SECTION 500 - CONSTRUCTION METHODS

501. 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 underground water mains and appurtenances. All work shall conform to the applicable provisions of the AWWA Specifications of latest revision except as otherwise specified herein.

502. 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.

503. CLEARING AND GRUBBING

Areas for water system construction shall be cleared and grubbed. All trees, shrubs, stumps, brush, paving and other waste material must be removed from the site.
On water line extensions to the development, the road right-of-way 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. The trees, brush, stumps and other debris from clearing shall removed from the site. No trees or stumps shall be pushed beyond the right-of-way or any timber beyond the right-of-way 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.

504. TRENCH EXCAVATION

1.) It is the responsibility of those installing water mains 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 water main and the depth thereof shall be such that the water mains shall be installed so that the top of the pipe is a minimum of four feet below final grade, four feet below the edge of the pavement, or four feet below the ditch paralleling the road, whichever is deepest. Permission must be granted by the Authority to vary from this requirement. Maximum trench width at the top of the pipe shall not be more than the outside diameter of the bell plus two feet. The sides of the trench above the pipe shall be sloped or benched as necessary to maintain stability. Minimum pipe cover shall be as shown on the approved plans.

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 D.I.P. In cases where water mains parallel sewer mains there shall be a minimum of ten (10) feet horizontal separation maintained between the mains. In cases where water mains parallel sewer mains, the water lines shall be a minimum of twelve inches (12”) above the sanitary sewer. These distances are measured edge to edge. See Section 313 for further information regarding water and sewer mains in close proximity.

4.) Pipe trenches shall be straight and true to grade and in the location 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. Excavation must be made under the bell of each pipe so that the entire length of the pipe will lie uniformly on the bottom of the trench and the pipe weight shall not rest on the bells.

5.) 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 relaid later during dry conditions. No pipe shall be laid in wet trench conditions that preclude proper bedding, or on frozen trench bottom, or when, in the opinion of the Authority, the trench conditions or the weather are unsuitable for proper installation.

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.

6.) All changes in grade shall be made gradually. At points of interference with storm sewers and cross drains on D.O.T. right-of-way, the pipe will be run under the conflicting utility. Where the water main crosses beneath a storm sewer, there shall be a minimum of 12" clearance between the main and the storm sewer.

7.) In laying pipe across water courses, the top of the water main or casing shall be a minimum of two feet below the creek or river bed. Three feet of cover shall be maintained over water mains crossing ditches or depressions of any kind. Railroad crossings shall be installed according to American Railway Engineering Association requirements.

8.) Where necessary, the line shall be lowered at valves so that the top of the valve stem is approximately two feet below the finished grade. The trench shall be deepened to provide a gradual approach to all low points of the line.

9.) No excavation shall be made under highways, streets, alleys or private property until satisfactory arrangements have been made with the State, City, County 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. 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. Not more than 100 feet of trench shall be opened on any line in advance of pipe laying. The Chief Inspector shall have the right to limit the amount of trench open at any one time to less than 100 feet if he believes the reduced limits are necessary.

10.) All excavations shall be adequately guarded with barricades and lights in compliance with all OSHA, Cherokee County and Georgia Department of Transportation requirements so as to protect the public and workers from hazard.

11.) 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 sub-grade, 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.

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.

12.) 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 immediately.

13.) All excavation shall be placed on one side of the trench, unless permission is given by the Authority to place it on both sides. Excavation 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 or water valve boxes, etc.

14.) 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, sheathing, shoring and bracing to support the sides of the excavation and 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.

15.) 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.

16.) During the water line construction an effort shall be made to minimize the cutting of trees.

505. 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:

Size of Pipeline, Inches	Depth of Excavation Below Bottom of Pipe, Inches
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 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 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 2" in 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 75 feet in advance of pipe laying.

506. SUBGRADE AND BEDDING

The bottom of the trench shall be accurately cut to grade so that the pipe will have a longitudinal bearing on undisturbed soil for the full length of the pipe, except for such distances that are necessary for bell holes.

If the soil at the bottom of the trench is in such condition that it cannot be properly shaped or graded, due to the hardness of the soil and in all cases where rock or shale is encountered at sub-grade, the trench shall be refilled with suitable backfill material to the required sub-grade elevation, thoroughly tamped with mechanical tampers and shaped to fit the outside of the pipe as specified in the preceding paragraph. Wherever water is encountered in conjunction with the additional sub-grade excavation, the backfill shall consist of sub-grade stabilizer stone.

