PEACHTREE CITY
WATER AND SEWERAGE AUTHORITY
STANDARDS AND SPECIFICATIONS

August 31, 2015

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1.1 General Provisions

1.1.1 Authority and Title

1.1.1.1 Authority

These Standards and Specifications are adopted by the Peachtree City Water and Sewerage Authority under the authority of the Constitution of the State of Georgia.

1.1.1.2 Title

These regulations shall be known as "Peachtree City Water and Sewerage Authority Standards and Specifications," and may be referred to generally as "Standards and Specifications."

1.1.2 Purpose and Intent

The purpose of this document is to set forth the policies, procedures, design requirements, material requirements, and construction requirements of the Peachtree City Water and Sewerage Authority for the design, installation, and construction of sanitary sewerage systems. It is intended that these Standards and Specifications will provide guidance for the design of sanitary sewerage systems and will protect and promote the health, safety, and welfare of the general public as it relates to sanitary sewerage systems.

1.1.3 Variance

Any variance from these Standards and Specifications shall be approved in writing by the Peachtree City Water and Sewerage Authority.

1.1.4 Amendments and Revisions

The Peachtree City Water and Sewerage Authority shall amend and/or revise these "Standards and Specifications" whenever it is determined to be necessary in order to improve the performance and integrity of the sanitary sewerage systems.

1.2 Definitions

ACI – American Concrete Institute

ANSI – American National Standards Institute

ASTM – American Society for Testing and Materials

AWWA – American Water Works Association

Contractor – Any individual, firm, or corporation with whom a contract is made by the developer or the PCWASA for the purpose of constructing the sanitary sewerage systems described herein.

Developer – Any individual, firm, or corporation who contracts with a contractor to construct a sanitary sewerage system.

Developer Engineer – The engineer or land surveyor who is hired by the Developer and is in responsible charge of the sanitary sewerage system design. Developer's engineer or land surveyor shall be licensed by the Georgia State Board of Registration for Professional Engineers and Land Surveyors.

DIP – Ductile Iron Pipe

DIPRA – Ductile Iron Pipe Research Association

Domestic Wastewater – Wastewater from sanitary fixtures such as toilets and urinals.

Food Service Facility – Any facility which cuts, cooks, bakes, prepares, or serves food, or which disposes of food related wastes.

GIS – Geographic Information System

GPD – Gallons per day

GPM – Gallons per minute

Grease – A material composed primarily of fats, oil, and grease from animal or vegetable sources. The terms fats, oil, and grease shall be deemed as Grease by definition. Grease may also include petroleum based products.

HDPE – High density polyethylene

PCWASA – Peachtree City Water and Sewerage Authority

PCWASA Engineer – The Peachtree City Water and Sewerage Authority's engineer or authorized representative.

PCF – Pounds per cubic foot

PSI – Pounds per square inch

PVC – Polyvinyl chloride

Sanitary Sewer Lateral – A pipe that extends from a sanitary sewer main to the public street right-of-way or easement for the purpose of providing sewer service to a parcel.

Sanitary Sewer Main – A gravity sewer line which has one or more sanitary sewer laterals connected to it.

SCADA – Supervisory Control and Data Acquisition System

1.3 General Sanitary Sewerage System Requirements

1.3.1 Sanitary Sewer Requirements

Sanitary sewers are required for all new single family, multi-family, commercial, institutional, and industrial developments where sanitary sewerage service is available. Sanitary sewerage service shall be considered "available" when a gravity sewer runs within 100-feet of the property line. An exception to this requirement is for single family homes constructed on lots 1-acre and larger which may utilize septic tanks if approved by the Peachtree City Planning Department and the Fayette County Health Department.

1.3.2 Sewer Availability

Prior to preparing and submitting construction plans for a sanitary sewerage system, the Developer/Owner shall notify the PCWASA of the proposed development. One or more meetings, as required, shall be conducted with PCWASA to determine if there is sewer availability for the proposed development. A proposed development that would cause the existing sanitary sewerage system to exceed PCWASA or Georgia EPD limits, or would adversely affect the system, will not be connected to the PCWASA sanitary sewerage system.

Information that shall be submitted to the PCWASA when inquiring about sewer availability includes the following.

- A Letter of Intent that clearly states the proposed use of the development and the estimated time period for construction.
- A Preliminary Site Plan that clearly presents the following minimum information.
    - Location of proposed development (identify all adjacent roads that will be used to access proposed development).
    - Overall size of proposed development.
    - Land Lot(s) and District(s) that the proposed development is located in.
    - Current and proposed zoning classification.
    - Proposed lot layout (identify total number of proposed lots).
    - Topography
    - Show existing sanitary sewer line sizes and locations. If an extension of the sanitary sewerage system is required, a preliminary route of the proposed extension shall be provided. Preliminary profiles of a proposed sanitary sewer extension may be required.
    - Preliminary Site Plan shall be dated and the date shall correspond with the submittal to the County or City.
    - A statement of whether or not the property is located within a protected watershed as defined by the Peachtree City Code of Ordinances and/or the Fayette County Watershed Protection Ordinance.
    - If the property is located within a protected watershed, include proposed minimum lot sizes, estimate of impervious surface area, required stream buffers, and statement of whether or not the property is within the Water Quality Critical area.
- Any additional information that the PCWASA Engineer determines is necessary in order to determine sewer availability.

If it is determined that sewer capacity is available, a Sewer Availability Letter will be issued. Sewer Availability Letters are valid for twelve (12) months. If no development activity commences within twelve (12) months after issuance of the Sewer Availability Letter, the letter shall become invalid and the applicant shall be required to submit a new application. If the applicant is unable to commence development within twelve (12) months of the issuance of the Sewer Availability Letter, a one-time

extension of six (6) months may be considered by the PCWASA. The request for extension must be in writing and must be received prior to the expiration of the original Sewer Availability Letter.

1.3.3 Sewer Responsibility

It shall be the responsibility of the Developer/Owner of the structure or structures being connected to the PCWASA sanitary sewer system to determine the elevation, grade, and alignment of sanitary sewer lines necessary to serve the structure(s) prior to constructing the structure, and to design and construct the connecting sewer in accordance with these Standards and Specifications.

1.3.4 Dry Sewers

Dry sewers shall be required for all new developments which sanitary sewer service is not currently available, but which is projected by the PCWASA to be available within 10 years from the date of application. If sanitary sewer service is not projected to be available within 10 years, the Developer/Owner shall provide an easement for future installation of sanitary sewer lines.

1.3.5 Underground Power

Where underground power service is present or proposed to be installed, the PCWASA reserves the right not to approve plans and specifications until the plans have been approved, in writing, by the power company.

1.3.6 Grease Traps and Sand Traps

All commercial food service facilities shall have a grease trap. All wastewater shall pass through the grease trap prior to being discharged in to the PCWASA sanitary sewerage system.

All dischargers whose wastewater contains large quantities of grit, sand and/or gravel shall have a sand trap. All wastewater shall pass through the sand trap prior to being discharged into the PCWASA sanitary sewerage system. The PCWASA Engineer will determine when a sand trap is required.

All car/truck wash systems shall have a sand trap. All wastewater shall pass through the sand trap prior to being discharged into the PCWASA sanitary sewerage system.

Commercial facilities such as hair salons and pet washing/grooming (inclusive of pet salons, veterinarian clinics, animal shelters, etc.) facilities shall (or may) be required to install an indoor (above floor or underneath slab) grease trap or outside grease interceptor whose wastewater contains grease.

Addendum (January 8, 2019)

Commercial facilities such as hair salons and pet washing/grooming (inclusive of pet salons, veterinarian clinics, animal shelters, etc.) facilities shall (or may) be required to install an indoor (above floor or underneath slab) grease trap or outside grease interceptor whose wastewater contains grease.

1.4 Plan Review and Approval Process

1.4.1 General

PCWASA only approves plans and specifications for the design and construction of the sanitary sewerage system portion of a development project. The Developer/Owner is responsible for obtaining all other required approvals and permits from other agencies prior to beginning construction.

Plan approval by the PCWASA Engineer does not relieve the Developer/Owner of his responsibility to comply with all applicable laws and regulations.

1.4.2 Plan Preparation

1.4.2.1 General

All sanitary sewerage system designs and plans shall conform to these standards and specifications.

1.4.2.2 Licensed Professionals

All sanitary sewerage system design and plan preparation shall be performed by a professional engineer who is knowledgeable in the design of sanitary sewage systems and who is licensed by the Georgia State Board of Registration for Professional Engineers and Land Surveyors.

Likewise, all structural, electrical, etc. design and plan preparation shall be performed by a professional engineer who is knowledgeable in the particular discipline and who is licensed by the Georgia State Board of Registration for Professional Engineers and Land Surveyors.

1.4.2.3 Reference Documents and Standards

The design of all sanitary sewerage systems shall conform to the Peachtree City Water and Sewerage Authority Standards and Specification and the following standards.

- American Concrete Institute (ACI) Standards, latest editions
- American National Standards Institute (ANSI) Standards, latest editions
- American Society for Testing and Materials (ASTM) Standards, latest editions
- American Water Works Association (AWWA) Standards, latest editions
- Georgia Department of Transportation (GDOT) Standard Specifications, latest editions
- *Recommended Standards for Wastewater Facilities, latest edition,* Great Lakes-Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers
- *Utility Accommodation Policy and Standards, latest edition,* Georgia Department of Transportation

When standards conflict with one another, the PCWASA Engineer shall determine the applicable standard.

1.4.2.4 CAD Requirements

PCWASA requires that Record Drawings be submitted prior to final acceptance of the sanitary sewerage system. Record Drawings shall be submitted on an external drive, flash drive, etc. and shall be in AutoCAD (.dwg), ESRI shapefile (.shp), and portable document (.pdf) formats.

1.4.2.5 Plan Requirements

Engineering plans shall be prepared on 22”x34” or 24”x36” sheets of paper.

All drawings shall be sealed and signed by a design professional licensed by the Georgia State Board of Registration for Professional Engineers and Land Surveyors.

Engineering plans shall contain the following drawings and information as applicable.

- Cover Sheet
  - Show project name
  - Show location map with street names, north arrow, and scale (minimum scale shall be 1" = 2000')
  - Show Developer/Owner's name, address, and telephone number
  - Show engineer's name, address, and telephone number
  - Show name and telephone number of a 24-hour contact person
  - State land lot number(s) and district number(s) of proposed development location
  - Georgia 811 logo
- Overall Site Plan Sheet(s)
  - Show north arrow and scale (minimum scale shall be 1" = 500')
  - Show property lines with bearings and distances
  - Show land lot lines and district lines
  - Show any jurisdictional (city or county) boundary lines
  - Show names of adjacent property owners
  - Show all existing and proposed structures, roads, etc.
  - Show all roads adjacent to and within proposed development
  - Show all streams, lakes, and wetland areas
  - Show all State waters located within 200 feet of the project site
  - Show all undisturbed buffers
  - Show a minimum of two (2) benchmarks referenced to the Georgia State Plain coordinate system for horizontal and vertical control
  - State the total acreage of the development
  - State the total disturbed acreage
  - State the acreage of contributing drainage basins to the proposed development
  - State the total number of lots or units in the proposed development
  - State the coordinate system that the design is referenced to
  - Georgia 811 logo
  - Table that identifies each lateral, its length, and its station
  - Table that identifies each manhole, its station, and the interior angle of the sewer passing through the manhole
  - Table that shows a tabulation of linear footage of sanitary sewers by size, number of manholes, and other items
- Grading Plan Sheet(s)
  - Show north arrow and scale (minimum scale shall be 1" = 50')
  - Show existing topography (in gray scale) and proposed topography with contour intervals in accordance with the following.

Ground Slope	Contour Interval
Flat (0% to 2%)	0.5 foot or 1 foot
Rolling (2% to 8%)	1 foot or 2 foot
Steep (greater than 8%)	2 foot, 5 foot, or 10 foot

  - Show existing and proposed spot elevations as required
  - Show clearing limits
  - Georgia 811 logo

- Sanitary Sewer System Plan Sheet(s)
  - Show north arrow and scale
  - Show proposed sewer line and manhole locations with staking information (include sewer line size and material)
  - Show all existing and proposed utilities
  - Show all stormwater drain lines and structures (include line size, material, and invert data)
  - Show all property lines, right-of-way lines, permanent easement lines, temporary easement lines
- Sanitary Sewer System Profile Sheet(s)
  - Show horizontal and vertical scale (minimum horizontal scale shall be 1" = 50'; minimum vertical scale shall be 1" = 20')
  - Show proposed sanitary sewer profile (include sanitary sewer size and material)
  - Show slope of each section of sanitary sewer
  - Show location of existing utilities that are crossing proposed sanitary sewer
  - Show "invert in," "invert out," and "rim" elevations for each proposed and existing manhole in profile
  - Show existing and proposed ground surface profile
  - Show approximate creek bottom elevation when lines are running adjacent to a creek
- Sanitary Sewage Lift Station Plan Sheet(s)
  - Show north arrow and scale
  - Show Top View of lift station with appropriate dimensions
  - Show Bottom View of lift station with appropriate dimensions
- Sanitary Sewage Lift Station Section Sheet(s)
  - Show pertinent elevation sections
  - Show pertinent dimensions
  - Show critical elevations (top of slab, bottom of wet well, etc)
  - Show pump control points (high level alarm, pump on, pump off, low level alarm, etc.)
  - Show pump curve and system head curve
  - Show pump design point
- Sanitary Sewer Force Main Plan Sheet(s)
  - Show north arrow and scale (minimum scale shall be 1" = 50')
  - Show proposed sanitary sewer force main location with staking information (include force main size and material)
  - Show grading plan in gray scale
  - Show all existing utilities (in gray scale) and proposed utilities
  - Show all stormwater drain lines and structures in gray scale (include line size, material, and invert data)
  - Show all property lines, right-of-way lines, permanent easement lines, temporary easement lines
  - Show names of property owners and/or Parcel ID numbers
  - Show all State water buffers, wetland areas, and 100-year flood plain elevation
- Sanitary Sewer Force Main Profile Sheet(s)
  - Show horizontal and vertical scale (minimum horizontal scale shall be 1" = 50'; minimum vertical scale shall be 1" = 20')
  - Show proposed sanitary sewer force main profile (include force main size and material)
  - Show location of existing utilities that are crossing proposed sanitary sewer force main

  - Show existing and proposed ground surface profile
  - Show approximate creek bottom elevation when lines are running adjacent to a creek
- Standard Detail Sheet(s)
  - Use PCWASA standard details where applicable
  - Other standard details approved by PCWASA
  - Details of all special sewer joints and cross sections
  - Details of special appurtenances such as manholes, service connections, elevated sewers, piers, pipe bedding, special highway crossings, railroad crossings, etc.

1.4.2.6 Survey Datum

Survey data shall be geo-referenced to the State Plane Coordinate System, NAD 83, Georgia West Zone, US Survey Feet.

1.4.3 Plan Submittal

1.4.3.1 Plan Review Fees

The PCWASA charges a fee for the review of sanitary sewerage system plans and specifications. The current Plan Review Fee Schedule can be obtained by visiting the PCWASA web site at www.pcwasa.org.

Payment of the Plan Review Fee is due once plans are approved by PCWASA.

1.4.3.2 Plan Submittal Process

Construction plans and specifications for sanitary sewerage systems shall be submitted to the PCWASA. If the property that is to be developed has been rezoned, the Developer/Owner shall have obtained a Sewer Availability Letter prior to submitting construction plans and specifications for review.

The plan submittal process is as follows.

1. Developer's Engineer shall submit one (1) electronic copy of construction plans and specifications in portable document format (.pdf) to PCWASA for the initial review.

2. Upon receipt of the construction plans and specifications, PCWASA will review the plans and specifications for technical adequacy and conformance with these Development Standards and Specifications. PCWASA comments will be marked in red (Redline Comments) on the plans and/or specifications.

3. Developer's Engineer will be notified whether or not PCWASA has comments.

4. If there are comments, Developer's Engineer shall pick up the construction plans and specifications from PCWASA and address the Redline Comments. After the Redline Comments have been addressed, Developer's Engineer shall submit the number of revised sets of construction plans and specifications requested in the Redline Comments along with the original Redline Comments to PCWASA for subsequent review.

5. If and when there are no comments, Developer's Engineer shall submit two (2) full-size paper sets of plans and one (1) electronic copy in portable document format (.pdf) for final approval.

1.4.4 Expiration of Plan Approval

Plan approval is valid for twelve (12) months. Projects with approved plans that are not initiated within six (6) months of plan approval or projects that are initiated and then become inactive for a six (6) month period shall become invalid. If an approved plan becomes invalid, the PCWASA Engineer shall determine if the plan can be revalidated or if a new design is required.

1.4.5 Plan Modifications

Approved plans shall not be modified or deviated from unless approved in writing by the PCWASA Engineer.

1.5 Easements and Deeded Property

1.5.1 General

All sanitary sewerage system appurtenances that will be owned by the PCWASA and are not located in a public street right-of-way shall be located in a permanent easement or deeded property that has been conveyed to the PCWASA.

All sanitary sewage lift stations shall be located on property that is platted and deeded to the PCWASA. Any roads required to access the sanitary sewage lift station from the public street right-of-way shall be included as part of the platted and deeded property or given as an access easement at the discretion of the PCWASA Engineer.

PCWASA will not approve any sanitary sewerage system construction until all off-site easements and/or deeded property is conveyed to the PCWASA. A design must be submitted and approved before easement acquisition can begin.

1.5.2 Permanent Easements

A permanent easement is a right granted by an underlying property owner that entitles its holder to a specific use of the property in perpetuity.

1.5.2.1 "On-Site" Permanent Easements

"On-site" permanent easements are permanent easements which fall within the boundaries of the current phase of the development and are shown on the final plat. Permanent easements are conveyed by recording the Deed of Conveyance and final plat.

The Developer/Owner shall grant to the PCWASA, the exclusive right to construct, re-construct, operate, maintain, repair, replace, improve, alter, remove, relocate, and inspect sanitary sewerage systems that are situated over, across, and under the land wherein the sanitary sewerage system lies on the Developer/Owner's property.

1.5.2.2 "Off-Site" Permanent Easements

"Off-site" permanent easements are permanent easements which fall outside the boundaries of the current phase of the development and must be provided by the Developer/Owner on a PCWASA easement document for each property where an easement is required in order to install the sanitary sewerage system. Plans must be submitted and approved along with an easement plat for each property where an easement is required before the Developer/Owner obtains an easement from the property owner.

Permanent easements through property owned by the Developer/Owner, including sewer lines that will be included in later phases of the same project, shall be treated as routine "off-site" permanent easements.

"Off-site" permanent easements shall be negotiated and acquired by the Developer/Owner.

Sanitary sewerage system plans shall not receive final approval until all "off-site" permanent easements required for system completion are approved and acquired.

1.5.2.3 Permanent Easement Requirements

Permanent easements for gravity sewers and sanitary sewage force mains shall have a minimum width of 20 feet. The gravity sewer or sanitary sewage force main shall be located in the center of the permanent easement.

Permanent easements shall be accessible from the public street right-of-way. If access from a public street right-of-way is not available, permanent ingress/egress easement(s) shall be provided, as required, to provide PCWASA access to the sewer easement. A sufficient number of permanent ingress/egress easements shall be provided so that all portions of the sewer easement is accessible by the PCWASA from the public right-of-way. The PCWASA Engineer will review all proposed easements and deeded property and determine the number and location, if any, of permanent ingress/egress easements required. In some cases, deeded property may be required for ingress/egress in lieu of a permanent easement. The PCWASA Engineer will determine what is required.

The size and/or width of permanent easements may be increased or decreased at the discretion of the PCWASA Engineer.

1.5.3 Temporary Easements

A temporary easement is a right granted for a specific period of time and once it expires, the rights granted return to the property owner. Temporary easements are typically used for the stockpiling of dirt, the maneuvering of equipment, or the storage of materials.

Temporary easements must be provided by the Developer/Owner on a PCWASA Temporary Construction Easement document for each property where a temporary easement is required in order to install the sanitary sewerage system. Plans must be submitted and approved along with a temporary easement plat for each property where a temporary easement is required before the Developer/Owner obtains a temporary easement from the property owner.

Sanitary sewerage system plans shall not receive final approval until all temporary easements required for system completion are approved and acquired.

Temporary easements shall be of the size required to install the sanitary sewerage system.

The size and/or width of temporary easements may be increased or decreased at the discretion of the PCWASA Engineer.

1.5.4 Deeded Property

1.5.4.1 General

Deeded property is property that is platted and deeded to the PCWASA.

Deeded property must be provided by the Developer/Owner.

1.5.4.2 Deeded Property Requirements

The minimum size of deeded property associated with a sanitary sewage lift station is 100-feet by 100-feet square.

Sanitary sewage lift station plans shall not receive final approval until deeded property is approved and acquired.

The required size of the deeded property may be modified at the discretion of the PCWASA Engineer.

1.6 Installation

1.6.1 General

Sanitary sewerage systems shall be constructed by a PCWASA approved utility contractor.

Sanitary sewerage systems shall be constructed in accordance with PCWASA approved plans and specifications. A set of PCWASA approved plans shall be present on the job site whenever work is being performed on the sanitary sewerage system and the plans shall be made available to the PCWASA Inspector upon request.

Installation of sanitary sewerage systems shall not commence until PCWASA has granted final approval of the construction plans and specifications and the appropriate agency has issued a Development/Land Disturbance Permit.

1.6.2 Approved Utility Contractors

Utility contractors must be approved by the PCWASA prior to performing any work on the PCWASA sanitary sewerage system.

Prior to being approved, utility contractor must submit copies of their State Utility Contractor's License, insurance information, and references to PCWASA. Contractors will be granted temporary approval status until they have completed at least three (3) jobs for the PCWASA. After the contractor has completed at least three (3) jobs, the PCWASA Engineer will determine if the contractor will be placed on the Approved Contractor List.

1.6.3 Inspections

A PCWASA Inspector, under the direction of the PCWASA Engineer, will inspect the installation of the sanitary sewerage system, on a daily basis; during all phases of construction to ensure that the system is being constructed in accordance with the PCWASA approved plans and specifications.

All work shall be inspected prior to backfill. It is the Developer/Owner's and/or Contractor's responsibility to schedule inspections and verify that work has been inspected before it is backfilled. Any work that is backfilled prior to inspection shall be exposed when directed by the PCWASA Inspector.

The PCWASA Inspector will inform the Developer/Owner and/or Contractor when there are deficiencies in workmanship or when there are deviations from the approved plans and specifications. Developer/Owner and/or Contractor shall address the deficiencies in a timely manner as determined by the PCWASA Inspector. Failure to address deficiencies in a timely manner may result in the PCWASA issuing a Stop Work order. Failure to address deficiencies and/or disregarding a Stop Work order may result in additional fees and the sanitary sewerage system will not be permitted to connect to the PCWASA system.

Inspection by the PCWASA does not relieve the Developer/Owner and/or Contractor of their responsibility for constructing the sanitary sewerage system in accordance with the PCWASA approved plans and specifications.

1.6.4 Pre-Construction Meetings

Prior to beginning construction of any sanitary sewerage system, Developer/Owner and/or Contractor shall arrange a pre-construction meeting with the PCWASA Engineer. The pre-construction meeting shall be held prior to beginning construction.

The PCWASA Inspector will conduct a separate pre-construction meeting with field personnel prior to commencement of work.

1.6.5 Testing

Sanitary sewerage systems shall be tested at the expense of the Developer/Owner. Testing methods and practices shall be as specified in these Standards and Specifications.

1.6.6 Warranty

The Developer/Owner and/or Contractor shall warranty the sanitary sewerage system against all defects in materials and workmanship for a period of one (1) year after Final Acceptance. This warranty shall be backed by a one (1) year Letter of Credit.

During the warranty period, the Developer/Owner and/or Contractor shall be responsible for any damage to the sanitary sewerage system.

1.7 Connecting to the PCWASA System

Connection to the PCWASA sanitary sewerage system will only be allowed provided that the Developer/Owner and/or Contractor has complied with PCWASA policies and procedures and the sanitary sewerage system has been installed in accordance with the PCWASA approved plans and specifications.

The PCWASA Inspector shall be notified a minimum of 48-hours in advance of making a connection to the PCWASA sanitary sewerage system.

The PCWASA Inspector shall be present when the connection is made to the PCWASA sanitary sewerage system.

All materials, equipment, and methods used in making a connection to the PCWASA sanitary sewerage system shall be approved by the PCWASA Inspector.

After the connection has been made to the PCWASA sanitary sewerage system, the Developer/Owner's system shall be immediately valved-off or plugged until Final Acceptance of the system.

Any unauthorized connection or connection that is made without the presence of the PCWASA Inspector shall be subject to a fine and/or refusal of service.

Any noncompliant connection or any damage to the PCWASA system shall be repaired and/or replaced at the expense of the Developer/Owner and/or Contractor. Methods of repair and/or replacement shall comply with these Standards and Specifications.

1.8 Final Acceptance

1.8.1 General

Prior to Final Acceptance of the sanitary sewerage system for final platting, the PCWASA will make a final inspection after all pavement is installed and the Developer/Owner shall provide the following items to the PCWASA.

1. Deed of Conveyance
2. Contribution of Fixed Assets form
3. Lien waiver(s)
4. Corporate Owner's Affidavit
5. Corporate Contractor's Affidavit
6. Two-year Letter of Credit
7. Two (2) hard copies of the Record Drawings and one (1) digital copy of the Record Drawings
8. Two (2) hard copies of Final Plat and one (1) digital copy of the Final Plat
9. Sanitary sewer television inspection report and video
10. All required fees (recording fees, etc.)
11. Field corrections

1.8.2 Deed of Conveyance

A Deed of Conveyance is a legal document signed and sealed and delivered to effect a transfer of property and to show the legal right to possess it. A Deed of Conveyance shall be provided for all easements and property to be dedicated to the PCWASA.

1.8.3 Contribution of Fixed Assets Form

The Contribution of Fixed Assets form itemizes the public assets that are being dedicated to the PCWASA. This form shall only include "public" materials and appurtenances. "Private" materials and appurtenances shall not be included on the form. The Contribution of Fixed Assets form is included in Appendix B.

1.8.4 Lien Waivers

The PCWASA must ensure that all materials being dedicated as public assets have been paid for; therefore, a lien waiver shall be secured from each supplier that materials and/or equipment is purchased.

1.8.5 Owner's Affidavit

The PCWASA must ensure that all labor and materials required to construct a project have been paid for and that there are no liens on the property; therefore, the Developer/Owner shall prepare a Corporate or Individual Owner's Affidavit and submit it to the PCWASA. Corporate and Individual Owner's Affidavit forms are included in Appendix B.

1.8.6 Contractor's Affidavit

The PCWASA must ensure that the utility contractor has been paid in full and that there are no liens on the property; therefore, the utility contractor shall prepare a Corporate or Individual Contractor's Affidavit and submit it to the PCWASA. Corporate and Individual Contractor's Affidavit forms are included in Appendix B.

1.8.7 One-Year Letter of Credit

A Letter of Credit shall be provided to the PCWASA as a warranty for the materials and workmanship for the sanitary sewerage system. The term of the Letter of Credit shall be one (1) year and the amount of the Letter of Credit shall be 10 percent of the total cost of the labor and materials required to construct the sanitary sewerage system.

Prior to the expiration of the Letter of Credit, a warranty inspection will be conducted by the PCWASA. The Developer/Owner will be required to correct any deficiencies that are found. Upon satisfactory repair of any deficiencies that are found, the PCWASA will release the Letter of Credit.

A sample Letter of Credit is included in Appendix B.

1.8.8 Record Drawings

Record Drawings shall be submitted to the PCWASA prior to final acceptance of the sanitary sewerage system.

