



SEWER SPECIFICATIONS

Revised April 30, 2018

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SECTION S100 - GENERAL INFORMATION

S101-GENERAL REQUIREMENTS

- 1.) This document is subject to periodic revision to meet changing requirements for materials, environmental regulations, etc. At the beginning of a project, users should verify that they have the latest edition.
- 2.) This document is intended to convey the general design and construction requirements for a typical project. It also lists specific Cherokee County Water & Sewerage Authority requirements relating to plan review, inspection, testing and acceptance of facilities. It is not intended as a substitute for site-specific engineering and construction techniques. Individual project conditions may require variances from the provisions in this document in which case such variances should be noted in the plans and other data submitted by the project design professional for the Authority's approval.
- 3.) The **CCWSA Standard Details Booklet** is complementary to the Specifications written herein. If the developer or designer notes any discrepancies or desires an interpretation of a specification, they should submit their question to the Authority in writing for a decision by the Authority or the Authority's representative.
- 4.) Failure by the Authority or the Authority's plan review representative to notice any deviations from the Authority's Standards during the plan review process does not alleviate the Developer's responsibility to adhere to the Standards.
- 5.) The Developer must submit five (5) paper copies of Construction Plans, plus the electronic data on CD, as outlined in these specifications, to the Authority for review.
- 6.) An approved set of construction plans and **CCWSA Standard Detail Booklet** stamped by the Authority must be kept onsite at all times by the Contractor.
- 7.) The Authority shall be notified by the Developer or his contractor before construction begins, and at the various stages in construction as required by the Authority. The Authority shall be given a minimum of 4 days' advance notice before an inspection is needed.
- 8.) Contractors performing utility construction must be licensed in accordance with State of Georgia law and local ordinances and approved by the Authority. They shall maintain liability insurance to the minimum requirements of the Authority. **(See CCWSA Standard Detail M-04 for a sample of the Certificate of Liability Insurance to be submitted.)** They should be completely familiar with the procedures and contract requirements associated with this type of project. Unsatisfactory work will cause a contractor to not be approved for future work.
- 9.) The Developer is responsible for replacing any and all water and/or sewer facilities which are damaged by the Developer and any of his Contractors and any Builder working at the project site. Water and sewer facilities include but are not limited to service lines, meters, meter boxes, valves, valve boxes, valve markers, fire hydrants, and manholes.

S102-APPROVAL BY OTHER GOVERNMENT AGENCIES

No part of the approval process is intended to relieve the Developer of the responsibility to comply with minimum standards of the Cherokee County Water & Sewerage Authority, Georgia Department of Natural Resources, EPA, EPD, NRCS, Georgia Department of Transportation, Cherokee County, U.S. Army Corps of Engineers or other appropriate regulatory agency.

S103-LIST OF COMMONLY USED TERMS

"Authority" shall mean the Cherokee County Water & Sewerage Authority.

"Contractor" shall mean the individual, firm or corporation undertaking the execution of the Work under the terms of the contract and acting through its agents and employees.

"Developer" shall mean the individual, firm or corporation financing the execution of the Work.

"Engineer" shall refer to the engineer appointed by the Developer as representatives of the Developer and to its properly authorized agents.

"General Manager" shall refer to the General Manager of the Cherokee County Water & Sewerage Authority.

"Chief Inspector" shall refer to the Chief Inspector of the Cherokee County Water & Sewerage Authority.

"Owner" shall refer to the Cherokee County Water & Sewerage Authority.

"Plans" shall refer to those drawings that show the character and scope of the Work and shall include all drawings identified in the contract documents.

"Shall" and "Will" are mandatory; "May" is permissive.

"Specifications" and "Standards" shall refer to the Sanitary Sewer Main Standards of the Cherokee County Water & Sewerage Authority.

"Work" of the contractor shall include all labor, material, equipment, transportation, skills, tools, machinery, and other equipment and things useful and necessary to complete the contract.

S104-LIST OF ACRONYMS

ASTM:	American Society for Testing and Materials
AWWA:	American Water Works Association
D.I.P.:	Ductile Iron Pipe
D.O.T.:	Georgia Department of Transportation
EPA:	United States Environmental Protection Agency
EPD:	Georgia Department of Natural Resources, Environmental Protection Division
CCWSA:	Cherokee County Water & Sewerage Authority
HDPE:	High Density Polyethylene
NRCS:	National Resource Conservation Service
OSHA:	United States Dept. of Labor, Occupational Safety and Health Administration
PVC:	Polyvinyl Chloride
RCP:	Reinforced Concrete Pipe
VCP:	Vitrified Clay Pipe

S105-APPEALS

Any requirement that is outlined in these specifications may be modified or revoked by a majority vote of the full membership of the **Cherokee County Water & Sewerage Authority Board of Directors**.

Persons wishing to file an appeal must submit a written request to the Authority prior to the Agenda date for the next Authority meeting stating the nature of the request to be made. If the request is not made prior to the Agenda date, it will be considered at the following regularly scheduled meeting of the Authority. Please contact the Authority's office for information regarding the deadline date to be included on the agenda.

S106-INSURANCE REQUIREMENTS**Cherokee County Water & Sewerage Authority****3rd Party Contractor Hold-Harmless Agreement, Insurance, Indemnity, and Additional Insured**

3rd Party Contractor

Contractor's Liability Insurance: Contractor shall maintain at its sole cost and expense such insurance as will fully protect it and Cherokee County Water & Sewerage Authority (et al), CCWSA's officials, directors, officers, employees, agents, and volunteers from incidents, accidents, and claims for bodily injury and property damage which may arise from operations under this Contract; whether such operations are performed by Contractor or by any Subcontractor directly employed or retained by either.

INDEMNITY AND INSURANCE**Commercial Insurance**

- 1.) Workers' Compensation Insurance in compliance with the applicable Workers' Compensation Act(s) of the state(s) wherein the work is to be performed or where jurisdiction could apply in amounts required by statutes.
- 2.) Employer's Liability Insurance, with limits of liability of not less than \$1,000,000 for each accident/disease.
- 3.) General Liability Insurance, including contractual liability insurance, explosion and underground collapse (XCU), product and completed operations, personal and advertising injury, damage to rented premises (each occurrence \$100,000), medical expense (any one person \$5,000), fire damage (\$50,000), and any other type of liability for which this Contract applies with limits of liability of not less than \$1,000,000 each occurrence / \$1,000,000 annual aggregate. General Liability Insurance must be written on an "occurrence" form and must apply on at least a per "project" basis.

Property Insurance

The Contractor assumes sole responsibility for loss or damage to its property and hereby releases CCWSA and its officials, directors, officers, employees, agents, and volunteers from loss or damage to Contractor and its employee's tools, equipment, goods, machinery, materials, and supplies.

Conditions

The aforementioned insurance policies shall contain a provision that coverages afforded under such policies shall not expire, be canceled or altered without at least thirty (30) days prior written notice to CCWSA's Risk Management Department. Except for insurance coverages relating to Workers' Compensation and Employer's Liability, the foregoing insurance policies shall include an endorsement making Cherokee County Water & Sewerage Authority an Additional Insured under such policies and a clause that insurance is on a primary and non-contributory basis. A copy of the endorsement and clause are to be provided to CCWSA's Risk Management Department. Certificates of Insurance showing that such coverages are in force shall be filed under this Contract by the Contractor.

The Certificate(s) of Insurance shall also contain a statement as follows:

"This/These certificate(s) of insurance conform(s) to all terms and conditions (including coverage of the indemnity agreement) contained in Contract with Cherokee County Water & Sewerage Authority."

Such certificates and notices are to be sent to:

**Cherokee County Water & Sewerage Authority
Attn: Risk Management Department
391 West Main Street
Canton, GA 30114**

with a copy to:

**Cherokee County Water & Sewerage Authority
Attn: Special Projects Department
583 Cokers Chapel Road
Ball Ground, GA 30107**

Non-Limitation on Contractor’s Liability

The obligations for Contractor to procure and maintain insurance shall not be construed to waive or restrict other obligations and it is understood that insurance in no way limits liability of the Contractor or limits the liability of Contractor whether or not same is covered by insurance.

The Contractor further understands and agrees that any damages, that the Cherokee County Water & Sewerage Authority deems to be a result of said contract work, whether made directly by the Contractor or a Subcontractor thereof, is the sole responsibility of the Contractor and will be repaired, replaced, or recompensed according to specifications in place at the time of discovery.

Insurance Form and Duration

All of the insurance herein specified shall be written on a form acceptable to CCWSA and shall be A.M. Best Company rated B+ 8 or better.

Indemnity

The Contractor agrees to protect, defend, indemnify, save and hold harmless Cherokee County Water & Sewerage Authority, its officials, directors, officers, employees, agents, and volunteers from and against any and all claims, demands, losses, costs, and expenses, and from and against all liability, awards, judgments, and decrees, of whatever nature for any and all damage to property of others and of the parties hereto, their officials, directors, officers, employees, agents, and volunteers, and of whatever nature for any and all injury or injuries (including death) to any person or persons including the officials, directors, agents, employees, agents, and volunteers of the party hereto, arising or in any way growing out of any of the acts or omissions whether of the Contractor, the Contractor’s officials, directors, officers, employees, agents, and volunteers or of any tier of the Subcontractor, the tier’s officials, officers, directors, employees, agents, and volunteers in connection with the performance of the work under this Contract.

This hold-harmless agreement must be signed and submitted to the CCWSA’s Risk Management Department prior to commencement of work.

Contractor

Date

CCWSA Representative

Date

SECTION S200 - PLANS

S201-PRELIMINARY PLAN REQUIREMENTS

The following steps apply to the approval for installation of sewer mains, manholes, force mains, lift stations and appurtenances by private developers in commercial, industrial, institutional, residential or other types of developments:

- 1.) Preliminary plans shall include the portion of the county tax maps highlighting the land to be developed, the type of development, the number of units, and the amount of sewage that is expected to be generated, the location and the general plan for sewage collection. The plans shall also include the name, address and telephone number of the Developer or his representative. Questions related to adequate remaining capacity and proposed locations of connections to the existing system should be resolved at this stage before proceeding with detailed planning. The submittal for preliminary review must include all land to be developed although the land is to be developed in several phases or units. Adequacy determinations of the existing sanitary sewer system will be made for the entire project.
- 2.) Developer/Land Owner must submit (3) copies of preliminary plans for any proposed project to the **Special Projects Coordinator and Sewer Coordinator** prior to submitting the construction plans.
- 3.) Sewer availability will be determined by the Authority or a representative of the Authority in the area of the proposed development. The Authority will review the preliminary plans to determine if the wastewater treatment facilities lift stations and sanitary sewer lines in the area of the proposed development have sufficient remaining capacity to serve the proposed development.
- 4.) Comments will then be addressed to the Developer by the Authority relating to the availability of sewer or other items pertinent to the development, such as the need for pretreatment of industrial waste or grease traps.
- 5.) The Developer should procure a copy of the current set of **Sewer Specifications and CCWSA Standard Details Booklet**. It is the Owner/Developer's responsibility to get copies made and distributed to the appropriate Contractors.

S202-PLAN REVIEW PROCESS

1.) Plan Review Schedule:

The Authority and reviewing engineer shall meet every Tuesday with Developers or their representatives to discuss plan review comments and to distribute new sets of plans to the various Authority departments for review. Plans must be delivered to the Authority's G.I.S. Department located at 110 Railroad Street, Canton, GA 30114 by **5pm on Friday** in order to be distributed for review on Tuesday. The review meeting will be scheduled for the second Tuesday from the submittal deadline (7 business days). **Plans shall not be distributed for review or placed on the schedule until all required documents and electronic data have been submitted and all review fees have been paid.**

- 2.) A list of comments noting any deficiencies of the plans will be returned to the Developer or representative at the Tuesday meeting. The Authority's G.I.S. Department staff will assign manhole I.D. numbers during this phase of the plan review. These manhole I.D. numbers shall be shown on the plans to be re-submitted along with the other revisions.

- 3.) After the revisions have been made, the Developer must submit five (5) revised copies of construction plans plus the electronic data on CD, as outlined in these specifications to the Authority for review. Re-submittals will be reviewed by CCWSA staff and once all revisions have been addressed plans will then be sent to the reviewing engineer for final approval.
- 4.) If all of the required revisions have been properly made, the Authority will deliver a comment list stating "No Exceptions" to the Developer or their representatives, thereby allowing the Developer to return to the Authority's G.I.S. Department to have the plans stamped "Approved". The Developer can have as many sets stamped "Approved" as he or she may need for construction, but the Developer shall submit a minimum of three (3) new sets of plans to the Authority for stamping and retention by the Authority for use during construction. Plus, the electronic data on CD, as outlined in these specifications.
- 5.) The Developer shall forward a copy of all county and state permits to the Authority's Construction Department before a CCWSA Construction Permit is issued to the Developer.
- 6.) The Developer shall arrange for the preconstruction meeting with the Chief Inspector.
- 7.) When the project is complete, the Developer shall submit As-Builts for review per Section S704. After the approval of the As-Builts, the final plat shall then be submitted for review. Only after As-Builts have been approved and Maintenance Bond posted, will the final plat be signed. After recording, one paper copy and a PDF of the recorded final plat shall be delivered to the Authority's G.I.S. Department before any water meters are released to the project.
- 8.) **SUBMITTAL OF REVISED PLANS:** All construction plans submitted for review of revisions requested by the Authority must list each revised item with a cloud around the revised area on the plan sheet and must identify which reviewing authority requested the revision.

S203-CONSTRUCTION PLAN REQUIREMENTS

- 1.) The Developer must submit five (5) paper copies of Construction Plans, (first submittal or revisions) plus the electronic data on CD, as outlined in these specifications to the Authority for review. Electronic data CD's shall be submitted with each submittal (first submittal or revisions). Plans and other submittals shall be delivered to the Authority's G.I.S. Department. **"These plans must carry the stamp of a registered professional engineer or registered land surveyor."** At this time the Developer will also pay the plan review fee for sewer system additions. If this amount is sufficient to cover the Engineer's hourly fee for the complete plan review, no further amount will be charged to the Developer. If the sewer plans are such that the Engineer's fee exceeds the review fee minimum, the Developer will be invoiced for the additional costs at the Engineer's hourly rate. This additional fee must be paid prior to the scheduling of the preconstruction conference. There will also be an additional fee charged if the project requires the plan review of a lift station to serve the development. Consult the Authority regarding the amount of this fee. Fees are subject to increase at any time.
- 2.) All plans for sanitary sewer projects shall bear a suitable title showing the name of the project, the name of the sewer basin, and show the scale in feet, the north arrow, date, the name of the design professional, the design professional's signature and his registration stamp. All design professionals preparing construction plans and specifications must be registered in the State of Georgia as a professional engineer or a registered land surveyor. If the project requires a sewer line extension of more than five hundred feet (500') to reach the project, a registered professional engineer must design and stamp the line extension. The cover sheet shall include the Owners/Developer's name, address, telephone number, and email, plus the

design professional's name, address, telephone number, and email. The cover sheet shall also include the funding source if state or federally funded, and a detailed project location map. The cover sheet shall also show the numbers of the tax map and parcel in bold letters.

- 3.) The plans shall be clear and legible. They shall be drawn to a scale which will permit all necessary information to be plainly shown. **Plans shall be submitted on 22" x 34" drawing sheets and shall be submitted concurrently in an "AutoCAD" drawing electronic format. Plans shall also be submitted in Adobe PDF format of entire project.** A sheet index shall be provided, as well as a legend of symbols used. Horizontal locations shall be referenced to Georgia State Plane Coordinates (West Zone feet). Vertical locations shall be shown referenced to Mean Sea Level. Reference all horizontal locations to the NAD83/94 (latest adjustment) datum and reference all vertical locations to the NAVD88 datum. All orthometric locations shall be referenced to Geoid 99/03. All points are subject to verification by the Cherokee County Water & Sewerage Authority. **Sewer line locations shall be shown on plans and submitted in ASCII Text or EXCEL electronic format for each point.** The Developer shall provide ASCII or EXCEL spread sheet files for coordinate data. (Comma delimited). Each Point I.D. (M.H., Force Main, etc...) shall be shown at the correct location on the printed plans.
- 4.) The information submitted electronically for gravity sewer lines shall include:

Manholes

- A.) Manhole ID (CCWSA staff will assign manhole ID number during plan review). The manhole ID numbers shall be shown on the revised construction plans submitted for final review before the plans are stamped.
- B.) North Coordinate
- C.) East Coordinate
- D.) Center of Manhole (Lid) Elevation
- E.) Invert (In and Out) Elevations
- F.) Each Manhole point shall include pipe(s) entering and leaving manhole. Pipe(s) size, Pipe Invert, Material, Type (i.e. Sewer line, service line or force main).

Cleanouts for each service shall be located.

Cleanouts

- A.) Cleanout ID
- B.) North Coordinate
- C.) East Coordinate
- D.) Center of Cleanout (Lid/Ground) Elevation
- E.) Invert (In and Out) Elevations
- F.) Each Cleanout point shall include pipe(s) entering and leaving manhole. Pipe(s) size, Pipe Invert, Material.

Force Mains shall be located at fifty foot (50') intervals (ground and top of pipe). If Force Main is within the development and maintains a constant distance behind curb and constant depth, locate at all transitions (vertical and horizontal). All fittings, tees and bends, valves, and air release valves shall also be located. All vertical locations shall be finished ground and top of pipe. The Contractor shall place a vertical piece of two inch (2") diameter PVC. pipe on top of the pipe at all bends, tees, fittings, valves, elevation transitions, horizontal transitions and every fifty foot (50') along the length of the force main (County or State Roads and cross country) for the purpose of enabling the surveyor/engineer to locate the force main for As-Built. The Contractor will then be responsible for removing the vertical PVC. sections after the As-Built locations have been verified by the Authority. The rim elevation, top of pipe and the manhole

invert elevation of all air release valve manholes shall be located. The size and material of all pipes shall be recorded.

Force Main Pipe Lines, Fittings etc.

- A.) Point ID (see CCWSA staff)
- B.) North Coordinate
- C.) East Coordinate
- D.) Ground Elevation
- E.) Top of Pipe Elevation
- F.) Point Description/Fitting Type and Pipe Size

Air Release Valves (Manholes)

- A.) Manhole ID (C.C.W.S.A. staff will assign manhole I.D. number during plan review. The manhole I.D. numbers shall be shown on the revised construction plans submitted for final review before the plans are stamped. The same I.D. numbers shall be used for As-Built.
- B.) North Coordinate
- C.) East Coordinate
- D.) Center of Manhole (Lid) Elevation
- E.) Invert Elevation
- F.) Top of Pipe Elevation
- G.) Each Air Release Valve Manhole point shall include Pipe Size and Material.

Construction Plans shall consist of the following:

- 1.) Site plan showing the Sewer layout only with project name, streets, street names, topography with contour lines at two foot (2') intervals, location map, lot layout (if subdivision) or building location (multi-family, commercial or industrial site), land lots, district and north arrow. Lot numbers shall run in consecutive order and there shall be no duplicate lot numbers within the project. Note, on the plans, if any other utilities are existing. The site plan shall also show all existing and proposed streets and their names, all streams, water courses, storm drains and the discharge points for all drainage structures. The site plan shall show the topography with contour lines at suitable intervals. On the site plan, show the sewer layout with existing and proposed lines, manhole numbers, line designation and direction of flow. Also, show the size of all lines and the location of proposed services. Plan scale shall be a minimum of 1"=100'. Match lines shall be provided where necessary. Both the Construction Plans and As-Built shall show station numbers along the alignment plus call out the specific stations of all features such as tees, crosses, fire hydrants, bends, etc. along with the Point I.D. Match lines shall be provided where necessary.
- 2.) The design of cross-country sewer lines and force mains shall be based on field-run surveys. The site plan for cross-country sewer lines and force mains need not show contour intervals, but the profiles shall be based on mean sea level elevation. Site plans for lift stations shall show existing and proposed contours.
- 3.) In the event the subdivision is developed in phases, the final construction plans for sewers may be submitted in phases or units. However, at the time the first phase is submitted, the engineer will submit one copy of the preliminary layout of the entire sewer system. This layout will show all lines required to serve any lots to be developed and any surrounding property that may be served through the property. The site plans for each phase or unit shall contain a location drawing showing the relationship of the phase or unit to the total project and to the surrounding streets and sewer outfalls.
- 4.) Profiles should have a horizontal scale of not more than 1"=100' for cross-country lines and

1"=50' for congested areas, and a vertical scale of not more than 1"=10'. The plan view should be drawn to a corresponding horizontal scale. The plan view should normally be shown on the same sheet as the profile. In any case both the plan and profile view should have line designations, station numbers, manhole numbers and any other indexing necessary to easily correlate the plan and profile view. Both the construction plans and the As-Built plans shall show station numbers along the alignment of the sewer main plus call out the specific stations of all features such as manholes, laterals, etc. along with the Point I.D. Match lines shall be provided where necessary.

