1.01 Contractor License

A. A licensed Utility Contractor shall install any underground utility or component thereof.

B. Prior to commencing construction activities on a LGWSD approved project, the LGWSD Manager shall receive a copy of the Utility Contractor's License.

1.02 Utility Notification

A. The Official Code of Georgia, Title 25, Chapter 9 requires that utilities be located in the proposed work area prior to commencing any clearing, grading or excavation activity.

B. The Utilities Protection Center can be reached at (770) 623-4344 or 1-800-282-7411.

C. The Utilities Protection Center shall be notified at least three (3) business days prior to commencing work.

1.03 Work Commencement

A. Clearing and grubbing activities shall not commence on any project until City of Locust Grove / local issuing authority has issued a Land Disturbance Activity Permit.

B. Work on a water distribution system and/or sanitary sewer system shall not begin until the LGWSD approves the development plans.

C. The LGWSD Manager shall receive a 48-hour notice prior to commencing construction activities on a water distribution system and/or sanitary sewer system.

D. A set of plans stamped approved by the LGWSD shall be present on the job site during all phases of construction of the water distribution system and/or the sanitary sewer system.

E. The installation of water distribution piping shall not begin until curb and gutter has been installed.

1.04 Miscellaneous Standards

Construction standards not covered in Division IV, Construction Standards, shall be in accordance with the approved plans. Construction should comply with the Department of Labor, Occupational Safety and Health Administration, 29 Code of Federal Regulations Part 1926, Subpart P, and revised July 1, 1995.

2.01 General

A. Work covered by this section shall include all labor, equipment and accessories required to distribute material.

B. All materials installed as part of an extension to the existing water distribution system and sanitary sewer system shall be new.

2.02 Delivery

Equipment and facilities shall be furnished for unloading and distributing pipe, equipment and materials.

2.03 Handling

A. Pipe shall be handled by use of forklift or excavator using choker straps or cable.

B. Any pipe, equipment or material dropped or dumped during handling procedures shall be subject to rejection by the LGWSD without further justification.

2.04 Storage

A. Pipe shall not be strung more than 1,000 feet beyond the point where pipe is being laid.

B. Drainage ditches shall not be obstructed.

C. Necessary arrangements shall be made to store pipe, fittings, valves and accessories that cannot be distributed along the route.

2.05 Maintenance and Protection

A. The contractor shall be responsible for maintenance and protection of all pipe, equipment and material.

A. All equipment shall be boxed, crated or otherwise completely enclosed and protected during transportation, handling and storage.

C. Equipment shall be stored above ground level and adequately supported on wood blocking or other approved support material.

D. All equipment shall be protected from exposure to elements and shall be kept dry at all times.

E. Pumps, motors, valves, control panels, instrumentation, electrical equipment and other equipment having anti-friction or sleeve bearings shall be stored in a weather-tight enclosure which is maintained at a minimum air temperature of 60°F.

F. Any pipe, equipment or material damaged by impact, vibration, abrasion, discoloration or other damage shall be repaired in accordance to manufacturer instructions or replaced at the discretion of the LGWSD.

3.01 Clearing and Grubbing

A. Prior to commencing clearing activities, areas designated by the plans to be cleared shall be demarcated using survey ribbon, stakes or other suitable means.

B. In areas to be cleared, all trees, stumps, buried logs, brush, grass and other unsatisfactory materials shall be removed.

C. Trees to remain in or near work area shall be protected from clearing activities.

D. All damaged trees over three (3) inches in diameter shall be repaired by an experienced nursery expert.

E. Tap roots and other projections exceeding 1-inch in diameter shall be grubbed out to a depth of at least 18 inches.

F. All holes remaining after grubbing activities shall be filled with suitable material and properly compacted in layers to density required for in-place backfill.

G. All materials cleared and grubbed shall be disposed of off-site in accordance with applicable local, state and federal regulations.

H. Burning of any material or debris shall not be permitted on LGWSD property.

I. Prior to and upon completion of clearing and grubbing activities, install erosion control and sedimentation measures as identified on the Erosion Control and Sedimentation Plan prepared by the Design Engineer.