In the event that a trench is excavated below grade, the Contractor shall refill the trench to the proper grade with suitable, thoroughly compacted material. Allowable soils shall be dry course-grained soils ranging from well-graded gravel-

sand mixtures with little or no fines to clayey sands and sand-clay mixtures with appreciable amounts of fines. All soil materials shall have 100% passing a 1-1/2 inch sieve and a maximum of 55% passing a no. 200 sieve. The maximum volume change allowable shall be 15%. Allowable soils shall be Class I and Class II as defined in Section 810, of the Georgia Department of Transportation Specifications for the Construction of Roads and Bridges.

All gravel or crushed stone used for Class "C" bedding shall have a gradation equal to or smaller than #57 stone in order to limit the void area, and all the material must pass a 1-1/2 inch sieve. Where sand or other acceptable soil is used, it shall be spread over the trench bottom, compacted to at least 90% maximum density and shaped before placing the pipe; after the pipe is placed, additional material shall be compacted under the haunches and for the full trench width as described above.

507. INSTALLATION OF WATER MAIN

Pipe and accessories shall at all times be handled with care to avoid damage. Proper and suitable tools and equipment for the safe and convenient handling and laying of pipe shall be used. Whether moved by hand, skidways or hoists, material shall not be dropped or bumped. Great care shall be taken to prevent the pipe from being damaged, particularly the cement lining on the interior of ductile iron pipe. Each joint of pipe shall be unloaded opposite or near the place where it is to be laid in the trench. All pipe shall be carefully examined for cracks and other defects. All such material that is defective in manufacture, has been damaged in transit, after delivery or in installation shall be removed from the job site and replaced with new material.

All pipe shall be laid straight, true to line and grade. Bell and coupling holes shall be dug in the trench and the pipe shall have a continuous bearing with the trench bottom between bell or coupling holes. No shimming or blocking up of the pipe shall be allowed. When the work is not going on, all pipe openings shall be securely closed by the insertion of the proper size plug and caulking so that dirt and debris will not be washed into the pipe in case of rain. The inside of the pipe shall be clean and free of trash and dirt, and if necessary a swab or brush shall be used to clean the pipe before lowering it into the trench. All pipe and fittings shall be kept clean until completion of the work.

Water mains shall be joined by "push-on" joints using elastomeric gaskets to affect the pressure seal. The spigot end of the pipe and the inside of the bell shall be thoroughly cleaned and the gasket inspected to see that it is properly placed; Lubricant shall be applied to the spigot end of the pipe and it shall be inserted into the bell of the adjoining pipe to the stop mark on the pipe, 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.

Restrained joints shall be provided where specified on the approved plans and shall be of the type specified in the Section 400 of these specifications. Assembly shall be in accordance with the manufacturer's recommendations. While the typical bedding required for water mains is Type 3, all restrained pipe and bends shall have Type 4 bedding.

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.

Where allowed by the Authority, PVC water mains shall be installed in accordance with the requirements of ASTM D 2774, latest revision. Where PVC pipe is installed, electric conductive wire shall be placed in the trench one foot above the pipe.

Ductile iron water mains shall be wrapped in black polyethylene tubing where required by the Authority. Polyethylene tubing shall be installed in accordance with AWWA C105, Method A, latest revision.

At changes in direction of the main and at other points shown on the plans or directed by the Engineers, the line shall be adequately blocked with concrete or restrained in some other manner approved by the Authority. The Chief Inspector shall be notified by the Contractor before blocking is placed. Prior to blocking any joint or fitting with concrete, that joint or fitting shall be wrapped with polyethylene film in such a manner that the concrete will not stick directly to the pipe but that the load bearing capacity of the blocking will not be affected.

For water mains, the Contractor shall place a vertical piece of 2" diameter PVC pipe on top of the pipe at all bends, fittings, valves, elevation transitions and every 50' along the length of the water main for the purpose of enabling the surveyor to determine the water main elevation for "As-Builts". The Contractor will then be responsible for removing the vertical PVC sections after the as-built locations have been verified by the Authority.

508. 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.

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 (12") inches above the top of the pipe shall be placed by hand in four (4") inch 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 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.

2.) Backfill under permanent concrete or bituminous pavement or floors and as elsewhere specified or indicated on the plans shall be approved bank-run sand or 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 below the top of the trench, and the top one foot 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.