5.) Plans and profiles shall show:

- A.)** Location of streets, sanitary sewers and drainage easements.
- B.)** Profile of ground surface, the grade of the sewer between each two adjacent manholes, size and material of pipe, length between manholes, invert of sewer in and out of each manhole, and surface elevation at each manhole. All manholes shall be numbered (CCWSA I.D. Number.) on the plans and correspondingly numbered on the profile and electronic data. Station numbers will be shown for each manhole. The profile of adjacent parallel stream beds and of adjacent lake surfaces, low buildings, and low lots shall be shown on the profile. When a body of water is located adjacent to a project, indicate the 100-year flood zone elevation of the stream/river and/or the high water/winter pool elevations of lakes or reservoirs.
- C.)** Locations of all special features such as connections to existing sewers, concrete encasements, collar walls, ductile iron pipe sections, elevated sewers, piers, special manhole covers such as vented outfall covers or sealed covers, etc.
- D.)** All known existing structures both above and below ground which might interfere with the proposed construction, particularly water mains, gas mains, storm drains, utility conduits, retaining wall footings, etc.
- E.)** Bench marks and control points shall be shown on the plan and profile sheets. Horizontal and vertical coordinate data shall be provided on the plans for each bench mark and control point. The vertical datum used shall be the elevation above mean sea level.
- F.)** Proposed pipe materials, sizes, lengths and alignment.
- G.)** Proposed service lateral locations.
- H.)** Location, type and size of cleanouts.
- I.)** Thrust blocks where used. (Force Main)
- J.)** Location and sizes of existing sewer mains and manholes surrounding project.
- K.)** Detail of connection to existing manhole.
- L.)** Details of special sewer main installations such as stream crossings, elevated lines on piers, bridges, pipe bedding, special highway crossings, railroad crossings, etc.
- M.)** Show all right-of-way widths, easement widths and pavement widths.
- N.)** Bench marks and control points shall be shown on the plan sheets. Horizontal and vertical coordinate data shall be provided for each bench mark and control point. The vertical datum used shall be the elevation above mean sea level.
- O.)** A sheet index shall be provided, as well as a legend of symbols used.
- P.)** All construction plans submitted for review of revisions requested by the Authority must list each revised item with a cloud around the revised area on the plan sheet and must identify which reviewing authority requested the revision.

PROTECTION OF UTILITIES

Each plan sheet should include a note stating "The Contractor must call the Utilities Protection Center "Call Before You Dig" telephone number (1-800-282-7411) four days before starting any excavation. Each set of plans shall include a reproduction of **CCWSA Standard Detail M-05** in the **CCWSA Standard Details Booklet**.

S204-EROSION AND SEDIMENTATION CONTROL PLAN

The provisions of the Erosion and Sedimentation Act of 1975 (O.C.G.A. 12-7-1 et seq.), as amended, shall govern all land disturbing activities as relates to construction performed. The Cherokee County Water & Sewerage Authority is not delegated enforcement powers for enforcing the provisions of the Erosion and Sediment Control Act of 1975.

The Georgia Soil and Water Conservation Commission has taken provisions of ACT 599 and published a **MANUAL FOR EROSION AND SEDIMENT CONTROL IN GEORGIA**, 2000 Edition (or any more current edition as they are published). Sewer construction plans and specifications shall include appropriate segments of this manual. Developers, Engineers, Design Professionals and Contractors performing work in Cherokee County are responsible for acquiring a copy and using the best practical methods contained therein to control the erosion and sedimentation of the construction site in conformance with the intent of ACT 599. Copies may be purchased from the Georgia Soil and Water Conservation Commission, P.O. Box 8024, Athens, Georgia 30603. For additional information, call the Commission at 706-542-3065.

The erosion control plan must be approved by Cherokee County Engineering and the Natural Resource Conservation Service (NRCS). The approval of the plan included in the NRCS Report of Technical Review must be attached to the initial submittal of construction plans.

S205-DETAIL DRAWINGS

Special detail drawings made to a scale to clearly show the nature of the design shall be furnished to show the following particulars:

- 1.) All stream crossings and storm drain outlets with elevations of the stream bed and of normal and extreme high and low water levels.
- 2.) Details of special sewer joints and cross sections.
- 3.) Details of special sewer appurtenances such as standard manholes, drop manholes, service connections, manhole frames and covers, manhole steps, air relief valves and thrust blocking for force mains, elevated sewers, piers, pipe bedding, special highway crossings, railroad crossings, etc.

S206-PLAN APPROVAL

- 1.) All projects requiring a lift station shall be reviewed and approved by the Sewer Coordinator and Pumping System Manager. All projects that serve, or has the potential to serve, a business that is required to have a grease trap or dumpster pad shall be reviewed and approved by the Industrial Pretreatment Coordinator.
- 2.) The following sanitary sewer projects shall be reviewed and approved by both the Cherokee County Water & Sewerage Authority and the Georgia EPD:
 - A.) Land Application Systems.
 - B.) Water Pollution Control Plants.
 - C.) Sewers greater than 36 inches in diameter.
 - D.) Pumping stations with a capacity of 700 GPM or more.
- 3.) No work shall begin until plan approval is received from the Authority and a Construction Permit is issued by the Authority. The CCWSA General Manager or authorized representative of the CCWSA shall have final approval of the preliminary plans, construction plans and final plans. If a discrepancy occurs between the approved plans and the Sanitary Sewer Main Standards, the Standards shall be the superseding document. The General

Manager of the Cherokee County Water & Sewerage Authority or his designated representative may modify or cause to be modified any plans that he believes are in the best interest and future integrity of the Authority.

S207-REVISIONS TO APPROVED PLANS

When any deviations from approved plans are proposed, the Chief Inspector shall be notified for authorization. Revised plans should be submitted as soon as possible to the Chief Inspector. Minor changes not affecting the sewer system operation may be allowed in the field during construction by the Chief Inspector. The Chief Inspector shall have authority as to what constitutes a minor or major change. As-Built drawings and the required electronic data on CD shall be furnished to the Authority's G.I.S. Department at the completion of construction.

Any section or unit must be built in accordance with the plans. If the Developer decides to phase a section off, a new set of plans showing the phase change will have to be resubmitted and approved.

S208-APPROVAL BY OTHER GOVERNMENT AGENCIES

- 1.) No part of the plan approval process is intended to relieve the Developer of the responsibility to comply with the minimum standards of the Georgia Department of Natural Resources, EPA, EPD, NRCS, Georgia D.O.T., Cherokee County Engineering or Department, U.S. Army Corps of Engineers or other appropriate regulatory agency.
- 2.) Generally speaking, the following documents should be provided to the Authority with the plans, and should also be sent to the proper agency claiming jurisdiction:
 - A.) An approved Erosion and Sedimentation Control Plan (Note, a Land Disturbing Activity Permit and a Grading Permit must be acquired by the Developer prior to beginning construction). Include with this plan the Natural Resource Conservation Service Report of Technical Review approving the erosion control measures.
 - B.) A letter stating that none of the sewers, services, or other utilities associated with the project are constructed on or proposed to be constructed on a solid waste landfill, according to the records of the County Roads and Bridges Department.
 - C.) A copy of the Comprehensive Monitoring Plan that complies with the EPD's NPDES Storm Water Monitoring Permit regarding storm water discharge.
- 3.) The submittals listed above are not intended to be an all-inclusive list of submittals needed to adhere to all of the government agencies having jurisdiction over construction on a project. It is up to the Developer to inform himself and adhere to the development regulations of the respective governing agencies.

S209-RELOCATION OF EXISTING WATER AND SEWER FACILITIES

All existing water or sewer facilities that have to be relocated, as might occur at roadway entrances, easements, elevation changes, etc., will be relocated by the Developer's Contractor at the Developer's expense. The Authority will inspect all such work prior to acceptance.

S210-EASEMENT ACQUISITION AND UTILITY ENCROACHMENT PERMITS

- 1.) It shall be the responsibility of the Developer to obtain any off-site easements required to connect the project to existing public sewers. Easements will be conveyed to the Cherokee County Water & Sewerage Authority for all facilities which are to be conveyed to the Authority. This process must be started early enough to allow construction of the sewer mains before any building construction is to begin. No building permits, water meter or sewer tap

applications shall be issued until off-site sewers mains have been constructed and accepted. This condition shall override any provision for speed up of house starts such as furnishing a bond to guarantee completion of the streets and other appurtenances. A Utility Easement agreement is included at the end of the **CCWSA Standard Details Booklet**.

- 2.) All easements shall allow adequate room to construct the sewer main and appurtenances. Permanent easements shall be a minimum of twenty feet (20') wide, and construction easements shall typically be a minimum of sixty feet (60') wide. Wider easements shall be required where sewers mains are deeper than normal or where a trunk or interceptor sewer main greater than fifteen inches (15") is expected to pass through the development. The maximum cross-slope of the permanent easement shall be ten percent (10%). The Authority reserves the right to require larger permanent easements where deemed necessary.
- 3.) Easement drawings shall be prepared for work outside the development prior to approval of the sewer plans. The drawings shall be of a size suitable for legal recording and shall be prepared by a Registered Land Surveyor. The drawing must be clear and legible for printing. The drawing shall be at a reasonable scale and shall not be a reduced copy of the plan sheet. The drawing will show property lines, the name of property owners with the length of line encroaching on each property owner, size of line, line designation, manhole numbers and stations, width of permanent and construction easement, scale of drawing, north arrow, land lot and district numbers, and a tie to the nearest land lot corner. Any streets or other existing easements shall also be shown. Easement agreements referencing these drawings shall be prepared and attached to the drawings, signed by the current property owner(s), notarized, witnessed and originals delivered to the Authority's G.I.S. Department for recording.
- 4.) All easements shall be subject to a title search, by a CCWSA designated attorney, for each easement, at the developer's expense. All title search fees shall be paid prior to approval of As-Builts or signing of final plat.

SECTION S300 - DESIGN CRITERIA

S301-GENERAL

The criteria listed herein is not intended to cover all aspects of design, but rather to mention the basic guidelines and those particulars that are required by the Cherokee County Water & Sewerage Authority.

S302-TYPES OF SEWERS AND LINE EXTENSION REQUIREMENTS

Sewers shall be designed as separate sanitary sewers only in which rainwater from roofs, streets, and other areas and groundwater from foundation drains are excluded. Overflows from sewers shall not be permitted.

All specifications required by the Authority and by the Georgia Department of Natural Resources must be met by the Developer.

If an existing sanitary sewer main must be extended to serve a particular development, the Developer will be required to pay all of the initial costs, including but not limited to construction costs, testing fees, engineering fees, etc.

In certain circumstances, the Authority may require a larger pipe size to be installed than is required by these standards, and the cost of this oversizing may be funded by the Authority. The Developer may be required to pay all of the initial costs. If the purpose of the oversizing is due to the Authority's master plan for sewage collection within the County, the Authority may enter into negotiations with the Developer to provide funding for the betterment.

S303-DESIGN PERIOD

Sewer systems should be designed for the estimated ultimate tributary population. Tributary population is considered to be all areas upstream of the discharge point of the system being designed. Consideration should be given to the maximum anticipated capacity of institutions, industrial parks, etc.

S304-DESIGN FACTORS

1.) Sewers will be designed and installed from the existing Authority sewer system to the uppermost property line of the development being served. In determining the required capacities of sanitary sewers, the following factors should be considered:

- A.) Maximum hourly sewage flow.
- B.) Additional maximum sewage or waste flow from industrial plants.
- C.) Ground water infiltration.
- D.) Topography of the area.
- E.) Depth of excavation.

2.) New sewer systems shall be designed on the basis of an average daily flow of sewage of not less than 400 gallons per household per day with a peaking factor of not less than 3.6. Sewers should be designed to carry the per capita flow when flowing one-half full. When deviation from the foregoing per capita rates is demonstrated, a description of the procedure used for design shall be included.

3.) The Authority has the option of granting a variance from the requirement for the Developer to install sanitary sewers within the development to the uppermost property line of the

development if this creates an undue hardship on the Developer. If this variance is granted, the Developer will be required to grant and record a sixty foot (60') wide construction easement and a twenty foot (20') wide permanent easement dedicated to the Cherokee County Water & Sewerage Authority for future use. The sanitary sewer line must be designed to the uppermost property line of the development so that the easements will be set in the proper location to build the sewer line. The construction easements will remain in effect until such time as the sanitary sewer lines are constructed and accepted by the Authority. The Cherokee County Water & Sewerage Authority may at its option require additional easements.

- 4.) Minimum easement widths to be dedicated are twenty-feet (20') for permanent easements and sixty feet (60') for construction easements, with both the permanent and the construction easements typically centered on the sewer main. The easements may need to be offset if paralleling a vegetative buffer adjacent to a creek. Also, in the event that a trunk or interceptor sewer line greater than fifteen inches (15") or of great depth is expected to pass through the development, the construction easement width shall be increased to the amount required for construction of the expected sewer. All easements are to be checked in the field and must be adequate for the purpose for which they are dedicated. Also, consideration must be given for expected building locations and the easement shall be located for the least possibility of conflict before the sewer may be constructed.
- 5.) No structures (Including, but not limited to any type of building, porches, foundations, stairs, signs, fences, retaining wall, other types of walls, trees, etc.....) shall be built on dedicated easements and the Authority will not be responsible for the removal of fences that are placed on dedicated easements in the event the sewer is constructed. Septic tanks in these types of developments shall be placed in a location to facilitate the connection of the sewer service to the sewer main.

S305-DETAILS OF DESIGN AND CONSTRUCTION

- 1.) **Size:** No sanitary sewer main shall be less than eight inches (8") after leaving the uppermost property line to be served. Trunk mains shall be a minimum of ten inches (10") in diameter.

Where the need for sizes of pipe differ between manholes (such as fifteen inches (15") PVC and sixteen inches (16") DIP), the Developer shall install the one size of DIP, SDR 26 or CCWSA approved equal for the entire section of line between the manholes. Transition sleeves are not allowed.

- 2.) **Depth:** Any sewers installed in the street shall be sufficiently deep to provide three feet (3') of cover at the inlet end of all service laterals at the street right-of-way, and over any part of the main or service within the street right-of-way.

Any sewers on off-street easements shall have a minimum of four feet (4') of cover unless ductile iron pipe is used. Filling over the pipe to obtain minimum cover is not allowed if the fill will impede the natural flow of surface water or will cause an erosion problem.

Sanitary sewers paralleling's or ditches shall be designed to make the top of the sewer line at least two feet (2') below the bottom of the creek or ditch adjacent to the sewer throughout the site to be developed.

- 3.) **Ditch and Creek Crossings:** Aerial sewers are not allowed. The required method of crossing a river, stream, creek, impoundments, or wet weather ditch is with a bore under the creek or

river with a minimum of two feet (2') of cover between the lowest point in the stream and the top of outside diameter of the casing.

4.) Polyethylene Encasement: Ductile iron pipe, SDR 26 or CCWSA approved equal shall be provided with polyethylene encasement whenever the sewer main either crosses or is in close proximity to a steel gas main. Ductile iron pipe installed in low-lying damp areas and in areas where anode beds are known to exist shall also be provided with polyethylene encasement. The length of the encasement of DIP, SDR 26 or CCWSA approved equal gravity sewers shall be in accordance with DIPRA recommendations. The reviewing engineer and the Authority shall have final authority over the required length of the encasement during the plan review process. The entire length of DIP, SDR 26 or CCWSA approved equal force mains shall be encased in green polyethylene tubing.

5.) Dams: Sanitary sewer structures are not allowed within a dam. Utility pipelines and structures must be a minimum of thirty feet (30') outside the toe of slope of the dam.

S306-GRAVITY SEWER PIPE

All gravity sanitary sewer pipes up through 24-inch diameter must be Polyvinyl Chloride (PVC), Vitrified Clay Pipe (VCP), Ductile Iron Pipe (DIP), or Steel Pipe, except where DIP or Steel Pipe is required. For pipe larger than 24-inches in diameter, the Contractor may have the option of using either Polyvinyl Chloride (PVC), Reinforced Concrete Pipe (R.C.P.), Ductile Iron Pipe or Steel Pipe, except where Ductile Iron Pipe (DIP) or Steel Pipe is specifically shown on the plans. High Density Polyethylene (HDPE) pipe is allowable for gravity installations only in trenchless technology applications. All pipe shall be installed with a minimum of Class "C" bedding.

S307-SLOPE

All sewers shall be so designed and constructed to give mean velocities, when flowing one-half full, of more than two feet (2') per second based on Kutter's formula using an "N" value of 0.013. The following are the minimum slopes which shall be provided; however, slopes greater than these are desirable:

Minimum Slope in Feet <u>Sewer Size</u>	<u>Per 100 Feet</u>
8"	0.50
10"	0.40
12"	0.30
15"	0.20
16"	0.20
18"	0.18
21"	0.14
24"	0.10
27"	0.10
30"	0.10
36"	0.10

These minimum slopes shall be used only when sufficient flows are expected to maintain a velocity of more than two feet (2') per second and maintain a cleansing action in the line. Sewers shall be laid with uniform slope between manholes. Sewers on twenty percent (20%) slope or greater shall be ductile iron pipe and shall be anchored securely with concrete anchors (See **CCWSA Standard Details Booklet**) to prevent displacement by erosion or shock. Maximum

slope of sewers shall be thirty percent (30%) and sewers shall be designed at less than twenty percent (20%) whenever possible.

S308-INCREASING SIZE

When a certain size sewer is connected to a larger one at a manhole, the connection shall not be lower than matching the 0.8 depth point of both sewers to the same elevation. For example, when connecting an eight inch (8") pipe to a sixty inch (60") pipe, a point six point four inches (6.4") above the invert of the eight inch (8") pipe shall not be lower than a point forty-eight inches (48") above the invert of the sixty inch (60") pipe. Match crowns of the two pipes whenever possible.

S309-SEWER LINES THROUGH GOLF COURSES

Where sewer lines are installed through existing or proposed golf courses, the pipe size shall be oversized as determined by the Authority. The Developer may be required to install parallel sewer lines if growth patterns indicate an increase in sewage generation upstream of the golf course. This applies to gravity mains and force mains and is subject to the discretion of the Authority.

S310-SANITARY SEWER FORCE MAINS

Force mains 4 inches in diameter or larger shall be ductile iron pipe and shall conform to **Section 503** of these Standards. Ductile iron force mains shall be encased in GREEN polyethylene tubing.

Force mains smaller than 4 inches in diameter shall be CertainTeed, Eslon, Dyka, Vulcan, or alternate acceptable to the Authority, Class 200 SDR 21 integral bell PVC pressure pipe. HDPE pipe is also allowable for these smaller force mains.

See **CCWSA Standard Details Booklet** for the minimum concrete blocking requirements. Design engineer shall be responsible for design of blocking where more than the minimum is required. For internal pressures in excess of 100 PSI, blocking calculations **MUST** be submitted to the Cherokee County Water & Sewerage Authority for review.

The location of force mains inside subdivisions shall be eleven feet (11') behind the back of the curb. The location of force mains outside of subdivisions shall be as allowed by Cherokee County and approved by the Authority. The preferred location of the force main is the side opposite the water main.

Force mains shall be installed so that the top of the pipe is a minimum of four feet (4') below final grade, four feet (4') below the edge of the pavement, or four feet (4') below the ditch paralleling the road, whichever is deepest. Permission must be granted by the Authority to vary from this requirement.

All force mains shall enter the receiving manhole with six inch (6") or larger diameter pipe. At a point ten feet (10') away from the manhole, the force main may reduce down to its normal pumping diameter.

S311-MANHOLES

- 1.) Manholes shall be installed at the end of each line; all changes in grade, size, or alignment; at all intersections; and at distances normally not greater than three hundred fifty feet (350'). Spacing for eight inch (8") sewers can be more than three hundred fifty feet (350') but not

more than four hundred feet (400') and will be allowed only in isolated cases when, in the opinion of the reviewing engineer, it is impractical to install an additional manhole and when the extra distance will not impede maintenance of the line. Manhole spacing in sewers ten inch (10") and larger will conform to Ten State Standards. In no circumstance will a spacing of greater than three hundred feet (300') be allowed when the slope exceeds ten percent (10%). Cleanouts may be used only for special conditions and shall not be substituted for manholes nor installed at the ends of laterals greater than one hundred fifty feet (150') in length. Manholes in cross-country areas shall be elevated so that the top is eighteen inches (18") above ground. Manholes installed in future streets for the next unit shall be elevated so that the top of the manhole is forty-eight inches (48") above ground.

- 2.) A maximum of four holes shall be cored into the base of a manhole for pipes. More holes may be cut into the manhole if the holes are staggered in elevation by two feet (2') and are used for laterals going with the flow.

S312-DROP MANHOLES

A drop pipe shall be provided for a sewer entering a manhole at an elevation of more than two feet (2') above the manhole invert. The drop pipe shall be of ductile iron materials. All outside 90° elbows shall have thrust block poured below the elbow. Drop Manhole will be noted on the construction plans at any time the drop exceeds two feet (2'). Where the difference in elevation between the incoming sewer and the manhole invert is less than two feet (2'), the invert shall be sloped to prevent solids deposition. **Inside drop manholes are required where the drop in elevation is ten feet (10') or more.** Inside drop manholes shall be a minimum of five feet (5') in diameter for pipe less than fifteen inches (15") diameter and six feet (6') in diameter for pipe greater than or equal to fifteen inches (15") diameter, and shall be constructed in accordance with the **CCWSA Standard Details Booklet**. The structure of the drop inside the manhole shall be located opposite of the manhole steps. Inside drop manholes are not allowed in manholes with safety platforms.

S313-CONNECTIONS TO THE AUTHORITY'S SEWER SYSTEM

At the point of connection to the Authority's existing sanitary sewer system, the new sanitary sewer line shall remain plugged or otherwise disconnected from the system until the new sanitary sewer lines are inspected, tested and determined to be acceptable to the Authority's Chief Inspector. The Developer will be fined for any storm water flows, mud or other construction debris that enters the Authority's system due to non-compliance with this requirement.

S314-CONNECTIONS TO EXISTING MANHOLES

Connections to existing manholes shall be made by coring the existing manhole with a coring machine. "Knocking out" holes for connections shall not be allowed. The cores shall be made at an elevation of two feet (2') or less above the invert of the manhole.