Record Drawings shall:

1. Be sealed and signed by a design professional licensed by the Georgia State Board of Registration for Professional Engineers and Land Surveyors;
2. Show all street names, right-of-way widths, easements, lot numbers and addresses, and location, size, and material of all sanitary sewerage system components;
3. Include a table that identifies each lateral, its length, and its station;
4. Include a table that identifies each manhole, its station, and the interior angle of the sewer passing through it; and
5. Be checked and signed by the PCWASA Inspector prior to final submittal.
6. "RECORD DRAWING" shall be shown in large, bold print on all drawings.

Submit two (2) full-size sets of Record Drawings and one (1) digital file.

1.8.9 Final Plat

Submit two (2) hard copies and one (1) digital file of the Final Plat. Digital file shall be prepared in accordance with PCWASA CAD standards.

1.8.10 Television Inspection Report and Video

All new sanitary sewer lines must be cleaned and television inspected to ensure that they are installed correctly and are clean prior to being placed into service. The PCWASA inspector must be present when the television inspection is conducted and a copy of the video inspection report must be submitted to the PCWASA.

Television inspection reports and videos shall be performed and presented in accordance with the National Association of Sewer Service Companies (NASSCO) standards. Use Pipeline Assessment and Certification Program (PACP) coding for pipelines and Manhole Assessment and Certification Program (MACP) coding for manholes.

1.8.11 Fees

All fees due to the PCWASA shall be paid in full.

1.8.12 Field Corrections

Prior to Final Acceptance, Developer/Owner and/or Contractor shall make all corrections to the sanitary sewerage system as directed by the PCWASA Inspector.

1.9 Sanitary Sewage Lift Stations

1.9.1 Ownership

In accordance with the Peachtree City Sewer Use Ordinance, no sanitary sewer lift station that serves two or more buildings shall be privately owned or maintained. All lift stations constructed or installed by a private individual or entity shall be dedicated to, and accepted by, the PCWASA for maintenance. The following shall be required before a lift station can be put in operation and the same accepted by the PCWASA.

1. Gravity flow sanitary sewer systems that flow into the lift station shall be designed and installed in accordance with these Standards and Specifications.
2. The lift station and the associated sanitary sewage force main shall be designed and installed in accordance with these Standards and Specifications.
3. The design of the gravity flow sanitary sewer line flowing into the lift station, the lift station, and the associated sanitary sewage force main shall be submitted to the PCWASA in accordance with these Standards and Specifications. Prior to construction and/or installation, the design of the gravity flow sanitary sewer line flowing into the lift station, the lift station, and the associated sanitary sewage force main shall be approved by the PCWASA.
4. Prior to acceptance of any lift station, or any gravity flow sewer line and sanitary sewer force main system, the PCWASA shall inspect the same to ensure that all applicable rules, regulations, and installation, design, and construction standards have been complied with.

SECTION 2 - DESIGN REQUIREMENTS

2.1 Gravity Flow Sanitary Sewer Systems

2.1.1 General

A. All gravity flow sanitary sewer systems that will be connected to the PCWASA sanitary sewage system shall be designed in accordance with these standards. Any deviation from these standards shall be approved in writing by the PCWASA Engineer.

2.1.2 Design Flow Rates

2.1.2.1 General

A. Sanitary sewer system shall be designed for the estimated build-out population of the drainage basin.

B. Sanitary sewers shall be designed and installed to the uppermost property line of the development being served.

2.1.2.2 Average Daily Flow Rates

A. The following Average Daily Unit Flow Rates shall be used in the design of sanitary sewerage systems.

Type of Facility	Unit of Flow	Unit Flow Rate (GPD)
Airport	Per Employee	25
Apartment (3 Bedroom)	Per Apartment	300
Apartment (2 Bedrooms)	Per Apartment	250
Apartment (1 Bedroom)	Per Apartment	200
Apartment Club House	Each	500
Center	Per Seat	10
Bar	Per Seat	50
Beauty/Barber Shop	Per Chair	50
Bowling Alley	Per Lane	125
Car Wash (Self Operating)	Per Bay	100
Car Wash (Automatic Bay)	Per Bay	200
Church	Per Seat	5
Coin Laundry	Per Machine	400
Commercial Laundry	Per Machine	640
County Club	Per Member	100
Day Care	Per Child	30
Fast Food	Per Seat	30
Hospital	Per Bed	200
Mobile Home (Single Wide)	Each	250
Mobile Home (Double Wide)	Each	300
Hotel/Motel	Per Room	100
Industrial/Manufacturing	Per Employee	35
Nursing Home	Per Bed	125
Office Space (Standard)	Per 1,000 ft^2	175
Office Space (Medical)	Per 1,000 ft^2	500
Residential (Single Family)	Per House	300
Restaurant	Per Seat	50
Retail	Per 1,000 ft^2	100
Service Station	Per Employee	25
School	Per Student	20

Type of Facility	Unit of Flow	Unit Flow Rate (GPD)
Stores/Shopping Center	Per 1,000 ft^2	100
Theater	Per Seat	5
Warehouse	Per 1,000 ft^2	25

2.1.2.3 Peak Hour Flow Rates

A. The Peak Hour Flow Rate for new residential developments shall be calculated using a peaking factor of 3.0.

B. The Peak Hour Flow Rate for new commercial developments shall be calculated using a peaking factor based upon the proposed use of the development. The minimum peaking factor shall be 2.0.

C. The Peak Hour Flow Rate for undeveloped areas shall be calculated using the following equation.

$$Q_{PHF} = Q_{ADF} \times \frac{18 + \sqrt{P}}{4 + \sqrt{P}}$$

Where:

Q_{PHF} = Peak Hourly Flow Rate

Q_{ADF} = Average Daily Flow Rate

P = Population in Thousands Based on 100 GPD/Capita

2.1.3 Hydraulics

A. Sanitary sewers shall be designed using Manning's equation.

$$Q = \frac{1.49}{n} (A)(r_h)^{2/3}\sqrt{S}$$

Where:

Q = Flow Rate, ft^3/s

n = Manning's Coefficient

A = Pipe Cross-Sectional Area, ft^2

r_h = Hydraulic Radius

S = Slope, ft/ft

B. The value of the Manning's Coefficient, n, shall be 0.013 for all pipe materials.

C. Sanitary sewers shall be designed to carry the Peak Hourly Flow Rate at 75 percent of the full depth (d/dFULL = 0.75).

D. Sanitary sewers shall be designed with a minimum velocity of 2 ft/s, flowing full, based on the Manning's equation and using a Manning's Coefficient of 0.013.

E. The following table presents the minimum allowable slopes for sanitary sewers; however, slopes greater than these are desirable.

Nominal Sewer Size	Minimum Slope in Feet per 100 Feet
8 inch	0.50
10 inch	0.28
12 inch	0.22
15 inch	0.15
16 inch	0.14
18 inch	0.12
20 inch	0.11
21 inch	0.10
24 inch	0.08
27 inch	0.07
30 inch	0.06
36 inch	0.05
42 inch	0.04
48 inch	0.04

F. The maximum slope of a gravity flow sanitary sewer shall be 15 percent unless approved by PCWASA.

G. Sanitary sewers with slopes greater than 20 percent shall be anchored with concrete anchors (dead-mans). The Developers design professional shall be responsible for calculating the size and spacing of the concrete anchors. Calculations shall be submitted to PCWASA.

H. The angle formed between the inlet sewer line and outlet sewer line in a manhole shall be greater-than or equal to 90° and less-than or equal to 270°.

I. Surcharging of manholes shall be prohibited.

2.1.4 Sanitary Sewer Size and Material

A. Minimum Sanitary Sewer Size

1. Sanitary Sewer Outfalls and Mains: 8” Diameter
2. Sanitary Sewer Service Laterals: 6” Diameter

B. Acceptable Sanitary Sewer Materials:

3. Ductile Iron Pipe (pressure class to be determined by engineer based on depth of cover)
4. SDR 26 PVC

C. Use ductile iron pipe when depth of cover is less than 3 feet or greater than 16 feet.

D. Use ductile iron pipe when slope of sewer line is greater-than or equal to 15 percent.

E. All creek crossings shall be ductile iron pipe.

F. All water line and storm water line crossings with less than 18-inches of clearance shall be ductile iron pipe.

2.1.5 Sanitary Sewer Location

A. Sanitary sewer lines located in the right-of-way shall be located as close to the center of the road as possible.

B. Sanitary sewer lines located in sanitary sewer easements shall be located in the center of the easement.

C. Sanitary sewer lines running parallel to an existing or proposed water line shall be located a minimum of 10 feet horizontally from the water line unless otherwise approved by the PCWASA Engineer. Distances shall be measured outside of pipe to outside of pipe.

D. Sanitary sewer lines that cross an existing or proposed water line shall have a minimum clearance of 18 inches vertically above or below the water line unless otherwise approved by the PCWASA Engineer. At water line crossings, the sanitary sewer line shall cross in the middle of one (1) full length of water line so that both pipe joints on the water line will be as far from the sanitary sewer line as possible. In cases where the PCWASA Engineer allows a vertical clearance of less than 18 inches, the first two joints on each side of the crossing shall be restrained and the pipe shall be protected as required by PCWASA.

2.1.6 Sanitary Sewer Bury Depth

A. Sanitary sewer lines shall have a minimum of 48" of cover as measured from top of pipe to ground surface. Where the ground surface above the sanitary sewer line is higher than the edge of pavement of the existing or proposed roadway, the minimum cover shall be measured from the top of pipe to the edge of pavement.

2.1.7 Sanitary Sewer Manholes

2.1.7.1 General

A. Sanitary sewer manholes shall be precast concrete structures with tongue and groove joints.

B. The minimum diameter of manholes shall be forty-eight (48) inches.

C. Manholes shall be provided with reinforced plastic manhole steps. Steps shall have a maximum spacing of twelve (12) inches.

D. Manholes shall have a minimum 0.10-foot drop from the influent invert to the effluent invert.

E. Manholes shall have a maximum inside drop of two (2) feet. Manholes that require a drop greater than two (2) feet shall be constructed with outside drops.

F. Manhole section joints shall be sealed using a preformed butyl joint seal.

G. Manhole joints shall be sealed watertight with an external rubber seal.

H. Pipe to manhole connections shall be sealed watertight using resilient connectors.

I. Use Details 101, 102, 103, 104, 105, and 106 when applicable.

2.1.7.2 Location and Spacing

A. Manholes shall be installed at the end of each line; at all changes in grade, size, or alignment; and at all intersections.

B. Maximum distance between manholes shall be 400 linear feet.

2.1.7.3 Rim Elevation

A. Manholes located in the street, in a sidewalk, or in a landscaped area shall have their lids installed flush with grade.

B. Manholes located outside of streets and sidewalks in non-landscaped areas shall have their lids installed a minimum of 2 feet above grade, unless otherwise approved by PCWASA.

2.1.7.4 Manhole Lids

A. Manhole lids shall have a minimum clear opening of 22-inches.

B. All manholes located outside of the pavement shall have bolt down, watertight lids.

2.1.8 Sanitary Sewer Service Laterals

A. All lots shall have a sanitary sewer service lateral stub.

B. Service lateral shall be low enough to serve the ground level floor and where possible, low enough to serve the basement.

C. Service laterals shall be installed to a minimum of 5 feet outside of the right-of-way or easement.

D. Minimum slope of a service lateral shall be 2 percent.

E. A separate and independent service lateral shall be provided for each building. An exception can be made to this design requirement when a building is located at the rear of another building and no private sewer is available or can be constructed to the rear building through an adjoining alley, courtyard, or driveway. In this case, the front building sewer may be extended to the rear building. This exception must be approved by the PCWASA Engineer.

F. Service laterals located in paved areas shall have their locations clearly marked by cutting a "^" in the curb and painting the "^" safety fluorescent green.

G. Service laterals located in non-paved areas and easements shall have their locations clearly marked by the extension of the service lateral for the lot.

H. Service laterals shall have a straight alignment.

I. Service laterals shall have a combination cleanout places at the property line or easement line.

J. Bedding for service laterals shall be the same as bedding for gravity sewers.

K. Service laterals shall have Mylar marking tape installed 1 foot below grade above the service lateral. The Mylar tape shall extend the entire length of the lateral from the structure to the main line.

L. Transition joints from ductile iron pipe to SDR 26 polyvinyl chloride pipe are acceptable on service laterals only.

M. Service laterals shall not cross other lot lines.

N. Service laterals shall not cross retention basins.

O. Service laterals shall not be connected to manholes unless approved by the PCWASA Engineer.

P. Service connection from the service lateral to the user shall be per Georgia State Plumbing Code and shall be installed by a licensed plumber.

Q. Use Detail 107 when applicable.

2.1.9 Corrosion Protection for Sanitary Sewer Systems

A. Manholes that that have a sanitary sewage force main discharging into them and manholes that are subject to corrosion shall be manufactured from corrosion resistant composite materials or

shall be standard concrete manholes lined with a fiberglass reinforced epoxy resin lining system or elastomeric polyurethane lining system.

B. The manhole that the sanitary sewage force main discharges into plus all manholes located within 1,600 feet downstream of the discharge manhole shall meet the requirements described above.

C. Existing manholes that exhibit corrosion and/or leaking shall be repaired using polyurethane grouts to stop infiltration and repair mortars to repair the structure prior to coating with a fiberglass reinforced epoxy resin lining system or elastomeric polyurethane lining system.

D. The sanitary sewer lines that connect these lined manholes shall be ductile iron pipe lined with PROTECTO 401 Ceramic Epoxy or PVC pipe.

2.1.10 Sanitary Sewer Flow Meters

A. All developments, both residential and non-residential, that generate an average daily flow rate of 100,000 GPD or more in flow shall provide a sanitary sewer flow meter in the last manhole before the flow leaves the development. The type of flow meter that is used shall be approved by PCWASA.

2.1.11 Jack and Bore Installations

A. Unless otherwise approved, sanitary sewer lines that cross a GDOT roadway, Fayette County DOT roadway, or railroad right-of-way shall be installed with cased jack and bores.

B. Use Detail 108 when applicable.

2.1.12 Creek Crossings

A. All pipe used in creek crossings shall be ductile iron.

B. All crossings shall be perpendicular to the creek unless otherwise approved.

C. A casing pipe that extends a minimum of 10 feet beyond the top of bank on each side shall be provided on all creek crossings.

D. The minimum depth of cover above the casing pipe shall be 12 inches.

E. Use Detail 109 when applicable.

2.1.13 Aerial Crossings

A. Aerial crossings shall be avoided whenever possible. All aerial crossings shall be pre-approved by PCWASA.

B. Any piping system that crosses a perennial or annual stream shall not cause an impedance to navigation or cause water to pool upstream of the pipe.

C. All pipe used in aerial crossings shall be ductile iron.

D. Aerial pipe supports shall be designed by a structural engineer licensed by the Georgia State Board of Registration for Professional Engineers and Land Surveyors.

E. Aerial pipe supports shall be situated on suitable soils. The soils on which an aerial support will be placed shall be tested by a soils testing company for bearing capacity and suitability for construction. A soils report shall be submitted with the construction plans and specifications.

2.1.14 Grease Traps and Sand Traps

A. Grease traps and sand traps used for restaurants and other eating establishments shall have a capacity of 15 gallons per seat, except that no grease trap shall be smaller than 1,500 gallons or larger than 3,000 gallons.

B. Grease traps and sand traps used for facilities other than restaurants and other eating establishments shall have a capacity that will provide a retention time of minimum 10 minutes and maximum 30 minutes at the peak 8-hour flow rate. Flow through velocities shall not exceed 1 foot per second at the peak 8-hour flow rate.

C. In cases where the temperature of the wastewater may prevent the solidification of the oil/grease, the PCWASA may require two grease traps in series. This requirement will be considered on a case-by-case basis.

D. Use Detail 112 when applicable.

2.1.15 Trenchless Sanitary Sewer Rehabilitation

A. Acceptable trenchless sanitary sewer rehabilitation methods

1. Pipe Bursting
2. Cured-in-Place

B. Pipe bursting shall be performed in accordance with the International Pipe Bursting Association (IPBA) *Guideline for Pipe Bursting*.

C. Reconstruction of pipeline and conduits using the cured-in-place pipe (CIPP) method shall be in accordance with ASTM F1216 and ASTM F1743.

2.2 Sanitary Sewage Force Mains

2.2.1 General

A. All sanitary sewage force mains that will be connected to the PCWASA sanitary sewage system shall be designed in accordance with these standards. Any deviation from these standards shall be approved in writing by the PCWASA Engineer.

2.2.2 Hydraulics

A. Sanitary sewage force mains shall be designed to have a minimum velocity of 2.5 ft/s and a maximum velocity of 6 ft/s. The minimum velocity in the force main when all pumps are operating shall be 3.5 ft/s.

2.2.3 Force Main Size and Material

A. Minimum Sanitary Sewer Force Main Size: 4" Diameter, unless otherwise approved by the PCWASA Engineer.

B. Acceptable Sanitary Sewer Force Main Materials:

1. Pressure Class 350 Ductile Iron Pipe and Fittings
2. High Density Polyethylene (HDPE) Pipe and Fittings
3. C900 Polyvinyl Chloride (PVC) Pipe with Ductile Iron Fittings

2.2.4 Force Main Location

A. Sanitary sewage force mains located in the right-of-way shall be located 5 feet inside the right-of-way and on the opposite side of the road as the water line whenever possible.

B. Sanitary sewage force mains located in sanitary sewer easements shall be located in the center of the easement.

C. Sanitary sewage force mains shall be located a minimum of 10 feet horizontally from any existing or proposed water main and 18 inches vertically below any existing or proposed water main. Distances shall be measured outside of pipe to outside of pipe.

D. Sanitary sewage force mains running parallel to an existing or proposed water line shall be located a minimum of 10 feet horizontally from the water line unless otherwise approved by the PCWASA Engineer. Distances shall be measured outside of pipe to outside of pipe.

E. Sanitary sewage force mains that cross an existing or proposed water line shall have a minimum clearance of 18 inches vertically above or below the water line unless otherwise approved by the PCWASA Engineer. At water line crossings, the sanitary sewage force main shall cross in the middle of one (1) full length of water line so that both pipe joints on the water line will be as far from the sanitary sewage force main as possible. In cases where the PCWASA Engineer allows a vertical clearance of less than 18 inches, the first two joints on each side of the crossing shall be restrained and the pipe shall be protected as required by PCWASA.

F. A permanent marker shall be installed along the sanitary sewage force main at 250-foot intervals, at all changes in direction, and at all locations where the force main leaves the right-of-way. Use Detail 113 when applicable.

G. Tracer wire and marking tape shall be installed on all HDPE sanitary sewage force mains.

2.2.5 Force Main Bury Depth

A. Sanitary sewage force mains shall have a minimum of 48" of cover as measured from top of pipe to ground surface. Where the ground surface above the sanitary sewage force main is higher than the edge of pavement of the existing or proposed roadway, the minimum cover shall be measured from the top of pipe to the edge of pavement.

2.2.6 Isolation Valves

A. All valves on sanitary sewage force mains shall be eccentric plug valves.

2.2.7 Combination Air/Vacuum Valves

A. Combination air/vacuum valves shall be provided at all locations along the sanitary sewage force main deemed appropriate as determined by the design engineer.

B. Combination air/vacuum valve locations are subject to review by the PCWASA.

C. Combination air/vacuum valves shall be sized in accordance with the manufacturer's recommendations.

D. Use Detail 114 when applicable.

2.2.8 Thrust Restraint

A. All fittings, valves, and dead-ends shall have two (2) forms of thrust restraint.

B. All pipe joints shall be restrained as required.

C. Acceptable thrust restraint includes restrained joint glands, field lock gaskets, threaded rods, and concrete blocking.

D. Sanitary sewage force mains shall be restrained, as required, using restrained joint type gaskets. The design engineer shall be responsible for calculating the length of pipe from each fitting that requires restrained joints. Calculations shall be submitted to PCWASA.

E. Use Details 115 and 116 when applicable.

2.2.9 Jack and Bore Installations

A. Unless otherwise approved, sanitary sewage force mains that cross a GDOT roadway, Fayette County DOT roadway, or railroad right-of-way shall be installed with cased jack and bores.

B. Use Detail 108 when applicable.

2.2.10 Creek Crossings

C. All pipe used in creek crossings shall be ductile iron.

D. All crossings shall be perpendicular to the creek unless otherwise approved.

E. A casing pipe that extends a minimum of 10 feet beyond the top of bank on each side shall be provided on all creek crossings.

F. The minimum depth of cover above the casing pipe shall be 12 inches.

A. Use Detail 109 when applicable.

2.3 Sanitary Sewage Lift Stations

2.3.1 General

A. This section shall be used as a guideline for the design of sanitary sewage lift stations.

B. Lift stations will only be allowed when pre-approved by the PCWASA.

C. Lift stations are to be avoided whenever possible.

D. When sanitary sewage lift stations are required, the PCWASA reserves the right to design and construct the necessary lift station(s), with appropriate charges being made to the Developer/Owner. The PCWASA may elect to make the lift station larger than necessary to serve the development so that other property within the drainage basin may be served.

E. Pumps, motors, and associated lift station appurtenances shall be furnished as a package from a single manufacturer.

F. The sanitary sewage lift station shall include a standby power system and remote monitoring system as described below.

G. In addition to complete construction plans and specifications, the following information shall be submitted to the PCWASA Engineer as part of the sanitary sewage lift station design package.

1. Average and Peak Hour design flow rate calculations
2. Total Head calculations
3. System head curve plotted on the manufacturer's pump curve
4. Brake Horsepower (BHP) calculations
5. Net Positive Suction Head Available (NPSHA) calculations
6. Net Positive Suction Head Required (NPSHR) data
7. 100-year flood elevation at the proposed sanitary sewage lift station site
8. Minimum wet well volume calculations/pump cycle time calculations
9. Wet well buoyancy calculations

2.3.2 Hydraulics

A. Total head shall be calculated using the following equation.

$$TH = h_S + h_f + h_m + h_p + \frac{V^2}{2g}$$

Where:

h_S = Static Head, ft

h_f = Head Loss due to Friction, ft

h_m = Minor Head Losses, ft

h_p = Pressure Head, ft

$V^2/2g$ = Velocity Head, ft

V = Velocity of the fluid in the piping system, ft/s

g = Acceleration due to Gravity, 32.2 ft/s^2

B. Friction losses shall be calculated using the Hazen-Williams equation.

$$h_f = 10.44 \times \frac{Q^{1.85} \times L}{C^{1.85} \times d^{4.8655}}$$

Where:

h_f = Head Loss due to Friction, ft

Q = Flow Rate, GPM

L = Length of Pipe, ft

C = Hazen-Williams Coefficient

d = Inside Diameter of Force Main, inches

C. Minor head losses shall be calculated as a fraction of the velocity head.

$$h_m = K \times \frac{V^2}{2g}$$

Where:

h_m = Minor Head Loss, ft

K = Minor Loss Coefficient. The minor loss coefficient is the sum of the head loss coefficients for all of the minor loss elements in the piping system. Use standard published values for "K."

V = Velocity of the fluid in the piping system, ft/s

g = Acceleration due to Gravity, 32.2 ft/s^2

2.3.3 Location of Sanitary Sewage Lift Stations

A. The location of all sanitary sewage lift stations shall be coordinated with and approved by the PCWASA prior to beginning design.

B. Sanitary sewage lift stations shall be accessible during a 100-year storm event.

C. All mechanical components of the sanitary sewage lift station shall be located above the 100-year flood elevation.

D. All electrical components shall be located a minimum of 3 feet above the 100-year flood elevation.

2.3.4 Sanitary Sewage Lift Station Property and Access

A. Sanitary sewage lift stations shall be located on a minimum 100 foot by 100 foot piece of property. This property shall be platted and deeded to the PCWASA at no cost. PCWASA may require a larger piece of property depending on site conditions.

B. Any roads required to access the sanitary sewage lift station from the public street right-of-way shall be included as part of the platted and deeded property. The minimum width of the access property shall be 30 feet.

2.3.5 Lift Station Components

2.3.5.1 Pumps

A. Pumps shall be submersible, heavy duty sewage pumps.

B. A minimum of two (2) pumps shall be provided.

C. The sanitary sewage lift station shall be capable of pumping the Peak Hour flow rate with the largest pump out-of-service.

D. Pumps shall be capable of passing a 3" diameter sphere.

E. One (1) complete spare parts kit shall be provided with each pump.

2.3.5.2 Motors

A. Motors for submersible pumps shall be NEMA B design, induction type with squirrel cage rotor, shell type design, housed in an air filled, watertight chamber.

B. Motors shall operate on 480 Volt, 3 phase, 60 HZ power, and shall have a 1.15 service factor unless otherwise approved by PCWASA.

C. Motor shall be non-overloading at all points along the pump curve.

2.3.5.3 Piping

A. Piping inside the wet well, valve vault, and pump station property fence line shall be appropriately sized ductile iron pipe. Minimum diameter shall be four (4) inches.

B. A bypass connection shall be provided on the discharge header of the pump station. The size of the discharge connection shall be equal in size to the discharge connection of the pump, but no less than 4-inches.

2.3.5.4 Valves

A. Check Valves

1. A rubber flap type check valve shall be provided on the discharge of each pump and at other locations as required.

B. Plug Valves

1. An eccentric plug valve shall be provided on the discharge of each pump.
2. An eccentric plug valve shall be installed on the force main within the lift station property. Location to be coordinated with PCWASA.

2.3.5.5 Pressure Gauge

A. A pressure gauge shall be installed on the discharge header of the sanitary sewage lift station.

B. Above ground sanitary sewage lift stations shall have a combination pressure/vacuum gauge installed on the suction side of the pumps.

C. Pressure gauges shall be liquid filled and shall be provided with a diaphragm seal and isolation ball valve.

2.3.6 General Electrical Requirements

A. All wiring shall be in accordance with NEC standards.

B. All electrical components shall be mounted in NEMA 4X, Type 304 stainless steel enclosure(s).

C. Power shall be 480 V, 3-phase, 60 HZ unless otherwise approved by PCWASA.

2.3.7 Controls

A. Pump Controls

1. Pump controls shall be designed and provided by the pump manufacturer.
2. Control panels located in non-hazardous locations shall be NEMA 4X, Type 304 stainless steel. Control panels located in hazardous locations shall be NEMA 7, Type 304 stainless steel.
3. Controls shall be provided which will allow the pumps to be operated either manually or automatically.

B. Level Control

1. A submersible pressure transducer shall be used to measure the water level in the wet well and turn the pumps on and off.
2. A low level float switch and high level float switch shall be provided as an emergency backup to the submersible level transducer. A cable weight shall be provided with each float switch.

2.3.8 Backup Power System

A. All sanitary sewage lift stations shall be provided with a backup power system.

B. Backup power system shall be a diesel fuel driven generator. Diesel fuel driven generators shall be provided with a fuel storage tank that provides a minimum of 24 hours of operation.

C. Generator shall be sized to operate all pumps and appurtenances without exceeding 85 percent of the generators full capacity.

D. Generator shall have an acoustical enclosure that reduces the noise level to at least 75 dB at 3 feet.

E. Generators shall be provided with a platform that provides access to all entry points to the enclosure.

F. Generator shall have the manufacturer's standard equipment plus the following additional equipment.

1. Insulated fiberglass enclosure
2. Exterior flashing alarm light
3. Critical exhaust silencer
4. Inside insulated exhaust
5. Sound attenuation
6. Heater

2.3.9 Supervisory Control and Data Acquisition (SCADA) System

A. Sanitary sewage lift station shall be provided with a supervisory control and data acquisition (SCADA) system that communicates with the PCWASA. Specifications for the SCADA system are presented in Appendix C.