J. Prior to commencing any other job site activity, installed erosion control and sedimentation measures shall be inspected and approved by City of Locust Grove / local issuing authority.

3.02 Topsoil Stockpiling

A. Remove topsoil to full depth encountered in areas to be graded and stockpile soil and install erosion control devices as indicated on drawings.

B. Soil shall be placed such that the integrity of an excavation or proposed excavation is not jeopardized.

C. Soil shall not be stockpiled against tree trunks.

D. Stockpile shall be shaped to drain.

3.03 Removing Pavement

A. Removal of pavement shall be performed so as not to endanger roadway activity. Work shall be coordinated and be in compliance with the appropriate road and highway agencies.

B. Pavement shall be marked squarely and neatly to size of excavation.

C. Pavement shall be scored and broke along the marked lines using a rotary saw and jackhammer. Pavement shall not be machine pulled for initial brake.

D. Upon removal, pavement shall be loaded and disposed of off-site.

E. Adjacent pavement damaged during construction shall be removed as described above.

F. Driveways and sidewalks shall be removed to their full width from the edge of curb or road pavement to the nearest construction/control joint.

G. Curbs shall be removed for the entire length from control joint to control joint.

4.01 Soil Excavation

A. Excavation shall include those measures necessary to establish grades indicated on drawings for utilities, structures and appurtenances.

B. Excavated soil shall be placed in a location such that the integrity of the excavation is not jeopardized.

C. Excavation walls shall be sloped or stepped in accordance with recognized industry standards.

D. The Contractor shall assume the responsibility for design and construction of excavation shoring and bracing capable of supporting excavations and construction loads.

E. The excavation shall provide space for foundation work and inspection.

F. Excavations shall be covered in accordance with applicable regulations and/or barricaded and roped-off with identifying tape during work progress.

4.02 Rock Excavation

A. Excavation shall include those measures necessary to establish grades indicated on drawings for utilities, structures and appurtenances.

B. Rock shall be excavated to a minimum depth of six (6) inches below grades indicated on drawings.

C. The Contractor shall be responsible for determining methods required for removal of rock or hard materials.

D. Perform blasting only after receiving written approval from the LGWSD Manager and regulatory agencies.

E. A licensed explosive contractor shall perform blasting operations.

F. Blasting operations shall be conducted in accordance with all local, state and federal regulations.

G. Excavated rock shall not be used as backfill in the pipe trench.

4.03 Pipe Trench Excavation

A. Pipe trenching shall comply with excavation and rock excavation specifications.

B. Trench should be excavated to natural undisturbed soil.

C. Where unsuitable material is encountered, over excavate through unsuitable material and backfill to required grade with No. 57 stone. The LGWSD Inspector shall determine depth of over excavation.

D. Where encountered, remove rock to a minimum of six (6) inches below required bottom of trench elevation and backfill to required grade with No. 57 stone.

E. Bottom of trenches shall be prepared so that the entire length of the pipe barrel is supported.

F. Maintain trenches dry at all times using pumps, well points or other dewatering means.

G. Limit trenching to not greater than 300 feet ahead of completely backfilled work.

H. In populated areas, cover or barricade open trenches until completely backfilled.

I. Open trenches shall be made safe at all times.

5.01 Pipe Bedding

A. PVC sewer shall be laid atop a minimum of four (4) inches of No. 57 stone. No. 57 stone shall be extended to the top of pipe. Stone shall be shovel sliced from beneath the pipe up to one-half (½) the pipe diameter.

B. DIP minimum standard shall be Class C bedding, type 2. See Detail No. 32.1.

C. Valves shall be laid atop a minimum of eight (8) inches of No. 57 stone. No. 57 stone shall be extended up to one-third (1/3) the valve diameter. Stone shall extend twelve (12) inches in all directions of valve. Stone shall be shovel sliced.

D. Fire hydrants shall be set atop a minimum of eighteen (18) inches of No. 57 stone. Stone shall extend up six (6) inches above drain holes. Stone shall extend eighteen (18) inches to the sides of the hydrant.