S315-STEEL CASINGS

Steel casing pipe shall be used for all cased piping where the carrier pipe is eight inches (8") or greater in size.

S316-PROTECTION OF WATER SUPPLY AND OTHER UTILITIES

- 1.) The Cherokee County Water & Sewerage Authority has an established Cross- Connection Program (**Section W700**) to prevent the entry of contaminants or pollutants into any area of the potable water supply through the control of cross connections. It is illegal to introduce any substance into or to have any cross connections with the potable water supply. There

shall be no physical connection between a public or private potable water supply system and a sanitary sewer which would permit the passage of any sewage or polluted water into the potable water supply.

- 2.) Separation between Water Main and Sanitary Sewer Mains:** A horizontal separation of at least ten feet (10') is required between water mains and existing or proposed sanitary sewer mains (measured edge to edge). Should conditions prevent a separation of ten feet (10'), the lines shall be laid in separate trenches.
- A.)** When sewers cross under water mains, the sewer shall be laid so that the crown of the sewer shall be at least eighteen inches (18") below the invert of the water main. The two pipes shall be installed such that a full length of pipe will be centered over the crossing so that all joints will be separated as much as possible. Ductile iron pipe, SDR 26 or CCWSA approved equal shall be installed for both mains when clearance is less than two feet (2').
 - B.)** In the rare circumstance when the eighteen inches 18" clearance between the water and sewer mains cannot be maintained, the DIP, SDR 26 or CCWSA approved equal mains shall be installed as described in the paragraph above with the joints as far apart as possible, plus both mains shall be placed in casing for a distance of ten feet (10') on each side and grout each end of casing.
 - C.)** When sewers are laid within public streets, the manholes and sewer lines shall normally be laid along the centerline of the street at a depth of not less than seven feet (7') from the pavement surface to the top of the pipe. In curves and other areas where this is not possible, the lines and manholes are to be installed within the confines of the curb to avoid conflict with the curb and other utilities. Ductile iron pipe shall be used for sewer lines crossing storm sewers with less than a two feet (2') of clearance and at other times when directed by the Authority.

S317-SEWER SERVICES

- 1.)** All sewer service laterals shall have a minimum diameter of six inches (6") and a minimum grade of two percent (2%). A sewer service shall be provided for every existing or proposed lot or building. All services shall be shown on the construction and As-Built drawings. The service shall extend to the Right-of-Way or the easement line of the lot being served and shall normally be within ten feet (10') of the lower corner of the lot. Each service shall terminate with a six inch (6") PVC clean-out stubbed out of the ground and sealed with a temporary PVC cap as shown in **CCWSA Standard Detail S-14**. All sewer laterals shall be installed using a laser level or slope level. All laterals shall have minimum pipe bedding. Laterals and cleanout "SHALL" be located per **CCWSA Standard Details S-13, S-14 and S-15**. Clean out shall not be located outside of Right-of-Way or Easement. No structure can be within five feet (5') of a sewer clean out. Including, but not limited to any type of building, porches, foundations, stairs, signs, fences, retaining wall, other types of walls, etc.....
- 2.)** The Developer shall be responsible for serving all lots developed. On any lot where the service cannot be found, the Developer shall be responsible for payment of the cost of installation of the service. Also, unless noted on the final plat, the service shall be low enough to serve the first floor elevation at building line. The Builder shall be responsible for the location of the service prior to the pouring of the foundation, driveway or other appurtenance. **The Authority will not be responsible for any house that is built too low to be served nor for any service covered by construction.**
- 3.)** No plumber or contractor will be allowed to connect to the sewerage system except to the

end of the service provided for his connection. Also, any service provided will be utilized without the installation of additional services. The Builder will be responsible for replacing the temporary PVC cap with a sewer cleanout and installation of cast iron meter box flush with grade (meter box shall be traffic rated if located in driveway or sidewalk) as shown in **CCWSA Standard Detail S-15**.

- 4.) CCWSA shall maintain the sewer mains and sewer laterals to the County, City or State Right-Of-Way or to the edge of an easement dedicated to CCWSA. If sewer main is located within a private ingress-egress or a blanket utility easement, CCWSA shall maintain sewer mains and laterals from back of curb to back of curb. In the event of zero building setback adjacent to a Right-Of-Way, CCWSA will maintain sewer mains and laterals from back of curb to back of curb.

S318-GREASE TRAPS AND SAND/OIL TRAPS

The Cherokee County Water & Sewerage Authority has developed and implemented a sewage pretreatment program to limit the amount of grease, sand and oil entering the sewer system from restaurants, service stations, feed mills, car wash operations and any other establishment where such devices are necessary for the proper handling of liquid wastes containing sand, grease, oil, flammable wastes or other harmful ingredients. The Developer is hereby required to meet with the Authority's Pretreatment Coordinator to determine the need for such a device. The Authority requires all such establishments to include a grease trap and/or a combination sand/oil trap as part of their sewage collection system, located between the business and the tap into the Authority's sewer line. The **CCWSA Standard Details Booklet** includes a typical design for these structures, but the size and dimensions of the trap and piping are dependent on the quantity of flow from the business. **The design engineer will be responsible for sizing the structure and the piping and submitting design calculations with the plans. The Authority will review the design and calculations for minimum requirements prior to approving the construction plans.** (Minimum Grease trap size shall be = 1500 gallons). Eating establishments/restaurants shall have a 1500-gallon grease trap for an occupancy of 75 seats or less. Eating establishments/restaurants shall have two (2) 1500-gallon grease traps in series for an occupancy of 76 seats or more. The Authority shall determine the size(s) and the number of grease traps for establishments/restaurants with more than 150 seats or 150-person occupancy. All grease traps shall be installed according to the Authority's **Typical Grease Trap Detail S-27**. The Authority will require that the traps be maintained and cleaned out on a regular basis at intervals determined by the Authority's policy. Sanitary sewage from the facility's toilets shall not route through the grease trap. Authority approval shall be required for any connection varying from this.

S319-INDUSTRIAL SEWAGE PRETREATMENT

- 1.) Wastewater connections from industrial processes shall not be made until the Authority's Pretreatment Coordinator has approved the deposit of the sewage into the system. Industrial wastewater may need to be pretreated on site before the Authority will accept the wastewater from certain processes. This need for pretreatment will be reviewed in the first stages of the preliminary plan review process. Sanitary sewage from the facility's toilets shall not route through the pretreatment process.
- 2.) The Authority has developed a set of "Sewer Use and Industrial Wastewater Control Regulations". Developers are required to meet with the Authority's Pretreatment Coordinator to determine if the project will be required to meet the additional requirements specified in this document. If the Authority determines that the sewage does need to be pretreated, the

designer will be responsible for the design of the pretreatment process and related calculations. The design engineer will be responsible for designing the process and the piping and submitting the design and calculations with the plans. The Authority will review the design and calculations prior to approving the construction plans.

S320-DUMPSTER PAD REQUIREMENTS

- 1.) A dumpster pad drain shall be installed on sites that require a Grease Trap and Dumpster Pad. If Environmental Health requires a dumpster pad drain on site a Grease Trap must be installed. Dumpster pad drains shall be connected up stream of the grease trap and routed through the grease trap.
- 2.) Authority approval shall be required for any connection varying from this.

SECTION S400 – LIFT STATION DESIGN CRITERIA

S401-GENERAL LIFT STATION DESIGN SPECIFICATIONS

The following minimum requirements apply to wastewater lift stations:

General:

The Cherokee County Water & Sewerage Authority reserves the right to make any changes in these requirements as may be deemed necessary. The design of the lift station shall be based on the future build out of the drainage basin upstream of the station.

Submittals to the Authority for lift stations shall include:

- 1.) TDH calculations.
- 2.) Pump curves from pump manufacturer.
- 3.) System curves.
- 4.) Cycle time calculations.
- 5.) Buoyancy calculations.
- 6.) Profile and aerial views of force main and pump station.
- 7.) Surge relief calculations showing whether surge control valves are necessary.
- 8.) The NRCS report of technical review for erosion and sediment control.
- 9.) Submittals shall be stamped by a professional engineer licensed to do work in the State of Georgia.

S402-PUMP REQUIREMENTS

- 1.) Pumps that are acceptable are Flygt, Hydromatic, or alternate acceptable to the Authority, except that others for specific applications may be accepted on special approval by the Authority.
- 2.) Lift stations with pumps up to 25 HP shall be supplied with a spare complete pump at the request of the Authority. A spare total rebuild kit and spare impeller shall be required with all pump stations.
- 3.) All submersible pumps shall be provided with stainless steel chains connected to each pump to facilitate the removal of the pump from the wet well for maintenance.
- 4.) Pump operation shall be by pressure transducer and programmable controller with a 4- 20MA output for SCADA. A spare pressure transducer and controller or a redundant level control system shall be supplied at the Authority's request.
- 5.) A pump operation and elevation schedule shall be provided on the design drawings. This schedule shall call for pump operation elevations, ground water elevations and minimum liquid level in the wet well. There shall be a minimum of five levels of control as follows:
 - A.) Low Level Alarm
 - B.) Pumps Off
 - C.) Lead Pump On
 - D.) Lag Pump On
 - E.) Lag-Lag Pump On (Triplex and Quadplex Only)
 - F.) Lag-Lag-Lag Pump On (Quadplex Only)
 - G.) High Level Alarm
- 6.) The pump horsepower, pump model and impeller size shall be clearly shown in bold print on the plans next to the drawing of the pumps and wet well. Future impeller cuts and pumping

rates must be shown on the plans.

- 7.) Upon installation, all pumps shall be checked by a manufacturer's representative for proper rotation, pumping capacity, amperage draw, lack of vibration, and other checks as may be deemed necessary to assure proper operation. All submersible pumps shall be pulled out of and reinstalled in the wet well in the presence of a representative of the Authority to assure proper clearances for easy removal of the pumps for maintenance. (Min. 2 day start-up time for all lift stations.)

S403-WET WELL

- 1.) Wet wells shall be a minimum of six feet (6') in diameter. Rectangular wet wells shall be allowed upon approval of the Authority. Sizing of wet wells shall be as follows:

For lift station pumping, $V_{\min} = T_{\min} \times Q/4$, where:

V_{\min} = The minimum effective wet well volume in gallons. This effective volume is the volume between the "Pumps On" and the "Pumps Off" elevations. The "Pumps On" elevation shall be a minimum of two feet (2'-0") below the invert of the inflow pipe.

T_{\min} = The minimum cycle time in minutes. All lift stations shall be sized based on six starts per hour or $T_{\min} = 10$ minutes. Although most pumps are rated at much higher starts per hour, the size is set at six starts per hour due to the limited number of starts per hour allowed by the electrical hardware. Ideal cycle time is achieved when the pump capacity (Q) is two times the inflow.

Q = Pump capacity in GPM.

- 2.) The wet well subgrade must have a minimum ninety-five percent (95%) Std. proctor and a minimum of twenty-four inch #57 stone base.
- 3.) All wastewater lift stations shall be designed so that the base elbow to the submersible pumps be mounted on a grout shelf approximately one foot (1') above the base slab or to the pump manufacturer's recommendations. The base elbow shall be anchored to the base slab with four $\frac{3}{4}$ " stainless steel bolts – 5000-pound pull-out each. Bolts shall be threaded into concrete a minimum of eight inch (8"). Anchor inserts shall be cast into the invert. Carbon steel bolts shall not be accepted.
- 4.) All miscellaneous metals inside the wet well shall be stainless steel. Typical wet well pipe supports shall be constructed of stainless steel with stainless steel mounting hardware. Bracket shall be a minimum of 3" x 3" x 5/16". Pipe strap shall be minimum 3" x 5/16" with minimum $\frac{1}{2}$ " stainless steel bolts. Base of support shall be constructed of 5/16" stainless steel plate mounted with $\frac{3}{4}$ " stainless steel bolts.
- 5.) A vent for the wet well shall be supplied constructed of ductile iron pipe. The vent shall be a minimum of six inch (6") diameter floor pipe, FL. x P.E., shall be cast in place and shall extend six inches (6") up from the top of the wet well. A one foot (1'-0") long DIP FL. x FL. spool shall be connected to the floor pipe and two six inch (6") diameter 90-degree bends shall be mounted to the spool to complete the vent pipe. A stainless steel bird screen shall be attached to the open end of the bend.
- 6.) For wet wells larger in area than a ten foot (10') diameter well, squirrel cage type ventilator fans shall be supplied and shall have enough capacity to provide a minimum of six air

changes per hour. The fan shall include mounting curb, bird screen and explosion-proof motor. Acceptable manufacturers are Penn, Acme and Twin City Blowers or alternate acceptable to the Authority.

- 7.) The wet well influent line(s) shall be provided with a channel grinder by Franklin Miller, JWC, or alternate acceptable to the Authority. Stations equipped with grinder pumps may be exempt from the channel grinder but may still require the removable aluminum trash basket(s) with guide rails connected for easy removal via the wet well access. The basket shall be 8" x 20" x 28" as detailed by Halliday Products Series B1A. The basket shall have two inch (2") diameter holes at three inches (3") on center each way. The guide rails shall be mounted to the wet well walls, and shall be as detailed by Halliday Products Series B1A or alternate acceptable to the Authority.
- 8.) A lift station wet well access ladder shall be provided. The ladder is to be constructed of materials not likely to be affected by the corrosive atmosphere of the wet well. The ladder is to be permanently mounted in the wet well to provide access for maintenance. Cast-in concrete steps will not be acceptable as an access ladder. The ladder steps shall be roughened to deter foot slippage. Minimum ladder width shall be eighteen inches (18"). Ladder shall be equipped with "Safety-Climb" and must be easily accessible.
- 9.) **Odor control equipment is required on all new sewer lift stations.** Proposed odor control equipment is subject to review and approval by C.C.W.S.A. on a case by case basis.

S404-CHECK VALVE VAULTS

- 1.) Lift station check valves, isolation valves, and surge control valves (if required) shall be housed in a concrete valve pit adjacent to the lift station. Check valves provided shall be slow-closing check valves. Floor drain (3" diameter minimum) for the valve pit shall be provided and connected to the wet well. A P-trap shall be installed in the floor drain to block sewer gases from the wet well. Valve pits must be large enough for easy maintenance operations, with two to three feet (2' to 3') clearance on all sides and with bottom of piping two to two feet six inches (2'-0" to 2'-6") off of the concrete floor. Valve pits shall be no deeper than eight feet (8') deep. Valve pits must have easy access. A hatch opening must be placed directly over the steps so that the steps are not recessed back away from the hatch opening. See **CCWSA Standard Detail S-31**.

Acceptable manufacturers are as follows:

Check Valves: Golden-Anderson, Crispin or alternate acceptable to the Authority
Isolation Valves: Dezurik, Val-Matic, M&H or alternate acceptable to the Authority
Surge Relief Valves: Golden-Anderson or alternate acceptable to the Authority
Air Release Valves: Hawle or alternate acceptable to the Authority. (**Section S507**)

- 2.) The discharge pipe inside the check valve vault shall be tapped for a discharge pressure gauge. The gauge shall be Ashcroft Type 1009 or alternate acceptable to the Authority, Liquid-filled, 3 1/2" dial, 0-200 PSI Range with a diaphragm seal suitable for wastewater service. An isolation valve shall be supplied between the pipe and the gauge.
- 3.) All pipes in the valve vault shall be supported by either flanged pipe supports or concrete pier pipe supports. All piping in the valve vault shall be restrained using stainless steel threaded rod.
- 4.) A quarter turn plug valve shall be installed on the force main just outside the valve vault but within the chain linked fenced area of the lift station. Valve must be accessible by valve key.

Valve port must be one hundred percent (100%) of pipe diameter. Manufactures shall be DeZURIK one hundred percent (100%) port eccentric (PEF), Val-Matic model 5600R one hundred percent (100%) ported eccentric or alternate acceptable by the Authority.

S405-PUMP CONTROL PANEL

- 1.) For lift stations less than 100 HP, controls and electrical components shall be housed in completely weather proof stainless steel metal cabinets (NEMA 4X stainless steel). The cabinets shall be provided with condensate heaters, spare fuses and spare bulbs of each type that is used in the electrical/control system. Soft start starters shall be acceptable in NEMA 3R ventilated or air-cooled panels.

For lift stations that are 100 HP or larger, an electrical building shall be provided to house the electrical distribution equipment. NEMA 1A enclosures shall be used in buildings. The buildings must be provided with a heat pump for climate control within the building.

- 2.) The pump motor starters shall be provided by the pump manufacturer. Starters for motors less than 20 horsepower shall be full voltage, non-reversing, NEMA rated. Starters for 20 horsepower and larger motors shall be Square D Altistart, Allen Bradley, Solid State Reduced Voltage or alternate acceptable to the Authority.
- 3.) The Developer shall furnish a pump controller with all necessary controls including, but not limited to, the following:

- A.) Provide starters for each pump. (See description under Part 10 of this Section.)
- B.) HOA Switches
- C.) Pilot Lights
- D.) Power Indicator Lights
- E.) Other Lights as Required
- F.) Alarm Silence Push Button
- G.) Alarm Reset Button
- H.) Elapsed Time Indicators
- I.) Control Transformers – 480V to 120V Step Downs shall not be mounted inside the control panel for heat control purposes.
- J.) Strip Heater and Thermostat
- K.) Alarm Horn and Wiring – 120 Volt
- L.) NEMA 4X Red Alarm Light and Wiring – 120 Volt
- M.) Phase Under Voltage Monitor With Time Delay
- N.) Moisture Sensing Seal Failure Relays With Indicator
- O.) Provide Alarm Outputs For High Water Alarms and Pump Trouble For Each Pump. Coordinate With SCADA Unit Manufacturer For Types of Outputs Required. Note: The Pump Trouble Outputs Are To Have No Time Delay Added.
- P.) Provide Relays for Phase Failure and Phase Unbalance Protection.
- Q.) Provide Lag Pump On Delay Timer Relay, 0-60 Seconds For Each Pump, Such That The Pumps Cannot Start At The Same Time.
- R.) Provide Pump Failure Alarm Output For Each Motor To Include Motor Overload, Motor Thermal Cutout and Leak Seal Failure (FLS) Conditions.
- S.) Only the high level and low level alarms are to be wired to the alarm horn and red light. No pump failures shall be wired to the horn and light circuit.
- T.) Breakers for security lighting, generator block heater, and battery charger. Add two spare 120V breakers.
- U.) Provide Terminal Blocks For All Connections Into and Out Of the Panel.

- 4.) Phase converters will not be used on lift station electrical power supply. Lift station power shall be 240 VAC / 3 phase or 480 VAC / 3 phase and control circuits shall be 120 VAC / 1 phase.
- 5.) All 480V circuit breakers in the pump control panel shall be rated a minimum of 14 KAIC and all 240V and 120V circuit breakers shall be rated a minimum of 10 KAIC.
- 6.) All wiring shall be done in rigid galvanized steel conduit. Conduit installed below grade shall be painted with two coats of asphaltum paint. Schedule 40 PVC conduit may be used for conduit runs underground. All PVC conduit shall be installed in concrete duct banks per NEC. Concrete ducts shall be poured monolithically with steel reinforcement as necessary.

S406-SCADA REQUIREMENTS

- 1.) The control panel manufacturer shall coordinate with the pump manufacturer and the generator manufacturer, such that the SCADA system can be installed into the control panel. The control panel shall be sized such that there is adequate space for this equipment. The control panel manufacturer shall coordinate the receipt and installation of the SCADA equipment in the control panel. Make all connections between the SCADA equipment and the pump controls as required by the SCADA manufacturer.
- 2.) Each lift station shall be provided with a Remote Terminal Unit (RTU) to communicate with the Authority's SCADA System as provided by Dexter Fortson Associates, Inc, or alternate acceptable to the Authority to include any and all radio repeater site/station required to communicate with the SCADA system. Each RTU at a minimum will provide the following monitoring/control points:
 - A.) Each Phase Voltage, Current, And Power Factor for Each Pump in The Station.
 - B.) Station Voltage Phase to Phase and Phase to Neutral and Current In Each Phase At The Line Side Of The Main Disconnect Switch And At The Emergency Power Input To The ATS.
 - C.) Manual On/Off Control for Each Pump from A Remote Signal to The RTU.
 - D.) Status of Each Pump – On/Off.
 - E.) Pump Trouble Alarm for Each Pump with 20 Second Time Delay.
 - F.) Station Operation – Simplex, Duplex, Triplex or Quadplex.
 - G.) Station On Normal Power.
 - H.) Station On Emergency Power.
 - I.) Generator Running.
 - J.) Generator Alarm.
 - K.) Maintenance Shutdown.
 - L.) Man Down
 - M.) SCADA Control Off
 - N.) Low Wet Well Alarm
 - O.) High Wet Well Alarm
 - P.) Alarm Acknowledge / Silence
 - Q.) Manual Off / On
 - R.) Generator Fuel Tank Leak Alarm
 - S.) Generator Start/Stop from A Remote Signal To The RTU.
 - T.) Provide Alternator for The Operation Of Pumps (Triplex And Quadplex Only).
 - U.) ATS Open (Normal Power) and Closed (Emergency Power) Indication.
 - V.) Control Voltage Alarm.
 - W.) Status of Control Voltage to The RTU.3

- 3.) Line power shall be provided with a quick disconnect and a transient voltage surge suppressor at the main service entrance. Disconnects shall utilize a solid state circuit breaker.