2.3.10 Wet Well

A. Circular wet wells shall have a minimum inside diameter of 72".

B. Rectangular wet wells shall be minimum 72" by 72" square.

C. The volume between the "Lead Pump On" elevation and the "Pump Off" elevation shall be calculated using the following equation.

$$V_{min} = \frac{Q \times t}{4}$$

Where:

V_{MIN} = Minimum Wet Well Volume, gallons

Q = Flow Rate of Largest Pump, GPM

t = Pump Cycle Time, minutes

D. The minimum pump cycle time, t, shall be 10 minutes (6 starts per hour). A longer pump cycle time, t, shall be used if required by the pump manufacturer.

E. The gravity sewer line that is connected to the sanitary sewage lift station shall not be included in the minimum wet well volume.

F. The distance from the bottom of the wet well to the "Pump Off" level shall be per the pump manufacturer's recommendation.

G. The distance between the "Lead Pump On" elevation and the "Lag Pump On" elevation shall be a minimum of six (6) inches.

H. The distance between the "Lag Pump On" elevation and the "High Level Alarm" shall be a minimum of six (6) inches.

I. The distance between the "High Level Alarm" and the invert of the gravity sewer line entering the wet well shall be a minimum of six (6) inches.

J. Wet well walls and piping shall be coated with a corrosion resistant coating system.

K. Wet well buoyancy calculations shall be prepared by the design engineer and submitted to PCWASA.

2.3.11 Fence and Gate

A. A six (6) foot tall chain link fence shall be installed around the lift station.

B. Fence shall have three (3) strands of barbed wire.

C. A sixteen (16) foot double gate (two 8-foot wide gate panels) shall be provided.

2.3.12 Security Light

A. A security light and light pole shall be provided.

2.3.13 Potable Water Service Line

A. A potable water service line shall be provided to the lift station property that terminates at a frost proof yard hydrant.

B. A reduced pressure zone (RPZ) backflow preventer shall be provided on the potable water line. RPZ backflow preventer shall be protected from freezing using a fiberglass enclosure with electric heating tape.

2.3.14 Landscape

A. Property outside of the fenced area shall be landscaped.

B. Install weed barrier fabric over all areas to receive landscaping.

C. Install evergreen shrubbery spaced no greater than five (5) feet apart around the fenced area. Shrubbery shall have a minimum height of three (3) feet at the time of planting and shall have a mature height of at least six (6) feet. Prepare soil and plant shrubbery in accordance with shrubbery planting instructions.

D. Install wood mulch, free of dirt, around shrubbery and to the edge of the property. Mulch shall have a minimum depth of three (3) inches.

SECTION 3 - MATERIAL SPECIFICATIONS

3.1 General

A. All materials and equipment used on sanitary sewerage systems shall be new.

3.2 Ductile Iron Pipe and Fittings

A. Ductile iron pipe shall meet the following specifications:

1. Ductile Iron Pipe:

   a. Ductile iron pipe shall be designed and manufactured in accordance with ANSI/AWWA C150/A21.50 and ANSI/AWWA C151/A21.51.
   b. Ductile iron used to manufacture ductile iron pipe shall meet the following minimum physical properties.

      1) Minimum Tensile Strength – 60,000 PSI
      2) Minimum Yield Strength – 42,000 PSI
      3) Minimum Elongation – 10 percent

   c. Ductile iron pipe thickness shall be in accordance with ANSI/AWWA C150/A21.50.

      1) 4-inch through 12-inch ductile iron pipe shall be Pressure Class 350.
      2) Greater than 12-inch ductile iron pipe shall be minimum Pressure Class 250.

2. Joints:

   a. Buried Pipe:

      1) Push-on joints in accordance with ANSI/AWWA C111/A21.11.

   b. Non-Buried Pipe:

      1) Flanged joints in accordance with ANSI/AWWA C115/A21.15.

3. Gaskets:

   a. Standard Push-on Joints:

      1) Plain rubber gasket in accordance with ANSI/AWWA C111/A21.11.

   b. Restrained Push-on Joints:

      1) Plain rubber gasket with restraining teeth meeting the requirements of ANSI/AWWA C111/A21.11.
      2) Acceptable manufacturers of restrained joint gaskets:

         a) American Ductile Iron Pipe Company Fast-Grip Gasket
         b) McWane SURE STOP 350 Gasket
         c) U.S. Pipe FIELD LOK 350 Gasket
         d) PCWASA Approved Equal

   c. Flanged Joints:

      1) Sewer Service

a) Full face, 1/8" thick, molded, high-quality SBR rubber in accordance with ANSI/AWWA C115/A21.15, Appendix A, Section A2 with a service temperature of 150 °F.

2) Air Service

a) Full face, 1/8" thick molded, high-quality FKM rubber in accordance with ANSI/AWWA C115/A21.15, Appendix A, Section A2 with a service temperature of 300 °F.

3) Acceptable manufacturers:

a) American Ductile Iron Pipe Company – Toruseal Flange Gasket
b) U.S. Pipe and Foundry Company – Flange/Tyte Gasket
c) PCWASA Approved Equal

4. Hardware:

a. Flanged Joints:

1) Bolts shall be ASTM A193, Grade B8, Type 304 Stainless Steel, heavy hex.
2) Nuts shall be ASTM A194, Grade 8, Type 304 Stainless Steel, heavy hex.

5. Coatings:

a. Buried Pipe:

1) Interior:

a) Non-corrosive conditions: Standard thickness cement-mortar in accordance with ANSI/AWWA C104/A21.4.
b) Corrosive conditions: PROTECTO 401 Ceramic Epoxy in accordance with ASTM A716/A746.

2) Exterior:

a) Asphaltic coating in accordance with ANSI/AWWA C151/A21.51.

b. Non-Buried Pipe:

1) Interior:

a) Non-corrosive conditions: Standard thickness cement-mortar in accordance with ANSI/AWWA C104/A21.4.
b) Corrosive conditions: PROTECTO 401 Ceramic Epoxy in accordance with ASTM A716/A746.

2) Exterior:

a) Universal primer

B. Ductile iron fittings shall meet the following specifications:

1. Ductile Iron Fittings:

a. Standard ductile iron fittings shall be designed and manufactured in accordance with ANSI/AWWA C110/A21.10.
b. Compact ductile iron fittings shall be designed and manufactured in accordance with ANSI/AWWA C153/A21.53.

c. Ductile iron used to manufacture ductile iron fittings shall meet the following minimum physical properties.

1) Minimum Tensile Strength – 70,000 PSI
2) Minimum Yield Strength – 50,000 PSI
3) Minimum Elongation – 5 percent

2. Joints:

a. Buried Fittings:

1) Mechanical joints in accordance with ANSI/AWWA C111/A21.11.
2) Mechanical joints that require restraining shall be restrained with wedge type mechanical joint retainer glands for ductile iron pipe. Retainer glands shall be manufactured from high strength ductile iron in accordance with ASTM A536, Grade 65-45-12. Retainer gland dimensions shall be in accordance with ANSI/AWWA C111/A21.11 or ANSI/AWWA C153/A21.53.
3) Acceptable manufacturers of retainer glands:

a) Mega-Lug Series 1100
b) Sigma ONE-LOK Series D-SLDE
c) Uni-Flange Series 1400
d) PCWASA Approved Equal

b. Non-Buried Fittings:

1) Flanged joints in accordance with ANSI/AWWA C110/A21.10.

3. Gaskets:

a. Mechanical Joints:

1) Plain rubber mechanical joint gasket in accordance with ANSI/AWWA C111/A21.11.

b. Flanged Joints:

1) Sewer Service

a) Full face, 1/8” thick, molded, high-quality SBR rubber in accordance with ANSI/AWWA C115/A21.15, Appendix A, Section A2 with a service temperature of 150 °F.

2) Air Service

a) Full face, 1/8” thick molded, high-quality FKM rubber in accordance with ANSI/AWWA C115/A21.15, Appendix A, Section A2 with a service temperature of 300 °F.

3) Acceptable manufactures:

a) American Ductile Iron Pipe Company – Toruseal Flange Gasket
b) U.S. Pipe and Foundry Company – Flange/Tyte Gasket
c) PCWASA Aproved Equal

4. Hardware:

a. Mechanical Joints:

1) Bolts shall be low carbon steel, zinc plated, tee-head bolts in accordance with ANSI/AWWA C111/A21.11.
2) Nuts shall be low carbon steel, zinc plated in accordance with ANSI/AWWA C111/A21.11.

b. Flanged Joints:

1) Bolts shall be ASTM A193, Grade B8, Type 304 Stainless Steel, heavy hex.
2) Nuts shall be ASTM 194, Grade 8, Type 304 Stainless Steel, heavy hex.

5. Coatings:

a. Buried Fittings:

1) Interior:

a) Non-corrosive conditions: Double thickness cement-mortar in accordance with ANSI/AWWA C104/A21.4.
b) Corrosive conditions: PROTECTO 401 Ceramic Epoxy in accordance with ASTM A716.A746.

2) Exterior: Asphaltic coating in accordance with ANSI/AWWA C151/A21.51.

b. Above Grade (Non-Buried) Fittings:

1) Interior:

a) Non-corrosive conditions: Double thickness cement-mortar in accordance with ANSI/AWWA C104/A21.4.
b) Corrosive conditions: PROTECTO 401 Ceramic Epoxy in accordance with ASTM A716.A746.

2) Exterior:

a) Universal primer

C. All ductile iron pipe and fittings used on a project shall be new and shall be the product of a single manufacturer, unless otherwise approved by the PCWASA Engineer.

D. Acceptable manufacturers of ductile iron pipe and fittings:

1. American Cast Iron Pipe Company
2. McWane, Inc.
3. U.S. Pipe and Foundry Company
4. PCWASA Approved Equal

3.3 Casing Pipe

A. Steel casing pipe for boring and jacking, open cut installation or micro-tunneling, shall be new longitudinal, electric fusion welded pipe in accordance with ASTM A139, Grade B.

1. Minimum Tensile Strength: 60,000 PSI
2. Minimum Yield Strength: 35,000 PSI
3. Minimum Elongation in 2 Inches: 30%

B. Minimum Wall Thickness

1. ≤18” Diameter Pipe: 0.25”

2. 20” Diameter Pipe: 0.3125”
3. 26” Diameter Pipe: 0.375”
4. 28” Diameter Pipe: 0.4375”
5. 30” Diameter Pipe: 0.4375”
6. ≥36” Diameter Pipe: 0.5”

3.4 Casing Spacers

A. Panel and riser shall be Type 304 stainless steel.

B. Band liner shall be 0.09 inches thick elastomeric PVC, with a Durometer “Shore A” hardness of 85-90 and a minimum 58,000 volt dielectric strength in accordance with ASTM D149.

C. Runners shall be glass reinforced polymer (nylon) or ultra-high molecular weight (UHMW) polyethylene.

D. Acceptable Manufacturers:

1. Advance Products & Systems, Inc., Model SSI
2. Cascade Water Works Manufacturing Company, Model CCS
3. GPT Inddustries (Link-Seal), Model S
4. Power Seal Corporation, Model 4810
5. PCWASA Approved Equal

3.5 Polyethylene Encasement (Wrapping)

A. Polyethylene encasement material shall be minimum 8-mil, linear low density, flat tube, virgin polyethylene film in accordance with ANSI/AWWA C105/A21.5.

B. Polyethylene encasement shall have the following properties.

1. Tensile Strength: Minimum 3,600 PSI
2. Elongation: Minimum 800%
3. Dielectric Strength: Minimum 800 V/mil
4. Impact Resistance: Minimum 600 grams
5. Propagation Tear Resistance: Minimum 2,550 grams force

C. Polyethylene encasement shall be marked with the following information.

1. Year of manufacture
2. Type of resin
3. Specification conformance
4. Applicable pipe sizes

D. Color of polyethylene encasement shall be green.

E. Securing tape shall be 2-inch wide PVC pipe tape, minimum 10 mil thickness, 245-percent elongation, and 30 PSI tensile strength.

3.6 Copper Tubing for Water Service Lines

A. Buried services line shall be Type K, seamless copper tubing in accordance with ASTM B88.

B. All above grade (non-buried) service lines shall be Type K, copper pipe in accordance with ASTM B88.

3.7 PVC Pipe for Gravity Sanitary Sewers

A. Polyvinyl chloride (PVC) gravity sewer pipe 8" to 15" in diameter shall be SDR 26 in accordance with ASTM D3034.

B. PVC gravity sewer pipe 18" in diameter and greater shall be minimum PS 46 in accordance with ASTM F679.

C. PVC shall meet the requirements of Cell Classification 12454-B in accordance with ASTM D1784.

D. PVC gravity sewer pipe joints shall be Bell and Spigot type in accordance with ASTM D3212.

E. Gaskets for PVC gravity sewer pipe shall be plain rubber gaskets in accordance with ASTM F477.

F. PVC gravity sewer pipe shall be colored green.

3.8 High Density Polyethylene (HDPE) Pipe for Pipe Bursting of Gravity Sewer

A. Polyethylene pipe shall be made from HDPE material having a material designation code of PE4710. The material shall meet the requirements of ASTM D 3350, have a minimum cell classification of PE445574, and be listed as meeting NSF-61.

B. Pipe pressure class shall be minimum DR-17.

C. HDPE pipe for pipe bursting shall be colored gray.

D. Approved manufacturers are:

1. Asahi/American, Inc.
2. ISCO Industries. LLC
3. JM Eagle
4. PCWASA Approved Equal

3.9 Sanitary Sewage Force Mains

3.9.1 High Density Polyethylene (HDPE) Pipe

A. Polyethylene pipe shall be made from HDPE material having a material designation code of PE4710. The material shall meet the requirements of ASTM D 3350, have a minimum cell classification of PE445574, and be listed as meeting NSF-61.

B. Pipe and fittings shall be ductile iron pipe size (DIPS) in accordance with ASTM F714 and AWWA C906.

C. Pipe pressure class shall be as specified by the Engineer but shall be minimum DR-11.

D. Fittings shall be Butt Fusion; meeting the requirements of ASTM D3261 and AWWA C906; have a pressure rating equal to the pipe, unless otherwise specified on the plans; and may either be molded and/or fabricated.

E. Approved manufacturers are:

1. Asahi/American, Inc.
2. ISCO Industries. LLC
3. JM Eagle

4. PCWASA Approved Equal

3.9.2 C900 PVC Pipe

A. C900 PVC pipe for sanitary sewage force mains shall be in accordance with AWWA C900.

B. Pipe pressure class shall be as required for application.

C. PVC shall meet the requirements of Cell Classification 12454 in accordance with ASTM D1784.

D. Joint assembly for C900 PVC pipe shall be in accordance with ASTM D3139.

E. Gaskets for C900 PVC pipe shall be plain rubber gaskets in accordance with ASTM F477.

F. C900 PVC pipe shall be colored green.

3.10 Valves

3.10.1 Plug Valves

A. Eccentric plug valve.

B. Valve body shall be ASTM A126, Class B ductile iron.

C. Valve plug shall be Type 316 stainless steel with resilient coating.

D. Valve stem shall be Type 316 stainless steel.

E. Minimum 175 PSI working pressure for valves less than or equal to 12” in size. Minimum 150 PSI working pressure for valves greater than 12” in size.

F. Operators:

1. Rotary type actuator

G. End Connections:

1. Buried Valves: MJ x MJ
2. Non-Buried Valves: FLG x FLG

H. Interior and exterior surfaces shall be coated with fusion-bonded epoxy coating.

I. Acceptable Manufacturers:

1. APCO/Dezurik
2. M&H Valve Company
3. Val-Matic Valve & Manufacturing Corporation
4. PCWASA Approved Equal

3.10.2 Check Valves for Submersible Sanitary Sewage Lift Stations

A. Rubber flap type swing check valve in accordance with ANSI/AWWA C508.

B. Disc material shall be EPDM.

C. Check valve shall have a mechanical position indicator.

D. Check valve shall have screw type backflow actuator.

E. Interior and exterior surfaces shall be coated with fusion-bonded epoxy coating.

F. Acceptable Manufacturers:

1. APCO/Dezurik
2. Crispin-Multiplex Manufacturing Company
3. Val-Matic Valve & Manufacturing Corporation
4. PCWASA Approved Equal

3.10.3 Combination Air/Vacuum Valves

A. Combination air/vacuum valve shall be suitable for potable water or sanitary sewage service.

B. Valve body shall be Type 316 stainless steel.

C. Maximum Operating Pressure: 250 PSI

D. Operating Range: 0 to 250 PSI

E. Air Release Capacity: 135 CFM

F. Connection:

1. 2" to 3": FNPT
2. 4" and larger: AWWA C115/ANSI B16.1

G. 2" to 3" connection nipples and isolation ball valves shall be Type 316 stainless steel.

H. Interior and exterior of 4" and larger valves shall be epoxy coated.

I. Acceptable Manufacturers:

1. H-Tec Model 986
2. PCWASA Approved Equal

3.11 Valve Vaults

A. Valve vaults shall be precast concrete in accordance with ASTM C478.

B. Concrete Compressive Strength: 4,000 PSI @ 28 days.

C. Tongue and groove joints with preformed butyl joint sealant.

D. Meter vault and valve vaults shall have a minimum 48"x48" aluminum access hatch. Access hatch shall be hinged with tamper proof bolts, shall have automatic hold open arm, shall have flush aluminum drop handle, and shall have a staple for pad lock. All hardware shall be Type 316 stainless steel. Access hatch shall be U.S. F. Fabrication Model APD300, or PCWASA approved equal.

E. Steps shall be located at hatch and hatch shall be offset so that steps are accessible.

3.12 Yard Hydrants

A. Non-freezing, compression, post type hydrant with stainless steel pipe & operating rod and self-draining barrel.

B. Suitable for 120 PSI working pressure.

C. Hose Connection Size: ¾"

D. Handle shall be capable of locking with a padlock.

E. Acceptable Manufacturers:

1. Simmons 800LF Series
2. PCWASA Approved Equal

3.13 Pressure Gauges

A. Pressure gauges shall be 3½" or 4" diameter, liquid filled, Type 316 stainless steel gauges.

B. Range of gauge shall be approximately 2 times the normal operating pressure.

C. Acceptable Manufacturers:

1. Ametek, Model 1550
2. Ashcroft, 1009 Duralife
3. Trerice, 700 Series
4. PCWASA Approved Equal

3.14 Diaphragm Seals

A. Diaphragm seals shall be Type 316 stainless steel seals with flushing connections.

B. Acceptable Manufacturers:

1. Ametek, Type SF
2. Ashcroft, 300 PU Series
3. Trerice, Series 5
4. PCWASA Approved Equal

3.15 Manholes

3.15.1 Precast Concrete Manholes

A. Precast concrete manholes in accordance with ASTM C478.

B. Concrete Compressive Strength: 4,000 PSI @ 28 days.

C. Tongue and groove joints for alignment and use with preformed butyl joint seals.

3.15.2 Precast Composite Manholes

A. Precast composite manholes with tolerances in accordance with ASTM C478.

B. Polyester or vinyl ester resin systems designed for use with particular application. Resin content shall be minimum 7-percent by weight.

C. Aggregate, sand, and quartz shall meet requirements of ASTM C33.

D. Elastomeric gaskets in accordance with ASTM C443.

3.15.3 Preformed Butyl Joint Seal

A. Preformed butyl joint seals shall be in accordance with ASTM C990.

B. Preformed butyl joint seals shall be provided in rope form.

C. Acceptable Manufacturers:

1. Hamilton Kent, Inc. (Kent Seal No. 2)

2. Henry Company (Ram-Nek Joint Sealant)
3. Press-Seal Gasket Corporation (EZ-STIK)
4. PCWASA Approved Equal

3.15.4 External Rubber Seal

A. External rubber seals shall be a stretchable, self-shrinking, rubber based designed specifically for sealing manhole joints conforming to ASTM C877.

B. Seal Width: Minimum 9”

C. Rubber thickness: Minimum 30 mils

D. Butyl Adhesive Thickness: Minimum 30 mils

E. Physical Properties:

1. Shear Strength, ASTM D816: Minimum 20 PSI
2. Tensile Strength, ASTM D412: Minimum 50 PSI
3. Percent Elongation, ASTM D746: Minimum 500%

F. Acceptable Manufacturers:

1. Press-Seal Gasket Corporation, Ez-Wrap
2. Sealing Systems, Inc., Infi-Shield Gator Wrap
3. PCWASA Approved Equal

3.15.5 Pipe-to-Manhole Connectors

A. Pipe-to-manhole connectors shall be resilient connectors with stainless steel clamps in accordance with ASTM C923.

B. Acceptable Manufacturers:

1. A-Lok Products, Inc.
2. Trelleborg Pipe Seals Milford, Inc. (Kor-N-Seal)
3. PCWASA Approved Equal

3.15.6 Manhole Steps

A. Manhole steps shall be copolymer polypropylene type with ½” Grade 60 steel reinforcing rod conforming to ASTM C478.

B. Acceptable Manufacturers:

1. American Step Company, Inc.
2. M. A. Industries, Inc.
3. PCWASA Approved Equal

3.15.7 Frames and Covers

A. Frames and covers subject to H-20 and less loading shall be heavy duty castings manufactured from ASTM A48, Class 35B gray iron.

B. Frames and covers subject to greater than H-20 loading shall be heavy duty castings manufactured from ASTM A536, Grade 80-5-06 ductile iron.

C. Minimum Clear Opening: 24”

D. Minimum Frame Height (Bottom of Flange to Rim): 6½”

E. Manhole frame shall have a mud ring for centering frame on the manhole cone.

F. Cover shall have a diamond pattern and two (2) closed pick holes.

G. Type 316 stainless steel, hex-head bolts and neoprene gasket shall be provided for bolt down covers.

H. The word “SEWER” shall be cast in cover.

I. Acceptable Manufacturers:

1. East Jordan Iron Works
2. Neenah Foundry
3. U.S. Foundry
4. PCWASA Approved Equal

3.16 Pipe Supports/Pipe Hangers

A. Pipe supports, saddles, hangers, etc. shall be manufactured from carbon steel and shall be prime coated in the factory.

B. Pipe supports shall be adjustable.

C. Hardware shall be Type 316 Stainless Steel.

D. Acceptable Manufacturers:

1. Anvil International
2. Cooper B-Line
3. PCWASA Approved Equal

3.17 Cast-In-Place Concrete

A. Concrete mix design shall be in accordance with ACI 318.

1. 28-Day Strength: 4,000 PSI
2. Cement Content: Minimum 560 pounds per cubic yard
3. Air Content: 5% to 7% in accordance with ASTM C231
4. Water to Cement Ratio: Maximum 0.44
5. Slump Range: 3 to 5 inches in accordance with ASTM C143
6. Use of fly ash shall be approved by PCWASA Engineer
7. Use of admixtures shall be approved by PCWASA Engineer

B. Materials

1. Cement
    a. Domestic Portland cement in accordance with ASTM C150, Type II.
2. Fine Aggregate
    a. Washed, inert, natural sand in accordance with ASTM C33.
3. Coarse Aggregate
    a. No. 57 stone in accordance with ASTM C33.

4. Water

    a. Clean, potable water free from injurious amounts of oils, acids, alkalis, salts, organic matter, or other deleterious substances.

C. The design mix shall be based on standard deviation data of prior mixes with essentially the same proportions of the same constituents or, if such data is not available, be developed by a testing laboratory, acceptable to the Engineer, engaged by and at the expense of the Contractor. Acceptance of mixes based on standard deviation shall be based on the modification factors for standard deviation tests contained in ACI 318. The water content of the concrete mix, determined by laboratory testing, shall be based on a curve showing the relation between water cementitious ratio and 7 and 28 day compressive strengths of concrete made using the proposed materials. The curves shall be determined by four or more points, each representing an average value of at least three test specimens at each age. The curves shall have a range of values sufficient to yield the desired data, including the specified design strengths as modified below, without extrapolation. The water content of the concrete mixes to be used, as determined from the curve, shall correspond to strengths 16 percent greater than the specified design strengths. The resulting mix shall not conflict with the limiting values for maximum water cementitious ratio and net minimum cementitious content as specified in Table 1.

D. Provide testing of the proposed concrete mix or mixes to demonstrate compliance with the specified design strength requirements in conformity with the above paragraph.

3.18 Reinforcement

A. Steel reinforcing bars shall be in accordance with ASTM A615, Grade 60.

B. Welded wire reinforcement shall be in accordance with ASTM A185.

3.19 Chain Link Fence and Gates

A. Chain Link Fence Fabric

1. Chain link fence shall be galvanized fabric in accordance with ASTM A392, Type II, Class 2, 2.0 ounces per square foot.
2. Fence height shall be six (6) feet.
3. Core Wire Gauge: No. 9
4. Pattern: 2-inch diamond-mesh

B. Posts

1. Intermediate/Line Posts

    a. Schedule 40 galvanized steel pipe in accordance with ASTM F1083.
    b. Diameter: 2.375”
    c. Weight: Minimum 3.65 pounds per foot
    d. Zinc Coating: Minimum 1.8 ounces per square foot

2. End, Corner, Angle, Pull, and Gate Posts

    a. Schedule 40 galvanized steel pipe in accordance with ASTM F1083.
    b. Diameter: 4”
    c. Weight: Minimum 9.1 pounds per foot
    d. Zinc Coating: Minimum 1.8 ounces per square foot

3. Top and Brace Rails

    a. Schedule 40 galvanized steel pipe in accordance with ASTM F1083.
    b. Diameter: 1.66”
    c. Weight: Minimum 2.27 pounds per foot
    d. Zinc Coating: Minimum 1.8 ounces per square foot

4. Gate Frame and Interior Bracing

    a. Schedule 40 galvanized steel pipe in accordance with ASTM F1083.
    b. Diameter: 1.90”
    c. Weight: Minimum 2.72 pounds per foot
    d. Zinc Coating: Minimum 1.8 ounces per square foot

C. Fence Fittings

1. All fence fittings shall be in accordance with ASTM F626.
2. Barbed wire support arms shall have 45 degree angle and shall support three (3) strands of barbed wire.

D. Tension Wire

1. Zinc-coated steel tension wire in accordance with ASTM A824, Type II.
2. Diameter: 0.177” (7 gauge)
3. Zinc Coating: 1.20 ounces per square foot

E. Barbed Wire

1. Zinc-coated barbed wire in accordance with ASTM A121.
2. Line Wire:

    a. Two (2) strands of twisted wire
    b. Diameter: 12½ gauge
    c. Zinc Coating: 0.80 ounces per square foot

3. Barbs:

    a. Number of Points: 4
    b. Length: Minimum 3/8”
    c. Diameter: 14 gauge
    d. Spacing: 5”

F. Gates

1. Gates shall be designed and fabricated in accordance with ASTM F900.

G. Gate Accessories

1. Provide gate hinges that are structurally capable of supporting the gate leaf and allow the gate to open and close without binding. Hinges shall be designed to allow the gate to open 180 degrees.
2. Single gates shall be provided with a gate latch that holds the gate in a closed position and has provisions for a gate lock.
3. Double gates shall be provided with a drop rod or plunger bar type gate latch arranged to engage the gate stop. Locking devices shall be constructed so that the center drop rod or

plunger cannot be raised when the gate is locked. Gate latch shall have provisions for a gate lock.
4. Double gates shall be provided with gate stops.
5. Gates with gate leafs greater than 5 feet shall be provided with gate keepers.

3.20 Waterproofing

A. Water repellent for above grade concrete, brick, and CMU surfaces that are not scheduled to be painted shall be a colorless, totally clean, penetrating water repellent made up of silanes and oligomeric alkoxysiloxanes.