E. Yard hydrants shall be set atop a minimum of six (6) inches of No. 57 stone. Stone shall extend up six (6) inches above drain hole. Stone shall extend twelve (12) inches to the sides of the hydrant.

5.02 Pipe, Fitting, Valve and Fire Hydrant Installation

A. Prior to placement, the interior of pipes, fittings and valves shall be cleaned free of dirt and debris.

B. Pipe, fittings, valves and accessories shall not be laid or jointed in water.

C. Pipe, fittings, valves and accessories shall be lowered into their respective positions using an excavator with choker straps or cables. A slight hole shall be dug where pipes are to be jointed to relieve pipe bell of any load. Pipe barrel shall be supported for its entire length.

D. Gravity flow pipe shall be laid to the consistent grade change as indicated on drawings and aligned straight using pipe laser or transit.

E. Pressure flow pipe shall be aligned to follow route. Pipe alignment shall not be deflected greater than 75% of the manufacturer's recommended maximum deflection.

F. Install compression type gaskets in accordance with manufacturer's instructions to ensure proper joint sealing.

G. Pipe shall be jointed in accordance with manufacturer's instructions. The mating ends (bell and spigot) shall be thoroughly cleaned and soaped before jointing. The mating ends shall be aligned and shoved together using a steady force.

H. Connections of fittings, valves and fire hydrants shall be with bolts and nuts as supplied with the component. Upon tightening, a minimum of two (2) bolt threads shall be exposed to ensure proper thread engagement.

I. Retaining gland of mechanical joint shall be evenly spaced from the fitting or valve for its entire circumference upon installation.

J. After jointing pipe, repair any damage to pipe's protective coating in accordance with manufacturer's instructions or replace pipe.

K. Prior to jointing consecutive pipe, backfill previously jointed pipe with sufficient material to prevent movement.

L. Place a plug in the open end of uncompleted laid piping at the end of each day.

M. Any component of a piping system disturbed after installation may be required to be taken up and reinstalled.

5.03 Thrust Blocking

A. Thrust blocking shall be installed at all bends, tees, valves, fire hydrants and points where thrust may develop in pressurized piping.

B. Thrust blocking shall consist of cast-in-place concrete, tie rods, combinations thereof or other method approved by the LGWSD Manager.

C. Cast-in-place concrete blocking shall be formed to the required dimensions and installed against undisturbed earth. Blocking size may be increased based on soil bearing capacity.

D. Concrete shall have a minimum 3,000 psi compressive strength at 28 days.

E. Bolts and nuts shall be protected from concrete coverage.

5.04 Manhole and Wet Well Installation

A. Manholes and Wet Wells shall be set atop a twelve (12) inch bed of No. 57 stone that extends a minimum of twelve (12) inches beyond all exterior sides.

B. The bedding of No. 57 stone may be replaced with a six (6) inch layer of steel reinforced cast-in-place concrete.

C. The bed shall be prepared so that the manhole is set level.

D. Manhole sections shall be handled with lifting straps or hooked cables using a minimum of two (2) of the manufactured manhole lifting holes.

E. Manhole sections shall be positioned such that influent and effluent piping enter the center of their respective opening not pinching the rubber boot seal. Pipe shall not rest on invert of opening.

F. Stainless steel boot clamps shall be tightened in accordance with the manufacturer's instructions.

G. Annulus between pipe and rubber boot shall be grouted with non-shrink grout prior to commencing backfill operations.

H. An invert shall be built in each manhole to transition flow from the influent pipe to the effluent pipe.

I. The built invert shall be shaped as a "U" channel and match the inverts of the influent and effluent pipes.

J. Inverts shall be built of cast-in-place concrete or brick and mortar. Note that brick and mortar inverts shall be finished on top with a ½-inch layer of mortar.