S407-SITE REQUIREMENTS

- 1.) A freeze proof yard hydrant of not less than 3/4 inch size shall be provided at each lift station for wash down purposes. The potable water line shall be equipped with a reduced pressure zone backflow preventer in an above-ground housing. Backflow preventers must have a 120 VAC receptacle in the housing with electrical heat tape installed. The backflow assembly must be raised at least one foot (1') above the concrete floor. (See the details in the Authority's Cross-Connection Control Program in **(Section W700)**). A water meter must be installed for the lift station by the developer. Meter will be supplied to the developer by the Authority.
- 2.) Access roads to any lift station shall be paved. Roads shall have a minimum of eight inches (8") of graded aggregate base topped with a minimum of two inches (2") of asphalt Type "B" or six inches (6") of reinforced concrete with control joints every ten feet (10'). Roads shall be a minimum of twelve feet (12') wide. A paved area inside the fencing shall be provided to facilitate service vehicle access to the pumping station wet well and other facilities. A paved turn around area shall be provided at each pumping station. All paved areas shall be contiguous with the paved access driveway.
- 3.) Lift station sites shall be fenced with a minimum of six foot (6') high chain link fencing topped with 3 strands of barbed wire. The fenced area must be fifty feet (50') by fifty feet (50') minimum with a fourteen foot (14')-wide chain link gate. (See **CCWSA Standard Detail S-30**) A cantilever gate shall be installed on the driveway entrance at the public right-of-way. Access gates shall be a minimum of fourteen feet (14') in width.
- 4.) All lift stations shall be provided with security lighting. Security light must be mounted on a hinged pole with winch. Standard pole shall be a galvanized steel hinged square pole, General Electric No. ASHS-(XX)-2T-4.011 GV, sixteen feet (16') to twenty feet (20') in height, with a General Electric No. M180 Winch/Chain and a No. RBSU2H6 GV Bracket. The security light attached to the top of the pole shall be a General Electric No. M2RR-07-S-1-H-2- LN-PEC1TL (Typ. for 2 lights) or alternate acceptable to the Authority
- 5.) All area inside the lift station chain link fence and extending two feet (2') outside the fence shall be asphalt or concrete.
- 6.) The sewage lift station access road and area within the fence shall be above the 100-year floodplain. The construction plans shall show the floodplain limits.

S408-EMERGENCY POWER REQUIREMENTS

- 1.) The minimum requirement for the provision of emergency power for lift stations shall be that each station shall be provided with an emergency generator capable of starting and running the appropriate number of pumps necessary to meet and/or exceed the maximum daily demand of the pump station and other ancillary devices. The generator shall be diesel powered with an automatic transfer switch and provisions for an automatic exercise cycle. The Contractor shall set the ATS transfer delay from utility to generator at a 30 second delay.
- 2.) The generator set shall be manufactured by Generac, Cummins Onan, Katolight, Caterpillar or alternate acceptable to the Authority.

- 3.) The generator and control panel shall be field located by the Wastewater Pumping System Manager. The generator pad thickness shall be twelve inches (12") installed such that the bottom of the pad is six inches (6") below grade and the top of the pad is six inches (6") above grade.
- 4.) The person responsible for sizing the KW rating of the standby generator must supply a letter to the Developer, Contractor and Cherokee County Water & Sewerage Authority, stating that they guarantee the unit will operate the lift station pumps and other electrical demands with no greater than a twenty percent (20%) voltage dip. This letter must be signed and delivered before the day of scheduled start up.
- 5.) This specification defines the requirements for an emergency or standby Electric Generator Set. The generator set shall consist of an engine directly coupled to an electric generator, together with the necessary controls and accessories to provide electric power for the duration of any failure of the normal power supply. The generator set shall have the following characteristics:

Voltage	480 VAC or 230 VAC
Phase	3
Connection	Y
Wire	4
Hertz	60
Power Factor	0.8

- 6.) The generator set shall be capable of starting and running the necessary loads without exceeding the maximum voltage and frequency variations specified herein, or the maximum temperature limitations of the engine and generator.
- 7.) All materials and parts of the generator set shall be new and unused. Each component shall be of current manufacture from a firm regularly engaged in the production of such equipment. Units and components offered under these specifications shall be covered by the manufacturer's standard warranty on new machines, a copy of which shall be included in the submittal.
- 8.) The Authority shall accept only engine driven generator sets that can be properly maintained and serviced without causing the Authority to either carry expensive parts stock or be subjected to the inconvenience of long periods of interrupted service because of lack of available parts. The Developer shall specify the nearest location of permanent parts outlets from which parts may be obtained.
- 9.) The rated net horsepower of the engine at the generator synchronous speed, with all accessories, shall not be less than that required to produce the KW required. The horsepower rating shall take into account the generator efficiency and all parasitic losses such as fan, battery charger, etc. The generator set shall be capable of producing the required KW (without overload) for the duration of the power outage (standby rating), under the following ambient conditions:

Altitude, feet	10
Ambient temperature	0-

Humidity at max. Ambient	%
Temp.	80

- 10.)** The system shall be free of injurious torsional and bending vibrations within a speed range from ten percent (10%) below to ten percent (10%) above synchronous speed.
- 11.)** The engine shall be of the internal combustion type equipped to operate on No. 2 diesel fuel. Accompanying the design submittals, the Developer shall supply fuel and oil consumption estimates based on engine manufacturer's data, a copy of which shall be included in the plan submittal. The engine shall be equipped with a suitable governor to maintain frequency within limits, as specified below, by controlling engine and generator speed.
- Type: isochronous
Stability: 1/4% maximum steady state frequency variation at any constant load from no load to full load.
Regulation: 1/4% maximum frequency deviation between no-load steady state and full-load steady state.
Transient: 5% maximum frequency dip on most severe motor starting condition. Transient: 2 seconds maximum recovery time for maximum motor start.
The manual speed adjusting control shall be mechanical or electrical if located on the generator set or electrical if located in a remote control panel.
- 12.)** The engine shall be electric start, provided with a solenoid energized motor, with either positive engagement or clutch drive to the engine. Lead-calcium batteries shall be furnished to provide power to the engine cranking motor. The batteries shall be designed for operation at a minimum ambient temperature of 0^oF. The batteries shall be capable of a minimum of four crank cycles (rolling) of the specified prime mover and have sufficient current available for "break-away" currents for the particular engine used at the specified worse case temperature.
- 13.)** A float type battery charger, compatible with the batteries selected, shall be furnished which shall maintain the starting batteries at full charge. Battery chargers for 25 kW – 200 kW shall be a 5 amp charger, 10 amp chargers for 230 kW - 800 kW, and 20 amp chargers for 900 kW - 2250 kW generators. The charging system shall permit charging from either the normal or the emergency power source. It shall have a high rate and low rate charging system. A voltmeter shall indicate the charge rate and the circuit will be protected by either fuses or circuit breakers. The charger or charging circuit shall be so designed that it will not be damaged during the engine cranking, achieved, for example, by a current limiting charger or a crank disconnect relay. It shall also be capable of recharging a discharged battery in 12 hours while carrying normal loads. The charger shall be suitable for operation at 120 volts ac, single phase.
- 14.)** The engine shall be liquid cooled. The type of liquid cooling system shall be a unit mounted radiator. The radiator capacity shall be suitable for operation in the ambient temperature specified, plus the air temperature rise across the engine.
- 15.)** An air cleaner and silencer shall be furnished as recommended by the engine manufacturer and shall be located and mounted as recommended by the engine manufacturer.
- 16.)** An exhaust system of suitable size, configuration and material in accordance with engine

manufacturer's recommendations shall connect the exhaust outlet of the engine to the silencer. The type of silencer shall meet the requirements of engine manufacturers and shall be critical silencing type.

- 17.) The exhaust system and silencer shall have the configuration shown on the plans submitted, and shall be of such size that back pressure on the system will not exceed the back pressure permitted by the manufacturer's recommendation. A flexible connection shall be mounted at the engine exhaust outlet and the discharge end of the exhaust line shall be protected against entry of precipitation. Screening or suitable lagging shall protect piping within reach of personnel. All exhaust piping shall be gas tight.
- 18.) The following engine protective devices shall be provided, and an indicating light shall be supplied for use with each device specified:
- A.) Alarm system for high water temperature.
 - B.) Alarm system for low oil pressure.
 - C.) Automatic engine shutdown for high water temperature.
 - D.) Automatic engine shutdown for low oil pressure.
 - E.) Alarm and shutdown system for high water temperature.
 - F.) Alarm and shutdown system for low oil pressure.
 - G.) Engine over-speed automatic shutdown device.
 - H.) Engine failed to start indicator light (over-crank).
 - I.) Alarm for low coolant level.

A shunt trip and under-voltage trip shall be incorporated to cause the circuit breaker to open simultaneously with any automatic shutdown of the engine.

- 19.) A dual wall sub-base fuel tank shall be supplied with the generator set, which will allow the generator to operate continuously under pump load for 72 hours, but shall not exceed 1,000 U.S. gallons. The tank shall be constructed of aluminized steel with all access ports and vents located on the top horizontal surface. The tank shall be pressure and load tested according to U.L. 142 and shall be U.L. listed. The tank shall be capable of supporting the weight of the generator, isolator, and enclosure, and shall have four lifting eyes capable of lifting the entire generator set package. Low level and leak detector float switches shall be provided, both wired to control panel alarm lights, and a tank mounted fuel gauge.

The generator fuel storage tank shall be completely filled with fuel by the Developer before start-up of the lift station and topped off after start-up.

- 20.) The generator shall be equipped with a permanent magnet generator (PMG) excitation system. Both the PMG and the rotating brushless exciter shall be mounted outboard of the bearing. The system shall supply a minimum short circuit support current of three hundred percent (300%) of the standby rating for 10 seconds. The rotating exciter shall use a three-phase full wave rectifier assembly with hermetically sealed silicon diodes protected against abnormal transient conditions by a multiplate selenium surge protector.
- 21.) The insulation system of both the rotor and stator shall be of NEMA Class H materials and shall be synthetic and non-hygroscopic. Field windings shall be on the rotor, and the rotor core shall be shrunk-fit and keyed to the shaft. The stator winding shall use an optimum pitch design to eliminate harmonics. Units rated above 1500 kW or 601 volts or higher shall be form wound. The temperature rises of both the rotor and the stator shall be in accordance with the applicable sections of NEMA MG-1-22, BS-5000 part 99, or CSA C22.2, for the type

of service intended. The generator shall be self-ventilated.

- 22.)** Load connections shall be made in the front-end mounted junction box. The generator construction will allow connection to the load through the top, bottom or either side of the junction box. The conduit box shall contain two compartments: one to house the rotating rectifier and PMG, and the other to house the connection area and regulator. This is to separate the rotating elements from the load connection and voltage regulator adjustments.
- 23.)** The generator shall be equipped with a voltage regulator to maintain voltage within limits as specified below:

Stability: 1/2% maximum voltage variation at any constant load from no load to full load.

Regulation: 1% maximum voltage between no load steady state and full load steady state.

Transient: 20% maximum voltage dip in most severe motor starting condition.

Transient: 2 seconds maximum voltage recovery time with application or removal of 0.8 P.F. full load.

The regulator shall be a solid-state type using transistors or SCR's. The unit shall include volts/hertz under speed protection, 3 phase RMS sensing, and over excitation protection. The regulator shall also provide loss of sensing protection, regulator current limit, temperature protection and an engine unloading circuit. EMI suppression shall be provided meeting MIL-STD-461B, part 9 standards.

- 24.)** A generator main circuit breaker shall be provided. The interrupting capability shall be greater than the generator short circuit capability, but not less than 30,000 symmetrical amperes at 480 volts. The breaker continuous current trip rating shall be selected to provide overload protection for the generator. Main circuit breaker shall have GFCI protection per NEC.

The breaker shall be provided with a shunt trip device. The generator starting circuit battery system will be used as the power source for the shunt trip circuit. The shunt trip coil voltage shall be suitable for use on the starting circuit. The breaker shall include 3 normally open and 3 normally closed auxiliary contacts. The breaker shall be a Square D Type MA, or alternate as manufactured by General Electric, Merlin Gerin, Eaton/Cutler-Hammer or alternate acceptable to the Authority.

- 25.)** Automatic starting and stopping controls shall be furnished to start the engine automatically when the normal electric power fails or falls below specific limits and to stop the engine automatically after the normal power supply resumes. The signal for starting or stopping the engine shall be from an external auxiliary contact. The controls shall be capable of operating at fifty percent (50%) of normal DC system supplied voltage.

- 26.)** Crank control and time delay relays shall provide at least four cranking periods. Each cranking period shall be for at least 7 seconds, and the cranking attempts shall be separated by appropriate rest periods. A sensing device shall automatically disconnect the starting circuit when the engine has started. If the engine has not started at completion of the starting program, the over-cranking signal shall so indicate. The engine starting controls shall be locked out and no further starting attempts shall take place until the over-cranking device has been manually reset.

- 27.) A selector switch shall be incorporated in the automatic engine start and stop controls. It shall include an "Off" position that prevents manual or automatic starting of the engine, a "Manual" or "Hand Crank" position that permits the engine to be started manually by the pushbutton on the control cabinet and run unloaded; an "Automatic" position which readies the system for automatic start or stop on demand of the automatic load transfer switch or a programmed exerciser.
- 28.) It shall be possible to start the engine manually and run it unloaded by a manual pushbutton on the control cabinet that causes the engine to start, run and stop through the automatic start and stop controls.
- 29.) The following engine and generator instruments and controls shall be furnished and installed:

A.C. ammeter
 A.C. voltmeter
 Voltage adjusting rheostat Battery Voltage Meter
 Governor speed adjusting control Water temperature gauge
 Oil Pressure Gauge Manual start/stop control
 Manual-Off-Auto mode switch Voltmeter/ammeter phase selector switch
Generator "Run" Status Dry Contacts (SCADA USE) Common Alarm Dry Contacts (SCADA USE)
 Elapsed time meter Panel lights
 Indicator lights for engine alarm
 All wiring and interconnections shall be in accordance with commercial electrical standards.

- 30.) Weatherproof, sound attenuating, outdoor enclosure. 14-gauge steel construction. Includes two (2) single access doors per side. Painted standard alkyd enamel finish. The Authority shall make the determination if the enclosure shall be sound attenuated for a commercial installation or residential installation. The Authority shall also make the determination as to the dBA level of attenuation required as each case may be unique. 65 dBA @ 7 meters will be considered the standard starting point for attenuation. Exhaust roof dress cap, silencer mounting brackets, exhaust system assembly including the above mentioned silencer designed to go inside the enclosure with flex, elbow and rain cap. Painted standard alkyd enamel finish. Oil and water drains are extended to the exterior of the enclosure, each with identifying nameplate.

The enclosure shall be provided with the following electrical accessories:

- A.) Junction boxes for battery charger and jacket water heater connection.
- B.) Connection for low alarm, high alarm, leak alarm, and fuel fill pump switch.

- 31.) An engine block heater shall be provided to keep the engine coolant at a temperature of 85-degree F with the ambient temperature. The heater shall be suitable for operation at 120 volts' ac, single phase. External only; No internal elements shall be inside the engine.
- 32.) All generators sitting on fuel tanks must have a painted steel or aluminum "Catwalk" all the way around the unit for service.
- 33.) The system supplier shall furnish 3 sets of operating, maintenance and parts manuals covering all components for the generator set. The supplier shall also instruct the Authority

in operation and maintenance of the unit.

S409-GENERATOR TRANSFER SWITCH

- 1.) The automatic transfer switch shall be manufactured by Generac, ASCO, Zenith or alternate acceptable to the Authority.
- 2.) The transfer switch shall be rated for total normal and emergency system transfer for use on a 480 or 230 VAC, 3 phase, 4 wire system.
- 3.) Each automatic transfer switch shall consist of a power transfer module and a control module, interconnected to provide complete automatic operation. The automatic transfer switch shall be mechanically held and electrically operated by a single-solenoid mechanism energized from the source to which the load is to be transferred. The switch shall be rated for continuous duty and be inherently double throw. The switch shall be mechanically interlocked to ensure only one of two possible positions, normal and emergency.
- 4.) The automatic transfer switch shall conform to the requirements of NEMA Standard ICS-2-447 and Underwriters' Laboratories UL-1008 and shall be UL listed as follows:
 - A.) For use in emergency systems in accordance with Articles 700, 701, and 702 of the National Electrical Code.
 - B.) Rated in amperes for total system transfer including control of motors, electric discharge lamps, electric heating and tungsten filament lamp loads as referred to in Paragraph 30.9 of UL-1008.
- 5.) Sensing and control logic shall be solid-state. Interfacing relays shall be industrial control grade plug-in type with dust covers.

All phases of the normal shall be monitored line-to-line. Close differential voltage sensing shall be provided. The pickup voltage shall be field adjustable from 85% to 100% of nominal and the dropout voltage shall be adjustable from 75% to 95% of the pickup value. The transfer to emergency will be initiated upon reduction of normal source to 85% of nominal voltage and retransfer to normal shall occur when normal source restores to 95% of nominal.

The following time delays shall be provided:

- A.) A time delay to override momentary normal source outages. The time delay shall be field adjustable from 0.5 to 6 seconds and factory set at 1 second.
- B.) A time delay on retransfer to normal source. The time delay shall be automatically bypassed if the emergency source fails and normal source is available. The time delay shall be field adjustable from 0 to 30 minutes and factory set at 5 minutes.
- C.) An unloaded running time delay for emergency generator cool down. The time delay shall be field adjustable from 0 to 5 minutes and factory set at 5 minutes.
- D.) A time delay on transfer to emergency. The time delay shall be field adjustable from 0 to 5 minutes for controlled timing of load transfer to emergency, and factory set at zero.

The following features and accessories shall be provided:

- A.) Independent single phase voltage and frequency sensing of emergency source. The pickup voltage shall be adjustable from 85% to 100% of nominal. Pickup frequency shall be adjustable from 90% to 100% of nominal. Transfer to emergency upon normal source failure when emergency source voltage is 90% or more of nominal and frequency is 95% or more of nominal.
- B.) A contact that closes when normal source fails and one that opens when normal

source fails, rated 10 Amps, 120V ac.

- C.) A white signal light to indicate when the automatic transfer switch is connected to the normal source. A yellow signal light to indicate when the automatic transfer switch is connected to the emergency source.
 - D.) Two auxiliary contacts that are closed when the automatic transfer switch is connected to normal and two auxiliary contacts that are closed when the automatic transfer switch is connected to emergency. Rated 10 Amps, 120 volts, 60 Hz. AC.
 - E.) A test switch to momentarily simulate normal source failure.
 - F.) Reset switch to manually bypass time delay on retransfer to normal.
 - G.) A permissive start/stop feature to provide for start/stop of the generator from a remote site regardless of the presence of normal utility power.
- 6.) The automatic transfer switch shall be mounted in a NEMA 4X for outdoor installations or a NEMA 1A for indoor non-ventilated installations.
- 7.) Copies of installation drawings and complete wiring diagrams and interconnections shall be furnished to the Authority.
- 8.) Each automatic transfer switch shall be furnished with 3 sets of the operator's manual providing installation and operating instructions.

S410-WASTEWATER TREATMENT PLANTS (PUBLIC AND PRIVATE)

All sanitary sewer treatment facilities that are constructed within the boundaries of Cherokee County, and are located outside of municipalities which have the ability to treat sewage (such as Canton and Woodstock), shall be designed and constructed in accordance with the specifications of the EPD, the Ten States Standards and the Authority. Where requirements conflict, the more restrictive of the requirements shall govern. The Authority shall have the final review authority over the design of the treatment facility. Any revisions to the design made during construction must be approved by the Authority.

SECTION S500 - MATERIALS FOR SANITARY SEWERS

S501-GENERAL

All materials used in the work including equipment shall be new and unused materials of a reputable U.S. Manufacturer conforming to the applicable requirements of these Standards, and no materials shall be used in the work until they have been approved by the Authority. Any reference to an AWWA, ANSI or other such specification shall mean the latest revision published.

S502-GRAVITY SEWER PIPE

All sanitary sewer pipes up through twenty-four inch (24") diameter must be Polyvinyl Chloride (PVC), Ductile Iron Pipe (DIP), or Steel Pipe, except where DIP, SDR 26 or CCWSA approved equal or Steel Pipe are required. For pipe larger than twenty-four inches (24"), the Contractor may have the option of using either High Density Polyethylene (HDPE), Polyvinyl Chloride (PVC), Reinforced Concrete Pipe (R.C.P.), Ductile Iron Pipe or Steel Pipe, except where Ductile Iron Pipe (DIP) or Steel Pipe are required. All pipe shall be installed with a minimum of Class "C" bedding.

1.) DUCTILE IRON PIPE (DIP)

Ductile Iron Pipe shall be designed in accordance with AWWA C150. The thickness and class of the pipe shall be governed by AWWA C150. Ductile Iron Pipe shall be manufactured in accordance with AWWA C151, and shall have an outside bitumastic coating per AWWA C151.

The interior lining of the pipe and fittings shall be Protecto 401 ceramic epoxy with a minimum thickness of 40 mils. **Both bare pipe and cement linings conforming to AWWA C104 are NOT allowed for any sanitary sewer pipe.**

Joints

DIP joints shall be of the bell and spigot type with push-on joints, conforming to AWWA C111, unless another type of restrained joint is required by the Authority.