B. Acceptable Manufacturers:

1. PROSOCO, Inc. Sure Klean Weather Seal Siloxane WB Concentrate
2. Tnemec Series 662 Prime-A-Pell Plus, Modified Siloxane/Silane
3. PCWASA Approved Equal

3.21 Coating Systems

A. TNEMEC product names and numbers are specified herein. Equivalent materials produced by PCWASA approved manufacturers shall be acceptable.

B. Coating Systems

1. Ductile Iron Pipe, Pumps, and Valves – Interior Exposed

   a. System Type: Epoxy/Epoxy
   b. Surface Preparation: Per manufacturer's recommendation
   c. Prime Coat: TNEMEC Series N69 Hi-Build Epoxoline, 3 to 5 mils DFT
   d. Finish Coat: TNEMEC Series N69 Hi-Build Epoxoline, 4 to 6 mils DFT
   e. Total DFT: 7 to 11 mils

2. Ductile Iron Pipe, Pumps, and Valves – Exterior Exposed

   a. System Type: Epoxy/Epoxy/Polyurethane
   b. Surface Preparation: Per manufacturer's recommendation
   c. Prime Coat: TNEMEC Series N69 Hi-Build Epoxoline, 3 to 5 mils DFT
   d. Intermediate Coat: TNEMEC Series 69 Hi-Build Epoxoline, 4 to 6 mils DFT
   e. Finish Coat: TNEMEC Series 73 Endura-Shield, 2 to 3 mils DFT
   f. Total DFT: 9 to 14 mils

3. Ductile Iron Pipe, Pumps, and Valves – Below Grade (Buried) and Immersed

   a. System Type: Epoxy/Coal Tar Epoxy
   b. Surface Preparation: Per manufacturer's recommendation
   c. Prime Coat: TNEMEC Series N69 Hi-Build Epoxoline, 3 to 5 mils DFT
   d. Finish Coat: TNEMEC Series 46H-413 Hi-Build Tneme-Tar, 14 to 20 mils DFT
   e. Total DFT: 17 to 25 mils

4. Ductile Iron Pipe, Pumps, and Valves – Severe Atmosphere (Inside Pump Station Wet Wells)

   a. System Type: Vinyl Ester
   b. Surface Preparation: Per manufacturer's recommendation

c. Prime Coat: TNEMEC Series 120-5002 Vinester, 12 to 18 mils DFT
d. Finish Coat: TNEMEC Series 120-5001 Vinester, 12 to 18 mils DFT
e. Total DFT: 24 to 36 mils

5. Structural Steel – Interior Exposed

   a. System Type: Epoxy/Epoxy
   b. Surface Preparation: SSPC-SP6/NACE 3
   c. Prime Coat: TNEMEC Series N69 Hi-Build Epoxoline, 3 to 5 mils DFT
   d. Finish Coat: TNEMEC Series N69 Hi-Build Epoxoline, 3 to 5 mils DFT
   e. Total DFT: 6 to 10 mils

6. Structural Steel – Exterior Exposed

   a. System Type: Epoxy/Polyurethane
   b. Surface Preparation: SSPC-SP6/NACE 3
   c. Prime Coat: TNEMEC Series N69 Hi-Build Epoxoline, 3 to 5 mils DFT
   d. Intermediate Coat: TNEMEC Series N69 Hi-Build Epoxoline, 2 to 3 mils DFT
   e. Finish Coat: TNEMEC Series 73 Endura-Shield, 2 to 5 mils DFT
   f. Total DFT: 7 to 13 mils

7. Structural Steel – Below Grade (Buried) and Immersed

   a. System Type: Epoxy/Coal Tar Epoxy
   b. Surface Preparation: SSPC-SP10/NACE 2
   c. Prime Coat: TNEMEC Series N69 Hi-Build Epoxoline, 3 to 5 mils DFT
   d. Finish Coat: TNEMEC Series 46H-413 Hi-Build Tneme-Tar, 14 to 20 mils DFT
   e. Total DFT: 17 to 25 mils

8. Structural Steel – Severe Atmosphere (Inside Pump Station Wet Wells)

   a. System Type: Vinyl Ester
   b. Surface Preparation: SSPC-SP5/NACE 1
   c. Prime Coat: TNEMEC Series 120-5002 Vinester, 12 to 18 mils DFT
   d. Finish Coat: TNEMEC Series 120-5001 Vinester, 12 to 18 mils DFT
   e. Total DFT: 24 to 36 mils

9. Concrete Masonry Unit (CMU) – Interior Exposed

   a. System Type: Epoxy/Epoxy
   b. Surface Preparation: SSPC-SP13/NACE 6, ICRI CSP1-3, CMU clean and dry
   c. Prime Coat: TNEMEC Series 130 Envirofill, 60 to 80 square feet per gallon
   d. Intermediate Coat: TNEMEC Series N69 Hi-Build Epoxoline, 4 to 6 mils DFT
   e. Finish Coat: TNEMEC Series N69 Hi-Build Epoxoline, 4 to 6 mils DFT
   f. Total DFT: 8 to 12 mils

10. Concrete Masonry Unit (CMU) – Exterior Exposed

    a. System Type: Acrylate/Acrylate
    b. Surface Preparation: SSPC-SP13/NACE 6, ICRI CSP1-3, CMU clean and dry
    c. Prime Coat: TNEMEC Series 130 Envirofill, 60 to 80 square feet per gallon
    d. Intermediate Coat: TNEMEC Series 156 Enviro-Crete, 4 to 8 mils DFT
    e. Finish Coat: TNEMEC Series 156 Enviro-Crete, 4 to 8 mils DFT
    f. Total DFT: 8 to 16 mils

11. Cast-In-Place and Precast Concrete – Interior Exposed

    a. System Type: Epoxy/Epoxy
    b. Surface Preparation: SSPC-SP13/NACE 6, ICRI CSP1-3, concrete cured a minimum of 28 days
    c. Prime Coat: TNEMEC Series N69 Hi-Build Epoxoline, 4 to 6 mils DFT
    d. Finish Coat: TNEMEC Series N69 Hi-Build Epoxoline, 4 to 6 mils DFT
    e. Total DFT: 8 to 12 mils

12. Cast-In-Place and Precast Concrete – Exterior Exposed

    a. System Type: Waterborne Acrylate/Waterborne Acrylate
    b. Surface Preparation: SSPC-SP13/NACE 6, clean and dry, concrete cured a minimum of 28 days
    c. Prime Coat: TNEMEC Series 156 Enviro-Crete, 4 to 8 mils DFT
    d. Finish Coat: TNEMEC Series 156 Enviro-Crete, 4 to 8 mils DFT
    e. Total DFT: 8 to 16 mils

13. Cast-In-Place and Precast Concrete – Severe Atmosphere (Inside Pump Station Wet Wells)

    a. System Type: Vinyl Ester/Vinyl Ester
    b. Surface Preparation: SSPC-SP13/NACE 6, ICRI CSP5, concrete cured a minimum of 28 days
    c. Filler: TNEMEC Series 120-5003, fill voids
    d. Prime Coat: TNEMEC Series 120-5002 Vinester, 12 to 18 mils DFT
    e. Finish Coat: TNEMEC Series 120-5001 Vinester, 12 to 18 mils DFT
    f. Total DFT: 24 to 36 mils

14. Coating systems not listed shall be approved by the PCWASA Engineer.

3.22 Manhole Repair Systems

A. Polyurethane Grouts for Stopping Leaks

1. Hydrophobic Polyurethane Grout

    a. Hydrophobic polyurethane grout shall be a grout that when it makes contact with water, is designed to fill large voids in rock fissures, gravel layers, joints, and cracks in concrete structures and is designed for the cut-off of gushing water.
    b. Acceptable Manufacturers:

        1) Hydro Active CUT, De Neef Construction Chemicals, Inc.
        2) Prime Flex EXP, Prime Resins, Inc.
        3) PCWASA Approved Equal

2. Hydrophilic Polyurethane Gel

    a. Hydrophobic polyurethane gel shall be a gel that when it makes contact with water, is designed to foam or gel and quickly cures to a flexible, impermeable foam or gel mass that is unaffected by mildly corrosive environments.
    b. Acceptable Manufacturers:

        1) Hydro Active MultiGel NF, De Neef Construction Chemicals, Inc.
        2) Prime Flex Hydro Gel SX, Prime Resins, Inc.

3) PCWASA Approved Equal

3. Hydrophilic Polyurethane Resin

a. Hydrophilic polyurethane resin shall be a resin that when it makes contact with water, is designed to expand quickly and cure to a tough, flexible, adhesive, closed-cell foam that is essentially unaffected by mildly corrosive environments.
b. Acceptable Manufacturers:

1) Hydro Active Sealfoam NF, De Neef Construction Chemicals, Inc.
2) Prime Flex 900 XLV, Prime Resins, Inc.
3) PCWASA Approved Equal

B. Repair Mortars

1. Calcium Aluminate Repair Mortar

a. Calcium aluminate repair mortar shall be a blend of quartz silica, fibers, and calcium aluminate cement designed for areas of moderate hydrogen sulfide concentration.
b. Calcium aluminate repair mortar shall have the following characteristics.

1) Compressive Strength: Minimum 8,000 PSI in accordance with ASTM C109 (Modified)
2) Flexural Strength: Minimum 1,200 PSI in accordance with ASTM C293
3) Shrinkage: Maximum 0.040% in accordance with ASTM C596
4) Tensile Strength: Minimum 600 PSI in accordance with ASTM C496
5) Freeze/Thaw After 100 Cycles: No effect in accordance with ASTM C666
6) Bond Strength: Minimum 1,500 PSI in accordance with ASTM C882 (Modified)

c. Acceptable Manufacturers:

1) Cem Tec Silatec CAM, A.W. Cook Cement Products
2) PCWASA Approved Equal

2. Microsilica Repair Mortar

a. Microsilica repair mortar shall be a blend of Portland cement, dry prozzolanic materials, and a densified microsilica powder admixture.
b. Microsilica repair mortar shall have the following characteristics.

1) Compressive Strength: Minimum 8,000 PSI in accordance with ASTM C109
2) Split Tensile Strength: Minimum 570 PSI in accordance with ASTM C496
3) Flexural Strength: Minimum 1,000 PSI in accordance with ASTM C293
4) Density: Minimum 118 pounds per cubic foot

c. Acceptable Manufacturers:

1) Reliner MSP Cement, Standard Cement Material, Inc.
2) PCWASA Approved Equal

3.23 Manhole Liner Systems

A. Flexible Polyurethane Elastomer Liner

1. Flexible urethane elastomer liner shall be a 100% solids material having the following characteristics.

a. Abrasion Resistance: 1 kg, 1,000 cycles, CS-17 Wheel – 106 mg loss in accordance with ASTM D4060
b. Adhesion: 300 PSI, concrete failure in accordance with ASTM D4541
c. Dielectric Strength: Minimum 430 V/mil in accordance with ASTM D149, Method A
d. Direct Impact: Steel pipe, 160 inches/pound, no failures in accordance with ASTM D2794
e. Durometer Hardness: Shore D 43 in accordance with ASTM D2240
f. Elongation: Recoverable 45% at 77 °F in accordance with ASTM D638
g. Flexibility: No effect bending 0.5 mm plate coated with 20 mils over mandrel of 8 mm diameter in accordance with ASTM D1737
h. Permeability: 0.189 grains per hour per square foot per inch Hg in accordance with ASTM E96
i. Thermal Conductivity: 0.133 BTU per hour per foot per °F at 77 °F in accordance with ASTM C177
j. Tensile Strength: 1,988 PSI at 77 °F in accordance with ASTM D638

2. Coating System

a. Sherwin Williams SherFlex Elastomeric Polyurethane

1) Surface Preparation: SSPC-SP13/NACE 6, concrete cured a minimum of 28 days
2) Prime Coat: Corobond LT Epoxy Primer, 4 to 8 mils DFT
3) Finish Coat: SherFlex Elastomeric Polyurethane, 250 mils DFT
4) Total DFT: 254 to 258 mils

b. Spraywall

1) Surface Preparation: SSPC-SP13/NACE 6, concrete cured a minimum of 28 days
2) Finish Coat: Spraywall, 250 mils DFT
3) Total DFT: 250 mils

3. Acceptable Manufacturers:

a. Sherwin Williams
b. Sprayroq, Inc.
c. PCWASA Approved Equal

B. Epoxy Liner

1. Epoxy liner shall be a 100% solids material having the following characteristics.

a. Abrasion Resistance: 1 kg, 1,000 cycles, CS-17 Wheel – <100 mg loss in accordance with ASTM D4060
b. Adhesion: >2,000 PSI, concrete failure in accordance with ASTM D4541
c. Durometer Hardness: Minimum Shore D 83 in accordance with ASTM D2240
d. Elongation: Minimum 1.5% in accordance with ASTM D638
e. Flexural Strength: Minimum 11,700 PSI in accordance with ASTM D790
f. Flexural Modulus: Minimum 530,000 PSI in accordance with ASTM D790
g. Compressive Strength: Minimum 13,500 PSI in accordance with ASTM D695
h. Tensile Strength: 1,988 PSI at 77 °F in accordance with ASTM D638

2. Coating System

a. Quadex Structure Guard Epoxy

1) Surface Preparation: Substrate must be free of all contaminants, such as oil, grease, rust, scale or deposits and have a surface profile equivalent to CSP2 to CSP5 in accordance with ICRI Technical Guideline No. 03732.
2) Prime Coat: SG 1100 Primer or Structure Guard, 80 mils DFT
3) Finish Coat: Structure Guard, 80 mils DFT
4) Total DFT: 160 mils

3. Acceptable Manufacturers:

   a. Quadex
   b. PCWASA Approved Equal

3.24 Stabilization Stone

A. Stabilization stone shall be No. 57 in accordance with Georgia DOT Specification Section 800 – Course Aggregate.

B. Stabilization stone shall be clean, durable particles of crushed stone or gravel capable of withstanding the effects of handling, spreading, and compacting without degradation.

3.25 Select Earth Backfill

A. Select earth backfill shall be excavated SM and ML material that is free from rocks larger than 3-inches in diameter, ashes, cinders, refuse, organic material, frozen soil, and other deleterious material.

B. Material containing more than 10-percent gravel, stones, or shale particles is not acceptable.

C. Provide imported material if required to accomplish work.

3.26 Underground Utility Marking Tape

A. Minimum 4 mil polyethylene film formulated to resist degradation due to acid and alkaline soils.

B. Width shall be 3-inches.

C. Color shall be green with the words “SEWER” printed continuously along the tape.

D. Lettering shall be 1-inch high, permanent black type.

3.26.1 Tracer Wire

A. Direct burial #10 AWG solid, soft drawn, high strength copper clad steel wire.

B. 30 volt rating.

C. 30-mil high molecular weight, high density, polyethylene jacket complying with ASTM D1248.

D. Color shall be green

E. Tracer wires shall be connected together using moisture displacement connectors with strain relief.

F. Acceptable Manufacturers:

1. Copperhead Industries, LLC
2. Pro-Line Safety Products Company

3. PCWASA Approved Equal

3.27 Tracer Wire Access Boxes

A. Direct bury, anti-corrosion, color coded, and locking cast iron cover Access/Test Station shall be a Lite Duty XL.

B. For non-roadway/driveway applications.

C. Color to be green.

D. Acceptable Manufacturers:

1. Copperhead Industries, LLC
2. CP Test & Valve Products
3. Valvo, Inc.
4. PCWASA Approved Equal

3.28 Other Materials

A. Materials not covered in these specifications shall be in accordance with the approved plans.

SECTION 4 - CONSTRUCTION STANDARDS

4.1 General

A. Sanitary sewerage systems shall be constructed by a PCWASA approved utility contractor.

B. Sanitary sewerage systems shall be constructed in accordance with plans approved by the PCWASA.

4.1.1 Permits

A. Construction activities shall not commence until PCWASA has granted final approval of the construction plans and specifications and Peachtree City has issued a Development Permit.

B. Developer/Owner and/or Contractor shall be responsible for obtaining all permits and approvals required for working in the county or state right-of-way.

4.1.2 Work Hours

A. Work shall be executed Monday through Friday during normal work hour (7:00 AM to 5:00 PM) unless otherwise approved by PCWASA.

B. Requests for work outside of normal working hours must be received in writing by the PCWASA a minimum of 36 hours in advance of performing the work.

C. An inspection fee equal to the employee's time and benefits will be assessed if the Contractor elects to work outside of normal working hours or on Saturday or Sunday.

D. A fee will be assessed to any Contractor who works on Saturday or Sunday without prior approval from the PCWASA.

4.1.3 Utility Notification

A. Contractor shall notify Utility Protection Center a minimum of three (3) days prior to beginning any clearing, grading, or excavating activities.

4.1.4 Site Safety

A. Contractor shall be responsible for site safety. Contractor shall identify a site safety officer who shall be responsible for conducting daily safety meetings and ensuring a safe work environment.

B. All work shall be conducted in accordance with OSHA standards. In accordance with Safety Resolution 2005-12, PCWASA will issue a "Stop Work" order if an unsafe condition exists.

C. All equipment and tools used in the construction of sanitary sewerage systems shall be in good working order.

D. Contractor shall provide, erect and maintain all necessary barricades, signs, lights, and danger signals necessary for the protection of the work and the safety of the public. Contractor shall provide a sufficient number of flagmen whenever it is deemed necessary.

E. All work shall be planned and performed by the Contractor in such a manner as to minimize interference with vehicular and pedestrian traffic. Whenever work will cause disruption to the normal flow of traffic or pose a potential hazard, the Contractor shall be responsible for implementing safety measures and traffic control procedures in accordance with the "Manual on Uniform Traffic Control Devices," latest edition, published by the U.S. Department of

Transportation, Federal highway Administration. Contractor shall obtain approval from the Peachtree City DOT, Fayette County DOT, and/or Georgia DOT prior to working in any public right-of-way.

4.2 Materials

4.2.1 General

A. All materials and equipment provided for the project shall be new and shall be in accordance with these Standards and Specifications.

B. Contractor shall be responsible for the delivery, handling, storage, and protection of all materials and equipment used on the project.

C. All materials and equipment shall be boxed, crated, or otherwise protected during transportation, handling, and storage.

4.2.2 Delivery

A. Contractor shall coordinate the delivery of all materials and equipment.

B. Contractor shall provide all equipment and tools required for unloading and moving materials and equipment.

4.2.3 Handling

A. Materials and equipment shall be handled in accordance with the manufacturer's instructions.

B. Any materials or equipment that are dropped, dumped, improperly handled, or otherwise damaged during construction shall be subject to rejection by the PCWASA without further justification.

C. Contractor shall provide all equipment and tools required for moving materials and equipment to, from, and around the project site.

4.2.4 Storage and Protection

A. Materials and equipment shall be stored in accordance with the manufacturer's instructions.

B. Contractor shall be responsible for the storage and protection of all materials and equipment.

C. Pipe may be stored along the route; however, pipe shall not be strung out for more than 1,000 feet beyond the point that the pipe is being installed.

D. Contractor shall be responsible for making the necessary arrangements for obtaining all storage locations/sites required to properly store and protect materials and equipment.

E. Materials and equipment shall be protected from exposure to the elements and shall be kept dry at all times. The materials and equipment shall be stored above ground level and shall be adequately supported using wood blocking, wood pallets, or other approved support material.

F. Pumps, motors, valves, electrical and instrumentation equipment, and other mechanical equipment shall be stored in a weather-tight enclosure which is maintained at a minimum air temperature of 60 °F.

4.3 Erosion and Sedimentation Control

A. Contractor shall be responsible for complying with all requirements of Peachtree City, Fayette County, the Georgia EPD, and the United States Army Corps of Engineers related to erosion and sediment control. This shall include obtaining all required permits and designing and implementing all erosion and sediment control measures.

4.4 Excavation

4.4.1 General

A. Prior to beginning any excavation, an investigation shall be conducted to determine the location of existing underground structures and conflicts. The Contractor shall be responsible for repairing damage to existing structures.

B. When obstructions not indicated on the plans interfere with the progress of work, an alteration of the plans may be required. All alterations or deviations in line and grade, or the removal, relocation, or reconstruction of the obstruction shall be approved in writing by the PCWASA.

4.4.2 Clearing and Grubbing

A. Areas to be cleared and grubbed shall be limited to the areas shown on the PCWASA approved plans.

B. Trees located within the area to be cleared or along the clearing limits that are not specified to be removed shall be protected with tree protection fence.

C. All materials that are cleared and grubbed from the project site shall be properly disposed of offsite.

D. Burning of debris onsite may be permitted; however, the Contractor must obtain a permit from the appropriate agency prior to burning.

4.4.3 Pavement Removal

A. When approved by Georgia DOT, Peachtree City DOT, and/or PCWASA, pavement and road surfaces shall be removed as required in order to install the water distribution and/or sanitary sewerage system appurtenances.

B. Pavement shall be cut using a rotary saw in order to ensure straight lines. If the adjacent pavement is damaged, the damaged pavement shall be cut out.

C. The width of pavement removal for pipe trenches shall be twelve (12) inches greater than the width of the trench on each side.

D. Driveways and sidewalks shall be removed to their full width and from control joint to control joint.

E. Curb and gutter shall be removed from control joint to control joint.

F. All materials shall be properly disposed of offsite.

4.4.4 Soil Excavation

A. Excavate soil to the lines, grades, and dimensions shown on the PCWASA approved plans and as necessary to accomplish work. Do not over excavate without authorization from the PCWASA Engineer.

B. Excavated soil shall be stockpiled in locations designated on the PCWASA approved plans. If a stockpile area is not designated, soil shall be stockpiled in a manner such that it will not obstruct the work nor endanger the workers or the public, obstruct sidewalks, driveways, roadways, or other structures.

C. Excavated soil shall not be placed against tree trunks.

D. Excavated soil that is unsuitable or exceeds the quantity required for fill or backfill shall be disposed of offsite.

4.4.5 Rock Excavation

A. When rock excavation is necessary, all rock shall be removed to provide a clearance below and on each side of all pipe, valves, and fittings. The required clearance for various nominal diameters of pipe is as follows:

Nominal Pipe Diameter (inches)	Clearance Around Pipe (inches)
4	4
6	6
8 to 18	8
18 to 30	10
Greater Than 30	12

B. Contractor shall obtain written approval from the PCWASA prior to conducting any blasting activities.

C. Rock blasting shall be conducted in accordance with Chapter 120-3-10-0.4 of the "Rules and Regulations for Explosives and Blasting Agents" and all other applicable local, state, and federal regulations.

D. A Blasting Report consisting of a pre-blast report, drilling log, and a post-blast report shall be submitted to PCWASA after rock blasting is complete.

E. Rock blasting shall be conducted by a licensed blasting contractor.

F. After rock removal, trench shall be backfilled with No. 57 stabilization stone up to the grade of the pipe or structure to be installed.

G. Excavated rock shall be disposed of offsite unless otherwise approved by PCWASA.

4.4.6 Trench Excavation

A. Trenches shall be excavated to the required alignment, depth, and width required to install the pipe or structure and shall conform to all federal, state, and local regulations for the protection of workers.

B. The Contractor is responsible for trench safety. PCWASA will issue a Stop Work order if unsafe conditions exist.

C. The width of the trench shall be of sufficient width to install the pipe, accommodate compaction equipment, and make necessary inspections. When required, trenches shall be made wider to permit the placing of shoring.

D. Trench bottom shall be constructed to provide a firm, stable, and uniform support for the full length of the pipe. Blocking shall not be used to change pipe grade or to intermittently support pipe across excavated sections.

E. If unsuitable soil exists, the trench shall be over-excavated to remove the unsuitable soil and backfilled with No. 57, or suitable PCWASA approved, stabilization stone. The PCWASA Inspector shall determine the depth of over excavation.

F. Open trenches shall be limited to 300 feet in length and shall be backfilled at the end of each work day.

G. Open trenches shall be barricaded or covered until they are completely backfilled.

H. Excavated soil that is unsuitable or exceeds the quantity required for backfill shall be disposed of offsite.

4.4.7 Dewatering

A. Where running or standing water occurs in an excavation or where the soil in the bottom of an excavation displays a "quick" tendency, the water shall be removed by pumping.

B. The excavation shall be kept free from water during installation operations by suitable means, such as well points, until the pipe has been installed and backfill placed and compacted to a sufficient height to prevent pipe flotation.

C. Contractor shall provide all labor, materials, and equipment required to remove and control water as required to accomplish work.

D. Contractor shall properly dispose of water in a manner that will not cause erosion or flooding, or otherwise damage existing facilities, completed work, or adjacent property. Contractor shall be responsible for any damage caused by the dewatering operation.

E. Contractor shall be responsible for obtaining any required permits, required by regulatory agencies, for discharging water from dewatering operations.

4.5 Installation

4.5.1 General

A. Pipe shall be laid and maintained on lines and grades established by the PCWASA approved plans and specifications.

B. Fittings, valves, hydrants, manholes, valve vaults, and other structures shall be installed at the locations shown on the PCWASA approved plans unless otherwise approved in writing by the PCWASA.

C. Prior to installation, the interior of pipes, fittings, valves, and other appurtenances shall be cleaned free of dirt and debris.

D. Materials shall be installed in accordance the manufacturer's recommendations.

E. Contractor shall provide all labor, materials, and equipment required to install water distribution and/or sanitary sewerage system appurtenances.

4.5.2 Ductile Iron Pipe

A. Ductile iron pipe shall be bedded in accordance with ANSI/AWWA C150/A21.50 and ANSI/AWWA C151/A21.51, Type 5 Laying Condition unless otherwise approved by the PCWASA Engineer.

1. Ductile iron pipe shall be bedded to its centerline with well compacted No. 57 stabilization stone. There shall be a minimum of 4-inches of No. 57 stabilization stone under the pipe.
2. Backfill from centerline of pipe to top of pipe with No. 57 stabilization stone or select earth backfill. Backfill shall be placed in 6-inch lifts and manually compacted to a minimum of 95 percent of the maximum dry density, as determined by ASTM D698, prior to placing succeeding lifts.
3. Backfill from top of pipe to finished grade with select earth backfill. Backfill shall be placed in 6-inch lifts and mechanically compacted to a minimum of 95 percent of the maximum dry density, as determined by ASTM D698, prior to placing succeeding lifts.

B. Ductile iron pipe that is installed above grade (non-buried) shall be properly supported with pipe supports, as approved by PCWASA.

4.5.3 PVC and HDPE Pipe

A. SDR 26 PVC pipe and HDPE pipe shall be bedded in accordance with AWWA C605, Type 5 Bedding.

1. PVC and HDPE pipe shall be bedded to crown of pipe with well compacted No. 57 stabilization stone. There shall be a minimum of 4-inches of No. 57 stabilization stone under the pipe.
2. Backfill from top of pipe to finished grade with select earth backfill. Backfill shall be placed in 6-inch lifts and mechanically compacted to a minimum of 90 percent of the maximum dry density, as determined by ASTM D698, prior to placing succeeding lifts.

4.5.4 Valves

A. Valves shall be installed plumb with the operator straight up and the valve aligned with the direction of the pipe. Valves shall not be used to bring misaligned pipe into alignment during installation.

B. Valves shall be properly supported so that they do not place any undue stress on the pipe.

C. Valves shall be placed on top of a minimum of eight (8) inches of No. 57 stabilization stone. No. 57 stabilization stone shall extend up to ½ of the valve diameter and shall extend out twelve (12) inches in all directions from the valve.

D. A valve box shall be installed plumb over the valve operator and adjusted so that it is flush with the finished grade. A concrete collar shall be cast around the top of the valve box.