3.) 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 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 below the top of the trench, and the top one foot 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 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.

5.) 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.

6.) 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.

7.) 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.

8.) All costs of compaction testing shall be the responsibility of the Developer.

509. THRUST RESTRAINT FOR PRESSURE LINES

1.) Reaction Blocking

a.) Underground piping laid around curves and at all unsupported changes of direction, all tees, wyes, crosses, plugs and other like fittings shall be solidly and properly blocked with high early strength concrete against solid earth to take the reaction of the main pressure and to prevent lateral movement of the pipe or fittings when under pressure. Concrete for reaction blocking shall be Class A concrete and shall have a minimum compressive strength of 3,000 psi at twenty-eight (28) days. The Contractor shall allow the concrete to set up for a minimum of four hours before backfilling. The blocking, unless otherwise shown, shall be so placed that the pipe and fitting joints will be accessible for repair.

b.) Reaction blocking shall be constructed in conformance with the Standard Detail Drawings for Reaction Blocking. Prior to blocking any joint or fitting with concrete, that joint or fitting shall be wrapped with polyethylene film is such a manner that the concrete will not stick directly to the fitting, but that the load bearing capacity of the blocking will not be affected.

c.) The sizing of the thrust block bearing area given in the detailed drawings is based on a soil strength of 2000 PSF and a water pressure of 250 PSI. The Design Professional preparing the water main design shall verify the soil conditions before the thrust block design is implemented.

2.) Retainer Glands

Mechanical joint fittings and valves on Ductile Iron Pipe shall be installed with retainer glands where specified herein.

3.) Rodding / Straps

Where blocking cannot be poured against undisturbed earth, the Contractor shall pour concrete deadmen with threaded rods and/or metal straps coming out of the deadman and connecting to the valve/fitting for restraint. The rods and metal straps shall be coated with an approved bitumastic coating prior to backfilling. Vertical bends shall be restrained with threaded rods and concrete deadmen as shown in the detailed drawings (Section 700).

4.) Restrained Joints

Where approved by the Authority, another option to using concrete blocking in tight areas is the use of restrained joints. Restrained joints shall be provided where specified on the approved plans and shall be of the type specified in the Section 400 of these specifications. Assembly shall be in accordance with the manufacturer's recommendations. While the typical bedding required for water mains is Type 3, all restrained pipe and bends shall have Type 4 bedding.

510. SETTING FIRE HYDRANTS

Fire hydrants shall be placed at the locations shown on the plans. Gate valves for fire hydrants shall be connected directly to the main by means of a "Locked Hydrant Tee". All other connections between the main and the fire hydrant shall be mechanical joint with ductile iron retainer glands. Fittings shall be restrained by a "Locked Hydrant Adapter" whenever the fire hydrant is located close enough to the main to allow its use. Not less than four cubic feet of No.5 or No.57 stone shall be placed around the base of the hydrants, as shown in the Standard Detail Drawings, Section 700. Before placing the hydrants, care shall be taken to see that all foreign material is removed from within the body. The stuffing boxes shall be tightened and the hydrant valve opened and closed to see that all parts are in first class working condition. All hydrant openings shall be kept capped, except when hydrant is being worked on.

When a fire hydrant has been constructed but is not yet in service, the Contractor shall provide and attach to the fire hydrant a flag or collar indicating that the fire hydrant is not in service. Said flags or collars shall remain on the fire hydrant until it is put into service. Whenever an existing fire hydrant is taken out of service, whether temporarily or permanently, it shall be equipped with a flag or collar indicating that it is not in service. The Contractor shall provide and install

flags or collars as required and shall notify the Fire Department whenever the operating status of any fire hydrant changes.

FIRE HYDRANTS SHALL NOT BE OPERATED WITH ANY TOOL EXCEPT A SPECIFICALLY DESIGNED FIRE HYDRANT WRENCH. If the Contractor observes any other contractor or person operating a fire hydrant with an unapproved fire hydrant wrench, he shall report that fact to the Authority immediately. It is the Contractor's responsibility to insure that all new facilities are maintained in new condition until final completion of the project and acceptance by the Authority. Fire hydrants with damaged operating nuts shall not be accepted.

511. SETTING VALVES AND FITTINGS

Valves and fittings shall be placed where shown on the plans. Valves shall be set plumb, and shall have cast iron valve boxes. The valve boxes shall be placed directly over the valve and set plumb, the top of the box being brought to the surface of the ground. After the boxes are in place, earth shall be filled in the trench and thoroughly tamped around the box. After all settlement has taken place, a concrete collar shall be constructed for each valve box.

