SECTION 600 - INSPECTION, TESTING AND ACCEPTANCE

601. INSPECTION

1.) Inspection will be done by the Cherokee County Water and Sewerage Authority. Inspections will be scheduled as received by the Authority. The Chief Inspector 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 B) (See form at end of Section 600.)
c.) As-built plans and electronic data prepared in accordance with the requirements set forth in Section 604.

4.) In no circumstances shall any buildings and plumbing fixtures be connected to the main until the main is 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 and 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 Inspector may at any time direct that he be allowed to see any pipe work, bedding, fire hydrant, tee, valve 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 valves, fire hydrants, tees,

thrust blocking or lot services 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. The Contractor shall furnish adequate personnel to check for open valves and give assistance needed by the Chief Inspector.

10.) The representative of the Chief Inspector will normally visually inspect all water lines and appurtenances for conformance to the specifications and will check the measurements shown on the "As-Builts" for accuracy. The representative will perform pressure and leakage tests to insure all lines are watertight. The representative shall also supervise a disinfection test. Any of the following tests may also be required at the discretion of the Inspector:

a.) Fire Hydrant / Hammer Test (See Section 403)
b.) Trench compaction tests

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.

602. WATER SYSTEM TESTING

1.) General

All lines designed to operate under pressure shall be successfully tested. Tests of installed piping shall consist of a pressure and leakage test and a disinfection test.

All piping to be tested must satisfactorily comply with these tests before being eligible for acceptance. In general, tests shall be conducted in accordance with AWWA C600 and C651 except as otherwise herein specified.

2.) Pressure and Leakage Testing

a.) After all piping has been placed, each section between line valves 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 hydrants, blow-offs or 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 testing and disinfection of the lines; 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 1.5 times the working pressure at the lowest point of the system to be tested. Test duration shall be two (2) hours. However, test pressure shall not exceed pipe, valve and/or thrust-restraint design pressures. The Chief Inspector or his representative may require a twenty-four (24) hour test if he so desires. Test pressure shall not vary by more than $\pm$ 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). Lines shall be tested in sections between the valves. The rate of leakage shall not exceed 15 gallons per 24 hours per inch diameter per mile of water main. (See Table below.)

LEAKAGE TABULATION

SIZE OF PIPE	GALLONS/HOUR/100 FT.	GALLONS/DAY/100 FT.
16"	.189	4.545
12"	.142	3.409
10"	.118	2.841
8"	.095	2.273
6"	.071	1.705

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.

3.) Disinfection

After leakage testing, and all necessary repairs have been made, the Contractor shall flush and disinfect all potable water mains and equipment installed by him in strict accordance with AWWA Standard For Disinfecting Water Mains, C651, latest revision, subject to the following special conditions:

a.) The method of disinfection shall be the Continuous - Feed Method as per AWWA C651, latest revision, Section 4.4.3. Care shall be taken in filling the mains so that extrained air is drawn from the pipes at all high points so as to permit intimate contact of the disinfection agent with the entire inside surface of the pipe and appurtenances. The potable water shall be chlorinated so that after a 24 hour holding period in the main, there will be a free chlorine residual of not less than 10 mg/L at all points in the system when tested with a standard orthotolindine solution.

b.) The form of chlorine shall be a 1 percent solution made from either sodium hypochlorite or calcium hypochlorite which shall be measured and pumped into the pipeline. Water must be flowing during the feeding operation and the injection point must be located so that the flow of water will disperse the chlorine throughout the pipeline. AWWA C651 requires the injection point be located at a point not more than 10 feet from the point of connection to the existing water supply. The chlorine should be fed at a constant rate such that the water will have not less than 25 mg/L free chlorine. The table

below gives the amount of chlorine required for each 100 feet of pipe of various diameters to produce a 25 mg/L concentration.

Chlorination Tabulation

Pipe Diameter (in.)	100% Chlorine (lb.)	1% Chlorine Solution (gal.)
6	0.030	0.36
8	0.054	0.65
10	0.085	1.02
12	0.120	1.44
16	0.217	2.60

c.) After 24 hours, the line shall be flushed until the chlorine content is not more than 2.0 parts per million. When this step is completed, the Developer will notify the Authority so as to schedule the taking of the water sample for the bacteria test. If the samples show evidence of contamination upon testing, the above procedure of disinfection shall be repeated until approved samples are obtained. No connections shall be made to the existing system until all of the samples have been tested and approved by the Chief Inspector. The Developer may be required to add additional taps for bleeding purposes at the ends of water mains or wherever necessary for taking samples.

d.) The Contractor shall dechlorinate the highly-chlorinated water being flushed from the water main to open areas where the discharge will not damage the roadbed or adjacent property.