E. Valves installed above grade (non-buried) shall be properly supported with pipe supports.

4.5.5 Yard Hydrants

A. Yard hydrants shall be set plumb in the locations shown on the PCWASA approved plans.

B. Yard hydrant shall be placed on top of a minimum of eighteen (18) inches of No. 57 stabilization stone. No. 57 stabilization stone shall extend up six (6) inches above the drain hole and shall extend out six (6) inches in all directions from the yard hydrant. Minimum two (2) cubic feet of No. 57 stabilization stone.

4.5.6 Thrust Blocking

A. Thrust blocking shall be installed at all bends, tees, dead-ends, and locations where thrust may be developed in the pressurized pipeline.

B. Thrust blocking shall consist of cast-in-place concrete, tie rods, combinations thereof, or other methods approved by the PCWASA Engineer.

C. Thrust blocking shall be placed against undisturbed ground.

D. A minimum 10-mil plastic sheet shall be placed between the concrete and the pipe and fittings. Concrete shall not cover the bolts and nuts on the valves and fittings.

E. Pipe that is encased in concrete shall be poly-wrapped.

4.5.7 Manholes and Wet Wells

A. Manholes and wet wells shall be set plumb in the locations shown on the PCWASA approved plans.

B. Manholes and wet wells shall be placed on top of a minimum of six (6) inches of No. 57 stabilization stone. No. 57 stabilization stone shall extend a minimum of six (6) inches beyond the outside of the structure in all directions. Unsuitable ground conditions may require additional and/or larger stabilization stone.

C. Manholes shall be positioned such that the influent and effluent pipes enter the center of their respective openings and do not pinch the resilient seal. Pipe shall not rest on the invert of the opening.

D. Prior to joining sections, tongue and groove joints shall be cleaned free of dirt and debris.

E. Manhole sections shall be aligned such that the interior manhole steps are vertically aligned.

F. Resilient pipe seal clamps shall be tightened in accordance with the manufacturer's instructions.

G. Manhole lifting holes shall be sealed using non-shrink grout throughout the entire depth of the hole.

H. Manholes and wet wells shall be backfilled with select earth backfill. Backfill shall be placed in 6-inch lifts and mechanically compacted to a minimum of 95 percent of the maximum dry density, as determined by ASTM D698, prior to placing succeeding lifts.

I. An invert shall be built in each manhole to transition flow from the influent pipe to the effluent pipe. The invert shall have a "U" shape.

J. Manholes that that have a sanitary sewage force main discharging into them plus all manholes located within 1,600 feet downstream of the discharge manhole and all other manholes that are subject to corrosion shall be lined with a fiberglass reinforced epoxy resin lining system or elastomeric polyurethane lining system. Liner shall be installed after the manhole has been set and backfilled. After liner is installed, the manhole shall be Holiday tested to verify coating does not contain any discontinuities.

4.5.8 Valve Vaults

A. Valve vaults shall be set plumb in the locations shown on the PCWASA approved plans.

B. Valve vaults shall be placed on top of a minimum of six (6) inches of No. 57 stabilization stone. No. 57 stone shall extend a minimum of six (6) inches beyond the outside of the vault in all directions.

C. The top of the valve vault shall be six (6) inches above grade when located "out of pavement" and shall be set flush with grade when located "in pavement." Valve vaults shall not be set in a depression.

D. Openings for pipe shall be sealed using non-shrink grout.

E. Valve vaults shall be backfilled with select earth backfill. Backfill shall be placed in 6-inch lifts and mechanically compacted to a minimum of 95 percent of the maximum dry density, as determined by ASTM D698, prior to placing succeeding lifts.

4.5.9 Pavement Replacement

A. Pavement shall be replaced in accordance with Georgia DOT, Fayette County DOT, and/or Peachtree City DOT standard specifications.

4.6 Coatings and Linings

A. The following items/materials shall be painted or lined with the appropriate coating system.

1. Above grade concrete, brick, and CMU that is scheduled to be painted
2. Above grade (non-buried) and submerged ductile iron pipe and fittings
3. Valves
4. Pipe supports
5. Structural steel
6. Equipment and appurtenances
7. Pump station wet wells
8. Manholes that a force main discharges into plus all manholes within 1,600 feet of the discharge manhole.
9. Other manholes subject to corrosion as determined by the PCWASA Engineer

B. All above grade concrete, brick, and CMU surfaces that are not scheduled to be painted shall be applied with a clear water repellent.

4.7 Testing

4.7.1 Hydrostatic Testing of Sanitary Sewage Force Mains

A. Sanitary sewage force mains shall be hydrostatically tested in accordance with AWWA C600.

B. Hydrostatic test shall be witnessed by the PCWASA Inspector.

C. Pipe shall be slowly filled with potable water until all air is removed and the line is pressurized to the test pressure. Service lines shall be included as part of the hydrostatic test.

D. Test pressure shall be 1.5 times the maximum working pressure or 150 PSI, whichever is greater as measured at the lowest point in the system.

E. Test pressure shall not vary by more than ±5 PSI for the duration of the test.

F. Test shall last a minimum of two (2) hours.

G. Makeup water shall be added, as required, to maintain the pressure within 5 PSI of the test pressure. The maximum amount of makeup water allowed shall be determined by the following formula.

$$L = \frac{SD\sqrt{P}}{133{,}200}$$

Where:

L = Testing Allowance (Makeup Water), GPH

S = Length of Pipe Tested, ft

D = Nominal Diameter of Pipe, in

P = Test Pressure, PSIG

H. Test shall be considered acceptable if pressure remains within the acceptable limits for the entire test period and the makeup water volume does not exceed the maximum allowable.

I. When unsatisfactory test results are obtained, repair pipe and retest until pipe passes hydrostatic test. Repair visible leaks regardless of quantity of leakage.

4.7.2 Air Pressure Testing of Gravity Sewer Lines

A. Gravity sewer piping shall be low pressure air tested in accordance with UNI-B-6.

B. Low pressure air test shall be witnessed by the PCWASA Inspector.

C. Gravity sewer lines shall be tested from manhole to manhole. Lines shall be free of dirt and debris and no personnel shall be permitted in the manholes when the test is being conducted.

D. The gravity sewer line shall be pressurized to 4.0 PSIG greater than the average back pressure of any groundwater above the pipe, but no greater than 9.0 PSIG.

E. After temperatures have equalized and the pressure has stabilized at 4.0 PSIG (greater than the average groundwater back pressure), the air supply shall be shut off. The pressure shall then be decreased to no less than 3.5 PSIG (greater than the average groundwater back pressure).

F. The time shall then start and the pressure shall not drop more than 1.0 PSIG during the testing period. The minimum test time for various diameter pipes is presented below.

Nominal Pipe Diameter (inches)	Minimum Test Time (min:sec)	Maximum Length for Minimum Test Time (feet)	Test Time for Longer Length (L) Sections (seconds)
8	7:34	298	1.520 L
10	9:26	239	2.374 L
12	11:20	199	3.418 L
15	14:10	159	5.342 L
16	15:07	149	6.078 L
18	17:00	133	7.692 L
20	18:54	119	9.497 L
24	22:40	99	13.674 L
30	28:20	80	21.366 L
36	34:00	66	30.768 L

G. In general, lateral sewers may be ignored when computing required test time. However, if a section fails to pass the air test when lateral sewers have been ignored, the test time shall be recomputed to include all lateral sewers using the method of calculation in UNI-B-6.

H. Test shall be considered acceptable if pressure does not drop more than 1.0 PSIG during the test period.

I. When unsatisfactory test results are obtained, repair pipe and retest until pipe passes low pressure air test. Repair visible leaks regardless of quantity of leakage.

4.7.3 Television Inspection of Gravity Sewer Lines

A. Gravity sewer lines shall be television inspected after the trench is backfilled and compacted.

B. Prior to television inspection, gravity sewer lines shall be cleaned using high pressure water. Water usage for cleaning gravity sewer lines shall be metered.

C. Television inspection shall be performed by a National Association of Sewer Service Companies (NASSCO) certified contractor using pan and tilt camera.

D. Pipeline Assessment and Certification Program (PACP) and Manhole Assessment and Certification Program (MACP) coding shall be used in inspection reports.

E. Television inspection shall be witnessed by the PCWASA Inspector.

F. Television inspection shall be recorded.

G. At a minimum, the television inspection shall look for the following deficiencies.

1. Cracks in the pipe and/or lining
2. Rolled gaskets
3. Leaking joints
4. Deviations from line and grade
5. Pipe deformations
6. Other deficiencies

H. A television inspection report containing the following information shall be submitted to the PCWASA.

1. Length of pipe between manholes
2. Location of services
3. Deficiencies

I. No paving shall be done until gravity sewer lines are passed by the PCWASA.

4.7.4 Mandrel Testing of Gravity Sewer Lines

A. If the television inspection indicates that there is excessive deflection of the sewer line or that the sewer line is egg shaped, the sewer lines shall be tested for deformation using a mandrel in accordance with ASTM D3034.

B. The sewer line shall be capable of passing a mandrel which has a diameter that is 95 percent of the diameter of the sewer line.

C. Any sewer line that fails the mandrel test shall be re-laid or replaced as required.

4.7.5 Hydrostatic Testing of Water Retaining Structures

A. Water retaining structures shall be hydrostatically tested in accordance with ACI 350.1 and 350.1R.

B. Hydrostatic test shall be witnessed by the PCWASA Inspector.

C. Hydrostatic testing shall not begin until concrete has cured for a minimum of 14 days.

D. Water retaining structures shall be filled with potable water to the maximum operating level within the structure. Water level shall be maintained at this level for 72 hours prior to beginning the actual test.

E. Test shall be considered acceptable when there is no visible sign of flowing or seeping water and no measureable loss of water (HST-NML) which means the drop in water surface shall not exceed 1/8 inch in three (3) days.

F. When unsatisfactory test results are obtained, repair water retaining structure and retest until structure passes hydrostatic test. Repair visible leaks regardless of quantity of leakage.

4.8 Field Testing and Starting of Systems

A. Contractor is responsible for start-up of all equipment and mechanical systems.

B. Contractor shall provide all labor and materials required to perform start-up of all equipment and mechanical systems.

C. Contractor shall obtain the services of the equipment manufacturer(s), as required, to certify the installation.

D. Equipment manufacturer(s) shall certify in writing that their equipment has been installed properly, the equipment functions properly, and the equipment warranty is valid. Written certification shall be on the manufacturer's letterhead.

E. Contractor shall obtain the services of the equipment manufacturer(s), as required, to train PCWASA personnel on the operation and maintenance of their equipment.

F. A copy of the start-up test report and manufacturer's certification shall be given to the PCWASA.

4.9 Site Cleanup

A. Contractor shall remove all unused material, excess soil and rock, and all other debris from the construction site as closely behind the work as practical. If the Contractor fails to maintain clean-up responsibilities as directed by the PCWASA Inspector, the PCWASA may issue a "Stop Work" order.

B. All trenches shall be backfilled and tamped before the end of each work day.

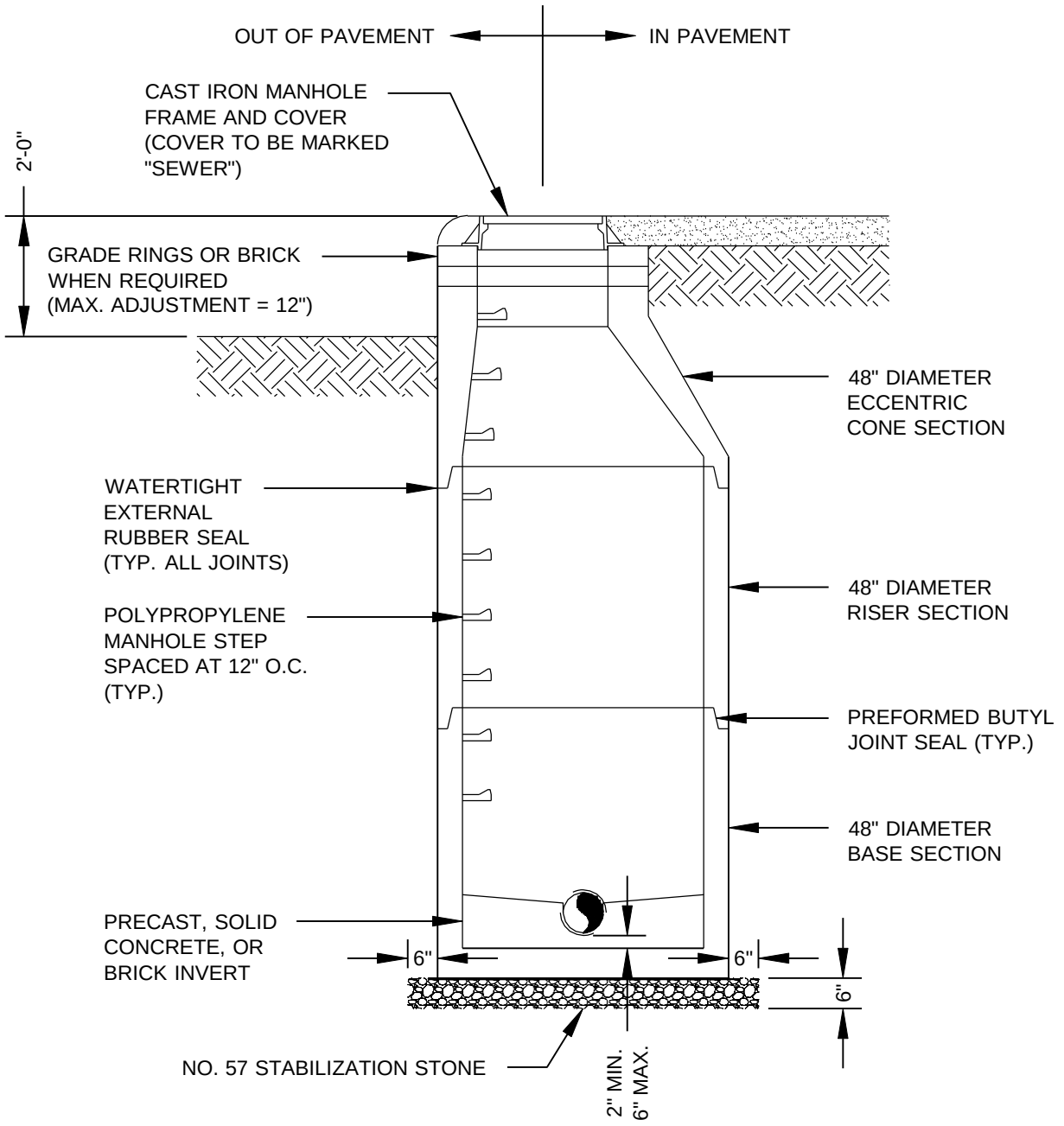
C. Prior to requesting final completion, the Contractor shall complete the following cleanup tasks.

1. Remove and properly dispose of all accumulated debris and all excess material of any kind from the job site.
2. Repair or replace any work, trees, lawns, shrubs, fences, flower beds, drainage culverts, or any other property damaged by the construction. All items damaged beyond repair shall be replaced with new material of equal quality.

3. Clean all road surfaces.

APPENDIX A

Standard Sewer Details



NOTES:

1. MANHOLES LOCATED OUTSIDE OF PAVEMENT SHALL HAVE BOLT-DOWN LIDS WITH NEOPRENE SEALS.
2. MANHOLES SHALL HAVE A MINIMUM DROP OF 0.10 FEET FROM INFLUENT INVERT TO EFFLUENT INVERT.

PEACHTREE CITY WATER & SEWERAGE AUTHORITY STANDARD DETAIL

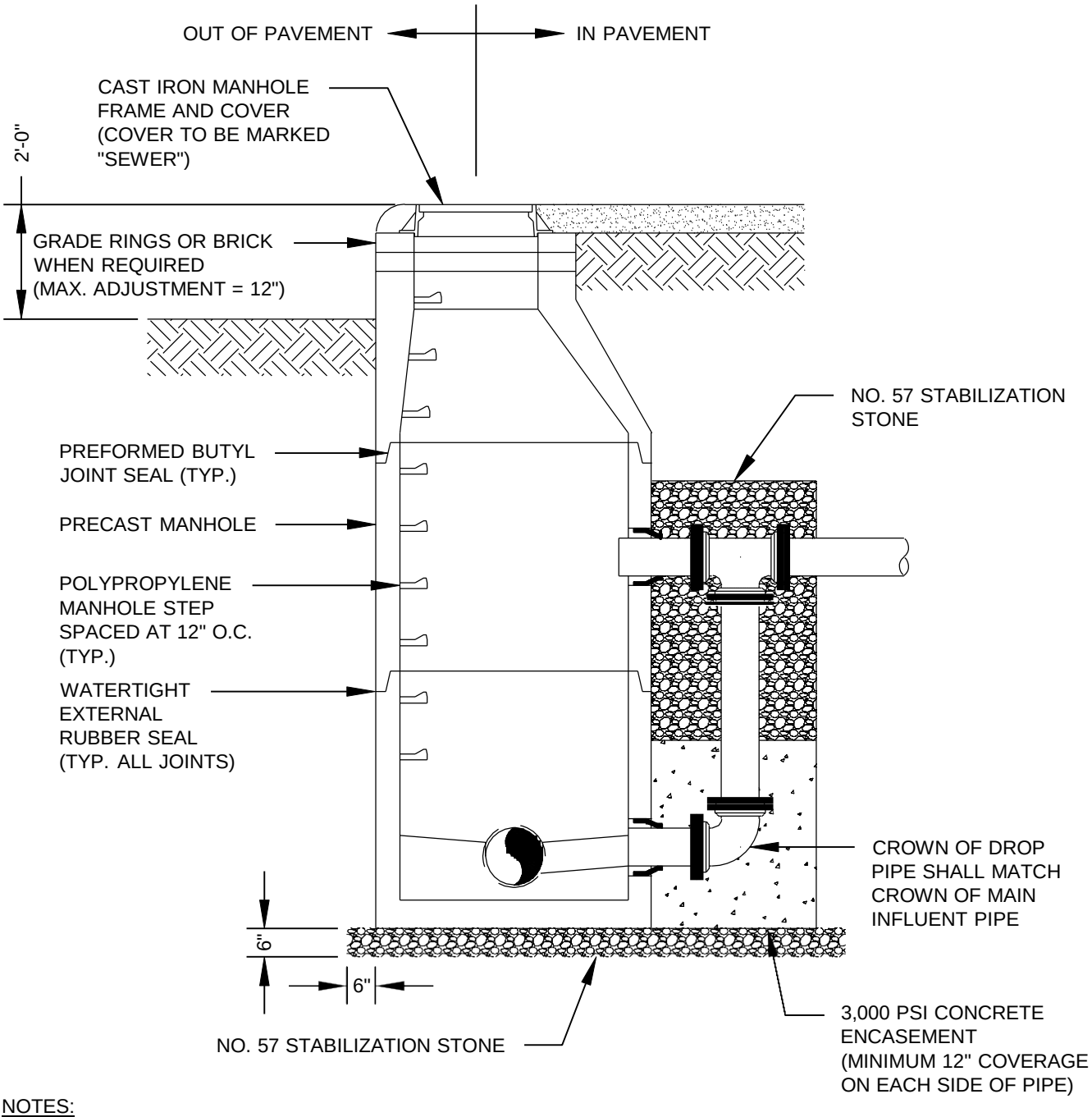
STANDARD PRECAST MANHOLE

REVISED: 08312015

SCALE: N.T.S.

DETAIL NO.

101



NOTES:

1. OUTSIDE DROPS REQUIRED WHEN INSIDE DROP IS GREATER THAN 2 FEET.
2. MANHOLES LOCATED OUTSIDE OF PAVEMENT SHALL HAVE BOLT-DOWN LIDS WITH NEOPRENE SEALS.
3. PIPE ENCASED IN CONCRETE SHALL BE WRAPPED WITH MINIMUM 10 MIL PLASTIC.

PEACHTREE CITY WATER & SEWERAGE AUTHORITY STANDARD DETAIL

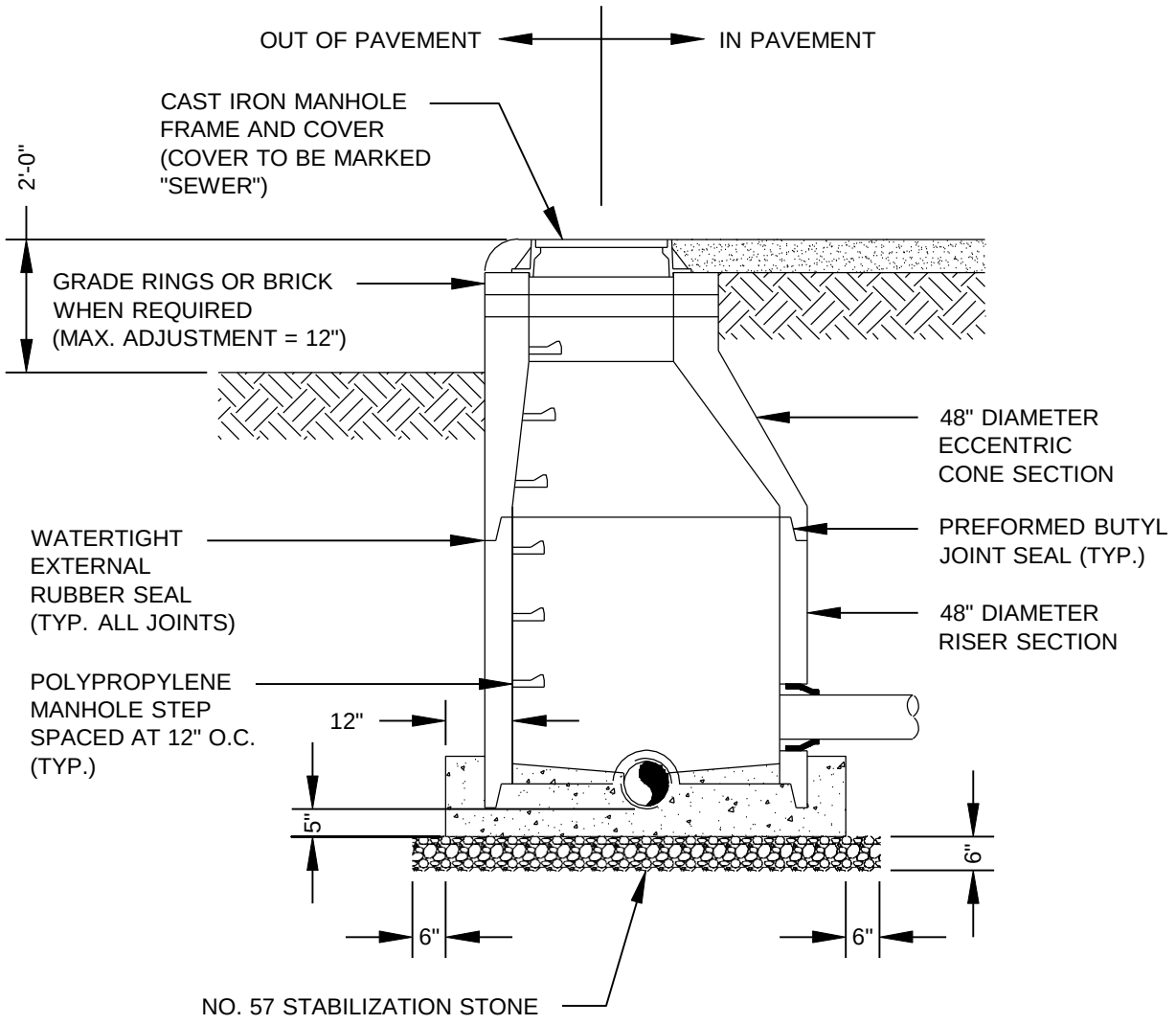
DROP MANHOLE

REVISED: 08312015

SCALE: N.T.S.

DETAIL NO.

102



NOTES:

1. ALL JOINTS AROUND EXISTING AND PROPOSED SEWER LINE SHALL BE GROUTED WATERTIGHT.
2. AFTER DOGHOUSE MANHOLE CONSTRUCTION IS COMPLETE, TOP HALF OF EXISTING SEWER LINE SHALL BE CUT OUT USING A METHOD APPROVED BY THE HCWSA INSPECTOR.
3. MANHOLES LOCATED OUTSIDE OF PAVEMENT SHALL HAVE BOLT-DOWN LIDS WITH NEOPRENE SEALS.

PEACHTREE CITY WATER & SEWERAGE AUTHORITY STANDARD DETAIL

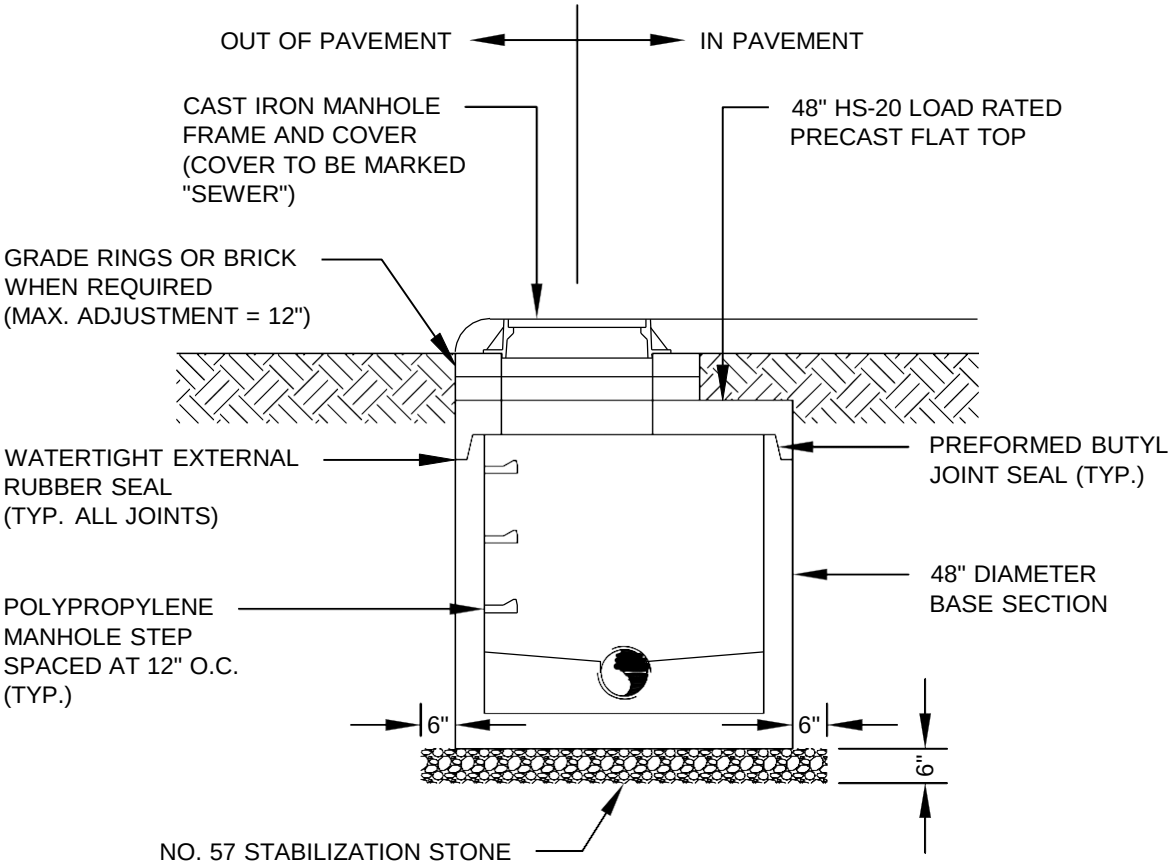
DOGHOUSE MANHOLE

REVISED: 08312015

SCALE: N.T.S.

DETAIL NO.