K. Prior to jointing consecutive sections, tongue-and-grooved ends shall be cleaned free of dirt and debris.

L. Tongue-and-grooved ends shall be fitted with preformed gasket sealing compound.

M. Manhole sections shall be stacked level and plumb at all times.

N. Manhole sections shall be stacked such that interior steps are vertically aligned.

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

P. Upon bringing manhole to finished grade with brick and mortar (if applicable), set ring and cover with non-shrink grout.

Q. Manholes shall be kept free of dirt and debris.

R. Drop manholes will be used where there is greater than two (2) foot drop between influent and effluent pipe. See Detail No. 30.1.

S. Doghouse manholes shall be placed in accordance to Detail No. 31.1.

5.05 Meter Box and Vault Installation

A. Meter boxes shall be installed as follows.

1. Meter box shall be set atop undisturbed or compacted soil. Backfill around box shall be compacted using a hand tamp.

2. Top of meter box shall be set flush with finished grade. Meter box shall not be set in a depression.

3. Soil level within meter box shall be to the bottom of the meter assembly and free of debris.

B. Meter vaults shall be installed as follows.

1. Meter vault shall be bedded atop undisturbed or compacted soil. Backfill around vault shall be compacted in accordance with Division IV, Section 6.

2. Vaults shall be set atop a minimum 12 inch layer of No. 57 stone that extends a minimum of twelve (12) inches beyond the outside face of all walls.

3. The bedding of No. 57 stone may be replaced with a six (6) inch layer of steel reinforced cast-in-place concrete.

4. The stone filled sump beneath vault drain shall be fully encased in a geo-fabric membrane.

5. The bed shall be prepared so that vault is set level.

6. Annulus between pipe and wall openings shall have a flexible water tight seal installed prior to commencing backfill operations.

7. Prior to installing vault cover, abutting ends shall be cleaned free of dirt and debris.

8. Abutting ends of vault and cover shall be fitted with preformed gasket sealing compound.

9. Vault lid lifting holes shall be sealed using non-shrink grout throughout the entire depth of hole.

10. Vault shall be kept free of dirt and debris.

11. Top of vault lid shall be set three (3) inches above finished grade. Vault shall not be set in a depression.

5.06 Borings and Casings

A. Construction shall be performed so as not to interfere with, interrupt or endanger roadway and railway surface and activity thereon, and minimize movement of the surface, structures and utilities above and in the vicinity of the casing.

B. Work shall be coordinated and be in compliance with the appropriate highway and railroad agencies and their policies.

C. Contractor shall monitor ground movement during construction. Contractor shall be responsible for all settlement or up heave resulting from casing operations and shall repair and restore moved or damaged property to its original condition.

D. Work shall not interfere with storm water drainage devices. Storm water and/or groundwater shall be controlled and shall not enter any excavation or boring.

E. Boring and jacking operations shall be performed from an excavation located at one end of the section to be bored. The excavation shall be kept dry at all times.

F. Boring and jacking of casings shall be completed by dry auger boring without jetting, sluicing or wet boring. Free boring (boring without casing) shall be prohibited. The boring diameter shall be essentially the same as the outside diameter of the casing.

G. Boring may be advanced slightly ahead of jacked casing in a manner that will prevent voids forming in the earth around the perimeter of the casing. Horizontal and vertical alignment of the casing shall be frequently checked.

H. When rock is encountered, the Utility Contractor at his option may continue to install the casing by removing the rock through the casing. Should the LGWSD or other governing agencies determine the rock cannot be removed through the casing then an alternate means of crossing shall be determined.

I. Casings damaged during installation shall be repaired. Should the damaged casing prevent the installation of the pipe, then that boring and casing shall be abandoned.

J. Casing lengths shall be as long as practical. Jointing shall be accomplished by single grooved butt welding for the entire circumference of the pipe.

K. Casing shall be cleaned free of dirt and debris prior to installing pipe.

L. After casing installation is complete, the proposed pipe can be installed. The pipe shall be installed to proper grade and alignment according to the contract documents.

M. Pipe shall be supported within casing to limit radial movement to a maximum of one (1) inch.

N. A minimum of one (1) spacer shall be provided for each nominal section of pipe. Casing spacers shall be attached to the pipe at a maximum of 18 to 20 foot intervals.