Maximum Depth of Cover

The table below indicates the maximum depth of cover for varying thickness classes and laying conditions:

Nominal		Maximum Depth of Cover Per	
Pipe Size,	Thickness	Laying Condition In Feet	
<u>Inches</u>	<u>Class</u>	<u>Type 4</u>	<u>Type 5</u>
8"	50	46	64
8"	51	61	81
8"	52	77	99
10"	50	38	55
10"	51	49	66
10"	52	59	79
12"	50	36	52
12"	51	43	60
12"	52	53	71
16"	50	30	47
16"	51	34	51
16"	52	40	57
20"	50	27	38
20"	51	30	44
20"	52	34	50
24"	50	23	31
24"	51	27	36
24"	52	30	41
30"	50	18	25
30"	51	21	29
30"	52	24	33
36"	50	17	25
36"	51	20	28
36"	52	24	32

For further information on larger diameter pipe and thicker walls than those presented in this table, refer to AWWA C150. The laying conditions, Types 4 and 5 are also described in AWWA C150.

Where transitioning from DIP to PVC, solid sleeves are required if the pipe sizes are the same. Where pipe sizes differ, such as when installing fifteen inch (15") PVC. and sixteen inch (16") DIP, the Developer shall install DIP, SDR 26 or CCWSA approved equal for the entire length between the two manholes.

2.) POLYVINYL CHLORIDE (PVC) SEWER PIPE

Scope

The Contractor shall provide un-plasticized polyvinyl chloride (PVC) plastic gravity sewer pipe meeting the requirements shown below unless otherwise required by the Authority

Materials

Pipe and fittings shall meet the requirements as specified under ASTM D3034 for PVC pipe through fifteen inch (15") in diameter and ASTM F679 for pipe eighteen inch (18") through twenty-four inch (24") in diameter. All pipe and fittings shall be suitable for use as a gravity

sewer conduit. Bell joints shall consist of an integral wall section with elastomeric gasket joint which provides a watertight seal. Standard laying lengths shall be twenty feet (20') (\pm 1 inch). The pipe shall be capable of passing all tests which are detailed in this specification. Minimum wall thickness shall be as follows:

ASTM D3034

4" - 0.120 inches
 6" - 0.180 inches
 8" - 0.240 inches
 10" - 0.300 inches
 12" - 0.360 inches
 15" - 0.437 inches

ASTM F679

18" - 0.536 inches
 21" - 0.632 inches
 24" - 0.711 inches

Fittings

All fittings and accessories shall be manufactured and furnished by the pipe supplier. They shall have bell and/or spigot configurations compatible with that of the pipe and shall have an equivalent wall thickness.

Pipe and Fittings Tests

The Contractor will be required to furnish a written outline of the manufacturer's quality control program for the Engineer's approval prior to shipping any pipe to the project. Before installing any pipe, the Contractor shall furnish written certification that all pipe through fifteen inch (15") in diameter meets ASTM Specification D3034 and all pipe eighteen inch (18") through twenty-four (24") in diameter meets ASTM F679. At least one sample from each 100 pieces of pipe furnished shall be subjected to each test outlined under Section 8 of ASTM D3034. The samples will be tested by an independent laboratory approved by the Authority, and a certified copy of results will be furnished to the Authority. If any test is not met then 9 additional tests of that property will be ordered, and if any of these 9 tests are not met, the manufacturer will not be allowed to furnish materials for the project. The cost of all testing shall be at the Developer's expense.

Pipe Stiffness

Minimum "pipe stiffness" (F/Y) at 5 percent deflection shall be 46 psi for all sizes, when tested in accordance with ASTM Standard Method of Test D2412, to determine the "External Loading Properties of Plastic Pipe by Parallel Plat Loading". There shall be no evidence of splitting, cracking, or breaking at a deflection of up to 30 percent of the original diameter.

Fusion Quality

There shall be no evidence of flaking, swelling, or disintegration when the pipe material is tested in accordance with ASTM D2152, "Quality of Extruded Poly (Vinyl Chloride) pipe by Acetone Immersion".

Joint Tightness

Pipe and fitting joints shall comply with ASTM D3212 for "Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals". Joint assemblies shall not leak when subjected to both an internal and external hydrostatic test at equivalent pressures of 10.8 psi gauge for a period of one hour. Pipes shall be tested in straight alignment, axially deflected position, and by shear load test as otherwise defined in Paragraphs 7.2, 7.3, and 7.4 of ASTM D3212.

Installation

PVC pipe will be installed in accordance with ASTM D2321. In any area where the pipe is

below existing ground water level, the contractor will embed PVC pipe in sand or graded gravel. No special compaction requirements will be necessary; however, the sand or gravel must extend from six inches below the pipe to twelve inches above the pipe, and the material must be firmly placed under the pipe haunches. When embedding PVC pipe in friable, compressible soils (Eg. silt, clay, sandy clay, silty clays, etc.), special care must be exercised to provide a uniform (undisturbed or fully compacted) trench bottom. Additionally, the backfill must be compacted to ninety-five percent (95%) standard proctor in six to eight inch (6" - 8") lifts to twelve inches (12") above the top of the pipe. Initial backfill shall be compacted to the densities outlined in D2321. The Authority may require random compaction tests to insure compliance with D2321. If any material tested is less than the required density, the contractor shall re-compact said material and the Authority shall then have the right to additional compaction tests at the expense of the Developer to insure compliance with D2321.

The Contractor shall use SDR-35 material for pipe with zero to sixteen feet (0'-16') of fill. Gravity sewer used at depths exceeding sixteen feet (16') shall be SDR-26. The design engineer shall determine the classification of bedding.

Deflection Limit

Vertical deflection of installed pipe shall not exceed five percent (5%) of the un-deflected diameter as defined in Table X1.1 of ASTM D3034.

3.) HIGH DENSITY POLYETHYLENE PIPE (HDPE)

Scope

This specification covers the requirements of high density polyethylene profile wall gravity sewer and drain pipe fittings in nominal sizes 18 through 96 inches with integral bell and spigot gasketed and welded joints. Note: HDPE pipe is acceptable only for trenchless technology applications and for small diameter (< 4") force mains. The designer shall not specify HDPE pipe for open-cut gravity sewers.

Classes

Class selection for high density polyethylene profile wall sewer pipe shall be a minimum of Class 160 for pipe with zero to sixteen feet (0'-16') of fill. HDPE cannot be used at depths exceeding sixteen feet (16').

Material

Pipes and fittings shall be manufactured from high density polyethylene resin compound which shall meet the requirements of Type III, Class C, Category 5, Grade P 34 per ASTM D 1248. Materials meeting the requirements of ASTM D3350 with a cell classification PE 334433C or higher are also suitable. The pipe shall contain a minimum of two percent carbon black as an ultraviolet inhibitor.

Pipe Dimensions

The average inside diameter and the minimum wall thickness of the waterway of the pipe shall comply with ASTM F894 for RSC Class 160 pipe.

Joints

The pipe shall be produced with bell and spigot end construction. Joining shall be accomplished by use of neoprene rubber gaskets complying with the physical requirements as specified in ASTM F477. Joints shall be in accordance with ASTM D3212 and withstand an internal operating pressure of 50 psi.

Pipe Stiffness

The profile wall shall be substantially strong to protect against any diametrical deformation. All polyethylene profile wall pipe shall have a minimum specific pipe stiffness of 46 psi at a deflection of five percent of the internal diameter when tested and calculated in accordance with ASTM D24212.

Retest and Rejection

If the results of any tests do not meet the requirements of this specification, the tests may be conducted again in accordance with agreement between purchaser and seller. In retesting, the product requirements of this specification shall be met and the test methods designated in this specification shall be followed. If upon retest failure occurs, the quantity of product represented by the tests shall be rejected.

Deflection Limit

Vertical deflection of installed pipe shall not exceed 5 percent of the undeflected diameter as defined in Table X1.1 of ASTM D3034.

Each segment of line (except service lines) will be tested at the end of each month just prior to inspection on that segment. Upon completion of the pipe installation, and at least 30 days after installation (to allow for settling), the pipe will be tested again for final acceptance. The test shall be performed by the Contractor pulling a mandrel of specified dimensions through the pipeline.

4.) REINFORCED CONCRETE PIPE (RCP)

Scope

The work included in this section includes furnishing all labor, equipment, and materials required to install, test, and inspect reinforced concrete (ASTM C-76) pipe sanitary sewers, including all risers, plugs, fittings, and bedding, as shown on the drawings and/or specified herein.

Quality Assurance

The Contractor must submit to the Owner and Engineer the concrete pipe manufacturer's evidence of a working Quality Control Program for approval prior to any pipe being manufactured. The program and standards of manufacturing must be established and well defined. The program must include the minimum following requirements:

- A.)** A full time Quality Control Technician.
- B.)** A complete and working Quality Control Laboratory capable of testing and recording the requirements set forth in these Specifications for concrete pipe.
- C.)** Written documentation of the concrete pipe manufacturer's performance on a recent sewer project. The performance results must be from a tested and approved installation of the pipe material set forth in this specification from either the Owner and/or Engineer stating that the pipe tested and met the requirements.
- D.)** A zero defect program for daily material testing and finished product testing to assure quality control as the pipe is being manufactured and shipped for this particular project.
- E.)** Provide the services of a competent factory representative of the pipe manufacturer for purposes of supervising and/or inspecting the installation of pipe. This service shall be for the duration of the project.
- F.)** Provide equipment and labor to air test each joint of pipe (thirty inch (30") dia. and larger) as it is installed. Joint tester shall be "Cherne Large Diameter Joint Tester" or equal. This testing shall in no way relieve the contractor from the responsibility of performing infiltration/exfiltration tests.

Testing of Concrete Pipe

- A.) Concrete gravity pipe (ASTM C-76) shall meet all materials and testing requirements of ASTM C-76, ASTM C-443, and ASTM C-497 (except where modified herein). Manufacturer shall secure the services of an independent testing laboratory to conduct the tests. Testing laboratory shall be approved by the Authority prior to conducting any tests. All testing costs shall be paid for by the pipe manufacturer.
- B.) Testing shall be in Job Lots (a Job Lot is a continuous run of one size of pipe for this project) for a maximum of 6% of pipe quantity or a minimum of 5% of pipe quantity. The test specimen will have a minimum of two (2) joints for pipe of sixteen foot (16') foot laying length. For pipe of twelve foot (12') laying length, the maximum number of joints shall be seven (7) and the minimum number shall be two (2). Bulkheads will be included in this joint count.
- C.) A representative of the Developer will be present to witness all tests that are conducted at the manufacturer's site and shall record all results. Manufacturer shall notify the Developer at least 48 hours prior to conducting any tests.
- D.) The following test shall be required:
 - a.) Pipe barrels shall be subjected to an internal hydrostatic pressure of 10 psi for 10 minutes. Pipe joints shall be subjected to an internal hydrostatic pressure of 13 psi for 10 minutes. The testing of the joints will be in the straight and deflected alignment.
 - b.) The manufacturer shall conduct three (3) external load crushing strength tests per Job Lot. This test shall be by the three-edge bearing method. The test may be taken to Ultimate Load.
 - c.) Absorption tests shall be conducted as per ASTM C-497. The absorption rate of the sample from the pipe wall shall not exceed 6%.
- E.) If any test specimen fails to pass any of the above tests, two (2) additional test specimens shall be chosen at random from the Job Lot and tested. If either of those two specimens fails the test, then the entire Job Lot is subject to rejection. If the manufacturer requests further testing, then every section of pipe in the Job Lot must be tested.
- F.) In addition to the above tests, manufacturer shall conduct tests to determine alkalinity of cover concrete as detailed in the material sub-section of this concrete specification.
- G.) Each pipe shall be clearly marked as required by the governing ASTM standard specifications to show its class, date of manufacture, and the name of trademark of the manufacturer.
- H.) Any pipe or specials which have been broken, cracked or otherwise damaged before or after delivery or which have failed to meet the required tests, shall be removed from the site of the work and shall not be used therein.

Guarantee

The Developer shall provide a guarantee against defective materials and workmanship in accordance with the requirements of the section entitled "Guarantees and Warranties" of these Standards.

Material

- A.) All concrete pipe and fittings 12 inches in diameter and larger shall be reinforced concrete sewer pipe conforming to the latest requirements of ASTM C-76 with the following modifications: All concrete pipe with zero to twenty feet (0'-20') of fill shall be a minimum of Class III with 4500 psi concrete. All pipe with twenty to thirty feet (20'-30') of fill shall be Class IV with 4500 psi concrete. All pipe with thirty feet (30') of fill

- and over shall be Class V with 5500 psi concrete.
- B.)** Pipe shall have circumferential reinforcement as required for the particular class of pipe furnished. The bell and spigot of the joint shall contain circumferential and longitudinal reinforcement. Reinforced concrete pipe shall be centrifugally cast or vibrated, horizontally or vertically cast or made on a Packerhead machine and shall be furnished in lengths not more than twenty feet (20') and not less than eight feet (8'), except where short lengths are required for construction conditions. Reinforced concrete pipe shall have bell and spigot joints suitable for the use of a rubber gasket to be provided as a part of this item.
 - C.)** Concrete pipe for sanitary sewers shall have bell and spigot joints consisting of self-centering steel joint rings securely attached to the pipe reinforcing steel. The steel joint rings shall be suitable for use with a rubber O-ring type gasket to be provided as part of this item.
 - D.)** Bell and spigot joints consisting of self-centering steel joint rings shall have the joint rings securely attached to the pipe reinforcing steel. The rings which form the joint shall be made so that they will join with a close, sliding fit. The joint surfaces shall be such that the rubber gasket shall be confined on all sides and shall not support the weight of the pipe.
 - E.)** The spigot ring shall have an external groove accurately sized to receive the gasket. Special section steel for spigot rings shall conform to ASTM A-283, Grade A, or ASTM A-306, Grade 50.
 - F.)** The bell ring shall be flared to permit gradual deformation of the gasket when the joint is assembled. Minimum thickness of bell rings shall be 3/16 inch. Bell rings 1/4 inch or thicker shall conform to ASTM A-283, Grade A, or ASTM A-306, Grade 50. Bells less than 1/4-inch-thick shall conform to ASTM A-570, Grade A.
 - G.)** Each ring shall be precisely sized by expansion beyond the elastic limit of the steel and then gauged on an accurate template. All exposed surfaces of both rings shall be protected by a corrosion-resistant coating of zinc applied by an approved metalizing process after proper cleaning.

Lining

- A.)** Acceptable interior linings shall be Koppers Bitumastic 300 M coal tar epoxy, Porter Tarsel, Wise Chem CTE 200, Amercoat 78, polyurethane or approved equal.
- B.)** The interior concrete or mortar surfaces of pipe and fittings are to be sandblasted and coated with the liner in accordance with the manufacturer's recommendations. The dry film thickness of the total system shall be 40 mils minimum of polyurethane or 90 mils of coal tar epoxy on concrete or mortar surfaces and on steel joint ring surfaces.
- C.)** Sandblasting shall result in a clean dry surface free of oil, grease, or other contaminants. Any air pockets over 1/4 inch in diameter and 1/8-inch deep appearing on the concrete surface after sandblasting will be filled with an epoxy sand patching material such as those sold by Sherwin-Williams, Glidden, or Moran. The epoxy sand patch should be troweled prior to the application of the coal tar epoxy.
- D.)** Any steel surfaces to be painted should be sandblasted, solvent cleaned, or wire brushed prior to painting. Application of the coal tar epoxy shall be by brush, roller, or spray system using equipment recommended by the manufacturer of the coal tar epoxy system. The temperature during application and curing of coal tar epoxy shall be as recommended by the manufacturer of the coal tar epoxy. Time between coats (if applicable) shall be as recommended by the manufacturer of the liner.
- E.)** If the inside joint recess will be mortared and painted with coal tar epoxy in the field, the pipe supplier shall not paint the inside vertical surfaces at the ends of the pipe. When the inside joints will not be mortared in the field, the pipe supplier shall paint the inside vertical concrete or mortar surfaces at each end of the pipe.

- F.) The liner shall be extended continuously over the front lip of the steel spigot ring and a minimum of 2 inches onto the sealing surface of unrestrained bell rings so that all interior joint surfaces which can be exposed to the fluid inside the pipe are coated.

5.) STEEL PIPE:

Steel pipe shall meet the requirements of ASTM A-139 Grade B, AWWA C-200, and shall be lined with 40 mils of polyurethane or 90 mils of coal tar in accordance with AWWA C-203. Acceptable coal tar epoxy interior linings shall be Koppers Bitumastic 300 M coal tar epoxy, Porter Tarsel, Wise Chem CTE 200, Amercoat 78, or approved equal. The outer coating shall be sand/grit blasted, primed to Federal Specification TTP-86C. Pipe shall have a minimum wall thickness of 0.250 inches.

S503-SANITARY SEWER FORCE MAINS

- 1.) Force mains 4 inches in diameter or larger shall be ductile iron pipe and shall conform to **Section S502.1** of these specifications. The interior lining of the pipe and fittings shall be Protecto 401 ceramic epoxy with a minimum thickness of 40 mils. **Both bare pipe and cement linings conforming to AWWA C104 are NOT allowed for any sanitary sewer pipe.**
- 2.) Force mains smaller than 4 inches in diameter shall be CertainTeed, Eslon, Dyka, Vulcan, Class 200 SDR 21 integral bell PVC pressure pipe or approved equal. HDPE pipe is also allowable for these smaller force mains.
- 3.) See **CCWSA Standard Details Booklet** for the minimum concrete blocking requirements. Design engineer shall be responsible for design of blocking where more than the minimum is required. For internal pressures in excess of 100 PSI, blocking calculations **MUST** be submitted to the Cherokee County Water & Sewerage Authority for review.
- 4.) All non-ferrous pipe shall be marked with the installation of detection wire installed one foot (1') above the pipe and properly connected to valves, fittings and manhole rings so that the sewer line can be located with a pipe detector after burial.
- 5.) All fittings shall be mechanical joint with retainer glands. All retainer glands shall be EBAA Mega-Lug or approved equal.
- 6.) Ductile iron force mains shall be encased in GREEN polyethylene tubing. Polyethylene encasement tubing shall be manufactured of virgin polyethylene material conforming to the requirements specified in AWWA C105, Section 4.1.1 for linear, low density polyethylene film. The polyethylene film shall have a minimum thickness of 8 mils.

S504-PRECAST CONCRETE MANHOLES

- 1.) **MANHOLES:** Precast manholes shall be constructed of Portland Cement concrete with a compressive strength of not less than 4,000 pounds per square inch at an age of 28 days. The wall thickness shall not be less than 5 inches. Manholes over sixteen feet (16') deep shall also be placed on a reinforced slab as shown in the **CCWSA Standard Detail S-01**. Precast concrete manholes shall consist of precast reinforced concrete sections with eccentric top section, or flat slab for shallow manholes, and a base section conforming with the typical manhole details as shown in the **CCWSA Standard Details Booklet** Flat top manholes will be approved only if a real need for such can be demonstrated by the design engineer. All manholes shall be water tight when completely built.

- 2.) **MANHOLE SECTIONS:** The design, the materials used in, the manufacturing process, the testing and the transportation of precast manhole sections shall be subject to inspection at any time by the Engineer. Materials found defective by the Engineer will not be delivered to the job site. Material on the job site that is found defective shall be moved immediately after being notified that such materials are unacceptable. Precast manhole shall conform to ASTM C478.
- 3.) **MANHOLE SECTION JOINTS:** Joints of the manhole sections shall be of the tongue-and-groove type, sections shall be joined using O-ring rubber gaskets, flexible plastic gaskets conforming to the applicable provisions of ASTM Standard Specification, Serial Designation C 433, or an approved bituminous mastic joint material.
- 4.) **LIFT HOLES:** Each section of the pre-cast manhole shall have not more than two holes for the purpose of handling and laying. These holes shall be sealed with cement mortar using one part Portland cement to two parts clean sand, meeting ASTM Standard Specifications, Serial Designation C144.
- 5.) **MANHOLE STEPS:** Manhole steps conforming to the applicable provisions of ASTM Specification C478, shall be of #4 steel reinforcing bars covered with Polypropylene Plastic or rubber and shall be supplied with depth rings and other necessary appurtenances. Steps shall be similar to and of an equal quality to the "PS-1-PF" by M. A. Industries, Inc. of Peachtree City, Ga. The step shall be factory built into the precast sections.
- 6.) **PIPE HOLES:** Holes in precast bases to receive sewer pipe shall be precast at the factory at the required locations and heights. Knocking out of holes in the field will not be permitted, however, holes can be cored in the field with a coring machine. Pre-molded rubber boots with stainless steel bands shall be used for connecting sewer pipe to manholes. These may be either the lock-in "Kor-N-Seal" type as manufactured by National Pollution Control Systems, Inc. or the cast-in type as manufactured by Interpace Division of Ball Rubber, Inc. In all cases the boot shall be sized to suit the outside diameter of the type pipe being used.
- 7.) **BASES AND INVERTS:** Manhole bases and inverts shall be constructed of 4000 psi concrete or brick in accordance with details in the **CCWSA Standard Details Booklet** and the trough shall have the same cross-section as the sewers to which it connects. The manhole base and invert shall be carefully formed to the required size and grade by gradual and even changes in sections. Changes in direction of flow through the sewer shall be made to a true curve with as large a radius as the size of the manhole will permit. The minimum drop through a manhole shall be 0.1 foot.
- 8.) **MANHOLE FOUNDATION:** The manhole base shall be set upon a 6 inch compacted (minimum thickness) mat of Size #57 crushed stone. Manholes over sixteen feet (16') deep shall also be placed on a reinforced slab as shown in the **CCWSA Standard Detail S-01**.
- 9.) **BRICK:** Brickwork required to complete the precast concrete manhole shall be constructed using 1 part Portland cement to 2 parts clean sand, meeting ASTM Specifications, Serial Designation C 144, thoroughly mixed to a workable plastic mixture. Brickwork shall be constructed in a neat and workmanlike manner. Cement mortar shall be used to grout interior exposed brick joints and faces. No more than 3 courses of brick with 9-inch maximum total depth of bricks may be used to adjust manhole covers.
- 10.) **FRAME AND COVER**
 - A.) Manhole covers shall be of cast iron with a coat of asphaltic paint applied at the foundry.