103



NOTES:

1. MANHOLES LOCATED OUTSIDE OF PAVEMENT SHALL HAVE BOLT-DOWN LIDS AND NEOPRENE SEALS.

PEACHTREE CITY WATER & SEWERAGE AUTHORITY STANDARD DETAIL

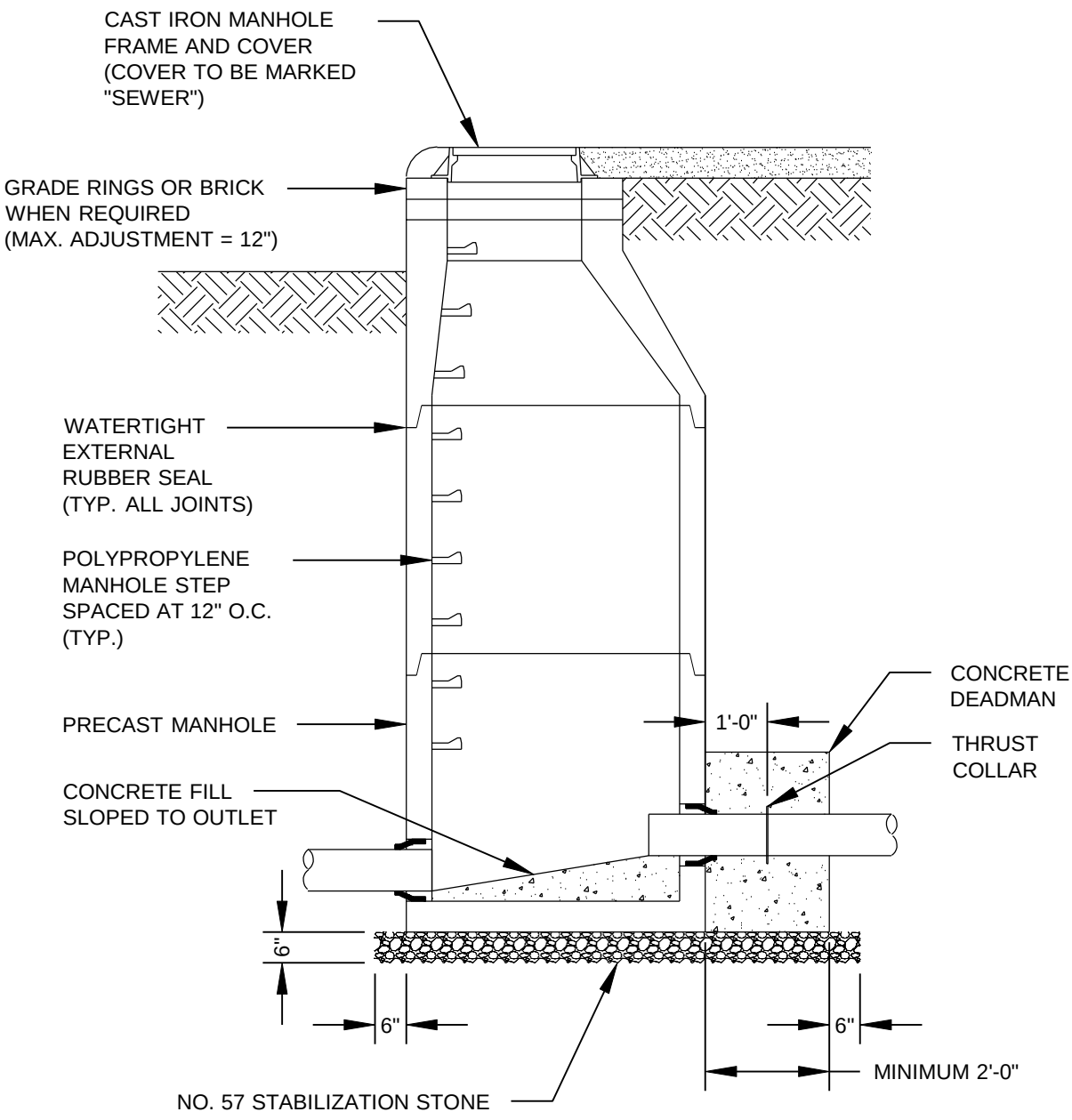
SHALLOW MANHOLE

REVISED: 08312015

SCALE: N.T.S.

DETAIL NO.

104



NOTES:

1. DISCHARGE MANHOLE AND ALL MANHOLES WITHIN 1,600 FEET OF THE DISCHARGE MANHOLE SHALL BE LINED WITH A CORROSION RESISTANT FLEXIBLE ELASTOMERIC POLYURETHANE OR EPOXY LINING SYSTEM.

PEACHTREE CITY WATER & SEWERAGE AUTHORITY STANDARD DETAIL

SANITARY FORCE MAIN

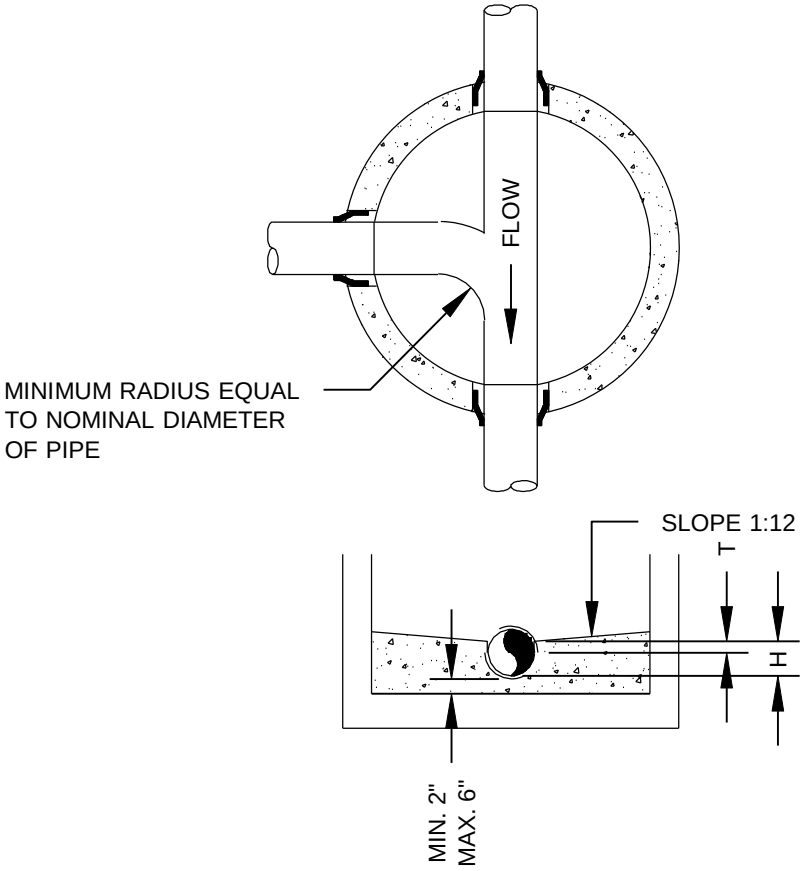
DISCHARGE MANHOLE

REVISED: 08312015

SCALE: N.T.S.

DETAIL NO.

105



NOMINAL PIPE DIAMETER	VERTICAL TANGENT "T"	HEIGHT OF WATER TABLE "H"
8"	2"	6"
10"	3"	8"
12"	3"	9"
15"	4"	12"
18"	5"	14"
21"	6"	17"
24"	7"	19"
27"	8"	21"
30"	9"	24"
33"	10"	26"
36"	0'-11"	29"

NOTES:

1. "H" AND "T" DIMENSIONS APPLY ONLY AT THE UPSTREAM INSIDE EDGE OF MANHOLE.

PEACHTREE CITY WATER & SEWERAGE AUTHORITY STANDARD DETAIL

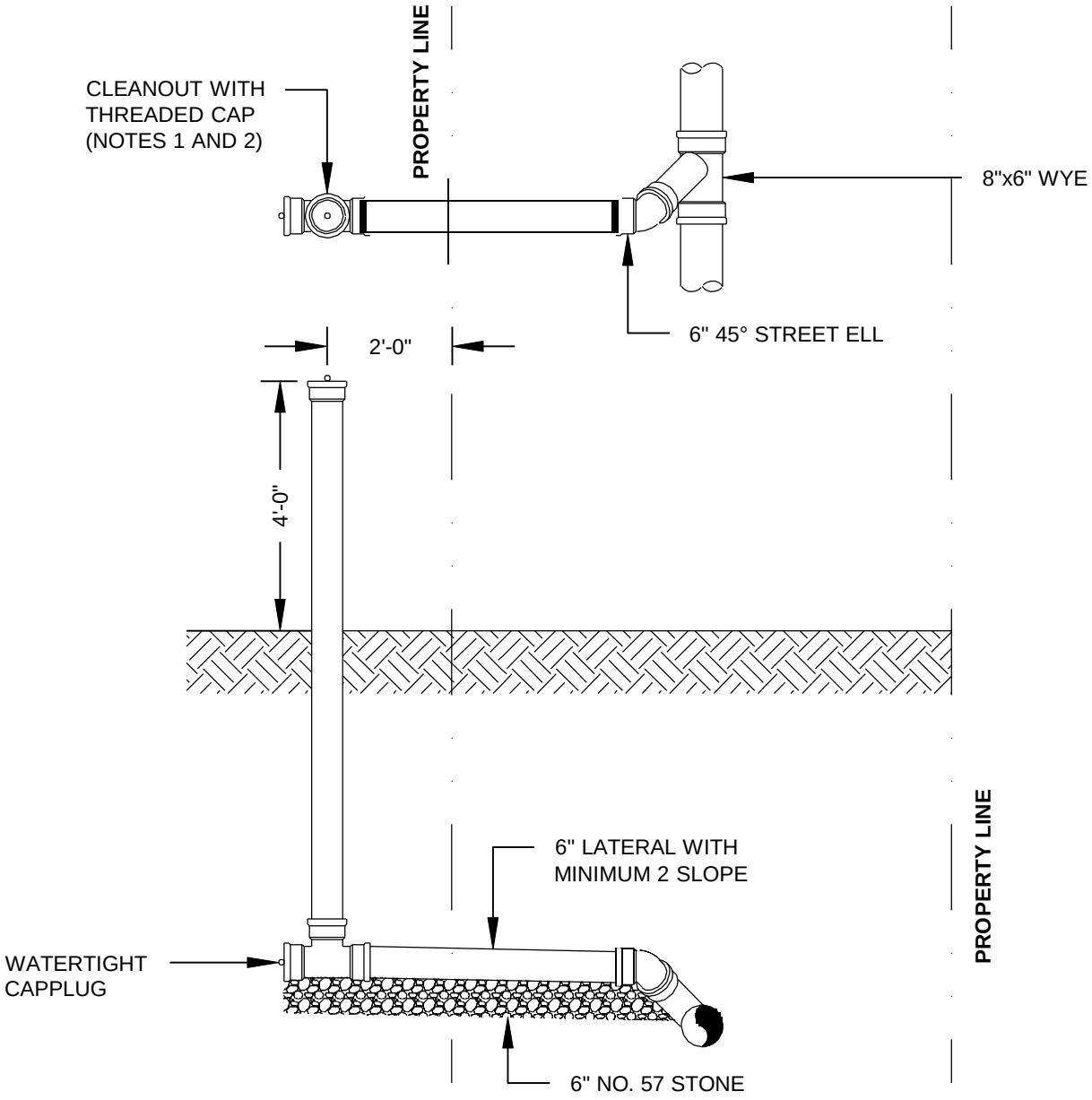
STANDARD MANHOLE INVERT

REVISED: 08312015

SCALE: N.T.S.

DETAIL NO.

106



NOTES:

1. CLEANOUT SHALL BE LOCATED 2-FEET INSIDE PROPERTY LINE.

2. CLEANOUT RISER SHALL EXTEND A MINIMUM OF 4-FEET ABOVE FINISHED GRADE UNTIL SERVICE LINE IS TIED IN AND FINAL GRADING IS COMPLETE. AT THAT TIME, IT SHALL BE CUT AND CAPPED (WITH A THREADED CAP) AT FINISHED GRADE.

PEACHTREE CITY WATER & SEWERAGE AUTHORITY STANDARD DETAIL

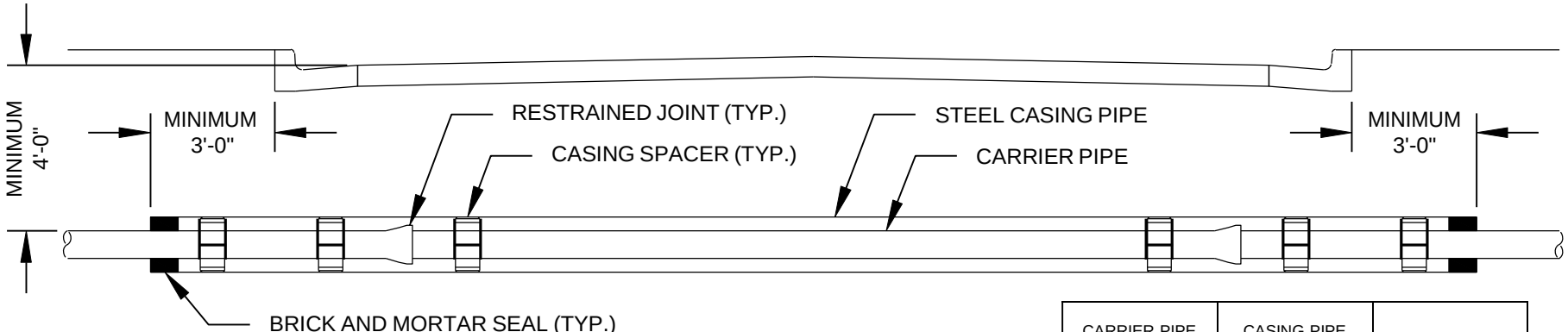
SEWER SERVICE LATERAL AND CLEANOUT DETAIL

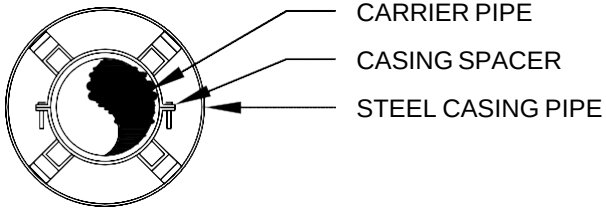
REVISED: 08312015

SCALE: N.T.S.

DETAIL NO.

107





CARRIER PIPE NOMINAL DIAMETER (IN)	CASING PIPE NOMINAL DIAMETER (IN)	CASING PIPE THICKNESS (IN)
8	16	0.250
10	18	0.250
12	20	0.313
16	26	0.375
18	28	0.406
20	30	0.438
24	36	0.500
30	42	0.500
36	48	0.500

NOTES:

1. JOINTS INSIDE CASING PIPE SHALL BE RESTRAINED.
2. PROVIDE A MINIMUM OF 2 CASING SPACERS PER JOINT OF PIPE.
3. ENDS OF CASING PIPE SHALL BE SEALED WITH 8" BRICK AND CEMENT MORTAR.
4. ALL COUNTY ROAD CROSSINGS SHALL BE INSTALLED IN ACCORDANCE WITH FAYETTE COUNTY DOT STANDARDS AND PERMIT REQUIREMENTS.
5. ALL STATE HIGHWAY CROSSINGS SHALL BE INSTALLED IN ACCORDANCE WITH GEORGIA DOT STANDARDS AND PERMIT REQUIREMENTS.
6. ALL RAILROAD CROSSINGS SHALL BE INSTALLED IN ACCORDANCE WITH AMERICAN RAILWAY ENGINEERING ASSOCIATION REGULATIONS AND IN ACCORDANCE WITH PERMIT REQUIREMENTS.

PEACHTREE CITY WATER & SEWERAGE AUTHORITY STANDARD DETAIL

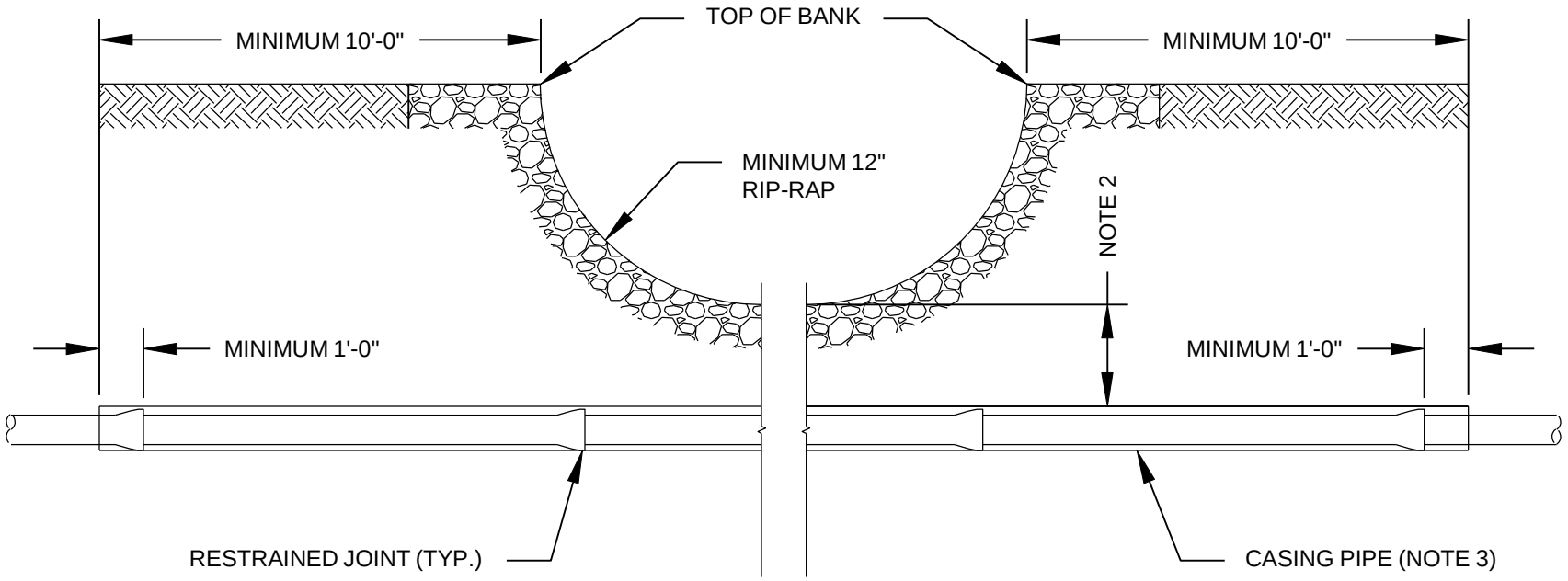
JACK AND BORE INSTALLATION

REVISED: 08312015

SCALE: N.T.S.

DETAIL NO.

108



NOTES:

1. **PIPE USED FOR CREEK CROSSINGS SHALL BE DUCTILE IRON PIPE. JOINTS SHALL BE RESTRAINED FOR A MINIMUM OF 20 FEET BEYOND TOP OF BANK ON EACH SIDE OF CREEK.**
2. **MINIMUM DEPTH OF COVER ABOVE CASING PIPE SHALL BE 12-INCHES.**
3. **REFER TO DETAIL 108 FOR CASING DIAMETER AND DETAILS.**
4. **PLACE STONE RIP-RAP APPROXIMATELY 5 FEET UPSTREAM AND 5 FEET DOWNSTREAM FROM CENTERLINE OF PIPE ALONG CREEK BED.**

PEACHTREE CITY WATER & SEWERAGE AUTHORITY STANDARD DETAIL

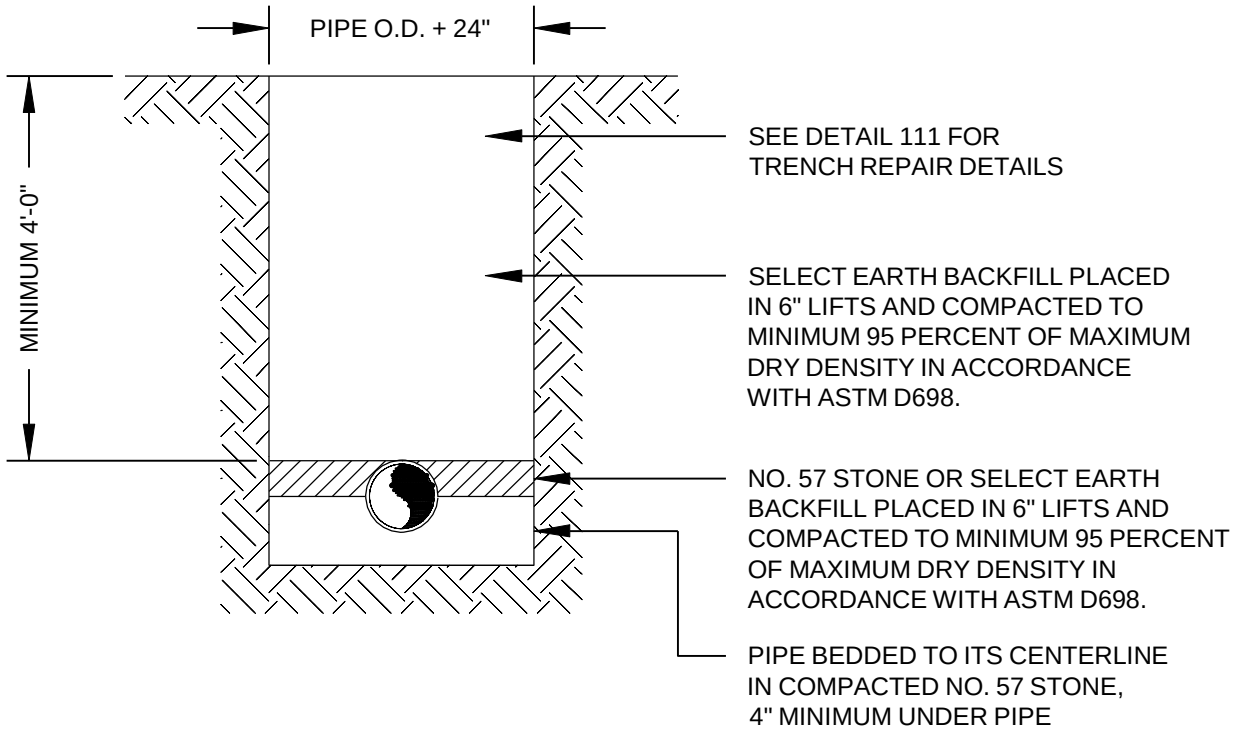
CREEK CROSSING

REVISED: 08312015

SCALE: N.T.S.

DETAIL NO.

109



NOTES:

1. DUCTILE IRON PIPE SHALL BE BEDDED IN ACCORDANCE WITH ANSIAWWA C150A21.50 AND ANSIAWWA C151A21.51, TYPE 5 LAYING CONDITION UNLESS OTHERWISE APPROVED BY PEACHTREE CITY WATER AND SEWERAGE AUTHORITY.

2. POLYVINYL CHLORIDE (PVC) AND HIGH DENSITY POLYETHYLENE (HDPE) PIPE SHALL BE BEDDED IN ACCORDANCE WITH AWWA C605, TYPE 5 LAYING CONDITION.

3. SELECT EARTH BACKFILL SHALL BE EXCAVATED SILTY SAND (SM) AND SILT (ML) MATERIAL THAT IS FREE FROM ROCKS LARGER THAN 3-INCHES IN DIAMETER, ASHES, CINDERS, REFUSE, ORGANIC MATERIAL, FROZEN SOIL, AND OTHER DELETERIOUS MATERIAL.

4. MINIMUM DEPTH OF COVER SHALL BE 4'-0" UNLESS OTHERWISE APPROVED BY THE PEACHTREE CITY WATER AND SEWERAGE AUTHORITY.

5. IF THE BOTTOM OF THE TRENCH IS ROCK, THE TRENCH SHALL BE EXCAVATED TO THE DEPTH BELOW THE BOTTOM OF THE PIPE SPECIFIED IN THE STANDARD SPECIFICATIONS AND BACKFILLED TO THE BOTTOM OF THE PIPE WITH NO. 57 STABILIZATION STONE.

6. IF THE SOIL IN THE BOTTOM OF THE TRENCH IS DETERMINED TO BE UNSUITABLE, THE TRENCH SHALL BE OVER EXCAVATED TO A DEPTH DETERMINED BY THE PEACHTREE CITY WATER AND SEWERAGE AUTHORITY AND BACKFILLED TO THE BOTTOM OF THE PIPE WITH NO. 57 STABILIZATION STONE.

PEACHTREE CITY WATER & SEWERAGE AUTHORITY STANDARD DETAIL

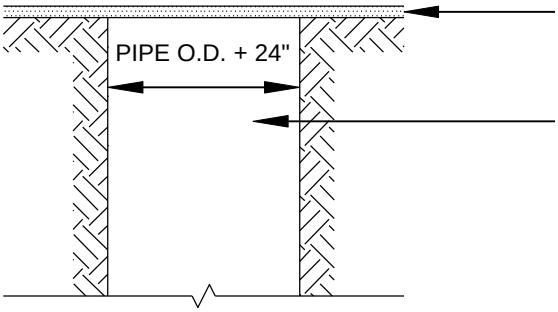
PIPE BEDDING DETAIL

REVISED: 08312015

SCALE: N.T.S.

DETAIL NO.

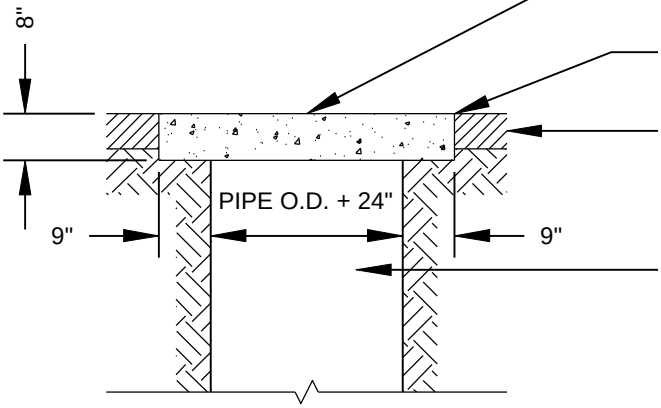
110



NEW GROUND COVER TO MATCH EXISTING GROUND COVER

SELECT EARTH BACKFILL PLACED IN 6" LIFTS AND COMPACTED TO MINIMUM 95 PERCENT OF MAXIMUM DRY DENSITY IN ACCORDANCE WITH ASTM D698. TRENCHES WITHIN GDOT RIGHT-OF-WAY SHALL BE COMPACTED TO 100 PERCENT OF MAXIMUM DRY DENSITY.

UNPAVED AREAS



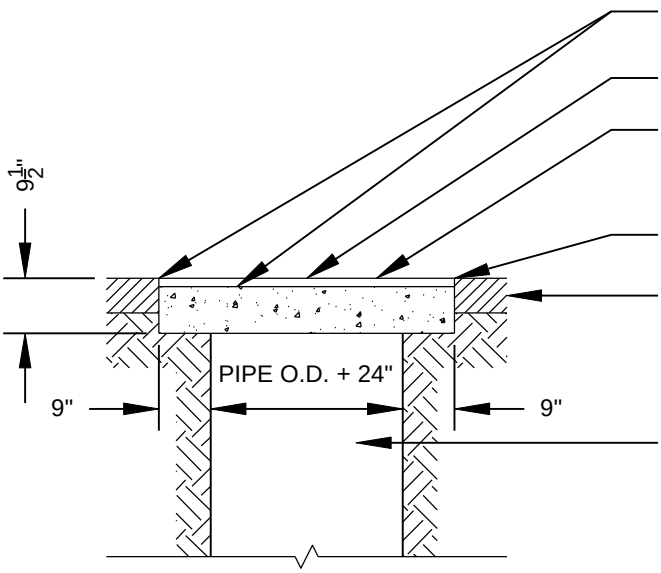
8" CLASS 1 HIGH EARLY STRENGTH CONCRETE CONFORMING TO GDOT STANDARD SPECIFICATION SECTION 430 (3,000 PSI AT 28 DAYS)

SAW CUT EDGES (STRAIGHT LINES)

EXISTING CONCRETE PAVEMENT (THICKNESS VARIES)

SELECT EARTH BACKFILL PLACED IN 6" LIFTS AND COMPACTED TO MINIMUM 95 PERCENT OF MAXIMUM DRY DENSITY IN ACCORDANCE WITH ASTM D698.