O. The annulus between the pipe and casing, at each end, shall be sealed using brick and mortar.

5.07 Pipe and Valve Identification

A. The marking of utilities immediately after installation is required as detailed in the Official Code of Georgia, Code 25-9 "Georgia Utility Facility Protection Act".

B. Install mylar detection tape and/or other detectable wire, during backfill operations, above nonferrous pipe or any pipe having more than six (6) feet of cover. Detection tape or wire shall be installed centered, approximately 12 to 18 inches above the pipe.

C. Service lines and valves shall be locatable via marked curbing or other LGWSD approved method. Adjacent street curb to service line and valves shall be marked via saw-cut as follows. Curb markings shall be a minimum of four (4) inches in height.

1. "W" for water service location.
2. "V" for water valve location.
3. "S" for sewer service location.

6.01 Backfill

A. Excavations shall be backfilled using suitable material.

B. Place no backfill until any poured concrete has developed design compressive strength.

C. Place backfill against below grade walls in uniform level lifts to prevent wedging action.

D. Backfill shall not be placed on surfaces that are saturated, frozen or containing frost or ice.

E. Place backfill in excavations as follows.

1. Backfill in loose lifts not exceeding 6 inches when compacting using manual tamping devices (jumping jack).

2. Backfill in loose lifts not exceeding 12 inches when compacting using vibrating/ramming devices (sheep-foot vibratory roller).

F. Any settlement shall be filled and compacted to conform with adjacent surfaces.

G. Material remaining after completion of backfill operations shall be disposed off-site.

6.02 Compaction

A. Backfill shall be compacted using manual tamping devices or vibrating/ramming devices.

B. Use manual tamping devices as follows.

1. When area is inaccessible to vibrating devices and within 5 feet of below grade walls (includes manholes).

2. From bottom of pipe trench to twelve (12) inches above the top of pipe.

C. Compaction requirements are as follows.

1. Backfill, beneath and within 10 feet of the building line of any structure, proposed structure or other area determined by the LGWSD, shall be compacted for the entire depth to a minimum of 100% of the maximum dry density as determined by a Standard Proctor Analysis.

2. Backfill, beneath any road, walk, proposed improvement or area determined by the LGWSD shall be compacted for the entire depth to a minimum of 100% of the maximum dry density as determined by a Standard Proctor Analysis.

3. Backfill in road right-of-way and not described above shall be compacted the entire depth to a minimum of 95% of the maximum dry density as determined by a Standard Proctor Analysis.

4. Backfill not described above shall be compacted for the entire depth to a minimum of 90% of the maximum dry density as determined by a Standard Proctor Analysis.

6.03 Compaction Testing

A. Soil samples from the proposed construction area shall be analyzed for maximum dry density in accordance with ASTM 698 – Method C.

B. The extent of testing required shall be dependent upon soil conditions, Contractor's methods of construction and regulatory requirements.

C. Minimum compaction testing shall be as follows.

1. Backfill in excavations shall be tested at 2-foot lift intervals per 1,000 square feet of fill or as deemed necessary by the LGWSD Inspector.

2. Backfill in trench excavations shall be tested at 2-foot intervals per 400 linear feet of fill or as deemed necessary by the LGWSD Inspector.

7.01 Grading

A. Grade areas to lines and elevations indicated on drawings or to surrounding surface grades.

B. Graded areas shall be within 0.10 foot of required subgrade elevation and shall not permit the ponding of water.

C. In areas to receive grassing, redistribute stockpiled topsoil over graded areas to a minimum depth of four (4) inches. Provide additional topsoil to achieve required depth.

D. Where finish grade meets or abuts curbs, walks or pavement, uphill grades shall be slightly higher than curb or pavement to permit drainage.

E. Excess soil and debris shall be removed from the jobsite.

F. Stabilize site in accordance with the approved soil erosion and sedimentation control plan.

7.02 Replacing Pavement

A. Existing pavement shall be replaced in accordance to the standards required by Henry County DOT and/or the Georgia Department of Transportation.

