by the Contractor and submitted to the City of Cumming Inspector.

C. Mandrel Testing:

All PVC pipe must pass a 5.0% deflection test as follows: Not before 30 days after pipe is laid and backfill placed, the Contractor shall, in the presence of the City Inspector, test the pipe for deflection. A mandrel, sized to permit up to 5.0% deflection, shall be used. The sequence for testing is as follows:

1. **Flush Line:** Completely flush the line making sure the pipe is clean of any mud or debris that would hinder the passage of the mandrel.
2. **Float Rope:** During the final flushing of the line, attach a floating block or ball to the end of the mandrel pull rope and float the rope through the line.
3. **Connect Mandrel:** After the rope is threaded through the line, connect the pull rope to the mandrel and place the mandrel in the entrance of the pipe.
4. **Connect a retrieval rope** to the back of the mandrel to pull it back, if necessary.
5. **Remove all the slack** in the pull rope and place a tape marker on the rope at the ends of the pipe where the mandrel will exit, determining the location of the mandrel in the line.
6. **Draw mandrel** through the sewer line.
7. **If a section with excessive deflection** is found, locate it; dig down and uncover the pipe; inspect the pipe, if any damaged pipe is found, replace it; if pipe is not damaged, replace and thoroughly tamp the haunching and initial backfill; replace remainder of backfill.

D. Vacuum Testing of Manholes:

1. **Test Method:** Each manhole shall be tested immediately after assembly and prior to backfilling. Test shall be in accordance with ASTM C1244-94.
2. **Plug Lift Holes:** All lift holes shall be plugged with approved non-shrink grout.
3. **No grout** will be placed in the horizontal joints before testing.
4. **Pipes Entering Manhole:** All pipes entering the manhole shall be plugged, taking care to securely brace the plugs from being drawn into the manhole.
5. **The test head** shall be placed at the inside of the top of the cone section and the seal inflated in accordance with the manufacturer's recommendation.
6. **Vacuum Requirements:** A measured vacuum of 10 inches of mercury shall be established in the manhole. The time for the vacuum to

drop to nine inches of mercury shall be recorded.

7. **Leakage:** Acceptance standards for leakage shall be established from the elapsed time for a negative pressure change from 10 inches to nine inches of mercury. The maximum allowable leakage rate for a four-foot diameter manhole shall be in accordance with the following:

Manhole Depth	Minimum Elapsed Time for a Pressure Change of 1 inch Hg
10 ft or less	60 seconds
>10 ft but < 15ft	75 seconds
>15 ft but < 25ft	90 seconds

Note: For manholes five feet in diameter, add an additional 15 seconds and for manholes six feet in diameter, add an additional 30 seconds to the time requirements for four-foot diameter manholes.

8. **Test Failure:** If the manhole fails the initial test, necessary repairs shall be made with a non-shrink grout while the vacuum is still being drawn. Retesting shall proceed until a satisfactory test is obtained.

9. **Test Equipment:** Vacuum test equipment shall be equal to that of P.A. Galzier, Inc., Worcester, MA.

12. **DEWATERING:**

A. **The Contractor shall provide and maintain:** adequate dewatering equipment, including back up equipment, to remove and dispose of all surface water and groundwater entering excavations, trenches, or other parts of the work. Each excavation shall be kept dry during sub-grade preparation and continually thereafter, until the structure to be built or the pipe to be installed therein is completed to the extent that no damage from hydrostatic pressure, flotation, or other cause will result.

B. **All excavations for concrete structures or trenches** which extend down to or below groundwater shall be dewatered by lowering and keeping the groundwater level beneath such excavations 12" or more below the bottom of the excavation.

C. **Surface water shall be diverted** or otherwise prevented from entering excavated areas or trenches to the greatest extent practicable without causing damage to adjacent property.

D. **The Contractor will be held responsible for** the condition of any pipe or conduit which he may use for drainage purposes, and all such pipes or conduits shall be left clean and free of sediment.

13. CLEAN-UP:

A. Construction Site: Prior to requesting the "completion of sewer construction" inspection, the Contractor shall remove and dispose in an acceptable manner all shipping timbers, shipping bands, spacers, excess materials, broken material, crates, boxes and any other material brought to the job site.