Fittings shall be properly braced to insure that they will not be blown off or broken loose under the greatest possible working pressure. All fittings shall be mechanical joint unless specified otherwise. In situations where there is insufficient undisturbed earth to act as a bearing surface or where otherwise directed by the Authority, fittings shall be restrained by the use of threaded rods or other method acceptable to the Authority. Line valves shall be supported and restrained by concrete blocking and threaded rods as shown in the detailed drawings (Section 700).

Valve stem extensions shall be installed where the valve operating nut is more than three feet below the finished grade. The valve stem extension shall be of sufficient length to place its operating nut at a depth between two and three feet below finished grade.

512. MARKING LOCATION OF VALVES AND THE END OF THE MAIN

1.) Each main line water valve shall be marked by cutting a letter "V" in the curb. The "V" shall be turned to point toward the valve. The letter height shall be 6".

2.) Concrete valve markers shall be set for main line water valves with an even number of feet between the center line of the valve and the center line of the aluminum disc in the top of the marker, and the distance in feet between the valve and marker shall be stamped in the marker at the time of setting.

3.) A concrete valve marker shall be placed directly over the end of any water main stubbed out for future use or any dead end main. The letters "EOL" shall be cast into the top of the marker or stamped into the aluminum disc in the top of the marker.

513. 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 508.

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 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. Where the carrier pipe is 24" in diameter or less, joint gaskets shall be "Field-Lok" gaskets or approved equal inside of the casing.

514. CONNECTION TO THE EXISTING AUTHORITY WATER SYSTEM

1.) The developer's private contractor shall make all required connections and taps to the Authority's water system. The Authority's Inspector will supervise the tap and all associated work. The contractor shall give the Authority a minimum of 24 hours notice prior to any tap on the CCWSA'S water system.

2.) The Contractor will provide proper traffic control devices and certified personnel to direct traffic if required.

3.) All taps shall be wet taps (on pressurized water mains in service). All taps to be made with saddles or tapping sleeves.

515. INTERRUPTION OF WATER SUPPLY DURING CONSTRUCTION

No interruptions of water service will be allowed without the permission and supervision of Authority personnel. Residents and building occupants shall be informed of the date, time of cutoff and the duration of stoppage. Failure to do so will make the Contractor liable for any damages reported to the Authority's Office. Four (4) days notice shall be prepared and given to the affected customers and must be coordinated with Authority. When it is necessary to schedule a water outage for any construction, signs must be posted at least four (4) days in advance to notify the public. In some cases, the water outage may need to be scheduled for nights or weekends to lessen the inconvenience to businesses or schools. (See Detail No. W724 for sign requirements. These signs are to be provided and installed by the Developer.)

516. RAILROAD CROSSINGS

All railroad crossings shall conform to the requirements of the American Railway Engineering Association Manual for Railway Engineering. The Contractor shall secure permission from the railroads to schedule the work so as not to interfere with the operation of the railroads. The Contractor shall be held responsible for any delays or damages occurring to the railroads. The Contractor will furnish the railroad with such additional insurance as may be required, cost of same to be borne by the Contractor, 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.

517. HIGHWAY CROSSINGS

1.) The Contractor shall be responsible for coordinating and scheduling all construction work in the Georgia 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 Georgia State Highway 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.

518. STREAM CROSSINGS

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.

1.) 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.

2.) Design engineer is responsible for checking and designing against floatation.

3.) The stream bed and sides at the crossing site shall be protected from erosion in accordance with the **Manual For Erosion and Sediment Control In Georgia**, 2000 or most current edition.

4.) Where streams are allowed to be open cut, the construction in stream beds shall follow the following guidelines:

a.) Construction in and around stream beds must adhere to the current regulations of the Georgia EPD, the Corps of Engineers, Cherokee County and the U.S. Department of Fish and Wildlife. The design engineer and contractor are responsible for knowing and complying with these regulations. Any item published within these specifications that is in conflict with stream bed protection regulations is hereby deemed invalid, unless the specification herein is considered more stringent by the reviewing agency.

b.) 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.

c.) 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 falsework, debris, and other obstructions placed therein or caused by the construction operations.

d.) Erosion control measures can include, but is not limited to, the following items:

a.) Silt fencing, types A, B, and/or C
b.) Erosion control checkdams
c.) Channel diversion through temporary storm drain pipe
d.) Rock filter dams
e.) River Stone in the creek bed

f.) Geotextiles for stream bank restoration
g.) Special vegetative installations

The construction and installation of these various structures are detailed in the **Manual For Erosion And Sedimentation Control In Georgia** or the Georgia Department of Transportation Standards and Construction Details, both of which are available for purchase by the Contractor. . All measures must be approved by the NRCS and the EPD.