B. Construction shall be performed so as not to endanger roadway activity. Work shall be coordinated and be in compliance with the appropriate road and highway agencies.

C. Pavement shall be reinstalled immediately after completing backfill operations and compaction requirements.

D. Driveways and sidewalks shall be replaced to their full width from the edge of curb or road pavement to the nearest construction/control joint.

E. Curbs shall be replaced for the entire length from control joint to control joint.

F. Removed pavement shall be disposed offsite.

G. Use Detail Nos. 28.1 and 29.1 when applicable.

8.01 General

A. The following tests shall be performed as indicated at the expense of the Developer/Utility Contractor.

B. Water distribution systems and/or sanitary sewer systems failing the required tests shall be repaired at the expense of the Developer/Utility Contractor.

8.02 Hydrostatic (Water Main and Force Main)

A. Water distribution piping and force mains shall be subjected to a hydrostatic pressure test in accordance with AWWA Standard C600, latest revision.

B. Combination air/vacuum release valves, corporations and curb stops and fire hydrant shall be installed at the high point of elevation in the pipe line system to release air.

C. Pipe shall be filled with potable water to a pressure of 250 psi and pipe pressure allowed to stabilize.

D. Pressure shall be maintained, without the addition of water, for a minimum period of two (2) hours.

E. Test shall be considered acceptable when a water pressure of 250 psi is maintained for a period of two (2) hours.

8.03 Air Pressure (Gravity Flow)

A. All gravity sewer pipe shall be subjected to a low air pressure test in accordance with Unibell UNI-B-6-90.

B. Pipe shall be free of dirt and debris.

C. During testing, personnel shall not be permitted in manholes connected to pipe being testing.

D. The internal air pressure of the pipe shall be raised to approximately four (4) psi.

E. The test shall begin when the stabilized pressure is at a minimum of 3.5 psi.

F. Test shall be considered acceptable when an air pressure equivalent to the stabilized pressure is maintained for a period of 10 minutes.

8.04 Televising (Gravity Flow)

A. Sanitary sewers shall be televised to ensure integrity.

B. Pipe shall be free of dirt and debris.

C. Televising cable attached to a video monitor shall be directed through pipe to view for the following deficiencies.

1. Cracks in pipe and liner material.
2. Rolled gaskets.
3. Leaking joints.
4. Deviations from line and grade – Sewer pipe shall be viewed from one manhole to the next adjacent illuminated manhole. Pipeline shall show more than three-quarters (3/4) of the opening at the opposite end of the pipeline.
5. Pipe deformations.
6. Other deficiencies.

D. Test shall be considered acceptable when the televised pipe does not reveal the deficiencies indicated in Item C.

8.05 Mandrel (Gravity Flow)

A. Sanitary sewers shall be tested for deformation using a mandrel in accordance with ASTM D 3034.

B. Pipe shall be tested when backfill and compaction are complete.

C. Pipe shall be free of dirt and debris.

D. Chords shall be attached to each end of the mandrel. One chord shall be passed through the section of pipe being tested. One chord shall be used to retrieve the mandrel should the pipe not allow passage.

E. The mandrel shall be sized such that its outside dimension is 5% less than the actual inside diameter of the pipe.

F. Test shall be considered acceptable when mandrel passes freely through pipe.

8.06 Static Water Level (Wet Well)

A. Test wet well for infiltration/exfiltration after receiving field approval of wet well lining installation.

B. Visually inspected wet well for infiltration.

C. Fill wet well with potable water to a level equal to the high water alarm elevation and mark that elevation.

D. Test shall be considered acceptable when a water level drop of less than one-quarter (<1/4) inch is measured after a 24 hour period.

E. Wet well sections exhibiting infiltration/exfiltration shall be replaced.

9.01 General

A. All newly installed water distribution piping and piping affected during construction shall be disinfected in accordance with AWWA C651.