B. Repair/Replace Damaged Items: Any work, trees, lawns, shrubs, fences, flower beds, drainage culverts or other property damaged by the sewer construction, shall be repaired or replaced.

C. All shoulders, ditches, culverts and other areas impacted by the sewer construction shall be at the proper grades and smooth in appearance.

D. All manhole covers shall be brought to grade.

E. Grassing: A uniform stand of grass is required prior to acceptance of the sewer by the City of Cumming.

14. AS-BUILT DRAWINGS:

A. The developer or the developer's engineer or Contractor is responsible for furnishing to the City of Cumming, As-Built drawings as soon as the sewer work has been completed. It is the engineer's responsibility to insure that the necessary information is received from the Contractor to complete the As-Built drawings.

B. As-built drawings shall be submitted to the City of Cumming for every project governed by this book of specifications. The City of Cumming will not permit the issuance of any certificate of occupancy or the approval of any final plat until appropriate as-built drawings are received.

C. As-Built drawing preparation guidelines are as follows:

1. Sewer As-Built should be on a separate plan sheet from other utilities.
2. The As-Built shall contain the name of the development.
3. The location of all sewer lines, manholes, stream crossings, road crossings and all other appurtenances should be shown.
4. Land lots and districts shall be shown.
5. All lots are to be numbered.
6. Road names shall be on plans.

7. The term "As-Built" is to be stamped in large clear print on the plans.
8. The "As-Built" drawings are to be submitted on 24" x 36" paper.
9. Minimum scale 1" = 20'. Maximum scale 1" = 100'.
10. When a phase of a subdivision is completed, a location sketch of entire subdivision with said phase outlines shall appear on plans.
11. Contour lines are acceptable as long as they are faint and do not interfere with or overpower details on the drawing.
12. Out lots should be so noted.
13. Contractor's name, address and phone number should be on the As-Built.
14. As-Built sewer plans shall show by appropriate dimensions the location of all plugged stubs to the nearest foot.
15. The As-Built drawings must be run from tracings which have been corrected to show all field changes made to the approved drawings. No hand-drawn or marked-up construction plans will be accepted as As-Built or record drawings.
16. The As-Built drawings shall include at a minimum a site plan as well as plan and profile sheets.
17. The As-Built drawings must be sharp, clear, clean and legible, and must be suitable for filming as permanent records.
18. Electronic copies of all as-built drawings, plans, etc. must be submitted to the City of Cumming. These electronic files must be submitted on a high-quality data CD and in AutoCAD format.

15. Temporary Soil Erosion and Sediment Control

A. Temporary erosion and sedimentation controls shall meet the requirements of the Georgia Erosion and Sedimentation Act of 1975 (as amended) and local soil erosion and sedimentation control ordinances. The Contractor shall acquire land disturbance permits from the City of Cumming and/or Forsyth County or other appropriate governing authority, and shall pay any fees for said permits. The Contractor shall be responsible for submitting to the City and/or County sufficient documents such that the City and/or County can acquire approval from the Soil and Water Conservation District. All fines imposed for improper erosion and sedimentation control shall be paid by the Contractor. A copy of the local soil erosion

and sedimentation control ordinances is available.

B. Description and working drawings shall indicate controls which will ensure that drainage from job site areas which will be denuded, stripped or modified of its natural existing or artificially established stabilization or protection against erosion shall pass through some type of filter system before being discharged. These areas shall be kept sufficiently moist to control dust.

C. Silt dams, traps, barrier, and appurtenances shall be installed, and shall be maintained in-place until no longer needed, and then removed. Hay bales that deteriorate, and filter stone which becomes dislodged shall be replaced with new materials. Detention ponds, if constructed, shall be maintained in a condition that will ensure that unfiltered water will not leave the pond. Materials used in temporary erosion and sedimentation control shall meet the following requirements.

1. Silt fence shall meet the requirements of Section 171 - Temporary Silt Fence of the Department of Transportation, State of Georgia, Standard Specification, latest edition. Silt fence fabric must be on the Georgia Department of Transportation Qualified Product List.

2. Hay bales shall be clean, seed-free cereal hay type.

3. Netting shall be 2-inch, galvanized steel, chicken wire mesh. Netting stakes shall be either steel rods not smaller than 2-inch diameter, or shall be fir, southern pine or hemlock.