The chlorine residual of water being disposed may be neutralized by treating the water with one of the chemicals listed in the table below:

Chemical Required

Residual Chlorine Concentration mg/L	Sulfur Dioxide (SO_2) lb	(kg)	Sodium Bisulfite ($NaHSO_3$) lb	(kg)	Sodium Sulfite (Na_2SO_3) lb	(kg)	Sodium Thiosulfate ($Na_2S_2O_3.5H_2O$) lb	(kg)
1	0.8	(.36)	1.2	(.54)	1.4	(.64)	1.2	(.54)
2	1.7	(.77)	2.5	(1.13)	2.9	(1.32)	2.4	(1.09)
10	8.3	(3.76)	12.5	(5.67)	14.6	(6.62)	12.0	(5.44)
50	41.7	(18.91)	62.6	(28.39)	73.0	(33.11)	60.0	(27.22)

Amounts of chemicals required to neutralize various residual chlorine concentrations in 100,000 gal (378.5 m^3) of water.

4.) Compaction Testing

All trenches shall be subject to compaction testing after backfilling and shall meet the compaction requirements set forth in Section 508. All trenches failing to meet compaction requirements shall be excavated and recompacted and retested. This process shall continue until a passing test is achieved. All costs of compaction testing shall be the responsibility of the Developer.

5.) Fire Hydrant and Valve Testing

All fire hydrants shall be tested per Section 403 and flushed to check the operation of the hydrant. All valves shall be located and their operation checked. All valves shall be left fully open.

603. ACCEPTANCE

1.) The Cherokee County Water and Sewerage Authority may issue a conditional approval letter certifying the completion of the water system when the Contractor has completed the work items shown on the plans to the satisfaction of the Chief Inspector and to the satisfaction of any applicable tests that he or she may direct.

On projects contracted with the Authority, this letter shall signal the start of the 12 month warranty period which is required of the Contractor.

On projects for private development, this letter will allow the Developer to apply for a permit for the next phase of development.

In no case will the conditional approval letter be considered as final acceptance of the project, nor will the Contractor and Developer be relieved of their responsibility to protect and maintain the system until final acceptance is given. A conditional approval letter may be issued for the water lines in a subdivision before the off-site supply mains are complete, but this will be noted in the letter and no building permits will be issued before completion of the entire water system.

2.) Upon completion of all work items in a private development including water and sewer lines, streets, storm drains and all other utilities, the Chief Inspector or his representative will reinspect all phases of the development. During this inspection, the water mains and appurtenances will be checked for any cut lines, shifted hydrants, adjustment of valve boxes and meter boxes, and any damage by other construction. The curbs will be checked for markings of line valves.

Upon satisfactory completion of any discrepancies noted during this inspection, the Developer will begin the 12 month maintenance period required for all phases of the development. (See Section 108)

3.) At the end of 12 months, the Inspector will again reinspect the entire development. When all discrepancies have been corrected, the Cherokee County Water and Sewerage Authority will issue an acceptance letter and will begin perpetual maintenance of the water system.

4.) Easement drawings shall be prepared for work inside the development prior to approval of the final plat and/or final plans. The drawing shall show the "As-Built" sewers as constructed and mathematical relationship to property line(s). Each lot that contains a sewer line and or easement line within its boundary's shall have an easement drawing and a standard easement agreement (see S740) signed by the land owner/developer. 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 copy of the plan sheet. The drawing will show property lines, the name of property owner(s), subdivision name, lot number, length of sewer line through property, size of line, line designation, manhole numbers, width of permanent easement, scale of drawing, north arrow, land lot and district numbers. 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 property owner(s), and recorded at the Cherokee County Clerk of Superior Court's office after review by the Authority. A copy of the recorded easement agreement shall be provided to the Authority before

the final plat will be signed by the Authority.

5.) When the water mains and/or sanitary sewer lines are completed, the Developer shall forward one copy of the recorded final plat to the Authority's GPS Department at the Rose Creek Facility. Water meter sales shall not be released to the project until the recorded final plat is delivered to the Authority.