The weight of the frame and cover shall be approximately 315 lbs. The clear opening shall be twenty-one and one half inches (21 1/2"). The frame and cover shall be equal and similar to Neenah R-1776.

- B.) Where waterproof covers are required, the weight of the frame and cover shall be approximately 375 lbs. The clear opening shall be twenty-four inches (24"). The frame and cover shall be equal and similar to Neenah R-1915-H2 with a "bolted-down" lid.
- C.) The cast iron frame for the manhole cover shall be set at the required elevation and properly anchored to the masonry. Frames and covers shall be in compliance with the latest edition of ASTM 48. Where manholes are constructed in paved areas, the top surface of the frame and cover shall be tilted, if necessary, to conform to the exact slope, crown and grade of the existing adjacent pavement. All covers shall have "SEWER" printed on them.

11.) MASONRY WORK

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

12.) RECEIVING MANHOLES (Force Mains Only)

All interiors of a receiving manhole will be epoxy, fiberglass or CCWSA approved equal coated. This includes 2 manholes upstream and 2 manholes downstream, wherever applicable.

S505-STEEL CASINGS

Steel casing pipe shall be used for all cased piping where the carrier pipe is eight inches (8") or greater in size. Steel casing pipe shall have a minimum yield strength of 35,000 psi and shall conform to the requirements of ASTM A139, Grade B, electric fusion welded steel pipe. It shall be fully coated on the exterior and interior with a coal tar varnish coating. The casing pipe diameter shall be six to eight inches greater than the "bell" diameter of the carrier pipe. Minimum wall thickness shall be as follows:

<u>Nominal Diameter (Inches)</u>	<u>Nominal Thickness (Inches)</u>
Under 14	0.250
16	0.250
18	0.250
20	0.281
22	0.312
24	0.344
28	0.406
30	0.406
36	0.469
42	0.500
48	0.625
54	0.750

S506-STONE AND GRAVEL MATERIALS

All rip-rap, construction exit stone, subgrade stabilizer stone, graded aggregate base and drainage stone shall meet the requirements set forth in the **Manual For Erosion and Sediment Control In Georgia**, Appendix C - Construction Materials, latest edition.

S507-AIR RELEASE AND VACUUM BREAK VALVES FOR FORCE MAINS

The valve shall be a combination air/vacuum- double orifice automatic air release valve with two inch (2") connection to the pipe line. The valve shall be of one-piece body design. The internal parts shall have a small orifice within tripod for small air discharge and a big orifice within bonnet of base housing for main air discharge and allow air to enter in the event of a vacuum condition. The material of the body and the flow shall be Delrin (Poloximethylene, POM). The valve sealing is rubber made of EPDM. The valve shall have a protection cap of PE. Air and vacuum valves shall be manufactured by H-TEC or alternate acceptable to the Authority. Valves shall be a minimum of 1 inch.

Gate valves between water main and air release valve shall be bronze, solid wedge with screw connection equal to Jenkins Company Figure 370 or alternate acceptable to the Authority.

SECTION S600 - CONSTRUCTION METHODS

S601-EXCAVATION GENERAL

It is the responsibility of the General Contractor, any subcontractor, their employees, and inspectors to job sites to observe all safety regulations. Deficiencies in safety measures noted should be immediately reported to the Contractor's superintendent, so that immediate corrective measures can be taken by the Contractor. It is, however, the Contractor's responsibility to conform to all safety regulations and practices as pertain to his construction site. The Contractor shall contact the U.S. Department of Labor, Occupational Safety and Health Administration (OSHA), Region IV, Atlanta, Georgia for any assistance needed to complying with the appropriate regulations.

All unsuitable excavated material must be properly disposed of in a manner acceptable to the Cherokee County Roads and Bridges Department and in a manner that will not adversely affect the environment.

It shall be expressly understood that these Standards are for the installation of all sanitary sewer mains and appurtenances. All work shall conform to the applicable provisions of the AWWA Specifications or ASTM Specifications of latest revision except as otherwise specified herein.

S602-EROSION AND SEDIMENTATION CONTROL

All erosion and sedimentation control methods shall be in compliance with the State, Federal and Local regulations, the Manual for Erosion Control in Georgia and the EPD requirements regarding the NPDES Storm Water Monitoring permit.

The Contractor shall designate one individual to be responsible for the implementation and maintenance of erosion and sedimentation controls on a 24-hour, everyday basis. The Contractor shall furnish the Authority the individual's name, address, and 24-hour telephone number. This information shall be updated as is necessary.

S603-CLEARING AND GRUBBING

Areas for sewer system construction shall be cleared and grubbed. All trees, shrubs, stumps, brush, paving and other waste material must be removed from the site. On sanitary sewer main extensions to the development, the road right-of-way or easement width shall be cleared to the width necessary for trenching and pipe laying operations. All stumps and roots within the trench dimensions shall be grubbed to such depths and widths as will enable the trenching to be done. No trees or stumps shall be pushed beyond the right-of-way / easement or any timber beyond the right-of-way / easement damaged. The Contractor shall remove only such trees on or along the work as the Chief Inspector permits, and shall carefully protect all other trees adjacent to the work. The Contractor shall not permit excavating machinery or trucks to scrape the bark or tear the limbs from the trees, nor connect ropes or guy cables to them.

S604-TRENCH EXCAVATION

- 1.) It is the responsibility of those installing sanitary sewers, lift stations, waste treatment plants, and related appurtenances to conform to OSHA regulations, 29 CFR Part 1926, Subpart P, Paragraph 1926.650 through 1926.653 during trench excavation. OSHA publications are available to assist the Contractor in having a safe construction site (i.e. **Excavating and Trenching Operations**, 1995(Revised), OSHA 2226). Publications from OSHA can be obtained by contacting OSHA Publications Distribution, Washington, D.C. The Authority assumes no liability nor responsibility for unsafe trench conditions.

- 2.) Trenches shall have a minimum width of twelve (12) inches plus the diameter of the outside of the bell of the sewer main and the depth thereof shall be such that there shall be a minimum of required cover measured below the roadway surface, natural ground, or proposed grade to the top of the pipe. The sides of the trench above the pipe shall be sloped or benched as necessary to maintain stability.
- 3.) In cases where water lines cross above sanitary sewers, there shall be a minimum of 18 inches' vertical separation between the water and sewer mains. At crossings, one full length of water pipe must be located so that both joints are as far from the sanitary sewer as possible. Both mains shall be DIP, SDR 26 or CCWSA approved equal. In cases where water mains parallel sewer mains there shall be a minimum of ten feet (10') horizontal separation maintained between the mains. In cases where water mains parallel sewer mains, the water lines shall be a minimum of eighteen inches (18") above the sanitary sewer. These distances are measured edge to edge.
- 4.) Pipe trenches shall be cut straight and true to the lines and grades and in the locations shown on the plans. The bottom of the trench shall be cut carefully to the required grade of the pipe except where bedding materials or cradles are shown, in which case the excavation shall extend to the bottom of the bedding or cradles as shown on the plans. Trenches shall be dug so that the pipe can be laid to the alignment and depth required, and the trench shall be of such width and shall be braced and drained so that the workmen may work therein safely and efficiently. No chocking under the pipe will be permitted. All joints shall be as specified herein.
- 5.) Bell holes shall be excavated at proper intervals so the barrel of the pipe will rest for its entire length upon the bottom of the trench and the pipe weight shall not rest on the bells. Bell holes shall be large enough to permit proper installation of all joints in the pipe.
- 6.) All excavations shall be adequately guarded with barricades and lights in compliance with all OSHA, Cherokee County and the Georgia Department of Transportation requirements so as to protect the public and workers from hazard.
- 7.) Pipe trenches shall not be excavated more than one hundred feet (100') in advance of pipe laying, and all work shall be performed to cause the least possible inconvenience to the public. Adequate temporary bridges or crossings shall be constructed and maintained where required to permit uninterrupted vehicular and pedestrian traffic. The Chief Inspector shall have the right to limit the amount of trench open at any one time to less than one hundred feet (100') if he believes the reduced limits are necessary.
- 8.) No excavation shall be made under highways, streets, alleys or private property until satisfactory arrangements have been made with the State, City, Cherokee County Engineering or owners of the property to be crossed. All excavated material shall be placed so as to not interfere with public travel on the streets and highways along which the lines are laid.
- 9.) Excavations adjacent to existing or proposed buildings and structures or in paved streets or alleys shall be adequately protected by the use of trench boxes, sheeting, shoring and bracing to prevent cave-ins of the excavation, or the undermining or subsequent settlement of adjacent structures or pavements. Underpinning of adjacent structures shall be done when necessary to maintain structures in safe condition.
- 10.) Trenches shall be free of water during the work. Whenever water is present in the trench,

it shall be removed in a manner satisfactory to the Authority and enough backfill shall be placed on the pipe to prevent floating. Any pipe that has floated shall be removed from the trench and re-laid later during dry conditions. No pipe shall be laid in wet trench conditions that preclude proper bedding, or on frozen trench bottom, or when, in the opinion of the Authority the trench conditions or the weather are unsuitable for proper installation.

- 11.) The Contractor shall do all necessary pumping or bailing, build all drains and do all other work necessary at his own expense to keep the trenches clear of water during the progress of the work. No structure shall be built or pipe shall be laid in water, and water shall not be allowed to flow over or rise upon any concrete, masonry or pipe until the same has been inspected and the concrete or joint material has thoroughly set. All water pumped, bailed or otherwise removed from the trench or other excavation shall be conveyed in a proper manner to a suitable place of discharge where it will not cause injury to the public health or to public or private property or to work completed or in progress, or to the surface of the streets or cause any interference with the use of same by the public.
- 12.) Construction occurring around active sewer systems shall be done in such a way so as to prevent the passage of wastewater onto the ground. **Absolutely no wastewater shall be allowed to spill onto the ground.**
- 13.) During the sewer line construction an effort shall be made to minimize the cutting of trees.
- 14.) When possible, all crossings of paved highways or driveways shall be made by boring or jacking the pipe under the pavement and shall be done in such manner as not to damage the pavement or subgrade, unless the casing or pipe is in solid rock, in which case the crossing shall be made by the open cut method or by tunneling. Wherever streets, roads, or driveways are cut, they shall be immediately backfilled and compacted after the pipe is laid and shall be maintained in first-class condition as passable at all times until repaved. Backfilling, compaction, dressing and clean-up shall be kept as close to the line laying crew as is practical, and negligence in this feature of the work will not be tolerated.
- 15.) Streets, sidewalks, parkways, and other public and private property disturbed in the course of the work shall be restored to as near as original condition as possible or better in a manner satisfactory to the Authority. The Contractor shall carefully protect all trees adjacent to the work. He shall not permit excavating machinery or trucks to scrape the bark or tear the limbs from the trees, nor connect ropes or guy cables to them. No trees or shrubs will be removed without the approval of the property owner and the CCWSA.
- 16.) In excavation and backfilling and laying pipe, care must be taken not to remove or injure any water, sewer, gas or other pipes, conduits or other structures without an order from the Designer. When an obstruction is encountered, the Contractor shall notify the Designer who will have the Owners of the obstruction adjust same or make necessary changes in grade and/or alignment to avoid such obstruction. Any house connection, drains or other structures damaged by the Contractor shall be repaired or replaced immediately.
- 17.) In laying pipe across water courses, the top of the sewer main or casing shall be a minimum of two feet (2') below the creek or river bed. Four feet (4') of cover shall be maintained over sewer mains crossing ditches or depressions of any kind. Railroad crossings shall be installed according to American Railway Engineering Association requirements.
- 18.) All excavated material shall be placed on one side of the trench, unless permission is given by the Authority to place it on both sides. Excavated materials shall be so placed as not to

endanger the work and so that free access may be had at all times to all parts of the trench and to all fire hydrants, water valve boxes, manholes, etc.

S605-ROCK EXCAVATION

Wherever rock is encountered in the excavation, it shall be removed by suitable means. Drilling and blasting operations shall be conducted with due regard for the safety of persons and property in the vicinity and in strict conformity with requirements of all ordinances, laws and regulations relative to the handling, storing and use of explosives. The Developer is fully responsible for filing for and acquiring any blasting permits which may be required by those agencies with such jurisdiction. Before blasting, the Contractor shall cover the excavation with heavy timbers and mats in such a manner as to prevent damage to persons or the adjacent property. Rock excavation near existing pipelines or other structures shall be conducted with the utmost care to avoid damage. The Contractor shall be wholly responsible for any damage resulting from blasting, and any injury or damage to structures or property shall be promptly repaired by the Contractor to the satisfaction of the Authority and property owner.

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

<u>Size of Inches</u>	<u>Depth of Excavation Below Bottom of Sewer Pipe, Inches</u>
4 and Less	4
4 to 6	6
8 to 18	8
18 to 30	10
Over 30	12

The space below grade for pipe lines shall then be backfilled with subgrade stabilizer or other approved bedding material and compacted.

In rock excavation, the backfill from the bottom of the trench to one foot (1') above the top of the pipe shall be finely pulverized soil, free from rocks and stones. The rest of the backfill shall not contain over fifty percent (50%) broken stone, and the maximum sized stone placed in the trench shall not exceed two inches (2") in diameter. Excess rock and fragments of rock larger than two inches (2") diameter shall be loaded and hauled to disposal. If it is necessary, in order to comply with these specifications, selected backfill shall be borrowed and hauled to the trenches in rock excavation. Sides of the trench shall be trimmed of projecting rock that will interfere with backfilling operations. Rock excavation by blasting shall be at least seventy-five feet (75') in advance of pipe laying.

S606-SUB-GRADE AND PIPE BEDDING

- 1.) All DIP, RCP and Steel pipe shall have a minimum of Class "C" bedding. All PVC pipe shall have minimum bedding as described below and shown in the **CCWSA Standard Details Booklet**. Wherever water or wet soil is encountered, Class "B" bedding shall be provided for DIP, RCP and Steel Pipe. If specifically designated on the plans, Class "A" or "B" bedding may be required. Class "D" bedding is not allowed for use with gravity sewers. All bedding shall conform to ASTM C12 specifications.

- 2.) A description of Class "A", "B", "C" and PVC Special Bedding is as follows:

- A.) Class "A" Bedding:** Class "A" bedding refers to bedding with concrete cradle or arch. The Contractor shall conform to details shown in the **CCWSA Standard Details Booklet** when Class "A" bedding is required.
- B.) Concrete Cradle:** The sewer pipe is bedded in a cast-in-place cradle of plain or reinforced concrete having a thickness equal to one-fourth the inside pipe diameter, with a minimum of four inches (4") and a maximum of fifteen inches (15") under the pipe barrel and extending up the sides for at least the outside diameter of the sewer pipe barrel plus eight inches (8"). Construction procedures must be executed carefully to prevent the sewer pipe from floating off line and grade during placement of the cradle concrete.
- C.) Concrete Arch** The sewer pipe is bedded in carefully compacted granular material having a minimum thickness of one-eighth the outside sewer pipe diameter but not less than 100 mm (4 in.) or more than 150 mm (6 in.) between the sewer pipe barrel and bottom of the trench excavation. Granular material is then placed to the spring line of the sewer pipe and across the full breadth of the trench. The haunching material beneath the sides of the arch must be compacted so as to be unyielding. Crushed stone in the 5-mm to 20- mm (0.25 in. to 0.75 in.) size range is the preferred material. The top half of the sewer pipe is covered with a cast-in-place plain or reinforced concrete arch having a minimum thickness of 100 mm (4 in.) or one-fourth the inside pipe diameter but not to exceed 380 mm (15 in.), and having a minimum width equal to the outside sewer pipe diameter plus 200 mm (8 in.).
- D.) Class "B" Bedding:** The pipe shall be bedded in crushed granite material or other suitable materials approved by the Authority. The bedding shall be placed on a flat trench bottom with a minimum thickness beneath the pipe of one-eighth the outside pipe diameter, but not less than six inches (6") and sliced under the haunches of the pipe with a shovel or other suitable tool to a height of one-half the outside pipe diameter, or to the horizontal centerline. The initial backfill shall be hand placed to a level of twelve inches (12") over the top of the pipe and shall consist of finely divided materials free from debris, organic material and large rocks or stones.
- E.) Class "C" Bedding:** The pipe shall be bedded in crushed granite material or other suitable materials approved by the Authority. The bedding shall be placed on a flat trench bottom with a minimum thickness beneath the pipe of one-eighth the outside pipe diameter, but not less than six inches (6") and sliced under the haunches of the pipe with a shovel or other suitable tool to a height of one-sixth the outside diameter of the pipe. The initial backfill shall be hand placed to a level of twelve inches (12") over the top of the pipe and shall consist of finely divided materials free from debris, organic material and large rocks or stones.
- F.) Special Bedding for PVC Pipe:** The pipe shall be bedded in crushed granite material or other suitable materials approved by the Authority. The bedding shall be placed on a flat trench bottom with a minimum thickness beneath the pipe of one-fourth the outside pipe diameter, but not less than six inches (6") and sliced under the haunches of the pipe with a shovel or other suitable tool to a height of two-thirds the outside pipe diameter. The initial backfill shall be hand placed to a level of twelve inches (12") over the top of the pipe and shall consist of finely divided materials free from debris, organic material and large rocks or stones.

S607-BEDDING MATERIAL

- 1.) Bedding material shall conform to ASTM D2487 standards.

Class I: This class includes angular, 6 to 40 mm (0.25 to 1.5 in.), graded stone, including a number of fill materials that have regional significance such as coral, slag, cinders, crushed stone, and crushed shells. Class I material provides the best material for the construction of a stable sewer pipe - soil system.

Class II: This class comprises coarse sands and gravels with maximum particle size of 40 mm (1.5 in.), including variously graded sands and gravels containing small percentages of fines, generally granular and non-cohesive, either wet or dry. Soil types GW, GP, SW and SP are included.

Class III: This class comprises fine sand and clayey gravels, including fine sands, sand - clay mixtures, and gravel - clay mixtures. Soil types GM, GC, SM and SC are included.

Class IV: Class IV materials require special effort for compaction, thus may be suitable for sewer pipe foundation if special care is taken during excavation to provide a uniform, undisturbed trench bottom. Use of Class IV materials for bedding, haunching or initial backfilling is not recommended. Soil types include ML, CL, MH, and CH.

Class V: Class V materials present special problems in providing an adequate foundation and should not be used for any part of the sewer pipe envelope. Soil types include OL, OH and PT.

S608-INSTALLATION OF SEWER PIPE

- 1.) **Section S500** of these Standards, entitled "Materials for Sanitary Sewers", includes the requirements for the installation and testing of the different types of pipe materials that are approved for sanitary sewers. In addition to those material-specific requirements, the general requirements below will be followed.
- 2.) Pipe and accessories shall at all times be handled with care to avoid damage. Whether moved by hand, skidways or hoists, material shall not be dropped or bumped. The interior of all pipe shall be kept free from dirt and foreign matter at all times. Each joint of pipe shall be unloaded opposite or near the place where it is to be laid in the trench.
- 3.) All such material that is defective in manufacture or has been damaged in transit or after delivery shall be removed from the job site.
- 4.) Sewer pipes shall be joined by "push-on" joints using elastomeric gaskets to affect the pressure seal. The ends of pipe to be joined and the gaskets shall be cleaned immediately before assembly, and the assembly shall be made as recommended by the pipe manufacturer. Lubricant used must be non-toxic and supplied or approved for use by the pipe manufacturer. Sewer pipes shall be laid in the uphill direction with the bells pointing upgrade. Any variation from this procedure shall require approval from the Authority. Pipe grades shall be obtained by use of a laser and double-checked with a surveying level and rod. Where PVC pipe is connected to DI pipe, the Contractor shall use a solid sleeve if the two pipe sizes are equal.
- 5.) When pipe laying is not in progress, the open ends of installed pipe shall be plugged by approved means to prevent entrance of trench water into the line.
- 6.) No special laying conditions are required for ductile iron pipe (DIP) other than haunching and soil compaction to twelve (12) inches above the spring line and any other conditions which are stipulated elsewhere in these specifications.
- 7.) The following laying conditions shall be followed with PVC pipe:
- 8.) PVC pipe shall be installed in accordance with the requirements of ASTM D 2321.