4. Filter stone shall be crushed stone conforming to Georgia Department of Transportation Table 800.01 H, Size Number 3.

D. Clean up and grassing operations shall be maintained with 2,000 feet of the pipe-laying operation and shall occur within seven days after pipe has been installed. Clean up and grassing shall be required daily during seasonal rain periods and on all cut & fill slopes and drainage areas. Grassing of cut & fill slopes shall conform to the Georgia Department of Transportation Standard Specification, latest edition.

E. Land disturbance activity shall not commence until the Land Disturbance Permit is issued and erosion control measures are in place.

16. Construction within State Highways, County Roads, and City Streets.

A. All storage of materials, excavation, backfilling, pavement removal and replacement, clean up and grassing shall be in strict accordance with the applicable State, County, or City regulations. It shall be the Contractor's responsibility to determine the exact requirements of the authority having jurisdictions over the right-of-way and no extra compensation will be allowed the Contractor for meeting such requirements. No highway, road, or street shall be closed to traffic without

authorization from the proper authority. The Contractor shall provide suitable lights, signs, barricades, and flagmen to insure the safety of pedestrians, vehicle traffic, and workers and to protect the work.

B. The Contractor shall coordinate the closing of any street at least 72 hours in advance with the Department of Utilities at 770-781-2020.

Note: Prior approval from the following agencies is required if working within their permitted or maintained right-of-way.

City of Cumming Street Department.	770-781-2010
City of Cumming Police Dept.	770-781-2000
Department of Utilities Construction Inspection	770-781-2020
Forsyth County Engineer	770-781-2165
State of Georgia DOT – Gainesville Office	770-532-5500

C. The Contractor shall provide, erect and maintain all necessary barricades, suitable and sufficient lights and other traffic control devices; shall provide qualified flagmen where necessary to direct traffic; shall take all necessary precautions for the protection of the work and the safety of the public.

D. Construction traffic control devices and their installation shall be in accordance with the current Georgia "Manual of Uniform Traffic Control Devices for Streets and Highways."

E. Placement and removal of construction traffic control devices shall be coordinated with the Georgia Department of Transportation, Forsyth County, and/or the City of Cumming a minimum of 48 hours in advance.

F. Placement of construction traffic control devices shall be scheduled ahead of associated construction activities. Construction time in street right-of-way shall be conducted to minimize the length of time traffic is disrupted. Construction traffic control devices shall be removed immediately following their useful purpose. Traffic control devices used intermittently, such as "Flagmen Ahead", shall be removed and replaced when needed. When working within State Highway right-of-way, provide trained and certified flag people who have completed a training program approved by the State of Georgia.

G. The City shall obtain a permit from the Georgia DOT for all work performed in Georgia DOT ROW. The contractor shall maintain a copy of the permit at all times on the work site and shall comply with all provisions of the document. The contractor shall contact the DOT prior to start of construction.

SECTION VI: Standard Drawings of Typical Details

- S-1 Utility Location Within Right-Of-Way Subdivision
- S-2 Sewer Service Lateral
- S-3 Typical Dry Sewer Service Line Termination
- S-4 Dry Service Line Installation
- S-5 Standard Manhole
- S-6 Outside Vertical Drop
- S-7 Standard Manhole In Pavement
- S-8 Standard Manhole--Outfall Line
- S-9 Standard Shallow Manhole
- S-10 Standard Manhole Steps
- S-11 Vented Manholes
- S-12 Manhole Frame and Cover
- S-13 Bedding Details for D.I. & PVC Pipe and Trench Detail for Rock
- S-14 Casing/Pipe Support Installation
- S-15 Concrete Encasement Detail
- S-16 Pavement Cut Repairs Type "A", "B", & "C"
- S-17 Sediment Barrier Erosion Control Hay Bale
- S-18 Sediment Barrier Erosion Control Silt Fence
- S-19 Sediment Barrier Erosion Control Silt Fence
- S-20 Erosion Control: Check Dams
- S-21 Creek Crossings
- S-22 Typical Grease Interceptor

- S-23 Typical Grinder Pump System
- S-24 Grinder Pump Check Valve at Force Main
- S-25 Sewer Notes
- S-26 Typical Grinder Pump 2