CONCRETE PAVEMENT



APPLY TACK COAT TO CONCRETE AND EDGES OF EXISTING ASPHALT

1½" 9.5-mm SUPERPAVE

8" CLASS 1 HIGH EARLY STRENGTH CONCRETE CONFORMING TO GDOT STANDARD SPECIFICATION SECTION 430 (3,000 PSI AT 28 DAYS)

SAW CUT EDGES (STRAIGHT LINES)

EXISTING ASPHALT PAVEMENT (THICKNESS VARIES)

SELECT EARTH BACKFILL PLACED IN 6" LIFTS AND COMPACTED TO MINIMUM 95 PERCENT OF MAXIMUM DRY DENSITY IN ACCORDANCE WITH ASTM D698.

ASPHALT PAVEMENT

PEACHTREE CITY WATER & SEWERAGE AUTHORITY STANDARD DETAIL

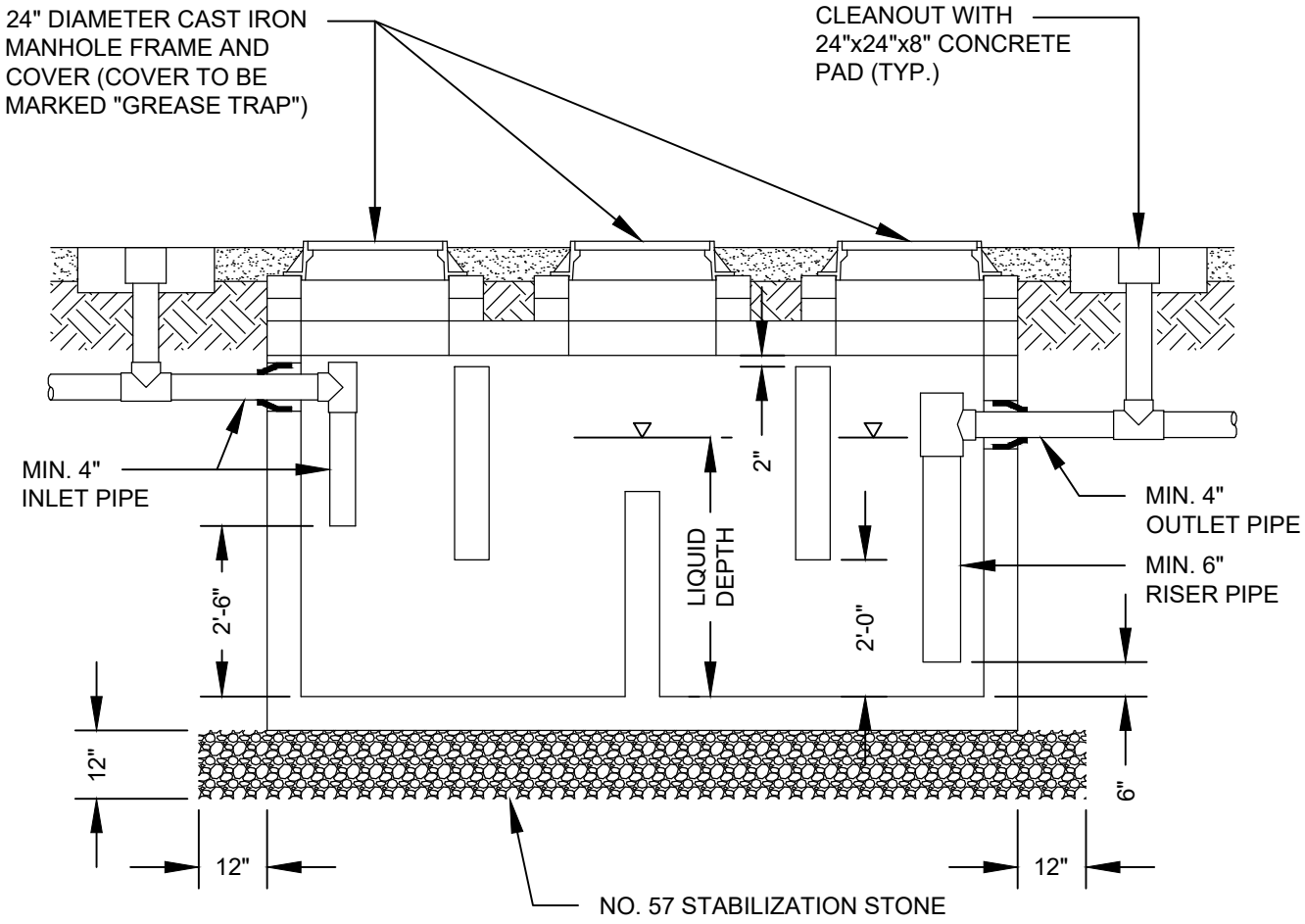
TRENCH REPAIR

REVISED: 08312015

SCALE: N.T.S.

DETAIL NO.

111



NOTES:

1. DETAIL SHOWS GENERAL SCHEMATIC REQUIREMENTS FOR THE GREASE INTERCEPTOR.
2. CONTRACTOR SHALL SUBMIT PROPOSED GREASE INTERCEPTOR INSTALLATION PLANS AND SPECIFICATIONS TO PCWASA FOR APPROVAL BEFORE ACQUISITION OF INTERCEPTOR.
3. GREASE INTERCEPTOR SHALL HAVE A MINIMUM CAPACITY OF 1,500 GALLONS AND A MAXIMUM CAPACITY OF 3,000 GALLONS. IF REQUIRED CAPACITY IS GREATER THAN 3,000 GALLONS, MULTIPLE GREASE INTERCEPTORS SHALL BE USED.
4. GREASE INTERCEPTOR SHALL BE REINFORCED PRECAST CONCRETE CONSTRUCTION. CONCRETE DESIGN STRENGTH SHALL BE 4,000 PSI @ 28 DAYS.
5. GREASE INTERCEPTOR SHALL BE HS-20 LOAD RATED.
6. ALL PIPE PENETRATIONS SHALL BE SEALED WATERTIGHT.
7. INLET PIPE INVERT SHALL BE SAME ELEVATION AS TOP OF OUTLET PIPE.
8. PROVIDE CLEANOUTS AS SHOWN.

PEACHTREE CITY WATER & SEWERAGE AUTHORITY STANDARD DETAIL

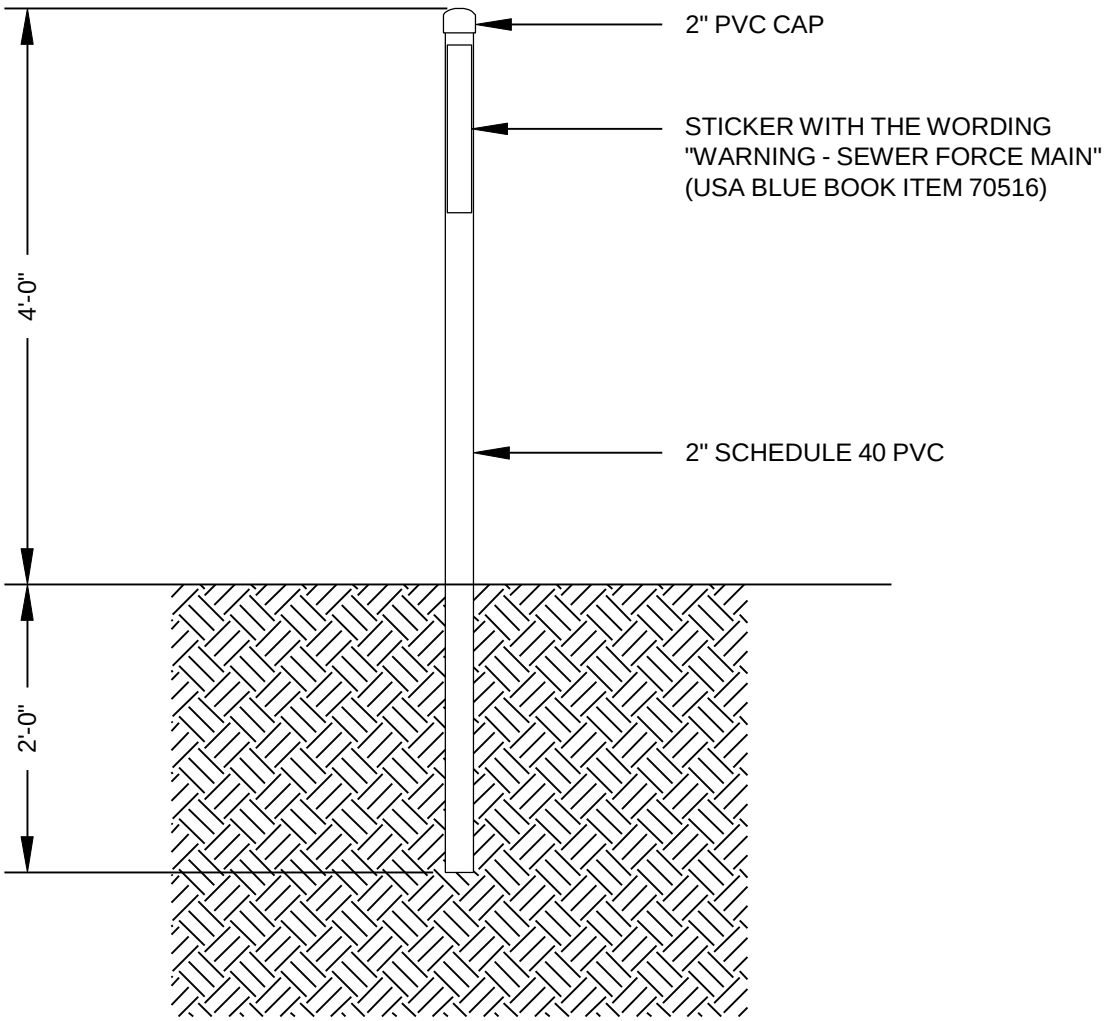
GREASE INTERCEPTOR DETAIL

REVISED: 01/26/2017

SCALE: N.T.S.

DETAIL NO.

112



NOTES:

1. INSTALL MARKER ABOVE FORCE MAIN AT MAXIMUM 250-FOOT INTERVALS.
2. INSTALL MARKER IN ALL LOCATIONS WHERE THE FORCE MAIN CROSSES THE RIGHT-OF-WAY.
3. INSTALL MARKER PLUMB.

PEACHTREE CITY WATER & SEWERAGE AUTHORITY STANDARD DETAIL

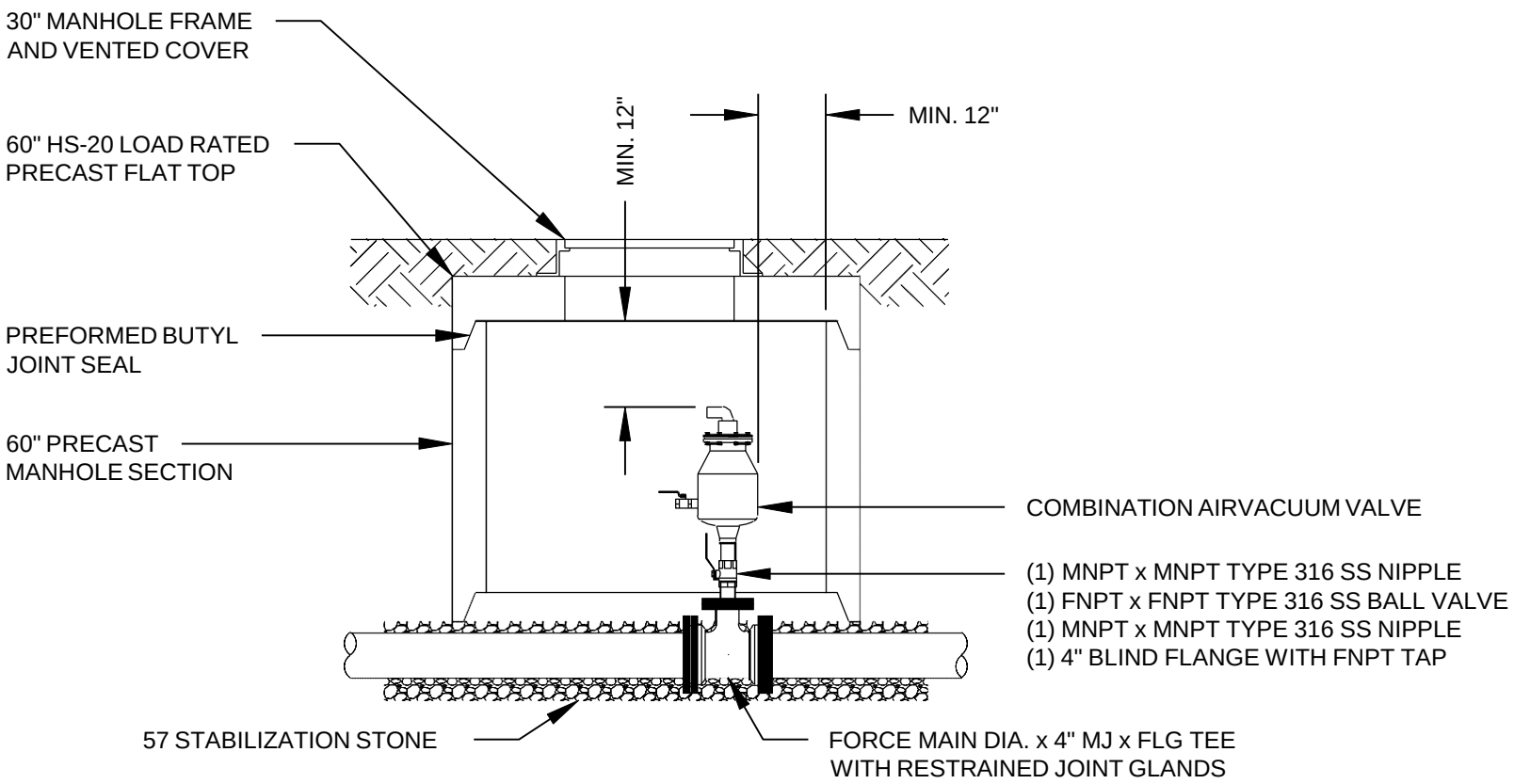
FORCE MAIN MARKER

REVISED: 08312015

SCALE: N.T.S.

DETAIL NO.

113



PEACHTREE CITY WATER & SEWERAGE AUTHORITY STANDARD DETAIL

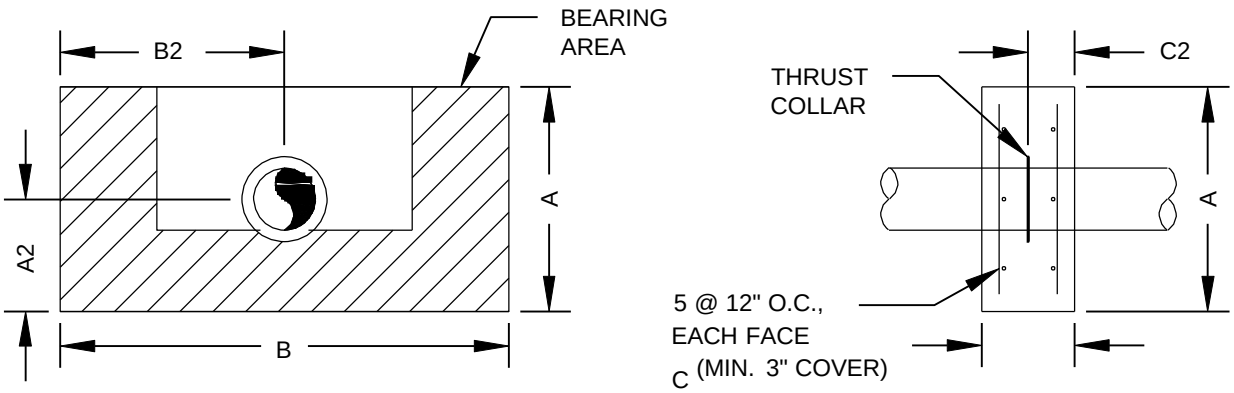
COMBINATION AIR VACUUM VALVE

REVISED: 08312015

SCALE: N.T.S.

DETAIL NO.

114



PIPE DIA. (IN)	A DIM.	B DIM.	C DIM.	MINIMUM BEARING AREA (FT^2)	TOTAL BLOCK AREA (FT^2)	CONC. VOLUME (YD^3)	THRUST (LBF)
4	1'-6"	3'-0"	1'-6"	2.04	4.50	0.24	4,072
6	2'-0"	4'-0"	1'-6"	4.21	8.00	0.43	8,413
8	2'-5"	4'-10"	1'-6"	7.24	11.68	0.62	14,473
10	2'-11"	5'-10"	1'-6"	10.89	17.01	0.91	21,773
12	3'-5"	6'-10"	2'-0"	15.40	23.35	1.66	30,791
14	3'-10"	7'-8"	2'-0"	20.68	29.39	2.08	41,367
16	4'-4"	8'-8"	2'-0"	26.75	37.56	2.66	53,502

NOTES:

1. THRUST COLLAR DIMENSIONS ARE BASED ON THE FOLLOWING DESIGN CRITERIA.

   WORKING PRESSURE = 150 PSI
   SOIL BEARING CAPACITY = 2,000 PSF
   SAFETY FACTOR = 1.5

   THESE ARE THE MINIMUM DESIGN CRITERIA. IF ACTUAL WORKING PRESSURE IS GREATER THAN 150 PSI OR IF ACTUAL SOIL BEARING PRESSURE IS LESS THAN 2,000 PSF, DIMENSIONS SHALL BE RECALCULATED.

2. THRUST COLLAR CONCRETE SHALL HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 3,000 PSI.

3. THRUST COLLAR SHALL BE WELDED ON BY DUCTILE IRON PIPE MANUFACTURER. ALTERNATIVELY, A RESTRAINED JOINT GLAND MAY BE USED.

4. THRUST COLLAR BEARING AREA SHALL BEAR AGAINST UNDISTURBED SOIL. BACKFILL THAT IS PLACED AGAINST THRUST COLLAR (NON-BEARING AREAS) SHALL BE COMPACTED TO MINIMUM 95 PERCENT AASHTO T-99-49 PROCTOR CURVE.

PEACHTREE CITY WATER & SEWERAGE AUTHORITY STANDARD DETAIL

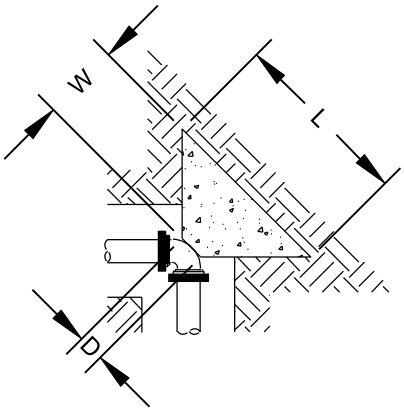
CONCRETE DEADMAN

REVISED: 08312015

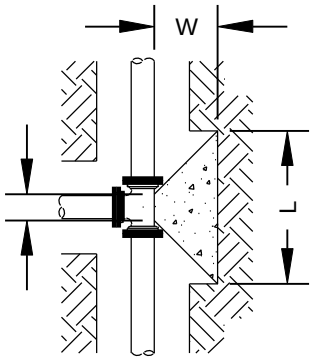
SCALE: N.T.S.

DETAIL NO.

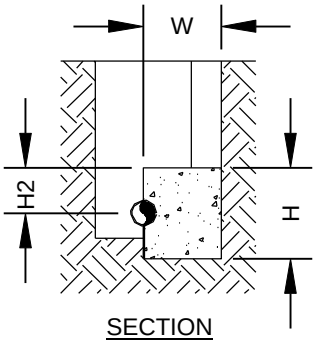
115



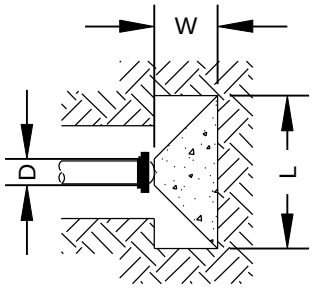
BEND PLAN



TEE PLAN



SECTION



DEAD-END PLAN

NOTES:

1. THRUST BLOCK DIMENSIONS ARE BASED ON THE FOLLOWING DESIGN CRITERIA.

   WORKING PRESSURE = 150 PSI
   SOIL BEARING CAPACITY = 2,000 PSF
   SAFETY FACTOR = 1.5

   THESE ARE THE MINIMUM DESIGN CRITERIA. IF ACTUAL WORKING PRESSURE IS GREATER THAN 150 PSI OR IF ACTUAL SOIL BEARING CAPACITY IS LESS THAN 2,000 PSF, DIMENSIONS SHALL BE RECALCULATED.

2. THRUST BLOCK CONCRETE SHALL HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 2,500 PSI.
3. THRUST BLOCK SHALL BEAR AGAINST UNDISTURBED SOIL.
4. A MINIMUM 10 MIL PLASTIC SHEET SHALL BE PLACED BETWEEN CONCRETE AND PIPE.
5. ALL BOLTS SHALL REMAIN ACCESSIBLE. DO NOT COVER WITH CONCRETE.

TEES AND DEAD-ENDS

PIPE DIA. (IN)	D DIM.	L DIM.	H DIM.	W DIM.	THRUST (LBF)
4	0'-6"	2'-2"	1'-1"	10	4,072
6	0'-8"	3'-0"	1'-6"	1'-2"	8,413
8	0'-10"	3'-10"	1'-11"	1'-6"	14,473
10	1'-0"	4'-8"	2'-4"	1'-10"	21,773
12	1'-2"	5'-8"	2'-10"	2'-3"	30,791
14	1'-4"	6'-6"	3'-3"	2'-7"	41,367
16	1'-6"	7'-4"	3'-8"	2'-11"	53,502
18	1'-8"	8'-4"	4'-2"	3'-4"	67,196
20	1'-10"	9'-2"	4'-7"	3'-8"	82,448
24	2'-2"	11'-0"	5'-6"	4'-5"	117,628

90° BENDS

PIPE DIA. (IN)	D DIM.	L DIM.	H DIM.	W DIM.	CONC. VOLUME (YD^3)	THRUST (LBF)
4	0'-6"	2'-6"	15	12	0.07	5,758
6	0'-8"	3'-6"	1'-9"	1'-5"	0.19	11,898
8	0'-10"	4'-8"	2'-4"	1'-11"	0.46	20,468
10	1'-0"	5'-8"	2'-10"	2'-4"	0.82	30,792
12	1'-2"	6'-8"	3'-4"	2'-9"	1.33	43,545
14	1'-4"	7'-8"	3'-10"	3'-2"	2.02	58,502
16	1'-6"	8'-10"	4'-5"	3'-8"	3.10	75,663
18	1'-8"	9'-10"	4'-11"	4'-1"	4.28	95,029
20	1'-10"	10'-10"	5'-5"	4'-6"	5.72	116,599
24	2'-2"	13'-0"	6'-6"	5'-5"	9.89	166,352

45° BENDS

PIPE DIA. (IN)	D DIM.	L DIM.	H DIM.	W DIM.	CONC. VOLUME (YD^3)	THRUST (LBF)
4	0'-6"	1'-10"	11	8	0.03	3,116
6	0'-8"	2'-8"	1'-4"	1'-0"	0.08	6,439
8	0'-10"	3'-4"	1'-8"	1'-3"	0.16	11,077
10	1'-0"	4'-2"	2'-1"	1'-7"	0.32	16,664
12	1'-2"	5'-0"	2'-6"	1'-11"	0.55	23,566
14	1'-4"	5'-8"	2'-10"	2'-2"	0.80	31,661
16	1'-6"	6'-6"	3'-3"	2'-6"	1.20	40,949
18	1'-8"	7'-4"	3'-8"	2'-10"	1.73	51,429
20	1'-10"	8'-0"	4'-0"	3'-1"	2.25	63,103
24	2'-2"	9'-6"	4'-9"	3'-8"	3.76	90,029

$22\frac{1}{2}$° BENDS

PIPE DIA. (IN)	D DIM.	L DIM.	H DIM.	W DIM.	CONC. (YD^3)	THRUST (LBF)
4	0'-6"	1'-4"	8	5	0.01	1,589
6	0'-8"	1'-10"	0'-11"	0'-7"	0.02	3,283
8	0'-10"	2'-6"	1'-3"	0'-10"	0.06	5,647
10	1'-0"	3'-0"	1'-6"	1'-0"	0.11	8,495
12	1'-2"	3'-6"	1'-9"	1'-2"	0.18	12,014
14	1'-4"	4'-2"	2'-1"	1'-5"	0.30	16,141
16	1'-6"	4'-8"	2'-4"	1'-7"	0.42	20,875
18	1'-8"	5'-2"	2'-7"	1'-9"	0.57	26,218
20	1'-10"	5'-10"	2'-11"	2'-0"	0.83	32,170
24	2'-2"	6'-10"	3'-5"	2'-4"	1.33	45,896

PEACHTREE CITY WATER & SEWERAGE AUTHORITY STANDARD DETAIL

CONCRETE THRUST BLOCK

REVISED: 08312015

SCALE: N.T.S.

DETAIL NO.

116

Appendix B

Standard Forms

CONTRIBUTION OF FIXED ASSETS

STATE OF GEORGIA, COUNTY OF FAYETTE

Project Name: _____

Project Location: _____

Developer: _____

Engineer: _____

Contractor: _____

Please complete applicable portions of categories below.

Gravity Sewer Materials

Gravity Sewer Pipe (Not Including Service Laterals)			Manholes		
Length (ft)	Diameter (in)	Material	Diameter (in)	Vertical Length (ft)	# of Manhole Lids

Materials: DIP = Ductile Iron Pipe, PVC = Polyvinyl Chloride, HDPE = High Density Polyethylene

Total Cost for Gravity Sewer Materials (Labor and Materials): $ _____

Sanitary Sewer Force Main Materials

Length (ft)	Diameter (in)	Material

Materials: DIP = Ductile Iron Pipe, PVC = Polyvinyl Chloride, HDPE = High Density Polyethylene

Total Cost for Sanitary Sewer Force Main Materials (Labor and Materials): $ _____

Sanitary Pump Station Materials

Wet Well Diameter (ft)	Wet Well Depth (ft)	# of Pumps	Pump Manufacturer	Generator? (Yes/No)

Total Cost for Sanitary Pump Station Materials (Labor and Materials): $ _____

Donated Property

Fee Simple Property (acres)	Permanent Easement (acres)

Total Value of Donated Property: $ _____

This is to certify that the materials for this project are donated to the **PEACHTREE CITY WATER & SEWERAGE AUTHORITY** as of this date at a declared total cost of $_____ (including labor and materials) with a 1-year warranty as to maintenance of said materials.