- 9.) In any area where the pipe is below the existing ground water level, the contractor will embed PVC pipe in sand or graded gravel. By embedding PVC pipe in sand or graded gravel, no special compaction requirements will be necessary. However, the sand or gravel must extend from six inches below the pipe to twelve inches above the pipe and the material must be firmly placed under the pipe haunches. See the **CCWSA Standard Details Booklet**.
- 10.) When embedding PVC pipe in friable, compressible soils (E.G., silt, clay, sandy clay, silty clays, etc.), special care must be exercised to provide a uniform (undisturbed or fully compacted) trench bottom. Additionally, the backfill must be compacted to ninety-five percent (95%) Standard Proctor in six inch lifts to twelve inches above the top of the pipe.
- 11.) Initial backfill shall be compacted to the densities outlined in D2321. The Authority may require random compaction tests to insure compliance with D2321. If any material tested is less than the required density, the contractor shall re-compact said material.
- 12.) The Contractor shall use SDR-26 material for pipe with zero to sixteen feet (0'-16') of fill. PVC pipe cannot be used at depths exceeding 16 feet.
- 13.) Deflection Limit: Vertical deflection of installed pipe shall not exceed five percent (5%) of the undeflected diameter as defined in Table X1.1 of ASTM D3034.
- 14.) Bell holes shall be provided of sufficient size to allow ample room for making the pipe joints properly. The bottom of the trench between bell holes shall be carefully graded so that the pipe barrel will rest on a solid foundation for its entire length as shown on the plans. Each joint shall be laid so that it will form a close concentric joint with adjoining pipe and in order to avoid sudden offsets or inequalities in the flow line.
- 15.) Water shall not be allowed to run or stand in the trench before the trench has been backfilled. The Contractor at no time shall open up more trench than his available pumping facilities are able to dewater.
- 16.) Any pipe which has its alignment, grade or joints disturbed after installation shall be taken up and re-laid.
- 17.) For force mains, the Contractor shall place a vertical piece of two inch (2") diameter PVC pipe on top of the pipe at all bends, fittings, valves, elevation transitions and every fifty feet (50') along the length of the force main for the purpose of enabling the surveyor to locate the force main for As-Built. The Contractor will then be responsible for removing the vertical PVC sections after the As-Built locations have been verified by the Authority. All ductile iron force mains shall be encased in green polyethylene tubing.
- 18.) At the point of connection to the Authority's existing sanitary sewer system, the new sanitary sewer line shall remain plugged or otherwise disconnected from the system until the new sanitary sewer lines are inspected, tested and determined to be acceptable to the Authority's Chief Inspector. The Developer will be fined for any storm water flows, mud or other construction debris that enters the Authority's system due to non-compliance with this requirement.
- 19.) If the As-Built capacity decreases below the approved plan capacity in excess of the acceptable percentages listed below, the pipe shall be taken up and re-laid.
- 20.) Acceptable Percent Decrease

<u>Proposed Flow Rate</u>	<u>In Capacity</u>
0 – 400 GPM	5%
401 – 800 GPM	7.5%
>801 GPM	10%

S609-BACKFILLING TRENCHES

- 1.) Backfill material shall consist of fine, loose earth containing sufficient but not excessive moisture content for thorough compaction. Material that is too dry for adequate compaction shall receive a prior admix of sufficient water to secure adequate moisture content. Material having excessive water content shall not be placed at any time. Backfill material shall be free of large clods, stones, vegetable matter, debris, and other objectionable material. All unsuitable excavated material and excess material must be properly disposed of in a manner that will not adversely affect the environment.
- 2.) After the pipe has been laid, backfilling shall be done in two (2) distinct operations. In general, all backfill beneath, around and to a depth of twelve inches (12") above the top of the pipe shall be placed by hand in four inch (4") layers for the full width of the trench and thoroughly compacted by hand with vibratory equipment. The remainder of the backfill shall be placed in six inch (6") layers and compacted to the top of the trench, either by pneumatic hand tamps, hydro-tamps, or other approved methods. Care shall be taken so that the pipe is not laterally displaced during backfilling operations. The backfill lifts shall be placed by an approved method in accordance with that hereinafter specified. Backfill materials shall be the excavated materials without bricks, stone, or corrosive materials.
- 3.) Backfill under permanent concrete or bituminous pavement and as elsewhere specified or indicated on the plans shall be compacted graded aggregate free from large stones and containing not more than ten percent (10%) by weight of loam or clay. This backfill shall be compacted to ninety-five percent (95%) as determined by the Standard Proctor test from pipe bedding to one foot (1') below the top of the trench, and the top one foot (1') of the trench shall be compacted to one hundred percent (100%) as determined by the Standard Proctor test. Mechanical vibrating equipment shall be used to achieve the required compaction.
- 4.) Backfill under gravel or crushed stone surfaced roadways and surface treated type bituminous roadways shall be the approved suitable excavated material placed in six (6) inch layers thoroughly compacted for the full depth and width of the trench. Backfill shall be free from large stones and contain no more than ten percent (10%) by weight of loam or clay. This backfill shall be compacted to ninety-five percent (95%) as determined by the Standard Proctor test from pipe bedding to one foot (1') below the top of the trench, and the top one foot (1') of the trench shall be compacted to one hundred percent (100%) as determined by the Standard Proctor test. Mechanical vibrating equipment shall be used to achieve the required compaction.
- 5.) Backfill in unpaved areas shall be compacted with mechanical vibrating equipment to ninety percent (90%) as determined by the Standard Proctor Test. Backfill material from pipe bedding to ground surface by shall be excavated earth free from large stones and other debris.
- 6.) Contractor shall fully restore and replace all pavement, surface structures, etc., removed or disturbed as part of the work to a condition equal to that before the work began. Pavement

shall be replaced immediately after the backfilling is completed.

- 7.) Contractors which are utilizing the roadway shoulders for construction are required to stabilize the earth shoulders every three days as a maximum time period. Also they are required to stabilize the shoulder before leaving the work area on any particular day if rain is forecast within the next 24 hours.
- 8.) Where sheeting is used in connection with the work, it is in no case to be withdrawn before the trench is sufficiently filled to prevent damage to banks, road surfaces, adjacent pipes, adjacent structures or property. When the removal of sheeting endangers adjoining improvements, it will be left in place.
- 9.) All costs of compaction testing shall be the responsibility of the Developer.

S610-RAILROAD CROSSINGS

All railroad crossings shall conform to the requirements of the American Railway Engineering Association Manual for Railway Engineering, Part 5. The Developer shall secure permission from the railroads to schedule the work so as not to interfere with the operation of the railroads. The Developer shall be held responsible for any delays or damages occurring to the railroads. The Developer will furnish the railroad with such additional insurance as may be required, cost of same to be borne by the Developer, together with the costs for flagmen, watchmen, temporary work of any nature, safety devices and any other items that may be imposed by the railroad.

S611-HIGHWAY CROSSINGS

- 1.) The Developer shall be responsible for the coordinating and scheduling of all construction work in the State Highway right-of-way with the Georgia Department of Transportation.
- 2.) Work along and across Georgia State Highway right-of-way shall conform to Georgia D.O.T. Standard Specifications for Construction of Roads and Bridges. The Developer is required to obtain all necessary permits.
- 3.) Traffic control within the state of Georgia right-of-way shall comply with Section 107.09 of the State of Georgia D.O.T. Standard Construction Specifications, or Sections 104.05 and 107.07 of the U.S. Manual on Uniform Traffic Control Devices for Streets and Highways, latest editions.

S612-STREAM CROSSINGS

- 1.) Crossing streams shall be done in compliance with the Federal, State and Local laws and permit requirements. The methods described below are subject to change due to more recent regulations implemented by the varying government agencies. The Developer is liable for knowing and complying with the most stringent regulations in force at the time of construction.
- 2.) The suggested method of crossing a river, stream, creek, impoundments, or wet weather ditch is with a bore under the creek or river with a minimum of two feet (2') of cover between the lowest point in the stream and the top of outside diameter of the casing. Casings and ductile iron pipe are required for all stream crossings and shall extend a minimum of twenty feet (20') beyond the vegetative buffer (State or County buffer, whichever is wider) on each side. An open cut of the stream is allowable if no endangered species are affected and if the Developer obtains permission from the various governing agencies. If the stream is open cut, concrete collars or encasement must be provided at all joints for ductile iron pipe with less than three feet (3') of cover.

- 3.) Design engineer is responsible for checking and designing against floatation.
- 4.) Where streams are allowed to be open cut by variance, the construction in stream beds shall follow the following guidelines:
- 5.) Construction in and around stream beds must adhere to the current regulations of the Georgia EPD, the Corps of Engineers, Cherokee County Engineering and the U.S. Department of Fish and Wildlife. The design engineer and contractor are responsible for knowing and complying with these regulations. All necessary permits and buffer variances must be acquired by the Developer prior to the final approval of the plans by the Authority. Any item published within these specifications that is in conflict with the EPD's stream bed protection regulations is hereby deemed invalid, unless the specification herein is considered more stringent by the reviewing agency.
- 6.) Fording of live streams with construction equipment will not be permitted, unless specifically approved in writing. Unless, otherwise approved in writing, mechanized equipment shall not be operated in live streams except as may be required to construct temporary diversion structures, and temporary or permanent structures.
- 7.) Erosion control measures shall be installed prior to performing any stream crossings. All work should be performed when stream flows are at their lowest, and all work should be performed as quickly and safely as possible. As soon as conditions permit, the stream bed shall be cleared of all false work, debris, and other obstructions placed therein or caused by the construction operations.

S613-PLACING OF STEEL CASING PIPE

- 1.) Casing pipe shall be installed at the locations required by the Authority. Unless directed otherwise, the installation procedure shall be the dry bore method. The hole is to be mechanically bored and cased through the soil by a cutting head on a continuous auger mounted inside the casing pipe. The installation of the casing and boring of the hole shall be done simultaneously by jacking. Lengths of pipe are to be full circumference butt-welded to the preceding section installed. Excavation material will be removed and placed at the top of the working pit. Backfill material and methods of backfilling and tamping shall be as required under **Section S609**. Carrier pipe shall be DIP, SDR 26 or CCWSA approved equal.
- 2.) Jacks for forcing the casing pipe through the roadbed shall have a jacking head constructed in such a manner as to apply uniform pressure around the ring of the pipe. The pipe to be jacked shall be set on guides, braced together, to properly support the section of the pipe and direct it to the proper line and grade. In general, roadbed material shall be excavated just ahead of the pipe, the excavated material removed through the pipe, and the pipe then forced through the roadbed into the excavated space.
- 3.) Where pipe is required to be installed under railroads, highways, streets or other facilities by jacking or boring methods, construction shall be done in a manner that will not interfere with the operation of the facility, and shall not weaken the roadbed or structure.
- 4.) The use of water or other fluids in connection with the boring operation will be permitted only to the extent necessary to lubricate cuttings. Jetting will not be permitted.
- 5.) The diameter of the excavation shall conform to the outside diameter and circumference of the casing pipe as closely as practicable. Any voids which develop during the installation

operation shall be pressure grouted.

- 6.) The pipe shall be jacked from the low or downstream end. At each end of the casing pipe the void between the carrier pipe and casing shall be sealed with brick and mortar. Any pipe damaged in jacking operations shall be removed, and replaced by the Contractor at his expense.
- 7.) After the steel casing pipe has been installed, the DIP, SDR 26 or CCWSA approved equal carrier pipe shall be installed in the casing pipe. Care shall be exercised at all times to protect the coating and lining of this pipe and to maintain tight, full-seated joints in the carrier pipe. The Contractor shall also take great care in setting the pipe on guides within the casing to insure that the carrier pipe stays on the correct grade without sagging. Where the carrier pipe is twenty-four (24") diameter or less, joint gaskets shall be "Field-Lok" gaskets or approved equal inside of the casing.

S614-REPLACEMENT OF PAVEMENT

1.) General

- A.) Contractor shall fully restore and replace all pavement, curbs, gutters, sidewalks and other surface structures removed or disturbed, to a condition that is equal to or better than the original condition in a manner satisfactory to the Authority.
- B.) Contractors which are utilizing the roadway shoulders for construction are required to stabilize the earth shoulders every three days as a maximum time period. Also they are required to stabilize the shoulder before leaving the work area on any particular day if rain is forecast within the next 24 hours.

2.) Pavement Cuts

- A.) All paved roads will be bored and cased. A bore must be attempted before consideration will be given to cutting the street.
- B.) Existing roadways shall not be open cut unless permission is granted by the Georgia
- C.) D.O.T. and/or the Cherokee County Engineering Department. Submittal of an authorization letter from the D.O.T. or the CCED is required.
- D.) One lane of traffic shall be maintained open at all times. Construction work shall be limited to time between 9 A.M. and 4 P.M.
- E.) The Contractor shall furnish traffic control devices and certified personnel to direct traffic, if required.
- F.) The above requirements may be altered with the written approval of the CCRBD in extenuating circumstances.
- G.) Assuming that a road bore has been attempted and failed, or that the Developer has received permission to open cut a road, pavement replacement shall adhere to the following guidelines:
- H.) Removing and replacing pavement shall consist of removing the type of pavement and base encountered, and replacing same to its original shape, appearance and riding quality, in accordance with the detailed plans. Final asphalt patches shall match the existing pavement type but be no less than one and one half inches (1 ½") thick. Special care shall be exercised to match existing slopes and grades for a smooth transition. Casing will be required where the installation is under any roadway. Carrier pipe shall be DIP, SDR 26 or CCWSA approved equal.
- I.) Concrete pavement shall be replaced with pavement of a thickness equal to that removed, or six inches (6") for driveways and nine inches (9") for roads, whichever is thicker. The concrete shall meet the specifications of the D.O.T. for concrete paving.
- J.) Where bitumastic paving is replaced, soil shall be compacted to ninety-eight percent (98%) up to a depth of two and one half feet (2 ½'). GAB stone shall be installed and

compacted up to a depth of five inches (5"). 9.5 mm Superpave Level B for State roads and 12.5 mm Superpave shall then be installed and compacted level with the existing paving. An Infrared Asphalt Bonding shall be performed to connect the existing and new pavements to each other.

- K.)** Unless otherwise directed in writing all pavement will be removed to a width of the trench plus twelve inches (12") on each side as shown in the **CCWSA Standard Details Booklet**.
- L.)** All pavement cuts on County roads shall be made by sawing prior to excavation to eliminate uneven and ragged edges.
- M.)** The Contractor shall adhere to the Georgia D.O.T. Specifications for the Installation of Safety Barricades, Section 107.09 during construction in the roadway or shoulder.
- N.)** Where possible, all pipe under existing paved driveways will be either free bored or installed in casing. Free bores under driveways will be made with DIP, SDR 26 or CCWSA approved equal.
- O.)** Where sewer lines are installed in existing paved streets, the streets in which the sewer lines are installed shall receive a full width asphalt repaving in accordance with these specifications.

S615-LOCATION AND PROTECTION OF EXISTING UNDERGROUND UTILITIES

- 1.)** It is the responsibility of the Contractor to locate and protect all underground utilities and structures. No utility is to be moved or disturbed without the approval of the utility company. Any damage caused by sewer line installation to any utility or structure shall be immediately reported to the Chief Inspector of the CCWSA and repaired at the Contractor's expense.
- 2.)** During construction and after the sewer main is operational and throughout the one-year maintenance period, the Developer will be responsible for locating all water and sewer facilities when called upon by the Utilities Protection Center or the Authority. These utilities must be marked within 72 hours of the time notified. Any water or sewer facilities cut by others will be repaired by the Developer's contractor at the Developer's expense if the lines are not located or if they are improperly located. The Developer shall provide the name and telephone number of the company providing this locate service for the Developer.

S616-CLEAN-UP

- 1.)** The Contractor shall remove all unused material, excess rock and earth, 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 Authority's representative, the Authority may choose to use their own forces to do so, followed by an invoice to the Developer for the Authority's work.
- 2.)** All trenches shall be backfilled and tamped before the end of each day's work.
- 3.)** Prior to requesting the "completion of sewer main construction" inspection, the Contractor shall do the following:
- 4.)** Remove and dispose of in an acceptable manner all shipping timbers, shipping bands, spacers, excess materials, broken material, crates, boxes and any other material brought to the job site.
- 5.)** Repair or replace any work, trees, lawns, shrubs, fences, flower beds, drainage culverts or other property damaged by the sewer line construction. All items damaged beyond repair shall be replaced with the same kind of material as existed prior to the damage occurring.

- 6.) All easement areas shall be cleared of trees, stumps and other debris and left in a condition such that the easement can be maintained by bush-hog equipment.
- 7.) All shoulders, ditches, culverts, and other areas impacted by the sewer line construction shall be at the proper grades and smooth in appearance.
- 8.) All manhole covers shall be brought to grade.

S617-GRASSING

- 1.) A uniform stand of grass is required over all construction easements and sanitary sewer easements prior to the Authority's acceptance of the sewer. Grass shall be as defined and installed or constructed in conformity with the Temporary and Permanent Disturbed Area Stabilization of the **Manual for Erosion and Sediment Control In Georgia**, 2000 or most current edition. The grassing shall be maintained for by the Contractor or Developer until final acceptance of the sewer line and appurtenances by the Authority.
- 2.) Grass seed shall be selected based on the type of seed suitable to the area and season of year. Refer to the **Manual for Erosion and Sediment Control In Georgia** for grass growing schedule, selection of grass seed, fertilizers, lime, inoculants, mulching, etc.
- 3.) The Contractor shall provide water for irrigation from the nearest available metered source. The soil must be thoroughly wet to a depth that will insure germination of the seed. Water must be applied at a rate not causing runoff or erosion.
- 4.) Growth and coverage on areas grassed shall be considered in reasonably close conformity with the intent of this requirement when a viable stand of grass covers at least ninety-eight percent (98%) of the total area with no bare spots exceeding one square foot (1' sq. ft.) and the ground surface is fully stabilized against erosion. The Contractor shall repeat all work, including plowing, fertilizing, watering, and seeding as necessary to produce a satisfactory stand.
- 5.) The Contractor or Developer shall do all maintenance work necessary to keep all planted areas in satisfactory condition until the work is finally accepted. This shall include mowing, repairing washes that occur, reseeding, and water as required to produce a healthy and growing stand of grass. Mowing will be required to remove tall and obnoxious weeds before they go to seed.

S618-STANDARD DETAILED DRAWINGS

Installation of sewer lines, bedding, manholes, services, force mains, etc. shall be made in accordance with the **CCWSA Standard Details Booklet**.

S619-CONSTRUCTION PERMITS

- 1.) The contractor shall submit one copy of the approved construction plans which have been stamped approved. The contractor shall furnish his name and address, telephone number, Certificate of Liability Insurance, and proof of his Cherokee County business license to do this type of work. He shall also furnish the name of the person in charge of the project and any subcontractors and the name and telephone number of a responsible person who can be contacted in case of emergencies during nonworking hours.
- 2.) The contractor (whose name shall appear on the approved contractor's list) shall furnish his construction schedule and shall notify the Chief Inspector a minimum of four (4) days prior to

doing any work. Once the contractor begins work, he shall proceed in a workmanlike manner and shall complete the work in a reasonable time without undue off days and periods of inactivity which make it hard for the Chief Inspector to keep up with his activity.

S620-BARRICADES

The Contractor shall provide, erect and maintain all necessary barricades, suitable and sufficient red lights, danger signals and necessary precautions for the protection of the work and the safety of the public. Streets closed to traffic shall be protected by effective barricades on which shall be placed acceptable warning signs. Barricades shall extend completely across the street which is to be closed, and shall be illuminated at night by lights not farther than five feet (5') apart, and lights shall be kept burning from sunset to sunrise.

S621-FENCES

On sewer line extensions to the development, the Contractor shall take down fences on or crossing right-of-way for such periods of time only as are necessary to prosecute the work of clearing, grubbing, trenching, pipe laying and backfilling. Gaps made in fences shall be closed in a substantial manner at night and during any suspension of work, and, upon completion of the pipe line, fences shall be restored to as good condition as before disturbed.

S622-RIP-RAP

Where required, stone rip-rap shall be dumped and hand placed to form a compact layer. Stone rip-rap shall be placed to a thickness of not less than eight inches (8") and not more than eighteen inches (18"), to the length and width shown on the plan or as directed by the Inspector. Rip Rap shall have a geotextile underliner between the soil and the stone.

SECTION S700 – SEWER LINE INSPECTION, TESTING AND ACCEPTANCE

S701-INSPECTION

- 1.) Inspection will be done by the Cherokee County Water & Sewerage Authority. Inspections will be scheduled as received by the Authority. The Authority must be notified four (4) days prior to any construction.
- 2.) The Chief Inspector shall be notified when specific inspections are required so that the inspection time can be scheduled.
- 3.) The Contractor shall present the following when requesting a final project inspection:
 - A.) The size and length of all lines installed including services.
 - B.) A completed Project Information Form (Exhibit A). (See form at end of **Section S700.**)
 - C.) As-Built plans and electronic data prepared in accordance with the requirements set forth in **Section S704.**
- 4.) In no circumstances shall any buildings and/or plumbing fixtures be connected to the line until inspected and approved by the Authority.
- 5.) Upon request, the contractor shall furnish the Inspector with appropriate copies of the manufacturer's certification that the materials to be used meet the materials requirements of these specifications. The Inspector may reject any materials not meeting specifications or any faulty or damaged materials. Any materials so rejected must be removed from the project immediately and must be prominently marked so that they can be spotted on this or any other project.
- 6.) Authorized representatives of the Cherokee County Water & Sewerage Authority, which may include appropriate county, state or federal agencies, shall have access to the site for inspection at any time.
- 7.) The Chief Inspector shall be notified by 8:30 a.m. of each workday when work is scheduled unless authorized otherwise.
- 8.) The Chief Inspector may at any time direct that he be allowed to see any foundation, bedding, pipe work, manhole or other appurtenance. If the Chief Inspector so directs, all pipe work shall be left open until the Inspector views the work. The trench may be backfilled with the approval of the Inspector if the work is not inspected by the close of the working day. No connections to manholes, nor wyes, bends, service laterals, nor service stoppers shall be backfilled without the approval of the Inspector.
- 9.) The contractor shall complete the project and shall have cleaned up the job site prior to requesting a final project inspection. The Chief Inspector may terminate the inspection and direct further work at any time he feels that the project is not substantially complete and ready for inspection. Manholes and lines shall be clean and free of all mud and debris at the time of inspection. The Contractor shall furnish adequate personnel to open manholes and give whatever other assistance is needed by the Chief Inspector.
- 10.) The representative of the Chief Inspector will normally visually inspect all manholes and lines for conformance to the specifications and will check the measurements shown on the

As-Built for accuracy. The representative may perform low pressure air test to insure all lines are sealed. T.V. inspection shall be performed by C.C.W.S.A. prior to approval of As-Built, signing of Final Plat or meters released for sale. Any of the following tests may also be required at the discretion of the Inspector:

- A.) Measurement of infiltration
- B.) Smoke test
- C.) Mandrel test
- D.) Velocity test
- E.) T.V. inspection
- F.) Compaction test
- G.) Ball Test
- H.) Force Main Pressure and Leakage Test

Any defects found by these tests must be corrected before construction of the project may proceed.