604. "AS-BUILT" RECORD DRAWINGS

At the completion of the water line installation and when requesting the final project inspection, the Authority's GPS Coordinator shall receive from the Contractor three sets of printed as-built plans and electronic data prepared in accordance with the following requirements:

1.) Attached to the As-Builts shall be a completed Project Information Form (Exhibit B), 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 water main size for each street, the length of the water main for each street, the pipe material used on each street, the cost of the water facilities for each street, and the work start date and work completion date for each street. (A copy of a blank Project Information Form is attached at the end of Section 600 on page 600-9.)

2.) Three (3) sets of "As-Built" plans shall be submitted to the Authority's GPS Coordinator. The plans shall show all water information "As-Built" in the field and any field changes made to the approved plans. In the event "As-Builts" cannot be made available at the completion of the line, the General Manager may authorize the continuation of the construction; however, the final inspection cannot be conducted and the conditional approval letter cannot be written until "As-Builts" are received. 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 as-built information presented. This certification and the certification of the engineer / land surveyor preparing the "As-Builts" 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 water main alignment and the various water system appurtenances shall be required on the "As-Builts" as well as the construction drawings along with the Point I.D. The "As-Built" drawings shall meet the same requirements as the plans for review. The printed version of the As-Built water plan shall show the correct location and Point I.D. of water mains at all transitions (vertical and horizontal) (50' intervals along County, State or Federal road ways), fire hydrants, fittings,

tap location(s), valves, meters, and lot services.

As-Built plans shall be submitted on 24" x 36" drawing sheets and shall be submitted concurrently in an "Autocad" drawing electronic format. The monumentation and the calculations used to reference and determine the coordinate system for locations shall be supplied at the same time that As-Built plans are submitted. 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 locations 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 water mains, including correct locations of the water main, Point I.D. of water mains at all transitions (vertical and horizontal) (50' intervals along County, State or Federal road ways), fire hydrants, valves, fittings, main line taps, master meters, and fire line meters, shall include:

a.) Point ID (see CCWSA staff)
b.) Northing
c.) Easting
d.) Ground Elevation
e.) Top of Pipe, Valve or Hydrant Elevation
Point Description (Pipe, Fitting or Valve Type and Size)

The following are specific guidelines for the preparation of the printed version of the "as-built" drawings:

A.) Water "As-Built" shall be a separate plan.
B.) No contour lines.
C.) Location of service, meter and backflow preventer should be shown.
D.) Road names shall be on plans.
E.) The center of all fire hydrants shall be located horizontally and vertically as described above.
F.) All lots are to be numbered.
G.) Printed "As-Builts" are to be clear and legible.

H.) Roads shall be shown on all plans.

I.) “As-Built” is to be in large clear print on plans.

J.) Drawings sheet shall be no larger than 22” x 34”.

K.) Scale no larger than 1”=20’, no smaller than 1”=100’ for cross-country lines and 1”=50’ for congested areas.

L.) When a phase of a subdivision is completed, a location sketch of the entire

M.) Ground water and solid rock encountered during construction will be noted on “As-Builts”.

N.) Water point I.D.’s (Valve I.D., Water Main points, etc…) shall be on plans, electronic data and ASCII or EXCEL data file. All point I.D.’s shall correspond.

3.) As-Built water 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 water, sanitary sewer, and fire lines and of any easements required.
b. Location and size of all fire mains and location of all fire hydrants.
c. Location, size and number of dwelling units and buildings.

4.) The As-Builts must be printed from the Autocad files supplied to the Authority concurrently with the As-Builts. 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-Builts".

5.) As-Built drawings shall include the site plan, construction plan sheets, and any supplementary drawings and shop drawings. Plan of fire meters or detector meters should be shown if applicable. "As-Builts" is to be stamped in large clear print on plans.

6.) The Authority shall have the right to withhold water meters until the “As-Builts” have been submitted as required.

7.) The conditional approval letter will not be issued until “As-Builts” have been completed and submitted to the Authority.

8.) Final Plat and or Final Plans will not be approved or signed by the Authority until “As-Builts”, easement drawing and easement agreements have been completed and submitted to the Authority.

EXHIBIT "B"
Cherokee County Water & Sewerage Authority
PROJECT INFORMATION FORM
WATER 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: _____ / _____ / _____

SECTION 700
S STANDARD WATER DETAILED DRAWINGS