B. All disinfection procedures shall be coordinated with the LGWSD inspector.

C. LGWSD personnel shall operate existing valves during disinfection procedures.

D. The LGWSD shall be involved in disinfecting the following in-place piping.

1. Water mains.
2. Service connections up to and including water meters and back flow prevention devices.

E. The LGWSD shall supply an appropriate chlorine solution and complete disinfection procedures.

F. Water for disinfection shall be provided by the LGWSD at no expense to the contractor. Excessive use of water during disinfection procedures, as determined by the LGWSD, may be reason for charges to be levied against the contractor.

G. Collection and testing of water samples shall be performed by the LGWSD.

H. No water piping system shall be placed in service until written approval is received from the LGWSD Manager.

I. The Contractor shall be responsible for preventing soil erosion associated with disinfecting procedures.

9.02 Initial Flushing

A. Prior to disinfection, the Contractor shall flush piping system with sufficient water to create a minimum velocity in the pipe of 2.5 ft/s.

B. Flushing shall be performed by pushing water through a laid section of pipe with one end of section open to the atmosphere above existing grade.

C. Piping shall be flushed until water sampled from the piping yields a turbidity measurement of 0.5 NTUs or less.

D. All piping and components associated with service connections shall be thoroughly flushed with fresh potable water prior to installation.

E. Upon completion of flushing, laid pipe with one end open to atmosphere shall be re-laid to depth indicated in Construction Drawings.

9.03 Chlorination and Flushing

A. The LGWSD shall introduce a chlorine solution having a concentration of 50 to 100 milligrams per liter (mg/l) into the water main.

B. Upon introducing the chlorine solution, all valves associated with the water main shall be fully operated to ensure complete disinfection.

C. All piping and components associated with service connections shall be thoroughly flushed with a 200 mg/l chlorine solution.

D. Water main shall have a minimum 25 mg/l chlorine residual after a 24-hour retention period.

E. After the 24-hour retention period, flush heavy chlorinated water from system through fire hydrants. When necessary, the Contractor shall provide sodium thiosulfate to neutralize the chlorine residual. Contractor shall apply sodium thiosulfate in accordance with manufacturer's recommendations.

F. Flushing shall continue until water in main has a residual chlorine concentration of 1 mg/l.

9.04 Disinfection Testing

A. After chlorination and flushing is complete, the LGWSD shall collect water samples from the system and perform 24-hour analyses in accordance with the Georgia Rules for Safe Drinking Water.

B. After the initial 24-hour analysis is complete and acceptable, a volume of water determined by the LGWSD Inspector shall be flushed from the water system and water samples shall be collected for a second 24-hour analysis.

C. After the second 24-hour analysis is complete and acceptable, the water main may be put into service.

D. Disinfection of the water main shall be repeated until testing is acceptable.

E. Laboratory analyses shall be performed and certified by the LGWSD.

10.01 Formwork

A. Formwork shall comply with ACI 347R-94.

B. Contractor shall be responsible for design and construction of concrete formwork capable of supporting construction loads. Forms shall be as follows.

1. Pre-engineered steel.
2. Pre-engineered reinforced fiberglass.
3. Wood.
4. Earth.

C. Construct formwork to lines and elevations as shown on drawings.

D. Construct forms to be removed without hammering or prying against concrete.

E. Plug holes in existing forms to prevent leakage of cement.

F. Clean forms of dirt and debris prior to each use.

G. Form ties shall be as follows.

a. Break-back type with 5/8-inch removable sleeve or 1-inch cone type.

b. For retaining walls and walls below liquid level, provide ties with positive water stop projection at center of wall.

H. Prior to placement of reinforcing steel, apply form release agent to formwork. Release agent shall be evenly applied and compatible with type form being used.

I. Construct bulkheads with shear keys at separation of pours.

J. Shear key width shall be 1/3 of the wall or slab thickness.

K. Removal of formwork shall take place only after concrete has developed sufficient strength to support itself and resist damage during removal.