Dated this_____day of_____, 20_____

_____ _____

Grantor/Owner Signature | Attest

_____ _____

Printed Name and Title | Notary Public
My Commission Expires: _____
(CORPORATE SEAL)

DEED OF CONVEYANCE AND EASEMENT

STATE OF GEORGIA, COUNTY OF FAYETTE

IN CONSIDERATION OF THE SUM OF ONE DOLLAR AND OTHER CONSIDERATIONS to them paid,

_____(herein after referred to as "Grantor") do hereby give and convey unto the **PEACHTREE CITY WATER & SEWERAGE AUTHORITY** (herein after referred to as "Authority"), a political subdivision of the State of Georgia, its successors and assigns, a tract of land, which is described as follows:

All that tract of land lying and being in Land Lot(s)_____, District_____of

Fayette County, Georgia, in a subdivision known as ___ and along the rights-of-way of roads located in said subdivision, a free, permanent and uninterrupted easement, use, liberty and privilege of a right of way for twenty (20) feet in width, in, on, under, and through the property of the undersigned, for the purpose of laying, maintaining and operating a line of sewer pipe or pipes, including all appurtenant structures, as part of the sewerage system of said Authority, and for the consideration aforesaid, undersigned hereby agrees that said Authority, through its agents, may lay such additional lines of sewer pipe or pipes in, on, under and through said property, and the said pipe or pipes may be of such size and may be laid at such depth as may be determined by the Authority or its agents, and the undersigned hereby expressly agrees that said Authority shall have construction and maintenance easement of such minimum working width (not to exceed an additional twenty (20) feet) as is reasonably necessary for the proper installation and maintenance of such sewer line or lines; and the undersigned further agrees that said Authority, its successors and assigns, shall have the right to operate and maintain said line or lines in and through said property and right of way granted, together with the right of ingress and egress to and from the same to the extent necessary to install, inspect, repair, keep up, replace, maintain and operate said line.

This Deed is also made for the purpose of conveying all of Grantor's right, title and interest in and to any sewer lines or appurtenances thereto located on the above described property. The Grantor and Grantee agree that the fair market value of the property and sewer lines and appurtenances thereto being conveyed by this Deed is $_____.

TO HAVE AND TO HOLD said land and appurtenances unto said **PEACHTREE CITY WATER & SEWERAGE AUTHORITY**, its successors, executors, administrators, and assigns, in fee simple.

Grantors warrant the title to said land against lawful claims of all persons.

IN WITNESS WHEREOF, Grantor(s) have hereunto set its hand(s) and affixed its seal this_____day of

_____, 20_____.

Signed, sealed and delivered in the presence of: _____ (L.S.)

_____ (L.S.)

_____
Unofficial Witness _____ (L.S.)

(L.S.)

Notary Public
My Commission Expires: _____ _____ (L.S.)

SAMPLE LETTER OF CREDIT

BANK LETTERHEAD

(Insert Date of Acceptance by PCWASA Here)

Peachtree City Water & Sewerage Authority
1127 Highway 74 South
Peachtree City, GA 30269

Re: Letter of Credit
(Insert Name of Developer/Contractor Here)
(Insert Name of Project/Development Here)
(Insert Project Number Here)

To Whom It May Concern:

This is to advise that **(Insert Name of Bank Here)**, as Surety, is holding at the request of **(Insert Name of Developer/Contractor Here)**, as Principal, the amount of $_____which is equal to 10-percent of the cost of labor and material for sanitary sewer lines and appurtenances installed in the above referenced project. The purpose of this Letter of Credit is to guarantee payment of any labor and/or material incurred by the Peachtree City Water and Sewerage Authority (PCWASA) in repairing or maintaining sanitary sewer infrastructure that has been constructed as part of the above referenced project. This Letter of Credit expires 12 months from the date hereon. Surety will notify PCWASA in writing at least 30 days prior to the expiration date of this Letter of Credit.

PCWASA may draw upon this Letter of Credit to the amount set forth above upon presentment at the bank of the following:

1. A bill for the labor and/or materials incurred by PCWASA for the repair or maintenance of said facilities;
2. A draft or drafts at sight on this bank for the amount of the bill;
3. A copy of this Letter of Credit.

This Letter of Credit shall be non-assignable and non-transferable and the proceeds shall be non-assignable and non-transferable.

This Letter of Credit shall be governed by the laws of the State of Georgia. We hereby agree with you that the drafts drawn under and in compliance with this Letter of Credit shall be duly honored upon due presentment to this bank.

Sincerely,
BANK NAME

_____	ATTEST: _____
Signature of Issuer	Signature
_____	_____
Typed Name of Issuer	Typed Name
_____	Corporate Secretary _____
Title of Issuer	Title

CORPORATE CONTRACTOR'S AFFIDAVIT

STATE OF GEORGIA, COUNTY OF FAYETTE

PERSONALLY APPEARED before the undersigned authority

_____, _____ of
(Name of Individual) (Corporate Office Held)

_____
(Name of Corporation)

who, being first duly sworn, deposed on oath, says as follows:

1. That the contractor has recently completed improvements on the property of

   _____
   (Owner of Property upon Which Improvements Were Made)

   located in Land Lot(s)_____, District_____of Fayette County, Georgia, under contract of said property.

2. The contractor has been paid the full price of said improvements.

3. That all bills for labor and materials have been paid in full in the amount of $_____

4. That no person has any claim or lein by reason of said improvements except as follows:

   _____% Retainage withheld for Construction Warranty Period of One Year, in the amount of $_____

5. That this affidavit is made to induce the Peachtree City Water & Sewerage Authority to accept improvements constructed by the Contractor.

IN WITNESS WHEREOF, Affiant has hereunto set his/her hand and seal this_____day of

_____, 20_____.

_____(L.S.)
Contractor's Signature

Signed, sealed and delivered in the presence of:

_____
Notary Public
My Commission Expires: _____

CORPORATE OWNER'S AFFIDAVIT

STATE OF GEORGIA, COUNTY OF FAYETTE

PERSONALLY APPEARED before the undersigned authority

_____, _____ of
(Name of Individual) (Corporate Office Held)

_____
(Name of Corporation)

who, being first duly sworn, deposed on oath, says as follows:

1. That the above named corporation is the owner of a certain tract of land located in Fayette County, Georgia known and designated as:

   Land Lot(s)_____, District_____of Fayette County, Georgia, in a subdivision known as

   _____
   (Name of Subdivision, if Applicable)

   herein after called "Project."

2. The said Corporation has recently completed the following improvements: SEWER

3. The Affiant has full and official knowledge of all debts and obligations incurred for labor and materials which have entered into or become a part of said Project.

4. The Affiant further says all debts and obligations incurred for the labor and materials for the said Project have been fully and complexly paid and discharged in good and lawful money of the United States of America.

5. That Affiant further says all Georgia Sales and Use Tax (if applicable) has been paid fully and completely in good and lawful money of the United States of America.

6. The Affiant further says that there are no suits, claims, or liens, prospective or otherwise, in consequence of the construction of said Project.

7. The Affiant further says that the Contractor has been paid in full in good and lawful money of the United States of America for all sums due Contractor by Owner.

IN WITNESS WHEREOF, Affiant has hereunto set his/her hand and seal this_____day of

_____, 20_____.

_____ (L.S.)
Owner's Signature

Signed, sealed and delivered in the presence of:

_____
Notary Public
My Commission Expires: _____

INDIVIDUAL CONTRACTOR'S AFFIDAVIT

STATE OF GEORGIA, COUNTY OF FAYETTE

PERSONALLY APPEARED before the undersigned authority

_____

(Name of Contractor)

who, being first duly sworn, deposed on oath, says as follows:

1. That the contractor has recently completed improvements on the property of

   _____

   (Owner of Property upon Which Improvements Were Made)

   located in Land Lot(s)_____, District_____of Fayette County, Georgia, under contract of said property.

2. The contractor has been paid the full price of said improvements.

3. That all bills for labor and materials have been paid in full in the amount of $_____

4. That no person has any claim or lein by reason of said improvements except as follows:

   (_____) NONE AS TO THE SEWER SYSTEM

5. That this affidavit is made to induce the Peachtree City Water & Sewerage Authority to accept improvements constructed by the Contractor.

IN WITNESS WHEREOF, Affiant has hereunto set his/her hand and seal this_____day of

_____, 20_____.

_____(L.S.)

Contractor's Signature

Signed, sealed and delivered in the presence of:

_____

Notary Public

My Commission Expires: _____

INDIVIDUAL OWNER'S AFFIDAVIT

STATE OF GEORGIA, COUNTY OF FAYETTE

PERSONALLY APPEARED before the undersigned authority

_____

(Name of Owner)

who, being first duly sworn, deposed on oath, says as follows:

1. That the Affiant is the owner of a certain tract of land located in Fayette County, Georgia known and designated as:

   Land Lot(s)_____, District_____of Fayette County, Georgia, in a subdivision known as

   _____

   (Name of Subdivision, if Applicable)

   herein after called "Project."

2. The Affiant has recently completed the following improvements: SEWER

3. The Affiant has full and official knowledge of all debts and obligations incurred for labor and materials which have entered into or become a part of said Project.

4. The Affiant further says all debts and obligations incurred for the labor and materials for the said Project have been fully and complexly paid and discharged in good and lawful money of the United States of America.

5. That Affiant further says all Georgia Sales and Use Tax (if applicable) has been paid fully and completely in good and lawful money of the United States of America.

6. The Affiant further says that there are no suits, claims, or liens, prospective or otherwise, in consequence of the construction of said Project.

7. The Affiant further says that the Contractor has been paid in full in good and lawful money of the United States of America for all sums due Contractor by Owner.

IN WITNESS WHEREOF, Affiant has hereunto set his/her hand and seal this_____day of

_____, 20_____.

_____(L.S.)

Owner's Signature

Signed, sealed and delivered in the presence of:

_____

Notary Public

My Commission Expires: _____

Appendix C

Supervisory Data Acquisition and Control (SCADA) Specifications

1.1 SCADA System General Specifications

The Contractor shall provide an RTU with radio and antenna to communicate with an existing SCADA system to monitor and control the Pump Station from the Peachtree City Water and Sewerage Authority Office. The RTU and Radio system shall be compatible in all aspects of radio frequency and functionality to the existing SCADA system and shall be manufactured by Universal Controls, Inc. of Cumming, Georgia or approved equal. The Contractor shall provide and install all conduit and wiring, for power and controls, between the Pump Control panel and the RTU. The RTU shall be mounted on the antenna pole near the Pump Station. The contractor shall provide and install a wood creosote treated antenna pole, class 3, up to 50 feet in height above the ground as required for the radio antenna. Actual pole height and location shall be determined upon the completion of a radio path survey provided by the RTU supplier after the start of construction. The RTU supplier shall make an application to the FCC to modify the existing Radio license of Peachtree City Water Sewerage Authority. The RTU supplier shall mount the antenna on the pole for proper height and orientation and modify the computer graphics of the existing SCADA system to include the new Pump Station/RTU of this Contract.

1.2 Required Output Parameters

The SCADA system shall be capable of monitoring, storing and communicating the following conditions of the pump station to the Base Station:

A. Pump # and current run status (On/Off)

B. High Water Level Alarm

C. Low Water Level Alarm

D. Power / Phase Failure Alarm

E. Backup Power (Generator) Status – On / Off

F. Communication Failure (with Base Station)

1.3 Remote Terminal Unit (RTU)

1.3.1 Overview

The remote controller shall be a fully integrated microprocessor based unit specifically designed for unattended operation in unconditioned environments having wide temperature ranges, wide humidity ranges, high electrical noise, high audible noise and high vibration. It shall include optically isolated analog, digital and communications interfaces to interface directly with all standard transducers, actuators, and communications equipment without the need for intervening conditioning devices. The unit shall require no cooling fans and shall be resistant to dust, water and insects.

1.3.2 Unit Setup

The RTU shall not require programming in the usual sense. Instead, the unit shall be configured using a manufacturer supplied Windows compatible program wherein the programmer designs his control strategies, displays, telemetry formats, etc. by interconnecting preprogrammed modules by pointing, clicking and dragging on the Windows compatible program. He then sends the configuration file to the RTU, where it begins running automatically.

1.3.3 RTU Electronic Characteristics

Units shall be designed to operate reliably in high electrical noise, wide temperature range environments without external cooling or noise suppression equipment. All components and subassemblies shall be new and of recent manufacture. The design shall be conservative in that all components shall operate at no more than 50% of rated thermal dissipation in worst case conditions. There shall be 30% timing margin in all critical timing paths.

1.3.4 Logic Family

Unit electronics shall be constructed entirely using the high noise immunity, lower power CMOS logic family. No NMOS, TTL or bipolar components shall be used.

1.3.5 Microprocessor

The microprocessor shall be a 32 bit pipelined design that shall employ a 24 bit address bus and 16 bit external data bus. Clock rate shall be 16 MHz.

1.3.6 Watchdog Timer

A hardware watchdog timer shall be provided that shall require correct operation of both the operating application program and background interrupt software. The timer shall timeout and restart the program within 0.5 seconds of program failure.

1.3.7 Brownout Detector

A hardware brownout detector shall detect sagging power or impending power loss and halt the processor in advance of loss of regulated power to assure orderly shutdown and restart in conditions of fluctuating primary power. It shall employ 10% hysteresis to eliminate the possibility of multiple restarts on power application.

1.3.8 Auto-Booting

Upon power application or upon restarting after a watchdog timer timeout, the unit shall restart the process that was operating prior to the outage. There shall be no loss of memory, loss of temporary storage contents, or loss of clock/calendar function due to power outages of up to 3 years.

1.4 I/O Interfaces

1.4.1 General Optical Isolation and Surge Protection

Each analog input, analog output and digital input shall be equipped with minimum 2500 V optical isolation to isolate the channel from the rest of RTU. Each analog or digital input shall be equipped with security to protect the input from surges in accordance with IEEE surge withstand guidelines. Additionally, analog inputs shall employ noise filters, current limiting resistors and zener clamps per channel to limit voltage excursion to within the A/D converter's operating range. Digital outputs shall employ relays with minimum 2500 V coil to contact isolation.

1.4.2 Analog Inputs

1.4.2.1 Analog Input Board 12 Bit Resolution

Each board shall provide 8 analog inputs for measuring external analog values from standard 4-20 ma or 0-5 VDC transducers. Inputs shall be optically isolated from the computer bus. Analog to digital conversion shall employ 12 bit successive approximation at a sample rate of 10 samplers per second. Inputs shall be individually jumper selectable as either 4-20 ma current loop or 0 to 5 VDC voltage

compatible. Input impedance shall be nominal 100 ohms for current loop channels, and 10 megohms for voltage channels. Power for electronics on the field side of the optical interface shall be provided by the RTU using transformer isolation. Power shall not be taken from the analog signal. Linearity, zero and full-scale error shall each be less than +/- 0.5 LSB over the range of -40 to +85 degrees C. Reference temperature drift shall be less than 0.1 mv/deg.C. Reference aging drift shall be less than 0.02 my. Over or under voltage inputs shall not affect other input measurement accuracy. A/D conversion techniques such as integrating types that allow out of range inputs to effect other channels shall not be acceptable. Background software shall sample the analog inputs modules shall apply low pass filtering and engineering units conversion as specified by the configuration file, and then transfer the samples to the floating point data base for use by other modules. Each board shall hold factory calibration for both 4-20 ma and 0-5 V in onboard EPROM so that field calibration will be unnecessary.

1.4.3 Digital Inputs

Each digital input board shall provide 8 optically isolated channels. They shall be 120 VAC compatible; or dry contact compatible using an onboard isolated lop power supply. Each digital input channel shall include an LED to annunciate the channel state and reverse polarity blocking diode along with current limiting resistor to protect the channel from miss-wiring and transients. Average KED current of 3 ma shall result in full LED illumination. How each channel is used depends upon the specific software module used to interface to them as defined below.

1.4.3.1 Standard AC Digital Inputs

Inputs shall be sampled 250 times per second. If the last four samples are zero, the input shall be regarded as off. Otherwise the input shall be regarded as on.

1.4.3.2 Standard DC Digital Inputs

Whenever the digital input is sampled by a DC digital input module, the returned state shall be regarded as the state of the input. Since digital inputs are optically isolated, and isolated 24 V DC supply shall be used to energize dry contacts for this type of module.

1.4.4 Digital Outputs

Each digital output board shall provide 8 normally open electromechanical relay output channels. They shall be 120 VAC/24 VDC compatible with 3-amp UL/CSA contact rating into a resistive load. Mechanical life shall exceed 10 million operations. Each digital output channel shall include LED to annunciate the channel state and a back EME diode. Relays shall require no more than 35 ma to pull on. How each channel is used depends upon the specific software module used to interface to them as defined below. All relays shall remain off during the boot up process.

1.5 Standard On/Off Control

When a relay output module calls for the relay, the relay shall energize; when the module calls for it to turn off, it shall turn off immediately.

1.6 Serial Ports

It shall be possible to install serial port cards into any slot in the base card cage for a total of 8 cards with serial ports in addition to the serial port on the CPU card. Serial ports shall be independently configurable as to baud rate, word length, stop bits, parity, buffer length, communications protocol, etc., using the standard serial port settings. Configuration shall be by communications setup module in the configuration file. Communications protocols supported shall be RUG6, RUG9, ASCII, or MODBUS RTU protocol,

minimum. Loading of any software or configuration files shall use the CRC secured RUG9 protocol and shall be possible on any serial port. Loading of the RUG9 operation system shall only be possible on the CPU serial port.

1.6.1 CPU RS232 Port

An RS232 port shall be provided on the CPU board for local terminal/printer control, program loading, operation system loading, logged data dumping, interfacing to a local computer, or for general communications with local serial devices. A standard DB9 connector shall be provided enabling the RS232 port to be connected to an IBM PC using a standard DB9 cable.

1.6.2 Modem/RS232 Port

A serial port board shall be provided which shall be selectable under software control as RS232 or modem; and, when selected as modern, shall be selectable by jumper as 2-wire modem, or 4-wire modem. It shall be used for communicating with remotely located computers or other RTUs. The RS232 port shall be compatible with spread spectrum radios, radios with integral modems, and with external high baud rate phone line modems. The integral modem shall support 300/1200 baud using Bell 103/212 standards for use over phone lines or radio. Audio interfaces shall be transformer isolated with 600-ohm line impedance. An integral audio amplifier with a 10 to 1 potentiometer adjustment range shall be provided on the transmitter channel to accommodate highly attenuated lines. The 2-wire circuit shall have a touch-tone generator, on/off hook relay, and optically isolated ring detector. A radio transmitter key circuit an isolation relay shall also be provided. An LED shall indicate transmitter keying and on/off hook status. Connection to the modern shall be via removable screw terminals for the leased line and radio interfaces, and by modular oxide varistor (MOV) and back to back zener diode lightning protection between tip and ring. The MOV shall be rated for 1200 amps surge current.

1.7 Printer Port

A Centronics compatible parallel printer port shall be provided for interfacing to a local printer. The unit shall be capable of reporting alarms, analog values, engineering units, totalizations, averages and other data along with time tag information in a convenient, understandable English language format. Provisions shall be made for detecting printer on line/off line status, power fail, and out of paper conditions. The printer port shall employ a standard DB25 connector enabling connection to a Centronics compatible printer using a standard IBM PC printer cable.

1.8 Power Interface

The unit shall operate from 12 VAC or 15 VDC. Input voltage tolerance shall be +/- 20%. An internal fuse shall protect the unit from over-current. Unit current draw shall be less than 150 ma with all output relays off and loop supplies off. Current consumption in the SLEEP mode shall be less than 2 ma. An integral power failure and brownout detector shall be provided. Diode isolation and fuse shall be provided to protect against external battery reverse connection.

1.9 I/O Channel Expandability

Each I/O type shall be expandable to at least the following in a single card cage. Up to 8 card cages shall be connectable to constitute a single RTU.

Channel Type	Channel/Cage	Channel/RTU
Digital Inputs	64 Channels	512 Channels
Digital Outputs	64 Channels	512 Channels

Channel Type	Channel/Cage	Channel/RTU
Analog Inputs	64 Channels	512 Channels
Analog Outputs	32 Channels	256 Channels

1.10 I/O Connections

All I/O connections shall employ individual screw type terminals using the rising cage clamp design capable of accepting 14 AWG wire. The terminals shall be removable in groups of 3 to 16 from PC board headers so that the unit can be changed out without removing field wires individually.

1.11 Onboard Diagnostics

The Diagnostics/Loop supply/Charger board shall measure bus voltage, battery voltage and unit temperature with 12 bit resolution. Measurements shall be factory calibrated, requiring no field calibration for accurate measurements. Calibration shall be retained on EPROM on the board and read at boot-up. The bus voltage measurement shall enable the unit to detect AC power failure. The battery voltage measurement shall enable the unit to sense battery discharge before battery voltage falls below the brownout shutdown voltage.

1.12 RTU Software

1.12.1 Security Software

Software shall be provided for verifying the integrity of the operation system and user configuration file on power application and immediately following file loading. Failure of the code to pass its check shall cause the unit to suspend operation of that software.

1.12.2 Scanning Software

All I/O scanning shall be done by operation system software without need for programmer attention. Keyboard and serial port scanning shall use interrupts for fast response and to reduce scanning overhead. Keyboard multi-digit user entries shall be captured by background software without effecting the running program. Each entry shall be entered into a setpoint register immediately after the user hits the [ENTER] key at which time the new setpoint entry will take effect.

1.13 Port Buffering

Each serial port and printer port shall have separate receive and transmit buffers of user specified length. Interrupt driven background software shall accomplish buffer filling and emptying using ring buffer structure to minimize to possibility of missing data. A continuous data rate of 9600 baud shall be supported. The speech board shall buffer 16 bytes of speech commands.

1.14 Serial Port Parameter Setting

Serial port and printer port parameter settings shall be set by a port setup module per port. The following parameters shall be defined in the setup module:

A. Baud rate

B. Word length

C. Stop bits

D. Parity
E. Tone use
F. UART connection
G. Address
H. Mode
I. Tx delay
J. Trigger to install
K. Rings to answer
L. Off hook max seconds

1.15 CRC Error Detection

Background software shall accommodate message reception and transmission using a subset of the DDCMP protocol employing CRC error checking. Each message shall consist of a fixed length header portion and an optional variable length data section. Each section shall have its own 16 bit CRC error check. Background software shall generate CRC codes for outgoing messages, and shall check CRC codes for received messages. Any received message having invalid CRC codes shall be discarded.

1.16 Communication with Other RTU's

Upon reception of a message with correct unit address and correct CRC codes, background software shall take the action specified in the message and generate the proper response. This action shall be transparent to the running program, except that the message reception and message type shall be made available to the program in the form of triggers. Using built in message formats, it shall be possible to transfer analog measurements, setpoints, statuses, commands, totalizations, clock settings, etc. between a central computer and any or all remote units, and between remote units. It shall be possible for messages contain a mix of 16 bit integers, 32 bit integers, statuses, and 32 bit floating point numbers. It shall also be possible to load a configuration file from a central computer to a remote unit. In addition to receiving messages having a unit's address, it shall be possible for a unit to capture messages from one unit to another, both of which have a different address than that of the receiving unit. In this case, no reply will be generated.

1.17 Peer-to-Peer Communication

It shall be possible for the unit to issue all commands supported by its formats except for memory loading and program run/stop commands by specifying destination unit address and message type. Background software shall take care of generating the message, accepting the response, and transferring data between the port buffers and the pre-assigned databases. Background software shall make message transfer status and result available to the program for use in accumulating statistics in link performance, and for notifying the requested data has been received. Using these messages it shall be possible to transfer analog values and statuses efficiently and securely between remote units.

1.18 Store and Forward Operation

The system shall support message store and forward operation so that stations out of range or otherwise out of communications visibility shall be able to communicate using intermediary RTU's. The specific

path each forwarded message is to take shall be specified at time of message initiation by the initiating station. The path shall be contained in the message so that any receiving station can determine whether it is to forward the message, and to which station it is to forward the message, based entirely upon the contents of the message. In this manner, the initiating station shall be capable of trying an alternate path to accommodate failed intermediary stations. The unit shall be capable of forwarding through a path of as many as 3 intermediary stations, and of retrieving a reply through the identical reverse path.

1.19 Unit Address Range

Each port shall have a one-byte address kept in flash memory.

1.20 Preprogrammed Modules

Instead of programming in the usual sense, the RTU shall be configured using, as a minimum, the following modules by connecting the outputs of certain modules, contained in the databases, to the inputs of other module(s).

1.20.1 I/O Modules

AI, AO, DI, DO, alarm out, pulse in, pulse out, pulse duration I/O, filtering

1.20.2 Control Modules

Alarm gen, alarm mismatch, deadband, PID, AND/OR/EOR, sequencer, trigger on sec/min/hour/day of week/month, string switch, trigger on boot, trigger on event, trigger on key, trigger on receive, ladder logic.

1.20.3 Statistics Modules

Totalize, average, min, max, log data, log list, trend setup

1.20.4 Communication Modules

Protocol select, poll setup, receive/transmit array setup, store & forward setup, log array dump

1.21 Ladder Logic

The RTU shall enable the programmer to use ladder logic to cover any control strategies not covered by preprogrammed modules. Each rung shall have a minimum of 7 input contacts and a single coil output. The programmer shall be able to refer to contacts and coils by user defined names.

1.22 Event Timing

Events shall be timed by either the real-time clock with one second resolution, or by individual countdown registers that are decremented each 1/10 second.

1.23 Sleep Timing

A timer shall run during SLEEP mode to accomplish a timed wakeup. The timer shall be initialized by the user's program and have a range of 1 to 32,768 seconds. To accommodate software errors, the timer shall not allow the unit to sleep longer than 32,768 seconds.

1.24 Fault Trapping

The unit shall test for potential math errors as it executes the modules and return the most reasonable result (MAXVALUE OR MINVALUE) instead of allowing run time errors. If any run time error occurs, the unit shall halt operation and allow the watchdog timer to reboot the system.

1.25 PERFORMANCE

1.25.1 I/O Scanning

Background software shall scan analog and digital inputs at the rates specified. For a nominal control application, the RTU shall accomplish all its scanning tasks in less than 0.2 second.

1.25.2 Communication Response Time

The unit shall issue a response to a CRC secured message in less than 60 milliseconds. Provisions shall be made whereby the delay from transmission tone-on to actual output of data is adjustable over the range of 10 to 3,277 milliseconds in increments of 10 milliseconds to accommodate transmitter turn-on delay, receiver acquisition time and receiving modem acquisition time. The specification of the tone turn-on delay shall be specified in the communications definition module held in flash memory. Assuming a transfer of digital inputs, the following response times shall be met, including time to request a transfer and receive and decode the transfer:

300 baud	9 transfers in 10 seconds
9,600 baud	90 transfers in 10 seconds

1.25.3 Communication Security

The CRFC error detection technique shall provide a probability of acceptance of an erroneous message of 1.0 E-14. It shall also reject all burst errors of 16 bits or less.

1.25.4 Temperature Range

The unit shall operate over an ambient temperature range of -40 to +85 degrees Centigrade. The display shall operate over a range of -20 to +65 degrees Centigrade and shall survive a range of -40 to +70 degrees Centigrade. No cooling fans or air circulation shall be required for normal unit operation over the temperature range specified.

1.26 Enclosure

The RTU shall be housed in a NEMA 4X stainless steel enclosure as manufactured by Hoffman or equal.

1.27 Radio

The radio transceiver and antenna for the RTU shall meet the frequency and RF power output requirements as determined by the FCC license for the Peachtree City Water and Sewerage Authority's existing SCADA system.

1.28 Battery Charger

A fused 160 ma. battery charger shall provide battery charging when AC power is present, and automatically switched to battery power when AC power fails. Batteries shall be 5-year industrial grade sealed rechargeable lead-acid batteries. The batteries shall be operable in any position. The batteries

shall be 12 VDC with a continuous current rating capable of providing power to the RTU for up to 60 minutes with RTU temperatures of 0 degrees to 60 degrees C.