- 11.) A punch list shall be issued for corrective work if needed. However, the Chief Inspector shall not perform the contractor's work by finding all of his problems before the project is reasonably complete.

S702-SANITARY SEWER SYSTEM TESTING

- 1.) **GENERAL:** All sanitary sewer lines, including both gravity sewers and force mains, shall be successfully tested before being eligible for acceptance by the Authority. Any of the following tests may be run at the discretion of the Chief Inspector. All sewer mains shall also be subject to the material-specific tests listed in **Section S500**, "Materials for Sanitary Sewers", under each type of pipe material acceptable for sanitary sewers.
- 2.) **LOW PRESSURE AIR TEST:** After completing backfill of a sewer line section, conduct a low pressure air test of all pipe constructed, using methods and devices acceptable to the Authority. Perform such tests using the following general procedures:
- A.) Temporarily plug line segment between two manholes using plugs having air tight fittings through which low pressure air can be introduced into the pipe segment being tested.
 - B.) Introduce low pressure air into the test pipe segment until the internal air pressure reaches 4.5 psig above ground water pressure, if any.
 - C.) Wait at least two minutes for air temperature in the test segment to stabilize while internal air pressure remains no less than 3.5 psig above ground water pressure.
 - D.) Bleed internal air pressure to exactly 3.5 psig above ground water pressure.
 - E.) Accurately determine the elapsed time for internal pressure to drop to 2.5 psig above ground water pressure.
 - F.) The air test is acceptable if elapsed time is no less than shown by the following table:

<u>Pipe Dia. Inches</u>	<u>Seconds Per 100 Ft. of Pipe</u>	<u>Pipe Dia. Inches</u>	<u>Seconds Per 100 Ft. of Pipe</u>
4	11	27	7
6	17	30	8
8	23	36	10
10	28	42	11
12	34	48	13
15	43	54	15
18	51	60	17
21	60	66	18
24	68	72	20

Air leakage time is based on pipe being damp. If pipe and joints are dry, dampen line if helpful in meeting air test time requirement.

Permanently correct excessive leakage determined by air testing, and repeat operations until Inspector witnesses a successful test on each line segment; then remove nipple through manhole wall without disturbing adjacent grout. Permanently caulk resulting hole watertight.

3.) MEASUREMENT OF INFILTRATION: The contractor shall furnish an adequate number of plugs of the proper size and acceptable weirs to measure infiltration into the system.

Measurements of flow shall be performed on any lines with a visible flow of water. In no case will an infiltration rate greater than 25 gallons per inch diameter of pipe per mile of sewer per day be allowed. All visible or audible leaks must be dug up and repaired unless it is found to be in a joint and can be repaired by chemical grouting. The testing procedure shall be in accordance with ASTM C 1091 or ASTM C 969 and shall generally include the following:

- A.) Plug the upper (inlet) end of the test section including laterals.
- B.) At the lower (outlet) end, collect the water and measure the quantity collected within a specific time in a calibrated container after a constant flow is generated at the pipe section outlet.
- C.) An alternate measurement method is to use a calibrated weir installed at the outlet.

4.) SMOKE TEST: Smoke tests show infiltration/exfiltration sources by blowing artificial smoke through the sewer line with a blower designed to sit on the manhole and push air through the lines so that the smoke exits the line through cracks and holes in the line and/or manholes. Sections of line are tested individually by blocking off other line sections with sandbags or line plugs. The local fire department shall be notified prior to any smoke testing.

5.) MANDREL TEST: The mandrel test shall be performed in accordance with the following procedure for testing sewer pipe for maximum allowable deflection:

- A.) Completely flush the line making sure the pipe is clean of any mud or trash that would hinder the passage of the mandrel.
- B.) During the final flushing of the line, attach a floating block or ball to the end of the mandrel pull rope and float the rope through the line. (A nylon ski rope is recommended).
- C.) After the rope is threaded through the sewer line, connect the pull rope to the mandrel and place the mandrel in the entrance of the pipe.
- D.) Connect a second rope to the back of the mandrel. This will enable the mandrel to

be retrieved if excessive deflection is encountered.

- E.) Remove all the slack in the pull rope by gently pulling the rope at the far manhole. After the slack has been removed, place a tape marker on the rope, close to the pipe opening where the mandrel will exit. If mandrel encounters excessive deflection, the marker will provide a means of measuring the travel distance of the mandrel so that the deflected area can be located.
- F.) Pull mandrel through the sewer line.
- G.) An increasing resistance to pull is an indication of excessive deflection. If this occurs measure the distance from beginning marker on rope to manhole. Locate section and replace bedding or pipe if visual examination reveals damage.
- H.) Retest until acceptable.

- 6.) **VELOCITY TEST:** On lines installed at minimum grade and at any time the Inspector suspects that a problem with flow will occur, a velocity test of the suspected section may be required.

The contractor will add sufficient water at a point upstream of the suspect section. After flow has reached a steady state, dye or some type of floating object such as a ping pong ball or fishing float will be passed through the line.

The float will be timed as it passes through the section. Any line in which a velocity of two feet (2') per second cannot be obtained will not be acceptable.

- 7.) **T.V. INSPECTION:** All sewer lines shall be televised and a film of the inspection made before the final plat is signed and again before the final acceptance of the sewer lines. The films may be stored on VHS or DVD. Prior to televising the mains, the mains shall be flushed with water so that sags are apparent. The mains shall be televised in segments identified by the approved manhole ID numbers (See **Section S704.2.A**). The manhole numbers shall be the same as those assigned by the Authority on the stamped plans. T.V. inspection shall also be performed by C.C.W.S.A. prior to approval of As-Built, signing of Final Plat or meters released for sale.

Any faulty pipe noted such as sagged pipes, broken pipes, bad joints, etc., will be dug up and will be corrected. Internal grouting to repair new lines will not be allowed. After correction of the discrepancies, the line will be re-televised.

- 8.) **COMPACTION TEST:** All trenches shall be subject to compaction testing after backfilling and shall meet the compaction requirements. All trenches failing to meet compaction requirements shall be excavated and re-compacted and retested. This process shall continue until a passing test is achieved. All costs of compaction testing shall be the responsibility of the Developer.

- 9.) **BALL TEST:** Procedure for Ball Test:

- A.) Clean lines.
- B.) Place ball that is not more than one half inch (1/2") in diameter less than diameter of pipe to be tested in the end of section to be tested. Example: Ball not less than seven and one half inches (7-1/2") in diameter for test of eight inch (8") diameter pipe.
- C.) Ball should travel freely through the section being tested.

10.) FORCE MAIN PRESSURE AND LEAKAGE TEST

- A.) After all piping has been placed, the main shall be tested by the Developer's Contractor in the presence of the Chief Inspector or his designated representative and tests shall be continued until all leaks have been made tight to the satisfaction of the Authority. The Contractor shall furnish all necessary meters, pumps, gauges, bulkheads, and other materials and appliances necessary to conduct the test as herein required. Every precaution must be taken to valve-off or otherwise protect control equipment in or attached to the pipe line to prevent damage thereto.
- B.) Before applying the specified test pressure, all air shall be expelled from the pipe. If air release valves are not available at the high places, the Contractor shall make the necessary taps at points of highest elevation before the test is made and insert plugs before the test has been completed.
- C.) Prior to the pressure test, pipe laid in trenches shall be backfilled adequately to secure the pipe during the test. Any observed leakage shall require corrective measures to pipe lines and/or joints to the satisfaction of the Inspector.
- D.) The Authority will furnish the necessary water for the testing of the force mains; however, any water lost through breakage of lines or unnecessary or excessive flushing of lines will be charged to the Contractor at the current residential rate. All lines shall be tested to a pressure of 200 PSI. Test duration shall be two (2) hours. However, test pressure shall not exceed pipe, valve and/or thrust-restraint design pressures. Test pressure shall not vary by more than ± 5 psi for the duration of the test which may require periodic pumping (in which case the added water will be counted as part of the leakage). The rate of leakage shall not exceed 15 gallons per 24 hours per inch diameter per mile of force main. (See Table below.)

LEAKAGE TABULATION

<u>SIZE OF PIPE</u>	<u>GALLONS/HOUR/100 FT.</u>	<u>GALLONS/DAY/100 FT.</u>
16"	.189	4.545
12"	.142	3.409
10"	.118	2.841
8"	.095	2.273
6"	.071	1.705
4"	.047	1.136
3"	.035	0.846

Any section of the line not meeting the above test shall have the leaks found and corrected at once and re-tested until the leakage falls within the limits specified above. Leakage testing must be witnessed and approved by the Authority.

S703-ACCEPTANCE

Please refer to the following CCWSA Maintenance Bond/Letter of Credit Administrative Policy for the procedures related to the final approval and acceptance of water and sanitary sewer facilities:

Cherokee County Water & Sewerage Authority

Maintenance Bond/Letter of Credit Administrative Policy and Procedures

General

- All new developments must submit to the Authority a maintenance bond or letter of credit prior to approval of the final plat for residential developments or the acceptance of the As-Built drawings for all other developments.
- Once the water and sewer infrastructure is in place and approved, the Developer must submit a maintenance bond or letter of credit in a form acceptable to CCWSA staff, prior to the Authority's approval of the Final Plat or As-Built plans.
- The maintenance bond or letter of credit **amount** will be generally determined by the linear feet of water and linear feet of sewer infrastructure within the development.
- Maintenance bonds or letters of credit shall be for a period of twelve (12) months from the receipt of Final Plat approval for residential developments or acceptance of As-Built drawings for all other developments.

Approval of Infrastructure for Final Plat Recording

- 1.) Upon the completion of the water and/or sewer construction, the Developer shall contact the CCWSA's Inspector requesting a final inspection of infrastructure.
- 2.) If the Authority's Inspector finds, upon inspection, that all infrastructures meet the requirements of CCWSA, he/she shall provide written notice of acceptance to the Developer.
- 3.) If the CCWSA's Inspector finds, upon inspection, that infrastructures do not meet the requirements of CCWSA, the Authority shall provide the Developer with written notice detailing the reasons for rejections of the infrastructure.
- 4.) Once the CCWSA's Inspector finds that all infrastructures meet the requirements of CCWSA, the inspector shall require the Developer to post maintenance bond or letter of credit.
- 5.) Once a maintenance bond or letter of credit has been posted, the Authority's Inspector will approve the Final Plat for residential developments or accept the As-Built drawings for all other developments.
- 6.) Final plat will not be signed or As-Built drawings will not be accepted until a satisfactory maintenance bond or letter of credit has been posted.

No Exceptions

Maintenance Bond/Letter of Credit Amount

- 1.) The maintenance bond or letter of credit amount will be determined generally by the linear footage of water line and/or the linear footage of sewer line within the development.
- 2.) Per foot amount will be determined by the CCWSA staff taking into account the current economic climate as well as the cost of materials, labor and fuel.
- 3.) The minimum maintenance bond and/or letter of credit amount required for a development shall be five thousand dollars (\$5000.00) for water and five thousand dollars (\$5000.00) for sewer.

Approval of Water and Sewer System for Authority Acceptance

- 1.) The twelve-month maintenance period will allow the CCWSA's Inspector to assure compliance with CCWSA development specifications. The developer shall be required to contact the CCWSA's Inspector in writing at the end of the nine (9) month period to initiate the CCWSA's punch list.
- 2.) The CCWSA's Inspector shall prepare a single punch list to the Developer affording it a 60-day period in which to make all necessary repairs. The Developer shall be required to contact the CCWSA's Inspector in writing at the end of the 60-day period after all punch list items have been completed. The CCWSA's Inspector shall have 30 days to make its final review for approval and shall notify the Developer in writing of the results of this inspection. An extension of the bond may be granted at the discretion of the CCWSA's General Manager. Developer shall pay for any additional inspections required by the Developers failure to complete punch list items prior to final approval.
- 3.) If any punch list items are not completed by the Developer within the specified period of time or extensions the maintenance bond or letter of credit shall be utilized to pay for the full cost of the repairs. Should the amount of the maintenance bond or letter of credit be inadequate to pay for the full cost of the repairs, CCWSA shall have the authority to collect the remaining amount from the developer.

Official Acceptance/Release of Bond or Letter of Credit

- 1.) At the time that the work is inspected and found free from defects, the Authority's Inspector shall provide the Developer with written "Final Approval" for the acceptance of the water and sewer infrastructure.
- 2.) Upon the issuance of final approval, the CCWSA shall release the Maintenance bond or letter of credit.

Lift Station Maintenance Bond

- 1.) All new subdivisions or commercial developments that include wastewater lift station(s) will be required to post a maintenance bond or letter of credit for each lift station.
- 2.) The amount of the maintenance bond or letter of credit will be in amount as determined by CCWSA staff.
- 3.) The maintenance bond or letter of credit will be for a twelve month (12) period from the date of acceptance a limited warranty deed for the fee simple ownership of the real property upon which the pump station is constructed.
- 4.) The maintenance bond or letter of credit will be released following the expiration of the twelve (12) month maintenance period and upon final inspection and final approval of the lift station.
- 5.) The Developer shall provide a detailed construction cost report to the CCWSA upon completion of construction of any lift station prior to the acceptance of As-Built drawings.

S704-AS-BUILT DRAWINGS

At the completion of the sanitary sewer lines and when requesting the final project inspection, the Authority's Plan Review Coordinator shall receive from the Contractor four (4) sets of printed As-Built plans and electronic data prepared in accordance with the following requirements:

- 1.) Attached to the As-Built shall be a completed Project Information Form (Exhibit A), which includes the name of the project, the project location, the Developer's name and telephone number, the Contractor's name and telephone number, the street names, the sewer main size for each street or cross-country line, the length of each sewer main by street or segment, the pipe material used for each street or segment, the cost of the sewer facilities for each street or segment, and the work start date and work completion date for each street or segment. (A copy of a blank Project Information Form (Exhibit A) is attached at the end of this section).
- 2.) Four (4) sets of As-Built plans shall be submitted to the Authority's Plan Review Coordinator. The plans shall show all sewer information As-Built in the field and any field changes made to the approved plans. In the event that the designer does not perform the field staking, the contractor must furnish certification from a licensed engineer or surveyor attesting to the accuracy of all elevations, grades, manhole locations, and service locations. This certification and the certification of the engineer / land surveyor preparing the As-Built must be shown on the drawings. As-Built drawings shall include a site plan, plan and profile sheets, and any supplementary drawings and shop drawings. Stationing of the sewer gravity and force main alignments, manholes and service laterals shall be required on the As-Built as well as the construction drawings along with the Point I.D. The As-Built drawings shall meet the same requirements as the construction plans for review.

As-Built plans shall be submitted on 22" x 34" drawing sheets and shall be submitted concurrently in an "AutoCAD" drawing electronic format and Adobe PDF of entire project. As-Built information for utility locations shall be shown on plans and submitted in ASCII text electronic format for each point.

Horizontal locations shall be referenced to Georgia State Plane Coordinates (West Zone feet). Vertical locations shall be shown referenced to Mean Sea Level. Reference all

horizontal locations to the NAD83/94 (latest adjustment) datum and reference all vertical locations to the NAVD88 datum. All orthometric locations shall be referenced to Geoid 99/03. All points shall be verifiable by the Cherokee County Water & Sewerage Authority control network. All Horizontal and Vertical location shall have no translation, rotation or angle adjustment. All points are subject to verification by the Cherokee County Water & Sewerage Authority.

The information submitted electronically for As-Builts of gravity sewer lines shall include:

Manholes

- A.) Manhole ID (CCWSA Staff will assign manhole ID numbers during the construction plan review). The same ID numbers shall be used for As-Builts. (See Sewer **Section S203.4.A**)
- B.) North Coordinate
- C.) East Coordinate
- D.) Center of Manhole (Lid) Elevation
- E.) Invert (In and Out) Elevations
- F.) Each Manhole point shall include pipe(s) entering and leaving manhole. Pipe(s) size, Pipe Invert, Material, Type (i.e. Sewer line, service line or force main).

Cleanouts for each service shall be located.

Cleanouts

- A.) Cleanout ID
- B.) North Coordinate
- C.) East Coordinate
- D.) Center of Cleanout (Lid/Ground) Elevation
- E.) Invert (In and Out) Elevations
- F.) Each Cleanout point shall include pipe(s) entering and leaving manhole. Pipe(s) size, Pipe Invert, Material.

The information submitted electronically for sewer force mains shall include:

Force Mains shall be located at 50' intervals (ground and top of pipe). All fittings, tees and bends, valves, and air release valves shall also be located. All vertical locations shall be finished ground and top of pipe. The rim elevation, top of pipe and the manhole invert elevation of all air release valve manholes shall be located. The size and material of all pipes shall be recorded.

Force Main Pipe Lines, Fittings etc...

- A.) Point ID (see CCWSA staff)
- B.) North Coordinate
- C.) Easting Coordinate
- D.) Ground Elevation
- E.) Top of Pipe Elevation
- F.) Point Description/Fitting Type and Pipe Size

Air Release Valves (Manholes)

- A.) Manhole ID (CCWSA staff will assign manhole ID number during plan review). The same ID numbers shall be used for As-Builts. (See Sewer **Section S203.4.A**)
- B.) North Coordinate
- C.) East Coordinate
- D.) Center of Manhole (Lid) Elevation

- E.)** Invert Elevation
- F.)** Top of Pipe Elevation
- G.)** Each Air Release Valve Manhole point shall include Pipe Size and Pipe Material.

The following are specific guidelines for the preparation of the printed version of the As-Built drawings:

- A.)** Sewer As-Built shall be a separate set of plan.
 - B.)** No contour lines.
 - C.)** Depth of lateral and cleanout shall be shown.
 - D.)** All lateral connections shall show a distance along the gravity main from the upstream manhole or clean out connection.
 - E.)** All measurements of laterals should be kept between manholes and both sides shall add up to the distance between manholes.
 - F.)** The center of all manhole rims shall be located horizontally and vertically as described above.
 - G.)** All lots are to be numbered.
 - H.)** Printed As-Built are to be clear and legible.
 - I.)** Profiles are to be included in all As-Built.
 - J.)** Roads and road names shall be shown on all plans.
 - K.)** Road right of way width or road utility easement width shall be shown on plans.
 - L.)** As-Built is to be in large clear print on plans.
 - M.)** Plan sheets shall be no larger than 22" x 34".
 - N.)** Scale no larger than 1"=20', no smaller than 1"=100' for cross-country lines and 1"=50' for congested areas.
 - O.)** When a phase of a subdivision is completed, a location sketch of the entire development shall be shown.
 - P.)** Line designation shall be used for correlation between profiles and plan view.
 - Q.)** Ground water and solid rock encountered during construction will be noted on As-Built.
 - R.)** Force Mains shall be located as described above.
 - S.)** Sewer point I.D.'s (M.H. I.D., Force Main points, etc...) shall be on plans, electronic data and ASCII or EXCEL data file. All point I.D.'s shall correspond.
 - T.)** Must show 911 address for each lot or parcel. Shall provide Excel file with 911 addresses and corresponding lot numbers.
 - U.)** Must show street light location. Shall provide Excel file with coordinates and point I.D.
- 3.)** As-Built sanitary sewer plans for commercial, multi-family, school and industrial sites shall show the following at a minimum scale of 1"=100':
- A.)** Location, size and elevation of all existing and proposed sanitary sewer lines and of any easements required.
 - B.)** Location, size and number of dwelling units and buildings.
- 4.)** The As-Built must be printed from the AutoCAD files supplied to the Authority concurrently with the As-Built. These plans shall have been corrected to show all field changes made to the approved drawings. Hand marked copies prepared by the contractor will not be accepted for As-Built.
- 5.)** As-Built drawings shall include the site plan, sewer plan sheets, and any supplementary drawings and shop drawings. Plan of lift stations or other special features should be shown if applicable.

- 6.) The Authority shall have the right to withhold water meters until the As-Built have been submitted and approved by the Authority as required.
- 7.) Final Plat and or Final Plans will not be approved or signed by the Authority until As-Built, easement drawing, easement agreements and maintenance bond have been completed and submitted to the Authority.

EXHIBIT "A"
Cherokee County Water & Sewerage Authority
PROJECT INFORMATION FORM
SEWER SYSTEM FACILITIES

Project Name: _____

Location: _____

Developer: _____ Phone No: (____) _____ - _____

Contractor: _____ Phone No: (____) _____ - _____

Street or Segment Name: _____

Water Main Size: __ Length: _____ Material: _____ No. of Manholes: _____

Start Date: _/_____/_____ Completion Date: _____/_____/_____

Street or Segment Name: _____

Water Main Size: __ Length: _____ Material: _____ No. of Manholes: _____

Start Date: _/_____/_____ Completion Date: _____/_____/_____

Street or Segment Name: _____

Water Main Size: __ Length: _____ Material: _____ No. of Manholes: _____

Start Date: _/_____/_____ Completion Date: _____/_____/_____