L. Forms used below grade shall be removed prior to backfill.

10.02 Steel Reinforcement

A. Shop fabricate reinforcement to shape and dimensions as indicated on drawings.

B. Use no bars or wire mesh with kinks or bends not shown on the drawings.

C. Secure reinforcement in forms in accordance with the drawings, ACI 315, ACI 318 and CRSI "Recommended Practice for Placing Reinforcing Bars".

D. Steel reinforcement shall set atop concrete bricks and/or be spaced using steel highchairs. When highchairs are used as a form spacer, the highchair feet shall be plastic dipped.

E. Concrete coverage over reinforcing shall be as follows.

1. Concrete cast against earth..... 3 inches.
2. Formed concrete exposed to earth or weather..... 2 inches.
3. Slabs and walls exposed to wet conditions ..... 2 inches.
4 Interior slabs and walls ..... ¾ inch.

F. Splice reinforcement a minimum of 48 times (x) bar diameter. Mechanical splices shall be prohibited.

G. Steel reinforcement, at the time cement is placed, shall be free of dirt, rust and debris. Reinforcement with flaking rust shall not be used.

H. Conduits and pipes shall have same concrete coverage as reinforcing steel.

I. Tie wire shall be used to secure reinforcing.

J. Joints in wire mesh shall be lapped one wire spacing plus 2 inches. Wire mesh shall have one (1) inch of concrete cover at forms.

10.03 Placement

A. Place concrete in accordance with ACI 301-89, Chapter 8.

B. Place no concrete until all embedded items and reinforcement have been placed in accordance with the plans.

C. A LGWSD Inspector shall approve formwork layout and placement of steel reinforcement prior to placing concrete. Provide 24-hour notice prior to placing concrete.

D. Concrete shall not be placed on loose, saturated or frozen soil.

E. Concrete shall not be placed in water unless approved by the LGWSD Manager.

F. Concrete shall be placed only when ambient temperature is at 40° F and rising or place concrete in accordance with ACI 306-R88.

G. During hot weather (>80°F), place concrete in accordance with ACI 305-R89.

H. Saw control joints as soon as concrete can be traveled by foot without leaving impressions. Saw joint depth shall be ¼ of the slab depth.

I. Consolidate all placed concrete with vibrator of suitable vibrations per minute.

J. Do not pull or push concrete with vibrator.

K. Do not drop concrete more than four (4) vertical feet.

10.04 Finishing

A. Screed floor slabs or tops of walls by use of straight edge or screed board.

B. Concrete shall be finished as follows.

1. Interior slab to receive setting bed..... float finish.
2. Interior slab exposed ..... trowel finish.
3. Exterior slab exposed ..... broom finish.
4. Exterior wall/column exposed ..... rubbed finish.
5. Unexposed concrete..... form finish.

10.05 Curing

A. Prevent freshly placed concrete from premature drying and protect from excessive hot or cold temperatures.

B. Maintain freshly placed concrete, without drying, at a relatively constant temperature.

C. Begin curing after placement and finishing of concrete as soon as free water has disappeared from concrete surface.

D. Curing methods shall be by the continuous application of water or by applying a liquid membrane forming curing-sealing compound to the fresh concrete surface.

1. Curing by the continuous application of water shall occur for a period of not less than 72 hours.

2. After application of liquid membrane forming curing-sealing compound, maintain continuity of coating and recoat areas damaged during curing period. Curing period shall be not less than 72 hours.

E. Do not apply liquid curing sealing compound to concrete that is to be finished with a coating material such as paint, flooring material, etc.

DIVISION IV CONSTRUCTION STANDARDS

SECTION 11: ENVIRONMENTAL COATINGS

A. Priming, painting and special coating of all surfaces shall include but are not limited to the following.

1. Piping and appurtenances.
2. Supports.
3. Pumps.
4. Valves.
5. Equipment and appurtenances.
6. Concrete and masonry.
7. Structural and miscellaneous metals.

B. Priming, painting and special coating of all surfaces shall be in accordance with the coating manufacturer's recommendations.

C. A manufacture's representative of the approved coating system shall field approve all surface preparation and coating application when lining manholes and wet wells.