519. REPLACEMENT OF PAVEMENT

1.) General

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.

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 D.O.T. and/or the Cherokee County Roads and Bridges Department (CCRBD). Submittal of an authorization letter from the D.O.T. or the CCRBD is required.

c.) 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.

d.) The Contractor shall furnish traffic control devices and certified personnel to direct traffic, if required.

e.) The above requirements may be altered with the written approval of the CCRBD in extenuating circumstances.

f.) 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:

i.) 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. Casing will be required where the installation is under any roadway.

ii.) Concrete pavement shall be replaced with pavement of a thickness equal to that removed, or 6" for driveways and 9" for roads, whichever is thicker. The concrete shall meet the specifications of the D.O.T. for concrete paving.

iii.) Where bitumastic paving is replaced, a base course of 3000 psi concrete shall be placed over the ditch line. The concrete shall be 6" thick for driveways and parking lots and 9" thick for public roads. The top of this base course shall be left with a rough float finish 1-1/2" below the surface of the existing paving. After the concrete has attained its strength, a tack coat of AC-15 or equal shall be applied at the rate of 0.25 gallons per square yard, and a plant mix asphalt course 1 ½" thick applied over this, and finished off level with existing pavement. (9.5 mm Superpave Level B for State Roads and 12.5 mm Superpave for County Roads.)

iv.) Unless otherwise directed in writing, all pavement will be removed to a width of the trench plus 12" on each side as shown on the detailed drawings. Under normal circumstances, the maximum allowable trench width shall be the nominal diameter of the pipe plus 24 inches.

v.) All pavement cuts on County roads shall be made by sawing prior to excavation to eliminate uneven and ragged edges.

g.) 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.

h.) Where possible, all pipe under existing paved driveways will be either free bored or installed in casing.

520. LOCATION AND PROTECTION OF EXISTING UNDERGROUND UTILITIES

It is the responsibility of the Contractor to locate and protect all underground utilities and structures. No utility or structure is to be moved or disturbed without the approval of the utility company or the Owner of the structure. Any damage caused by waterline installation to any utility or structure shall be immediately reported to the Chief Inspector of the CCWSA and repaired at the Contractor's expense.

During construction and after the water 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.

521. 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 days work.

3.) Prior to requesting the "completion of water main construction" inspection, the Contractor shall do the following:

a.) 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.

b.) Repair or replace any work, trees, lawns, shrubs, fences, flower beds, drainage culverts or other property damaged by the water line construction. All items damaged beyond repair shall be replaced with the same kind of material as existed prior to the damage occurring.

c.) Insure that all valves have been located and are fully open. Adjust all valve boxes to grade and pour concrete collars around all valve boxes outside paved areas.

d.) Insure that fire hydrants are set to grade and that connections are open.

e.) 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.

f.) All shoulders, ditches, culverts, and other areas impacted by the water main construction shall be at the proper grades and smooth in appearance.

522. GRASSING

A uniform stand of grass or mulch for erosion protection is required over all road shoulders and water main easements prior to the Authority's acceptance of the water main. Grass shall be as defined and planted 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.

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.

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.

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 98% of the total area with no bare spots exceeding one (1) square foot 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.

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.

523. STANDARD DETAILED DRAWINGS

Installation of fire hydrants, water valves, valve boxes, meters, long side services, water lines, etc. shall be made in accordance with the Standard Detailed Drawings in these specifications.

524. CONSTRUCTION PERMITS

No construction shall be allowed until a construction permit has been issued by the Cherokee County Water and Sewerage Authority. (See Sections 103 and 105). 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.

The contractor (whose name shall appear on the approved contractor's list) shall furnish his construction schedule and shall notify the Chief Inspector 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 inspectors to keep up with his activity.

525. 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 (5) feet apart, and lights shall be kept burning from sunset to sunrise.

526. FENCES

On water 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.

527. 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 8" and not more than 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.